

Congestion Management Program

October 2015







ALAMEDA
County Transportation Commission

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Executive Summary

ES



California law requires urban areas to develop and biennially update a "congestion management program," or CMP—a plan that describes the strategies to assess and monitor the performance of the county's multimodal transportation system, address congestion and improve the performance of a multimodal system, and strengthen the integration of transportation and land use planning. In Alameda County, the Alameda County Transportation Commission (Alameda CTC) as the Congestion Management Agency (CMA) for Alameda County prepares the CMP. Alameda CTC works cooperatively with the Metropolitan Transportation Commission (MTC), transit agencies, local governments, the California Department of Transportation (Caltrans), and the Bay Area Air Quality Management District (BAAQMD) to manage and update the CMP.

The CMP for Alameda County incorporates various strategies and measures to improve congestion management on the Alameda County multimodal transportation system. The CMP is required to incorporate five key elements: designated CMP roadway network, level of service monitoring, multimodal performance element, land use analysis program, and capital improvement program. The CMP also acts as a short-range plan to implement the long-range Countywide Transportation Plan.

The CMP law places considerable authority with the CMAs for the CMP. Appendix A contains the full text of the pertinent sections of state law. For example, these agencies are required to oversee how local governments meet the requirements of the CMP. The legislation also forges a new relationship between local governments and the California Department of Transportation (Caltrans) by requiring new highway projects in urban areas to be included in a CMP if they will be part of the State Transportation Improvement Program (STIP). This means that funding of highway projects is, in part, controlled by local government in the form of the CMAs. With this authority comes the responsibility to recognize federal and state funding limitations and to work with Caltrans and MTC to formulate cost-effective projects.

The CMP is designed to meet legal requirements and address the challenges in doing so. Furthermore, Alameda CTC has developed working relationships with all levels of government as well as the private sector and is prepared to demonstrate that local governmental agencies—working together—can solve regional transportation problems.

Since the CMP legislation was approved in 1991, and the CMAs came into existence, no substantive changes have been made to the legislative requirements of the

program to bring it in line with the changes occurring at every front–technological, behavioral, environmental, fiscal, etc. At least three legislative efforts are underway to address these changes. Senate Bill 743 and Assembly Bills 1098 and 779 are proposing to make modifications to either all or part of the Congestion Management Program.

SB 743 was signed into law in 2013, and will modify the metric used to measure the land development impacts on the transportation system in the California Environmental Quality Act (CEQA) process from a delay-based metric such as level of service to another metric such as vehicle miles traveled. Alameda CTC has been actively participating in this process by leading the Bay Area Working Group and by working with the governor's Office of Planning and Research, which is tasked with identifying the alternative metric and updating the CEQA guidelines on transportation impact assessment.

AB 1098 and AB 779 are two-year bills that aim to fully revise the complete CMP legislation and, therefore, revamp the program scope to be more current and in line with protecting the environment, particularly greenhouse gas (GHG) reduction. In this regard, Alameda CTC is actively working with the other CMAs in the region and regional partners to be proactive and inform the development of the bills, so that the resulting CMP is more meaningful and supports environmental goals at all levels of government. Based on the outcome of the legislative changes, Alameda CTC's CMP will be modified to align with the new legislative requirements while continuing to be a forward-looking program.

Until SB 743 is implemented or AB 1098 or AB 779 passes, any major update to the CMP or one of the five required elements will not be productive. Therefore, assuming that one of these actions will occur prior to the next CMP update in 2017, Alameda CTC only made focused changes during this update to report on the work performed and progress made in implementing the CMP elements as shown in Figure ES1.

Figure ES1—CMP and Five Main Elements

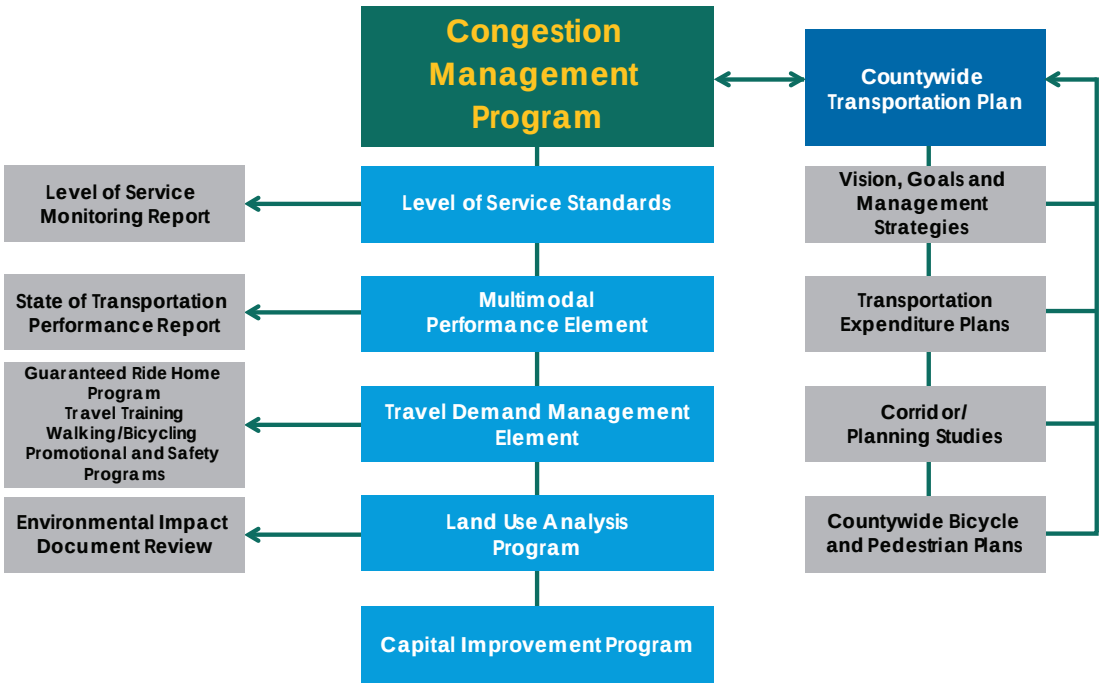


Table ES1—2015 CMP Update Actions Summary

Chapter	Technical Review, Evaluation, and Findings
2, Designated CMP Roadway Network	Updated to indicate that Alameda CTC will review the criteria for inclusion of roadways to the CMP network and will apply the updated criteria to identify potential new CMP routes in conjunction with the outcome of the three countywide modal plans: the Countywide Multimodal Arterial Plan, Countywide Transit Plan, and Countywide Goods Movement Plan.
3, Level of Service Standards	Incorporated the results of the 2014 LOS Monitoring Study of the CMP network that used a commercial speed data source.
4, Multimodal Performance Element	Incorporated a streamlined and consolidated list of performance measures based on a comprehensive review of performance measures used in various Alameda CTC monitoring activities. Included information that the annual update to the 2014 Performance Report is complete and available on the Alameda CTC website.
5, Travel Demand Management Element	Updated to include launching of the "Commute Choices" website that inventories and provides guidance on a range of travel demand management (TDM) programs available in Alameda County to employers, employees, residents, and other agencies and organizations. Reported on the continued implementation of the Guaranteed Ride Home Program.
6, Land Use Analysis Program	Updated information on development of a new database of countywide land use approvals and tracking of local jurisdiction Housing Element progress. Starting in 2014, local jurisdictions were required to submit information on development approvals that occurred in the prior fiscal year, and Alameda CTC began developing a countywide land use approvals database. Jurisdictions must also provide a copy of the most recent Housing Element Annual Progress Report submitted to the State Department of Housing and Community Development. As part of the ongoing land use impact analyses, incorporated ways to support in-fill development by offering alternative tri-generation methodologies. Updated the chapter to include that projects or studies underway related to implementing complete streets policies in Central County and parking management in North County. Incorporated the *Alameda County Priority Development Area Investment and Growth Strategy* update in May 2015.
7, Database and Travel Demand Model	Included information on the updated countywide model completed in August 2014 that incorporates *Plan Bay Area* assumptions.
8, Capital Improvement Program	Updated to incorporate Alameda CTC's new Comprehensive Investment Program (CIP) that serves as Alameda CTC's CMP Capital Improvement Program. The CIP focuses on project/program delivery over a five-year programming window with a two-year allocation plan.
9, Program Conformance and Monitoring	Implemented the existing requirements and new requirements identified in the 2013 CMP.
10, Deficiency Plans	Updated to reflect that Alameda CTC continued following updated deficiency plan guidelines for developing areawide deficiency plans, when appropriate, and no new deficiency plans were identified as a result of the of the 2014 LOS monitoring program.

The 2015 CMP update incorporates several actions identified as next steps in the 2013 CMP and closely aligns the CMP with the 2012 Countywide Transportation Plan (CTP) and the 2013 Regional Transportation Plan and Sustainable Communities Strategy *(Plan Bay Area)*, which are currently being updated, and other related efforts and legislative requirements (e.g., Assembly Bill 32 and Senate Bill 375) to better integrate transportation and land use for achieving GHG reductions.

Following the adoption of the 2015 CMP by the Alameda CTC Commission, Alameda CTC will submit the CMP to MTC. As the regional transportation planning agency in the San Francisco Bay Area, MTC is required to evaluate the CMP's consistency with MTC's RTP and with the CMPs of the other counties in the Bay Area. If the Alameda County CMP is found to be consistent with the RTP, MTC will incorporate the projects listed in the CMP's Capital Improvement Program into MTC's Regional Transportation Improvement Program.

The Transportation System

Alameda CTC must define and identify components of the transportation system that is being monitored and improved. For the purposes of the CMP, two different systems are used: the designated CMP roadway network (Chapter 2, "Designated CMP Roadway Network") and the broader Metropolitan Transportation System (MTS). The CMP roadway network is a subset of the MTS. Alameda CTC monitors performance in the CMP roadway network in relation to established level of service standards. Alameda CTC also uses the MTS in the Land Use Analysis Program (Chapter 6).

Designated CMP Roadway Network

The designated CMP roadway network was developed in 1991 and includes state highways and principal arterials that meet all minimum criteria (carry 30,000 vehicles per day; have four or more lanes; are a major cross-town connector; and connect at both ends to another CMP route or major activity center). The system of roadways carries at least 70 percent of the vehicle miles traveled countywide and contains 232 miles of roadways. Of this total, 134 miles (58 percent) are interstate freeways, 71 miles (31 percent) are state highways (conventional highways), and 27 miles (11 percent) are city/county arterials.

Recognizing the need to expand the CMP network to reflect the changes in land use patterns over the years, the Alameda CTC Commission in 2011 adopted a two-tier approach for the CMP network in Alameda County. The first tier (Tier 1) is the existing CMP network, and the second tier (Tier 2) consists of an expanded number of roadways identified using a set of adopted criteria. This Tier 2 network forms a supplemental network monitored for informational purposes only and is not used in the conformity findings process. The identified Tier 2 network roadways have a total length of 90 miles. Details are included in Chapter 2, "Designated CMP Roadway Network."

No new CMP roadways were proposed by the local jurisdictions during this 2015 update. For the 2017 CMP update, Alameda CTC will review and update the CMP roadway criteria including identifying ways to expand the CMP network to include key rural roadways that facilitate agricultural operations and tourism and support priority conservation area goals and objectives in Alameda County, in conjunction with the outcome of the three countywide modal plans: the Countywide Multimodal Arterial Plan, Countywide Transit Plan, and Countywide Goods Movement Plan. Alameda CTC will apply the updated criteria to identify potential new CMP routes in the 2017 update.

MTS System

A regionally designated system, MTS includes the entire CMP network, as well as major arterials, transit services, rail, maritime ports, airports, and transfer hubs critical to the region's movement of people and freight. MTS roadways were originally developed in 1991 and updated in 2005 and include roadways recognized as "regionally significant" and all interstate highways, state routes, and portions of the street

and road system operated and maintained by local jurisdictions.

LOS Monitoring

State law requires that level of service standards be established to monitor the CMP roadway network's LOS as part of the CMP monitoring process. The legislation leaves the choice of LOS measurement methodology to the CMAs, but mandates that the LOS be measured by the most recent version of the Transportation Research Board's Highway Capacity Manual (HCM) or a uniform methodology adopted by the CMA, in the case of Alameda CTC, that is consistent with the HCM. LOS definitions describe traffic conditions in terms of speed and travel time, volume and capacity, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is represented by letter designations, ranging from A to F. LOS A represents the best operating conditions, and LOS F represents the worst.

The purpose of these standards is to provide a quantitative tool to analyze the effects of land use changes and to monitor congestion, which is a measure of system performance. Alameda CTC is required to determine how well local governments meet the standards in the CMP, including how well they meet LOS standards. The CMP legislation requires a standard of LOS E for all CMP Tier 1 roadways in Alameda County.

Alameda CTC uses LOS standards as defined in the 1985 Highway Capacity Manual (HCM1985), the nationally accepted guidelines published by the Transportation Research Board, and re-evaluated its applicability in 2005 for roadway LOS monitoring purposes and again in 2013 for roadway and alternative modes purposes. The review conducted in 2013 showed that using the 2000 and 2010 HCM versions for roadway LOS monitoring purposes would result in applying density-based rather than speed-based LOS methodology for freeways and changed speed classifications for arterials, which would hinder the ability to compare past performance trends important for determining conformity with the CMP.

Based on this review, Alameda CTC continues to use the speed-based LOS methodology in the HCM1985 to monitor freeways and existing roadway classifications for arterials for the Tier 1 roadway network, which is subject to the conformity process. For the Tier 2 network, since it has been only monitored for informational purposes since 2012 and is not comparable to any previous performance data, LOS has been reported using the methodologies in both the HCM1985 and HCM2000 in the 2014 LOS Monitoring Study. Future use of appropriate HCM for Tier 2 purposes in the 2017 CMP update will be revaluated after completion of the countywide modal plans.

The evaluation of HCM2010 for the 2013 CMP update also reviewed its applicability for monitoring service level standards for alternative modes by using multi-modal level of service (MMLOS). It was found that using the 2010 HCM-based MMLOS is data and resource intensive and costly for large-scale applications such as monitoring countywide performance of the alternative modes; therefore, it is not well designed for annual LOS monitoring purposes. Alameda CTC will assess how to best include the performance measurement metrics for monitoring alternative modal performance in the 2017 CMP update, based on the outcomes of the countywide modal plans.

A summary of the evaluation and comparison of using 1985, 2000, and 2010 HCMs for LOS monitoring purposes, including a comparison of approaches adopted by various large CMAs in the Bay Area, is provided as Appendix B.

Alameda CTC conducts a LOS monitoring study every two years. The last study was conducted in spring 2014, and the next one will be in 2016. The 2015 CMP incorporates the results of 2014 LOS monitoring, which included the use of commercially available speed data.

Multimodal Performance Element

The CMP must contain performance measures that evaluate how highways and roads function, as well as the frequency, routing, and coordination of transit services. The performance measures should support mobility, air quality, land use, and economic objectives and be used in various components of the CMP. The legislation intends for the performance element to include multimodal performance measures, in addition to the required roadway and transit measures. However, only the roadway LOS standards will be used to trigger the need for a deficiency plan in Alameda County.

Combined with LOS standards, the multimodal performance element provides a basis for evaluating whether the transportation system is achieving the broad mobility and congestion management goals in the CMP. These include developing the Capital Improvement Program, analyzing land use impacts, and preparing deficiency plans to address problems. These performance measures help comprehensively evaluate the performance of the countywide multimodal transportation system and include the goals and performance measures adopted for the 2012 Countywide Transportation Plan. The measures are organized into the following categories (refer to Chapter 4, "Multimodal Performance Element" for a more comprehensive table listing the performance measures and related goals):

- Multimodal Accessibility and Transportation/ Land Use Integration
- Roadway
- Transit
- Bicycle
- Pedestrian
- Goods Movement
- Environment, Equity, and Health

Using these measures, Alameda CTC prepares an annual transportation system Performance Report, which local agencies and transit operators review prior to publication. To minimize cost, Alameda CTC relies on established data-collection processes and regularly published reports for data. A list of established data collection resources, by agency, follows in Table ES2.

Local agencies are encouraged to provide data to MTC or to maintain their own database of maintenance needs on the MTS. However, there is no compliance requirement for local agencies or transit operators related to the multimodal performance element.

The most recent performance report, the 2014 Performance Report for fiscal year 2013-14, is available on the Alameda CTC website.

Based on the comprehensive review of the Performance Report and performance measures used in various monitoring activities, as part of the 2015 CMP update, Alameda CTC developed a consolidated list of performance measures and the respective documents where they are tracked. As part of the 2017 CMP update, Alameda CTC will identify multimodal performance measures that can be periodically monitored, particularly identifying the documents and timelines for reporting on those measures. The re-evaluation will ensure that the timeline for reporting on different measures realistically aligns with data availability and potential changes in the measures.

Table ES2—Agency Data Collection Resources

Agency	Resources
Alameda CTC	• Roadway Speeds on CMP Roads, Except Freeways • Travel Times for origin-destination (O-D) pairs • Countywide Bicycle and Pedestrian Plans • Countywide Travel Demand Model analysis for mode share, activity center accessibility, etc.
Caltrans	• Freeway speed runs, duration of freeway congestion (if developed by Caltrans) • Accident rates on state freeways • Roadway miles in need of rehabilitation
Cities and County	• Pavement Management System data for the MTS • Countywide Bicycle Plan (Cities and County Public Works Department, and Alameda CTC)
MTC	• Freeway speed runs and duration of freeway congestion (when performed by MTC) • Pavement Management System Data for the MTS
Transit Agencies	• Service schedules (on-time performance) • Transit ridership routing (percentage of major centers served within one-quarter mile of a transit stop) • Frequency (number of lines operating at each frequency level) • Service Coordination (number of transfer centers) • Average time between off-loads (BART) • Miles between mechanical road calls (AC Transit, LAVTA, and Union City Transit) • Mean time between service delays (BART and ACE) • Transit availability (frequency of transit and population within one-half mile of rail station or bus and ferry stops and terminals) • Transit capital needs and shortfall (for high-priority, Score 16 transit projects for Alameda County transit operators)

Travel Demand Management Element

Travel demand management (TDM) measures seek to reduce pressure on existing roadway and parking capacity by using various strategies that include incentives and disincentives to influence travel choice. They reduce peak-period vehicle trips and total vehicle miles traveled. Related benefits include reducing congestion and carbon emissions, improving public health, and increasing transportation choice. The most effective TDM programs include some form of financial incentive, either through pricing parking or subsidizing transit and other non-drive alone modes. TDM strategies tend be cost-effective ways of meeting regional goals. By making the most efficient possible use of the available system capacity, they complement the region's investments in transit systems and other alternatives to driving.

The Commission adopted a Countywide Comprehensive TDM Strategy in May 2013 that provides an inventory of the broad range of TDM programs and activities present in Alameda County and recommends a strategy for better integrating, supporting, and building on these existing efforts, including implementation of the regional commute benefit program and the Guaranteed Ride Home Program. These programs are designed to reduce the need for new highway facilities over the long term and to make the most efficient use of existing facilities. The TDM element also incorporates strategies to integrate air quality planning requirements with transportation planning and programming. Funding generally comes from the Transportation Fund for Clean Air (from motor vehicle registration fees) and from the federal Surface Transportation Program and Congestion Mitigation and Air Quality Program. Alameda County's TDM element represents a fiscally realistic program that effectively complements the overall CMP.

A balanced TDM element requires actions that local jurisdictions, Alameda CTC, BAAQMD, Caltrans, MTC, and local transit agencies undertake. As required by state law, the Alameda County TDM program promotes alternative transportation methods (e.g., carpools, vanpools, transit, bicycles, park-and-ride lots), promotes improvements in the jobs-housing balance and SMART Growth, considers parking cash-out programs (paying employees who do not use parking), and promotes other strategies such as flextime and telecommuting.

The county's approach to TDM includes the following major actions:

- **Regional actions:** BAAQMD, Caltrans, and MTC take actions to support TDM throughout the San Francisco Bay Area. Alameda County's efforts work within the context of these broader regional initiatives.
- **Countywide actions:** Alameda CTC takes actions to encourage, supplement, and support local governments in their TDM efforts, including allocating funds for multimodal transportation improvements, providing guidance and technical assistance to localities in developing their own TDM programs, and monitoring compliance with the **Required Program** in the CMP. Alameda CTC also manages certain key TDM programs, such as Guaranteed Ride Home, that work most effectively at the countywide level. In 2015, Alameda CTC launched the "Commute Choices" website that inventories and provides guidance for a full range of TDM programs available to employers, residents, employees, and other organizations.
- **Local jurisdiction actions:** Local governments have primary responsibility for implementing TDM programs and encouraging and incentivizing TDM by private organizations. The CMP requires local governments to undertake certain TDM actions, known as the **Required Program**. The CMP also encourages local governments to undertake TDM efforts above and beyond these requirements.
- **Private TDM actions:** Private employers, developers, homeowner associations, and nonprofit organizations can undertake TDM measures on a voluntary basis or as required by a city. Alameda CTC provides resources to support these actions,

including guidance on best practices and other technical resources.

Chapter 5, "Travel Demand Management Element" includes a variety of tools available to local governments for facilitating TDM. To be found in conformance with this element of the CMP, local jurisdictions must adopt and implement the **Required Program** by September 1 of each year.

Land Use Analysis Program

The CMP incorporates a program to analyze the impacts of land use decisions made by local jurisdictions on the regional transportation systems (MTS), including estimating costs associated with mitigating those impacts. The intent of this legislatively required component of the CMP is to:

- Coordinate local land use and regional transportation facility decisions;
- Assess the impacts of development in one community on another community; and
- Promote information sharing between local governments when the decisions made by one jurisdiction will impact another.

While the Alameda CTC's land use analysis program was initially developed as a program to meet the CMP legislative mandate, the growing focus at all levels of governments on improved coordination between land use and transportation planning has resulted in the program's evolution. In this context, the Alameda CTC's Land Use Analysis Program (Chapter 6) currently includes:

- Legislatively required review of:
  - Land use actions of local jurisdictions by Alameda CTC to ensure that impacts on the regional transportation system are disclosed and mitigation measures identified; and
  - Long-range land use projections by local jurisdictions for use in the countywide model database.
- Planning initiatives and programs that foster transportation and land use connections; and
- Strategic monitoring of transportation-land use coordination performance measures.

Although land use remains the purview of local governments, Alameda CTC can apply sanctions if local agencies do not conform to the requirements of the CMP. Local jurisdictions have the following responsibilities under the Alameda CTC Land Use Analysis Program element of the CMP:

- Throughout the year:
  - Forward to Alameda CTC all Notices of Preparation, Draft and Final Environmental Impact Reports and Environmental Impact Statements, and final dispositions of General Plan amendment and development requests.
  - Analyze large development projects according to the adopted guidelines, including the use of the Alameda Countywide Travel Demand Model or an approved subarea model and disclosure of impacts to the MTS, if Alameda CTC determines the project exceeds the threshold for which CMP review is required.
  - Work with Alameda CTC on the mitigation of development impacts on the regional transportation system.
- By October 1 of each year as part of the annual conformity process:
  - Demonstrate to Alameda CTC that the Land Use Analysis Program is being carried out.
  - Provide the Alameda CTC with 1) a list of land use development projects approved during the previous fiscal year; and 2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development. Starting in 2014, Alameda CTC has used this information to develop a database of land use approvals for enhanced monitoring of transportation-land use coordination and planning.

- During travel model updates:
  - Provide an update (prepared by the jurisdiction's planning department) of the anticipated land use changes likely to occur using the most recent Association of Bay Area Government forecast for a near-term and long-term horizon year. This land use information should be provided in a format that is compatible with the countywide travel model.

The 2013 CMP update included expanded discussion of the Alameda CTC's activities to fulfill the legislative requirements of Senate Bill 375 and Assembly Bill 32 to better integrate transportation and land use and to reduce greenhouse gas emissions by curtailing vehicle miles traveled. The following enhancements were made to the Land Use Analysis Program to meet these objectives:

- Incorporated the recommendations of the *Alameda County Priority Development Investment and Growth Strategy* as required by MTC and adopted by the Commission in March 2013 and in May 2015 as updated;
- Modified the agency's guidelines for environmental review consistent with prior CMP action items.
  - HCM2010: Alameda CTC performed an assessment of the HCM2010 including its MMLOS methodologies for use in the Land Use Analysis Program similar to the evaluation effort for the LOS monitoring element. Based on this assessment, the following changes were made:
    - Encouraged use of HCM2010 to study auto impacts on roadways but provide flexibility to conform to local requirements as needed.
    - Encouraged study of multimodal trade-offs of mitigation measures proposed in environmental documents, including use of HCM2010 MMLOS to perform the analysis.
    - Expanded and clarified language as to the types of impacts to transit, bicyclists, and pedestrians that project sponsors should consider.
  - In-fill development trip generation: Alameda CTC performed an assessment of alternative project trip generation methodologies that more accurately account for the nature of trip generation in areas such as PDAs or infill sites; based on this assessment, Alameda CTC proposed three alternative methods for project sponsors to use for CMP land use analysis and developed guidelines for adjusting trip generation:
    - EPA's Mixed Use Development (MXD) model
    - Caltrans/UC Davis Smart Growth Trip Generation rates
    - MTC's Station Area Residents Study (STARS) mode share adjustment method

Many action items identified in the 2013 CMP update for a further enhanced land use analysis program are still valid and continue to be carried forward, so that based on the resource availability and coordination with other efforts of Alameda CTC, they can be implemented. Several of these action items will depend on the implications of forthcoming CMP legislation updates. Alameda CTC will modify the Land Use Analysis Program when legislative actions are finalized.

Database and Travel Demand Model

Alameda CTC has developed a uniform land use database for use in the countywide travel model. The database and travel demand model bring to the congestion management decision-making process a uniform technical basis for analysis. This includes consideration of the benefits of transit service and TDM programs, as well as projects that improve congestion on the CMP network. The model is also intended to assist local agencies in assessing the impacts of new development on the transportation system.

Table ES3—Alameda County Planning Areas

Planning Area	Cities
North Planning Area	Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont
Central Planning Area	Hayward, San Leandro, and the unincorporated areas of Castro Valley, Ashland, and San Lorenzo
South Planning Area	Fremont, Newark, and Union City
East Planning Area	Dublin, Livermore, Pleasanton, and the unincorporated areas of East County

The most recent update to the model was completed in August 2014. It incorporates land use assumptions based on the Sustainable Communities Strategy and RTP, *Plan Bay Area*, adopted in 2013. Projections of socioeconomic variables were incorporated from these sources for the traffic analysis zones defined for Alameda County. By aggregating the projections made for each zone, Alameda CTC produced projections of socioeconomic characteristics for unincorporated areas of the county, the 14 cities, and for the four planning areas. The updated model also incorporated 2010 US Census data along with updates to the model base year from 2000 to 2010, to correspond with the 2010 US Census and to change the long-term forecast year from 2035 to 2040, along with updates to other related features of the model (see Chapter 7, "Database and Travel Demand Model" for details).

Capital Improvement Program

The Capital Improvement Program reflects Alameda CTC's efforts to maintain or improve the performance of the multimodal transportation system for the movement of people and goods and to mitigate regional transportation impacts identified through the Land Use Analysis Program.

Per federal requirements, Alameda CTC considers various multimodal methods to improve the existing system, such as traffic operations systems, arterial signal timing, parking management, transit transfer coordination, and transit marketing programs.

Projects selected for the Capital Improvement Program also are consistent with the assumptions, goals, policies, actions, and projects identified in *Plan Bay Area*, MTC's and ABAG's basic statement of Bay Area transportation and land use policy.

In 2013, Alameda CTC adopted a Strategic Planning and Programming Policy that consolidates existing planning and programming processes to improve the efficiency and effectiveness of future policy decisions on transportation investments. This policy resulted in the Comprehensive Investment Plan (CIP) that the Commission adopted in June 2015. The CIP translates long-range plans into a short-range investment strategy by establishing a list of near-term priority improvements to enhance and maintain Alameda County's transportation system.

Alameda CTC's CIP serves three purposes:

- **Translates long-range plans into short-range implementation** by focusing on project/program delivery over a five-year programming window with a two-year allocation plan.
- **Serves as Alameda CTC's strategic plan** for voter-approved transportation funding (such as the 1986 Measure B, the 2000 Measure B, 2010 Vehicle Registration Fee, and the 2014 Measure BB) as required by the respective legislation for each funding program.
- **Establishes a comprehensive and consolidated programming and allocation plan** that integrates all fund sources into one programming document

that ensures coordinated programming and allocation of funds to maximize the effectiveness of transportation investments.

Alameda CTC will update annually the expenditure and revenue assumptions included in the CIP, which will serve as the basis of Alameda CTC's financial models and annual budget. The annual updates will also serve to satisfy any annual strategic plan requirements for the fund sources that Alameda CTC administers. The annual updates will afford Alameda CTC the opportunity to review the first year and confirm the allocations for the second year of the two-year allocation plan. The annual update process will include a status update on the first year and any recommended adjustments or amendments for the second year.

A full update of the CIP will occur every two years, including a comprehensive review of the remaining three years of the five-year CIP horizon and the addition of two new years of programming for a five-year programming window. The full update will involve notifying project sponsors of the enrollment period for adding new projects and programs to the CIP, and the subsequent review and approval of project and program submittals to be included in the updated CIP.

Alameda CTC will continue its coordination of long-range planning documents with short-range implementation via the CIP through the 2017 update. The first CIP (FY2015-16 through FY2019-20) was adopted by Alameda CTC in June 2015. In June 2017, the CIP will receive a full update that includes revenue projections and project/program allocations for FY2017-18 through FY2021-22.

Program Conformance and Monitoring

Alameda CTC is responsible for ensuring local government conformance with the CMP and annually monitors the implementation of four elements: LOS standards on CMP network, travel demand management including implementation of the **Required Program**, land use analysis program, and capital improvement program. Alameda CTC ensures local agencies are in conformance with CMP requirements for these elements.

To assist local jurisdictions, Alameda CTC provides LOS standards resources (Chapter 3, "Level of Service Standards"); travel demand management resources and countywide programs to facilitate implementation of the **Required Program** (Chapter 5, "Travel Demand Management Element"); and a database and Countywide Travel Demand Model (Chapter 7, "Database and Travel Demand Model"). Alameda CTC has also developed a Land Use Analysis Program for implementation by local agencies. This program analyzes the impacts and determines mitigation costs of land use decisions on the regional transportation system (see Chapter 6, "Land Use Analysis Program"). Local jurisdictions remain responsible for approving, disallowing, or altering projects and land use decisions. The program must be able to determine land development impacts on the MTS and formulate appropriate mitigation measures commensurate with the magnitude of the expected impacts.

In addition, Alameda CTC is required to prepare and biennially update a Capital Improvement Program (see Chapter 8, "Capital Improvement Program") aimed at maintaining or improving transportation service levels. Each city, the county, transit operators, and Caltrans provide input to these biennial updates.

As part of Alameda CTC's annual monitoring, if it finds a local jurisdiction in non-conformance with the CMP, it will notify the local jurisdiction, which then has 90 days to remedy the area(s) of non-conformance. If the local jurisdiction fails to provide a remedy within the stipulated time, it may lose local, state, and/or federal funding (see Chapter 9, "Program Conformance and Monitoring" for more information).

The 2017 CMP will incorporate any changes in conformity requirements based on the completion of the three countywide plans (Multimodal Arterial Plan,

Transit Plan, and Goods Movement Plan) and any legislative actions/decisions that reform the CMP.

Deficiency Plans

CMP legislation requires preparation of deficiency plans when a CMP roadway segment does not meet the adopted level of service standard, which is LOS E for Alameda County CMP roadways. Local jurisdictions must develop a deficiency plan to achieve the adopted LOS standards at the deficient segment or intersection, or to improve the LOS and contribute to significant air-quality improvements. The two types of deficiency plans include Localized Deficiency Plans and Areawide Deficiency Plans, which address transportation impacts to more than one CMP roadway and including alternative modes in a large geographic area. To provide support to local jurisdictions in terms of meeting any potential deficiency plan requirements, Alameda CTC updated the deficiency plan guidelines to include more details and procedures for developing Areawide Deficiency Plans (included as Appendix D) as part of the 2013 CMP update.

Responsibilities for Deficiency Plans

Local governments are responsible for preparing and adopting deficiency plans; however, they need to consult with Alameda CTC, BAAQMD, Caltrans, and local transit providers regarding the deficient roadway segment, and coordinate with more than one jurisdiction to develop multijurisdictional deficiency plans. Local public-interest groups and members of the private sector may also have an interest in developing deficiency plans.

During the process of developing a deficiency plan, a local agency needs to consider whether it is possible to make physical improvements to the deficient segment or if an areawide deficiency plan needs to be prepared. In developing the deficiency plan, the local agency must consider and describe both local and system alternatives. Local governments and Alameda CTC must consider the impact of the proposed deficiency plan on the CMP system. The local agency must also provide an action plan to implement the chosen alternative. The selection of either alternative is subject to approval by Alameda CTC, which must find the action plan in the interest of the public's health, safety, and welfare. In 2011, Alameda CTC adopted a policy to consider providing funding priority to projects that would improve the performance of deficient segments.

Conclusions and Future Considerations

The CMP has several interrelated elements intended to foster better coordination among decisions about land development, transportation, and air quality. Several conclusions can be reached about the CMP relative to the requirements of law and its purpose and intent (Chapter 11, "Conclusions and Future Considerations"). As mentioned previously, legislative efforts underway will reform the CMP and realign it with the current trends in all fronts. While Alameda CTC will be an active participant to inform the process to the best extent possible, once legislation is acted on, Alameda CTC's CMP will be modified to align with the requirements and will continue to be a forward-looking program.

Currently, the updated CMP:

- Contributes to maintaining or improving multimodal transportation service levels;
- Conforms to MTC's criteria for consistency with *Plan Bay Area*;
- Provides a travel model with specifications and output consistent with MTC's regional model;
- Is consistent with BAAQMD's Clean Air Plan Transportation Control Measures;
- Specifies a method for estimating roadway LOS that is consistent with state law and expanding options to assess LOS for alternative modes;
- Identifies candidate projects for the STIP and federal Transportation Improvement Program;

- Has been developed in cooperation with the cities, the County of Alameda, transit operators, the BAAQMD, MTC, adjacent counties, Caltrans, and other interested parties;
- Provides a forward-looking approach to deal with the transportation impacts of local land use decisions; and
- Considers the benefit of greenhouse gas reductions in developing the CIP.

A few long-standing issues identified during prior CMP updates need further action by Alameda CTC and will be re-evaluated during the 2017 CMP update:

- Lack of funding to support the CMP, including adequate capital resources and Alameda CTC/ local government funding;
- Limited ability of Alameda CTC to influence transportation investments when most transportation funding programs are beyond the purview of the CMP legislation; and
- Scope of the CMP network and lack of incentive to local jurisdictions to add new roadways.

Program Overview

1



California law requires urban areas to develop and biennially update a "congestion management program," or CMP—a plan that describes the strategies to assess and monitor the performance of the county's multimodal transportation system, address congestion and improve the performance of a multimodal system, and strengthen the integration of transportation and land use planning. As the congestion management agency (CMA) for Alameda County, the Alameda County Transportation Commission (Alameda CTC) prepares the CMP. Alameda CTC works cooperatively with the Metropolitan Transportation Commission (MTC), transit agencies, local governments, the California Department of Transportation (Caltrans), and the Bay Area Air Quality Management District (BAAQMD) to manage and update the CMP.

Alameda CTC, a joint powers authority (JPA) and countywide transportation agency, is a result of the July 2010 merger of the Alameda County Congestion Management Agency and the Alameda County Transportation Improvement Authority.

Alameda County's Congestion Management Agency

Alameda CTC performs congestion management activities, coordinates countywide transportation planning, and attracts federal, state, and local funding for project and program implementation (see Appendix A for full CMP legislation). The oversight and update of the CMP is one of Alameda CTC's key roles.

In addition, as the sales tax authority for Alameda County, Alameda CTC delivers the Expenditure Plans for Measure B passed in 2000, the Vehicle Registration Fee (VRF) passed in 2010, and Measure BB passed in 2014 to fund a variety of transit, bicycle and pedestrian, highway and local roadway, and freight projects, as well as special transportation programs for seniors, youth, and people with disabilities.

Mission

Alameda CTC's mission is to plan, fund, and deliver transportation programs and projects that expand access and improve mobility to foster a vibrant and livable Alameda County. This broad spectrum of projects and programs enhances mobility and improves air quality throughout Alameda County by:

- Providing streamlined methods to deliver transportation services;
- Strengthening local jurisdictions' ability to compete for transportation funds;

- Giving Alameda County a stronger voice in state and regional transportation decisions;
- Coordinating planning and development across jurisdictional lines; and
- Generating and supporting legislation to coordinate local and regional policies on transportation investment.

Key Responsibilities

To help guide and improve Alameda County's transportation system, Alameda CTC's activities and key responsibilities can be viewed in three parts:

- Developing plans that guide transportation development and funding decisions, including the Congestion Management Program;
- Programming funds to agencies for transportation improvements; and
- Delivering the projects, programs, legislative actions, and policy efforts set forth in the planning and programming documents.

As the congestion management agency, Alameda CTC also has the following functions and responsibilities to:

- Coordinate transportation planning and funding programs within Alameda County and with contiguous counties;
- Coordinate countywide input to the:
  - California Clean Air Act and Transportation Control Measures of MTC and the BAAQMD;
  - MTC's Regional Transportation Improvement Program; and
  - California Transportation Commission State Transportation Improvement Program (STIP);
- Prepare, adopt, update, and administer federal funding programs for Alameda County including the Surface Transportation Program and the Congestion Mitigation and Air Quality Program;
- Levy and collect fees and charges, including administrative and operating costs; and
- Recommend projects for funding from the Alameda County share of the STIP, as specified in Senate Bill 45. The Commission also oversees project implementation to ensure that projects meet "timely use of funds" requirements and that no programmed funds are lost from Alameda County.

In addition, Alameda CTC acts as the program manager for the Transportation Fund for Clean Air (TFCA) in Alameda County. The TFCA program, which aims to reduce pollution by reducing the use of single-occupant vehicles, is funded through a $4 per-vehicle registration fee and is managed by the BAAQMD. The law requires BAAQMD to allocate 40 percent of the revenue to each county. Other functions could be added by amendments to the JPA or by actions of the state or federal government.

Governance

Under a joint powers agreement, elected officials from throughout Alameda County—representing each city in the county, the County of Alameda, AC Transit, and BART (San Francisco Bay Area Rapid Transit District)—govern Alameda CTC. The 22-member Commissionconsiders the interests of local constituents and helps to include all areas of the county in guiding how Alameda CTC plans, funds, and delivers projects and programs throughout Alameda County. The Commission's leadership from throughout the county ensures all residents are represented.

Advisory Committees

Alameda CTC relies on the guidance and direction of a number of advisory committees, including (see Appendix E for detail on the standing committees):

- Alameda County Technical Advisory Committee
- Bicycle and Pedestrian Advisory Committee
- Independent Watchdog Committee, formerly the Citizens Watchdog Committee
- Paratransit Advisory and Planning Committee

Alameda County Congestion Managment Program

The Alameda County CMP is a short-range plan that includes a variety of congestion management strategies, programs, and projects that meet the legislative requirements and intend to further improve the countywide transportation system to better meet the needs of all users. It also supports the long-range Countywide Transportation Plan (CTP) as an implementation tool and helps to move the programs and projects included in the CTP closer to reality. The CTP is supported by the Alameda County Transportation Expenditure Plans for Measure B, Measure BB, and Vehicle Registration Fee funding. The CTP is informed by the adopted Countywide Bicycle and Pedestrian Plans and three major modal plans underway: the Countywide Goods Movement Plan, Countywide Multimodal Arterial Plan, and Countywide Transit Plan.

Countywide Transportation Plan

Alameda CTC updated and adopted the Countywide Transportation Plan in June 2012, and is currently in the process of updating it. The updated CTP will be adopted in the summer of 2016. The plan is a long-range policy document that guides decisions and articulates the vision for the county's transportation system over typically a 25-30-year planning horizon. Through its funding allocation program, the 2012 CTP seeks to ensure that transportation investments—over a 28-year planning period—are efficient and productive, and that maintenance and management of the system remain high priorities.

Specifically, the CTP:

- Documents existing and future transportation conditions;
- Documents a vision for land use that houses the region's population across all income levels in accordance with the requirements of Senate Bill 375;
- Coordinates countywide input to MTC guidelines for county transportation plans pursuant to Government Code Section 66531;
- Coordinates countywide input to the Regional Transportation Plan and Sustainable Communities Strategy, known as *Plan Bay Area*;
- Addresses all modes of transportation from goods movement to bicycle and pedestrian priorities to transportation needs for seniors and people with disabilities;
- Provides a strategy to guide transportation improvements to address changes in the regulatory and financial environment;
- Lays the groundwork for an investment program tailored to the diverse needs of the county's residents, visitors, and workers; and
- Identifies projects and programs for implementation over the next 28 or more years.

Transportation Expenditure Plans

The sales tax expenditure plans (Measure B and Measure BB) are key sources of funding for multimodal transportation projects and programs in Alameda County. Measure B was approved by the voters in 2000, and a previous measure was approved in 1986. Of the total collected funds under Measure B, 60 percent are dedicated to programs such as local streets and roads repair, bicycle and pedestrian safety, and transit and paratransit operators, and 40 percent of collected funds are dedicated to capital projects including transit and highway improvements.

Measure BB was approved by voters in 2014 and renewed and increased the existing Measure B half-cent county transaction and use tax for transportation by an additional half cent for 30 years. Measure BB will contribute nearly $8 billion to transportation improvements throughout the county. Alameda CTC will distribute approximately 65 percent of the net sales tax revenues to essential programs in Alameda County through direct local distribution

funds and discretionary grant awards. The remaining transportation sales tax dollars (approximately 35 percent) are identified for specifically named projects as described in the 2014 Transportation Expenditure Plan (TEP) .

The TEP also serves as a mechanism to fund a portion of select projects and programs identified in the CTP. See Chapter 8 for detail on the percentage of funding for each direct local distribution program, for the discretionary programs, and fund distribution for capital projects, as well as information on the Comprehensive Investment Plan that brings long-range and countywide plans into the near term by focusing on investments over a five-year programming and allocation window.

Purpose of CMP

The primary purpose of the CMP is to set forth fundamental congestion management strategies for implementing the long-range CTP. The CMP addresses day-to-day congestion problems including:

- Setting level of service standards for roadways;
- Identifying multimodal performance measures to evaluate the performance of the countywide transportation system;
- Exploring ways to manage travel demand and identify TDM strategies for trip reduction and air quality improvement;
- Analyzing the impacts of land development on regional transportation system and implementing the Alameda County Priority Development Area Investment and Growth Strategy;
- Developing and maintaining a travel demand model to provide a technical basis for analysis and assess impact of local land development on the regional transportation system;
- Developing a Capital Improvement Program that helps improve and maintain the countywide multi-modal transportation system;
- Monitoring conformance of required CMP elements implementation by local agencies; and
- Identifying development of deficiency plans and monitoring their implementation by local governments to improve performance of non-conforming transportation systems.

While the CMP is designed to meet the requirements of the law, to ultimately reduce congestion and greenhouse gas emissions, and to improve the ability of people and goods to move on the countywide multimodal transportation system, it also serves as an opportunity for strategic thinking to better integrate land use and transportation through collaboration with various local, regional, and state agencies, and develop transportation strategies and plan for land development that efficiently uses the transportation system, while ensuring it meets the mobility and access needs of residents and workers in Alameda County.

Organization

The CMP is organized into twelve chapters, with supporting appendices:

- Executive Summary
- Chapter 1, Program Overview
- Chapter 2, Designated CMP Roadway Network
- Chapter 3, Level of Service Standards
- Chapter 4, Multimodal Performance Element
- Chapter 5, Travel Demand Management Element
- Chapter 6, Land Use Analysis Program
- Chapter 7, Database and Travel Demand Model
- Chapter 8, Capital Improvement Program
- Chapter 9, Program Conformance and Monitoring
- Chapter 10, “Deficiency Plans”
- Chapter 11, Conclusions and Future Considerations

Alameda CTC updates the CMP biennually, and the next update will occur in 2017.

Designated CMP Roadway Network

2



The primary objective of designating a CMP roadway network is to monitor performance in relation to established level-of-service (LOS) standards. If adopted standards are not maintained on a specific roadway in the designated system, actions must be taken to address problems, or deficiency plans must be developed to improve the overall LOS of the system and improve air quality. To effectively manage congestion on Alameda County's transportation system, Alameda CTC has identified the components of Alameda County's CMP-designated roadway network, considered the core transportation network for the county.

California law requires that, at a minimum, the designated roadway system include all state highways and principal arterials.[1] Highways or roadways designated as part of the system cannot be removed from the system. The statutes also refer to the regional transportation systems as part of the required Land Use Analysis Program.[2] In the 1991 Alameda County CMP, the roadway system designated in the CMP was presumed to be the highway/street component of the regional transportation system. This changed with the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). ISTEA required the Metropolitan Transportation Commission (MTC) to develop a Metropolitan Transportation System (MTS)[3] that included both transit and highways. When the MTS was developed in 1991, it included roadways recognized as "regionally significant" and included all interstate highways, state routes, and portions of the major street and road system operated and maintained by the local jurisdictions.

MTC coordinated with the congestion management agencies (CMAs) in the Bay Area to develop the MTS and to use the CMPs to link land-use decisions to the MTS. The 1993 Alameda County CMP made a distinction between the CMP network and the MTS:

- The CMP network is used to monitor conformance with the level of service (LOS) standards; and
- The MTS[4] is used for the Land Use Analysis Program.

MTC removed the reference to the MTS in its updated Countywide Transportation Plan guidelines adopted in September 2014. However, considering the regional

[1] California Government Code Section 65089(b)(1)(A).
[2] California Government Code Section 65089(b)(4).
[3] MTC prior to 2005
[4] In 2005, MTC updated the MTS to include Rural Major Collector streets and higher based on the Federal Functional Classification System. The updated MTS is used by MTC for the purposes of funding and programming as well as in estimating roadway maintenance needs. The updated MTS was reviewed by the Commission during the 2009 CMP Update to determine its usefulness and applicability to the Land Use Analysis Program. Based on this input and discussions with MTC, it was determined that the updated MTS was not appropriate for the Land Use Analysis Program because it was too detailed for planning purposes and the previous version of the MTS would continue to be used.

significance of the MTS, its use traditionally for the CMP Land Use Analysis Program to assess impacts of developments on the transportation system, and the implementation of Senate Bill 743 (Steinberg), which is expected in the next two years, these all would soon affect the method of impact assessment. The next update of the CMP in 2017 will look into the appropriateness and necessity of updates, if any, to both the MTS and CMP networks.

Relationship to Regional Transportation Plan

Given the statutory requirement that MTC must find the CMP consistent with the Regional Transportation Plan (RTP), the designated CMP network has become a subset of the MTS. This helps to ensure regional consistency among the various CMP-designated systems, particularly for facilities that cross county borders. Alameda CTC's long-range Countywide Transportation Plan is the primary vehicle for coordination with the MTS. Continued coordination will be necessary to ensure consistency between Alameda County's CMP network and the MTS.

Designated CMP Network

The Alameda County CMP roadway network was initially adopted in 1991 by the local CMA, based on CMP legislation. Since the adoption of the CMP network, land use and transportation patterns across the county have changed significantly; however, until 2011, the CMP network had very limited expansion with only the addition of Hegenberger Road between I-880 and Doolittle Drive near Oakland Airport in 2007.

Recognizing the need to expand the CMP network to reflect land use changes, the Alameda CTC Commission discussed various options in 2011 and adopted an expanded two-tier CMP network. The first tier (Tier 1) is the original adopted CMP network, and the second tier (Tier 2) consists of principal and major local arterials of countywide significance. This second tier network forms a supplemental network that Alameda CTC monitors for informational purposes only and is not used in the conformity findings process.



The characteristics of the CMP-designated network are as follows:

Tier 1

- When established in 1991, it carried 72 percent of the countywide vehicle miles traveled (VMT); and
- It contains 232 miles of roadways, of which 134 miles (58 percent) are interstate freeways, 71 miles (31 percent) are state highwys, and 27 miles (11 percent) are city/county arterials.

Tier 2

- All of the roadways are city/county arterials and of local or countywide significance, and
- It contains 90 miles of roadways.

Criteria for Identifying the CMP Network

The roadway system must be detailed enough to identify significant impacts, yet be manageable for administration. The advantage of designating a relatively detailed CMP roadway system is that it may be easier to establish a link between proposed development projects and their impact on the CMP network. However, too large a CMP network could become difficult and expensive to monitor. The following criteria attempt to strike this balance. Alameda CTC will periodically review the effectiveness of these criteria and the CMP network to determine if changes are warranted.

Tier 1 network criteria

The statutes require designation of all state highways and principal arterials as part of the CMP network but do not provide guidance for determining the principal arterials to include. After evaluating several possible methods, an approach was adopted in 1991 for the CMP that provided for the systematic selection of principal arterials to include in the CMP network. The selected approach, which met MTC's expectations for a "reasonable" CMP network designation method, relies on a concept central to the CMP legislation—identifying a system that carries a majority of the vehicle trips countywide.

Using the countywide travel model, an average daily traffic volume was identified that would produce a system of roadways carrying at least 70 percent of the vehicle miles traveled countywide. This approach yielded an average daily traffic of roughly 30,000 vehicles per day as a minimum threshold. Additional criteria were included to refine the definition as described below.

All state highways:

- Must have a minium threshold of 30,000 vehicles per day.
- Will be evaluated according to the principal arterial criteria, if a route is relocated or removed from the State Highway System, to determine whether it should remain in the CMP network.

Principal arterials must meet all four criteria:

- Must carry 30,000 vehicles per day (average daily traffic) for at least one mile;
- Must be a roadway with four or more lanes;
- Must be a major cross-town connector, traversing from one side of town to the opposite side; and
- Must connect at both ends to another CMP route, unless the route terminates at a major activity center.

Tier 2 network criteria

In 2011, the Commission added 90 miles of roadways (arterials and major collectors) to the CMP network as Tier 2 roadways based on a set of qualitative criteria as follows.

Roadways must meet at least two of the following three criteria to be added to the Tier 2 network. Roadways must be:

- Major thoroughfares, not on the existing CMP network, whose primary function is to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways;
- Routes of jurisdiction-wide significance not on the existing CMP network; and
- Streets that experience significant conflicts between auto traffic and transit/other modes.

Criteria Review

In the 1991 Alameda County CMP, the Countywide Travel Demand Model (Model) was used to identify an average daily traffic volume that would produce a system of roadways carrying at least 70 percent of the vehicle miles traveled countywide. This approach yielded the criteria used for the Tier 1 network.

During the 2011 CMP update, applying the aforementioned qualitative criteria resulted in the Tier 2 network. The Commission recommended that the criteria for adding roadways to the CMP network periodically be reviewed. Accordingly, Alameda CTC will review the criteria for adding roadways to Tiers 1 and 2 during every other CMP update year. In view of the anticipated legislative changes (SB 743) that would impact the CMP regarding the transportation impact analysis and the likely need to realign the monitoring element, the next criteria review will occur in 2017 rather than in 2015.

No new CMP roadways were proposed by the local jurisdictions during this 2015 update. For the 2017 CMP update, Alameda CTC will review and update the criteria for inclusion of roadways to the CMP network in conjunction with the outcome of the Countywide Multimodal Arterial Corridor Plan, the

Countywide Transit Plan, and the Countywide Goods Movement Plan, to expand the CMP network to include significant rural roadways in the county.

Adding Potential Roadways

To identify potential roadways to add to the Tier 1 or Tier 2 networks, the jurisdictions review their roadway systems for roadways that may meet the Tier 1 and Tier 2 network criteria. This will be performed following the CMP update period when criteria for adding roadways are reviewed. There were no new roadways proposed to be added in 2015. The next review for adding roadways to the CMP network will occur in 2017. At this time, addition of roadways to the CMP network is voluntary for the local jurisdictions, particularly for the Tier 1 network in view of the conformity requirements and related funding implications.

Regarding the Tier 1 network criteria, only the criteria for inclusion of principal arterials are applied for this purpose, as any changes or additions to the state highways or freeways are by default added to the Tier 1 network of the Designated Roadway System, as mandated by state law.

For potential roadways to be added to the Tier 1 network, each jurisdiction conducts 24-hour traffic counts from Tuesday through Thursday of a typical week. Traffic counts will be taken around the first week in April of the year when adding new roadways to the CMP network is reviewed. Based on the traffic counts, each jurisdiction must submit potential CMP-designated routes to Alameda CTC by end of June.

For potential roadways to be added to the Tier 2 network, interested jurisdictions or transit operators could propose a roadway if it meets the Tier 2 criteria. While the collected traffic counts will be used as one of the criteria for identifying Tier 1 network roadways, it is used only as supplemental information for Tier 2 network roadways.

Alameda CTC staff performs a review of the proposed roadway additions to the CMP network with reference to the adopted criteria for both Tiers 1 and 2 and submits a recommendation to the Commission for final approval. In reviewing the proposed addition of new roadways that may meet the Tier 1 or Tier 2 criteria, the previously mentioned general approach to defining the CMP network is also considered (i.e., the roadway system must be detailed enough to identify significant impacts, yet be manageable for administration, as too large a network is difficult to manage and expensive to monitor).

Changes to the CMP Network Since 1991

The following changes were made to the CMP network after its initial adoption in 1991.

Tier 1 network changes: In 2005 and 2007 the following network changes were made:

- In 2003, Caltrans realigned State Route 84 (SR 84) in Livermore from 1st Street to Isabel Avenue-Airway Boulevard. Consequently, the new alignment was added to the CMP network in 2005. The former SR 84 alignment along 1st Street in Livermore was evaluated to see whether it met the principal arterial criteria for retention on the CMP network. Based on the results of the analysis, the 2.2-mile segment between Inman Street and I-580 was retained on the CMP network.
- In 2007, the City of Oakland conducted 24-hour traffic counts on Hegenberger Road between I-880 and Doolittle Drive. The traffic counts collected and other characteristics of the roadway met all the principal arterial criteria for inclusion in the CMP network. Accordingly, a 1.7-mile segment of Hegenberger Road between I-880 and Doolittle Drive was added to the CMP network.

Addition of Tier 2 network: Based on the new criteria approved by the Commission in 2011 for the Tier 2 CMP network, 90 miles of roadways were added during the 2011 CMP update. Alameda CTC will monitor the Tier 2 network only for informational purposes, and it will not be subject to conformity requirements.

CMP Network Update Schedule

To be in conformance with the CMP, local jurisdictions must submit a list of potential CMP-designated routes based on 24-hour counts by spring 2017. Table 1 shows the schedule for review and update of designated routes on the CMP network.

Table 1—Schedule for Updating CMP-Designated System

Task	Who	When
Re-evaluate Criteria for Adding Roadways	ACTAC/Commission	November/December 2016
Identify Potential Routes	Jurisdictions	January 2017
Review Routes	ACTAC	February 2017
Collect Traffic Data	Jurisdictions	March/April 2017
Review Data	ACTAC	May 2017
Select CMP Designated Routes	ACTAC/Commission	June 2017
Incorporate Routes in 2017 CMP	ACTAC/Commission	July 2017

Note: Criteria for adding roadways will be reviewed in one CMP update and the adopted criteria will be applied to identify potential routes in the subsequent CMP update.



CMP Network Tier 1 Roadways

Table 2 lists the designated Tier 1 CMP network, including all state highways and principal arterials that satisfy the Tier 1 criteria.

During the 2011 CMP update, applying the aforementioned qualitative criteria resulted in the Tier 2 network. The Commission recommended that the criteria for adding roadways to the CMP network be reviewed periodically. Accordingly, Alameda CTC will review the criteria for adding roadways to Tiers 1 and 2 during every other CMP update year. The next review will be in 2017.

Table 2—CMP-Designated System, Tier 1 Roadway List

Table 2.1—Cities of Albany and Berkeley

Route	From	To	Criteria [5] [6]
SR-123 (San Pablo)	Contra Costa County line	Emeryville city limit	State Route
University Avenue	I-80	Milvia Street	Satisfies criteria
University Avenue	Milvia Street	Shattuck Avenue	Connectivity[7]
Shattuck Avenue	University Avenue	Haste Street	Connectivity
Shattuck Avenue	Haste Street	Derby Street	Satisfies criteria
Adeline Street	Derby Street	MLK Jr. Way	Satisfies criteria
MLK Jr. Way	Adeline Street	Oakland city limit	Satisfies criteria
SR-13 (Ashby Avenue)	I-80	Tunnel Road	State Route
SR-13 (Tunnel Road)	Ashby Avenue	Oakland city limit	State Route
I-80/I-580	University Avenue	Central	State Route

Table 2.2—City of Alameda

Route	From	To	Criteria
SR-61 (Doolittle Drive)	Oakland city limit	Fernside Boulevard	State Route
SR-61 (Otis Drive)	Fernside Boulevard	SR-61 (Broadway)	State Route
SR-61 (Broadway)	Otis Drive	SR-61 (Encinal Avenue)	State Route
SR-61 (Encinal Avenue)	SR-61 (Broadway)	Sherman Street	State Route
SR-61 (Central Avenue)	Sherman Street	SR-260 (Webster Street)	State Route
SR-260 (Webster Street)	SR-61 (Central Avenue)	Posey/Webster tubes	State Route
SR-260 (Posey/Webster tubes)	SR-260 (Webster Street)	Oakland city limit	State Route
Atlantic Avenue	SR-260 (Webster Street)	Poggi Street	Satisfies criteria
Atlantic Avenue	Poggi Street	Main Street	Connectivity
Park Street	Oakland city limit	Central Avenue	Satisfies criteria
Park Street	Central Avenue	SR-61 (Encinal Avenue)	Connectivity

[5] Principal arterial criteria: a) must carry 30,000 average daily traffic for at least one mile; b) must be a 4- or more lane roadway; c) must be a major cross town arterial, traversing from one side of town to the opposite side; and d) must connect to another CMP route or major activity center.
[6] State highways and interstate freeways are included in their entirety within each jurisdiction and include all mileage within Alameda County.
[7] "Connectivity" indicates that the segment has been included in the designated system to provide continuity and avoid stub ends.

Table 2.3—City of Hayward

Route	From	To	Criteria
SR-185 (Mission Boulevard)	Ashland (unincorporated)	SR-92 (Jackson Street)	State Route
SR-92 (Jackson Street)	I-880	SR-185 (Mission Boulevard)	State Route
SR-238 (Foothill Boulevard)	Ashland (unincorporated)	SR-185 (Mission Boulevard)	State Route
SR-238 (Mission Boulevard)	SR-92 (Jackson Street)	Union City city limit	State Route
A Street	I-880	SR-238 (Foothill Boulevard)	Satisfies criteria
Hesperian Boulevard	San Lorenzo (unincorporated)	Tennyson Road	Satisfies criteria
Tennyson Road	Hesperian Boulevard	SR-238 (Mission Boulevard)	Satisfies criteria
SR-92	San Mateo County line	I-880	State Route
I-880[8]	A Street	Alvarado-Niles	State Route

Table 2.4—Cities of Emeryville, Oakland, and Piedmont

Route	From	To	Criteria
MLK Jr. Way	Berkeley city limit	SR-24	Satisfies criteria
SR-123 (San Pablo)	Berkeley city limit	35th Street	State Route
SR-13 (Tunnel Road)	Berkeley city limit	SR-24	State Route
SR-260 (Posey/Webster tubes)	Alameda city limit	I-880	Satisfies criteria
23rd/29th Avenue	Alameda city limit	I-880	Satisfies criteria
SR-77 (42nd Avenue)	I-880	SR-185 (E. 14th Street)	State Route
SR-185 (E. 14th Street)	SR-77 (42nd Avenue)	San Leandro city limit	State Route
Hegenberger Road	I-880	Doolittle Drive	Satisfies criteria[9]
Hegenberger Road	I-880	Hawley Street	Connectivity
Hegenberger Road	Hawley Street	SR-185 (E. 14th Street)	Satisfies criteria
SR-61 (Doolittle Drive)	Alameda city limit	San Leandro city limit	State Route
SR-13	SR-24	I-580	State Route
SR-24	I-980	Contra Costa County line	State Route
I-80[10]	SF County Line	University Avenue	State Route
I-580	I-80	MacArthur Boulevard	State Route
I-880	I-980	Hegenberger Road	State Route
I-980	I-880	SR-24	State Route

[8] A portion of this route to the Hayward border includes the city of Union City.
[9] Found to meet principal arterial criteria in 2007.
[10] A portion of this route to the Emeryville border includes the City of Berkeley.

Table 2.5—City of San Leandro

Route	From	To	Criteria
SR-61 (Doolittle Drive)	Oakland city limit	SR-61/112 (Davis Street)	State Route
SR-61/112 (Davis Street)	SR-61 (Doolittle Drive)	SR-185 (E. 14th Street)	State Route
SR-61 (Broadway)	Otis Drive	SR-61 (Encinal Avenue)	State Route
SR-185 (E. 14th Street)	Oakland city limit	Ashland (unincorporated)	State Route
150th Avenue	Hesperian Boulevard	I-580	Satisfies criteria
Hesperian Boulevard	SR-185 (E. 14th Street)	San Lorenzo (unincorporated)	Satisfies criteria
I-880[11]	Hegenberger Avenue	I-238	State Route
I-580[12]	MacArthur Boulevard	I-238	State Route

Table 2.6—San Lorenzo, Castro Valley, and Ashland (unincorporated areas)

Route	From	To	Criteria
SR-185 (Mission Boulevard)	San Leandro city limit	Hayward city limit	State Route
Hesperian Boulevard	San Leandro city limit	Hayward city limit	Satisfies criteria
SR-238 (Foothill Boulevard)	I-238	Hayward city limit	State Route
I-880[13]	I-238	A Street	State Route
I-238[14]	I-880	I-580	State Route
I-580[15]	I-238	I-680	State Route

[11] A portion of this route to the San Leandro border includes the City of Oakland.
[12] A portion of this route to the San Leandro border includes the cities of Hayward and Oakland.
[13] A portion of this route in the county includes the City of Hayward.
[14] A portion of this route in the county includes the City of San Leandro.
[15] A portion of this route in the county includes the City of Pleasanton.

Table 2.7—Cities of Union City, Fremont, and Newark

Route	From	To	Criteria
SR-238 (Mission Boulevard)	Hayward city limit	I-680	State Route
Decoto Road	I-880	SR-238 (Mission Boulevard)	Satisfies criteria
Mowry Avenue	I-880	SR-84 (Peralta Boulevard)	Satisfies criteria
SR-262 (Mission Boulevard)	I-880	I-680	State Route
SR-84 (Thornton Avenue)	I-880	Fremont Boulevard	State Route
SR-84 (Fremont Boulevard)	SR-84 (Thornton Avenue)	SR-84 (Peralta Boulevard)	State Route
SR-84 (Peralta Boulevard)	SR-84 (Fremont Boulevard)	SR-84 (Mowry Avenue)	State Route
SR-84 (Mowry Avenue)	SR-84 (Peralta Boulevard)	SR-238 (Mission Boulevard)	State Route
SR-84 (Niles Canyon)	SR-238 (Mission Boulevard)	I-680	State Route
SR-84	San Mateo County line	I-880	State Route
I-880	Alvarado-Niles	Dixon Landing	State Route
I-680	Scott Creek	SR-238	State Route

Table 2.8—Cities of Pleasanton, Dublin, Livermore, and Unincorporated Areas

Route	From	To	Criteria
SR-84 (Vallecitos)[16]	I-680	SR-84 (Isabel Avenue)	State Route
SR-84 (Isabel Avenue)[17]	SR-84 (Vallecitos Road)	SR-84 (Kitty Hawk Road)	State Route
SR-84 (Kitty Hawk Road)[18]	SR-84 (Isabel Avenue)	SR-84 (Airway Boulevard)	State Route
SR-84 (Airway Boulevard)[19]	SR-84 (Kitty Hawk Road)	I-580	State Route
1st Street	Inman Street	I-580	Satisfies criteria
I-580	I-680	I-205	State Route
I-680	SR-238	Alcosta Boulevard	State Route

[16] New alignment of SR-84 by Caltrans in 2003.
[17] A portion of old SR-84 alignment found to meet the principal arterial criteria.
[18] A portion of old SR-84 alignment found to meet the principal arterial criteria.
[19] A portion of old SR-84 alignment found to meet the principal arterial criteria.

CMP Network Tier 2 Roadways

Table 3 lists the designated Tier 2 roadways identified using the adopted qualitative criteria.

Table 3—CMP-Designated System, Tier 2 Roadway List

Table 3.1—Cities of Alameda, Berkeley, Emeryville, and Oakland

Route	From	To	Jurisdiction	Criteria[20]	Distance (miles)
W. Grand Avenue to Grand Avenue	I-80	I-580	Oakland	1,2	3.1
12th Street-Lakeshore Avenue	I-980	I-580	Oakland	1,2,3	2.4
Telegraph Avenue[21]	51st Street	Bancroft Way	Oakland, Berkeley	2,3	2.2
Broadway	I-880	College Avenue	Oakland	2,3	3.1
College Avenue	Broadway	Bancroft Way	Oakland, Berkeley	1,2,3	2.4
51st Street	Broadway	SR 24	Oakland	1,2	0.8
Shattuck Avenue[21]	Adeline Street	51st Street	Oakland, Berkeley	1,2,3	1.5
Bancroft Way	College Avenue	Shattuck	Berkeley	2,3	0.7
Powell Street-Stanford Avenue[21]	I-80	MLK Jr. Way/ Adeline Street	Emeryville, Berkeley	1,2	2.2
40th Street-Shellmound Avenue	San Pablo Avenue	Powell Street	Emeryville	1,2,3	1.5
International Boulevard	1st Avenue	42nd Avenue	Oakland	1,2,3	2.9
Foothill Boulevard	1st Avenue	73rd Avenue	Oakland	2,3	5.3
E. 15th Street	1st Avenue	14th Avenue	Oakland	2,3	1.0
73rd Avenue	International Boulevard	Foothill Boulevard	Oakland	1,2	1.1
High Street[21]	Otis Drive	I-580	Alameda, Oakland	1,2	3.5

[20] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

[21] Denotes that roadway traverses more than one jurisdiction.

Table 3.2—Alameda County and Cities of Hayward and Union City

Route	From	To	Jurisdiction	Criteria[22]	Distance (miles)
Crow Canyon Road	I-580	County Line	Alameda County	1,2	7.0
Winton Avenue-D Street	Hesperian Boulevard	Foothill Boulevard	Hayward	1,2	2.2
A Street[23]	Foothill Boulevard	I-580	Hayward, Alameda County	1,2	1.2
Grove Way[23]	A Street/ Redwood Road	I-580	Hayward, Alameda County	1,2	1.0
Hesperian Boulevard-Union City Boulevard[23]	Tennyson Road	Alvarado Boulevard	Hayward, Union City	1,2	2.9

Table 3.3—Cities of Fremont and Union City

Route	From	To	Jurisdiction	Criteria[22]	Distance (miles)
Alvarado Boulevard	Union City Blvd.	I-880	Union City	1,2	2.2
Fremont Boulevard	I-880 @ Alvarado Boulevard/ Fremont Boulevard	I-880 interchange south of Automall Parkway	Fremont	1,2	8.8
Automall Parkway	I-880	I-680	Fremont	1,2	1.6



[22] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

[23] Denotes that roadway traverses more than one jurisdiction.

Table 3.4—Alameda County and Cities of Dublin, Livermore and Pleasanton

Route	From	To	Jurisdiction	Criteria[24]	Distance (miles)
Vasco Road	I-580	County Line	Livermore	1,2	5.7
Dublin Boulevard	San Ramon Road	Tassajara	Dublin	1,2	3.6
San Ramon Road	I-580	County Line	Dublin	1,2	1.7
Dougherty Road	I-580	County Line	Dublin	1,2	1.9
Tassajara Road	I-580	County Line	Dublin	1,2	2.8
E. Stanley Boulevard-Railroad Avenue-1st Street	Isabel Avenue	Inman Street (connecting I-580)	Livermore	1,2,3	4.2
Stoneridge Drive	I-680	Santa Rita Road	Pleasanton	1,2	2.5
Santa Rita Road	Stoneridge Drive	I-580	Pleasanton	1,2	1.2
Sunol Boulevard-1st Street-Stanley Boulevard	I-680	Isabel Avenue	Alameda County, Pleasanton	1,2	5.6

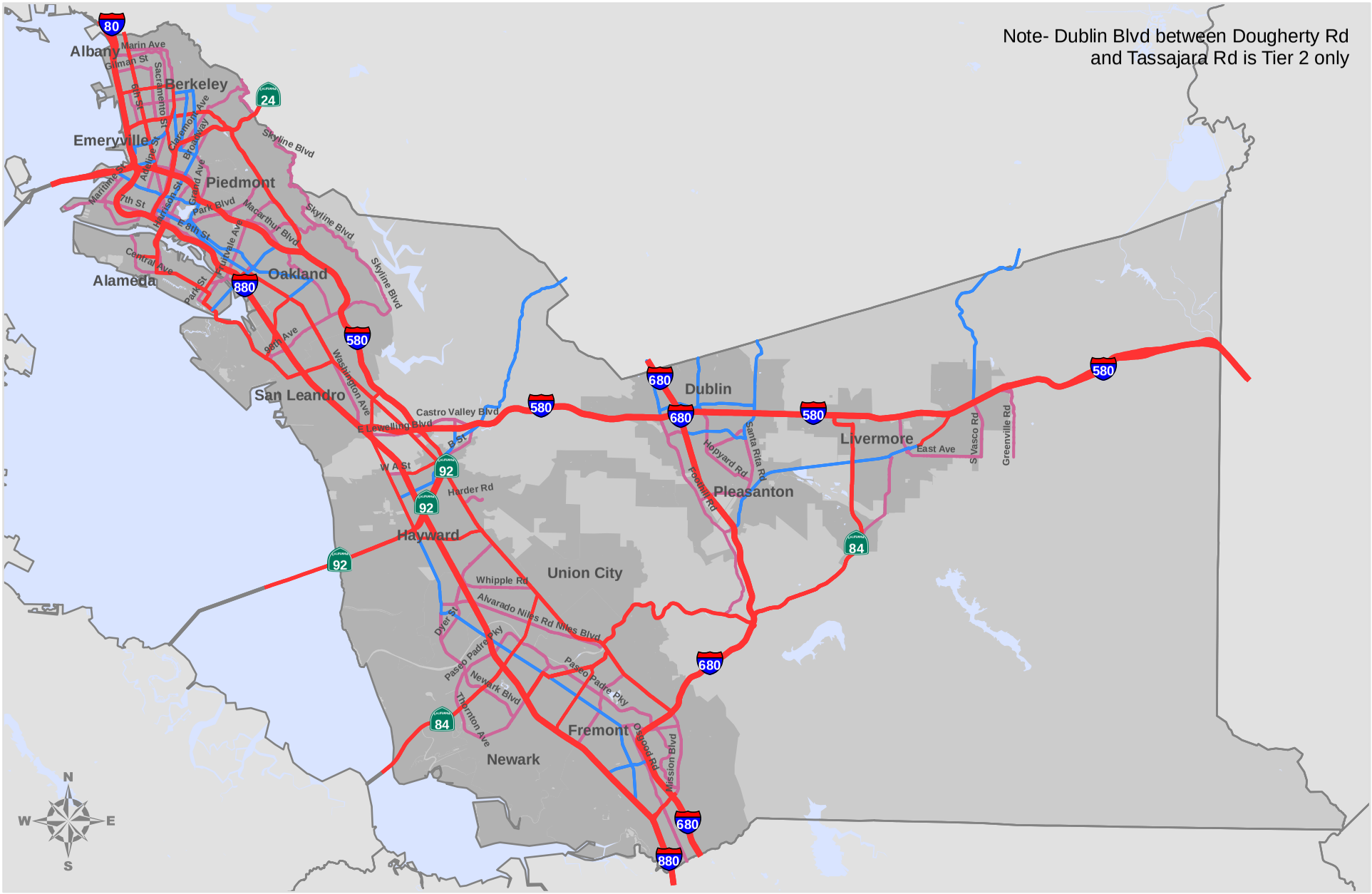
CMP and MTS Roadway Networks and MTS Transit Corridors

The entire CMP-designated system (Tiers 1 and 2) is illustrated in Figure 1, and detailed maps for each area within the county are shown in Figures 2 through 5. The Metropolitan Transportation System designated by MTC appears in Figure 1 through Figure 5. The MTS transit corridors appear in Figure 6 and Figure 7. The system includes the entire CMP-designated roadway network together with major arterials, transit routes, rail, maritime ports, airports, and transfer hubs critical to the region's movement of people and freight.

The following operators provide transit services in Alameda County:

- Altamont Corridor Express Commuter Rail
- AC Transit
- Alameda-Oakland Ferry Service
- Bay Area Rapid Transit
- Capitol Corridor
- Harbor Bay Ferry Service
- Livermore Amador Valley Transit Authority
- Union City Transit

[24] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

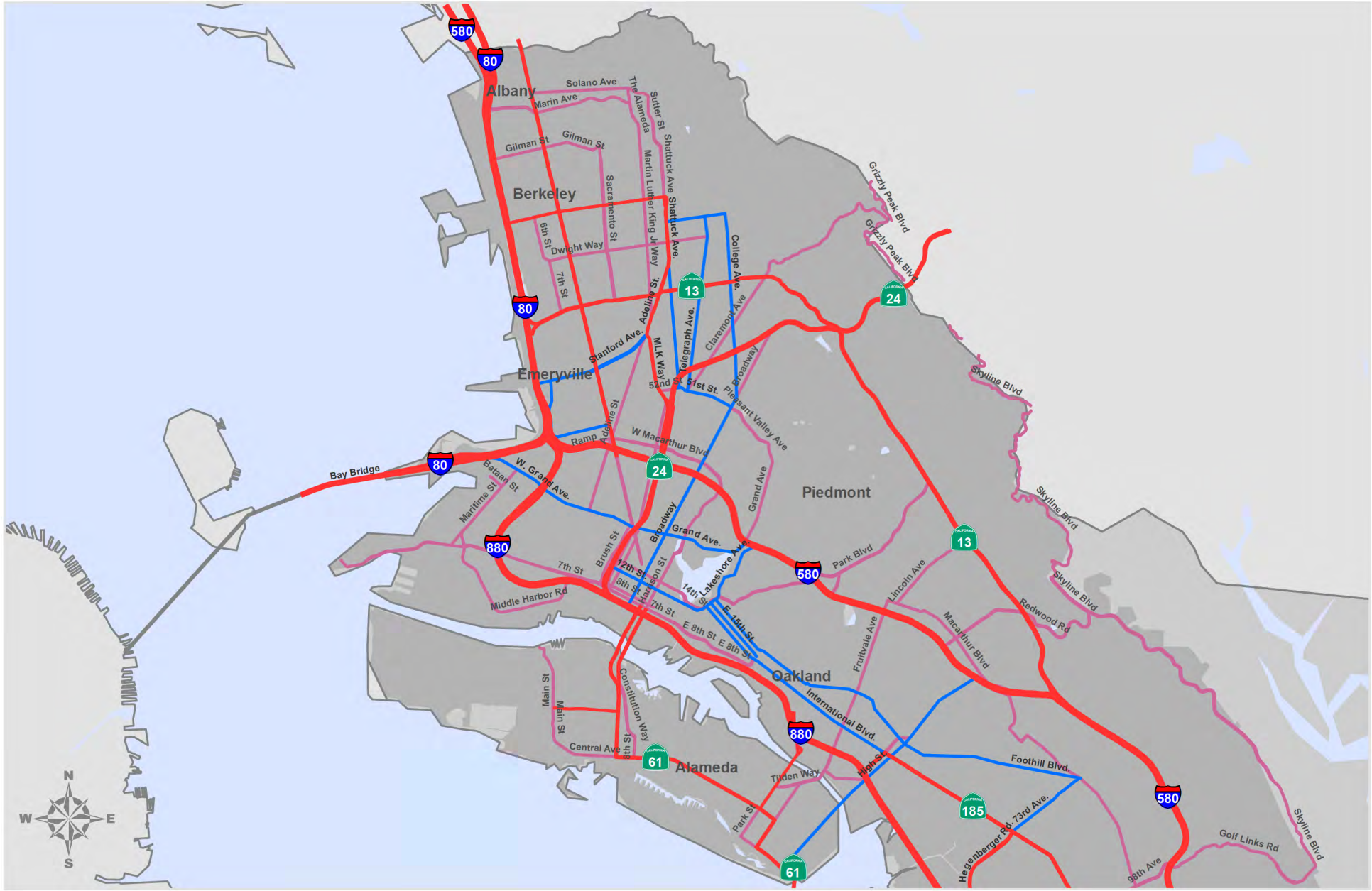


ALAMEDA County Transportation Commission

Figure 1 : Designated Countywide System Map

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



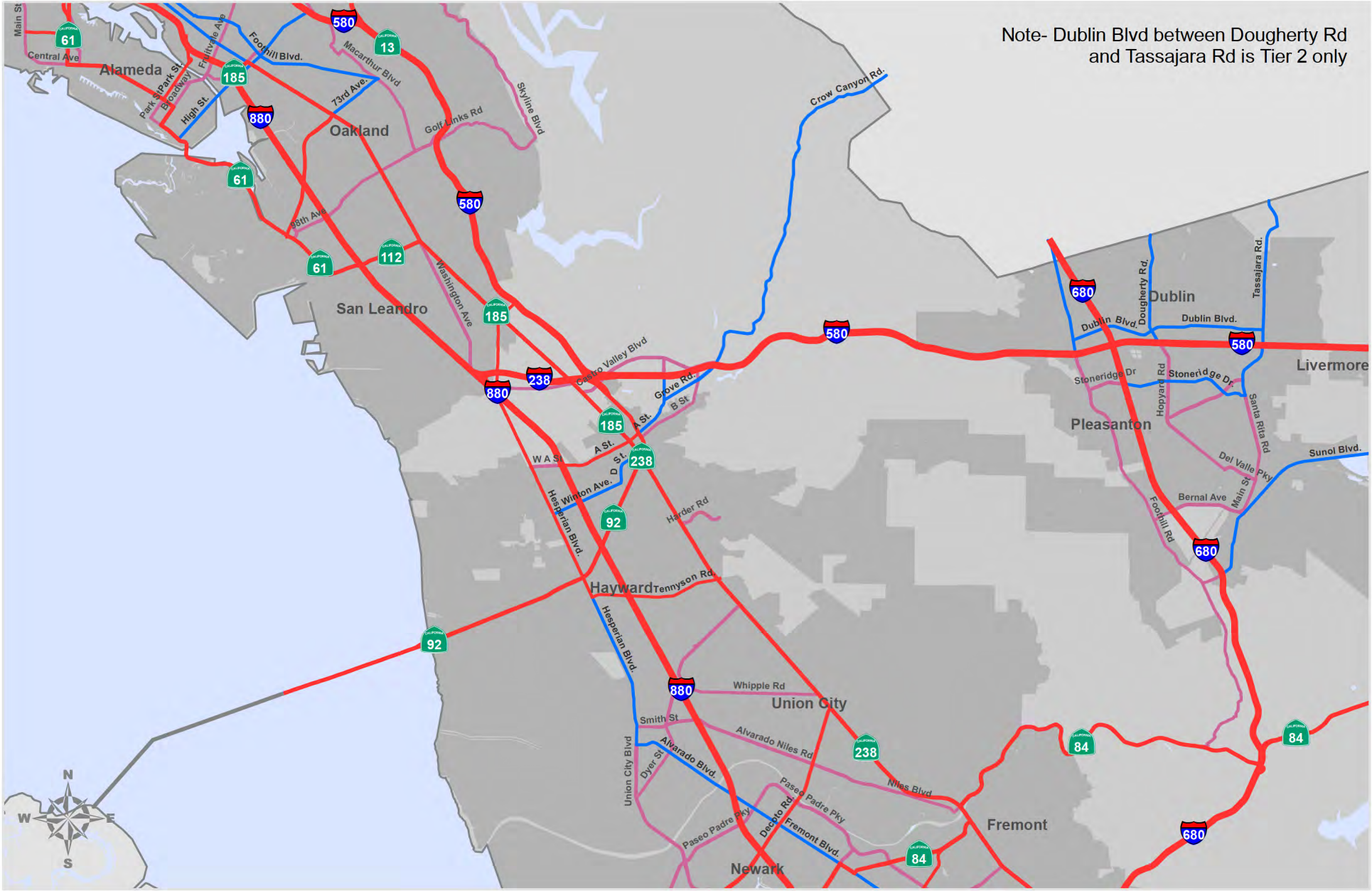
ALAMEDA County Transportation Commission

Figure 2: Designated System Map

Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



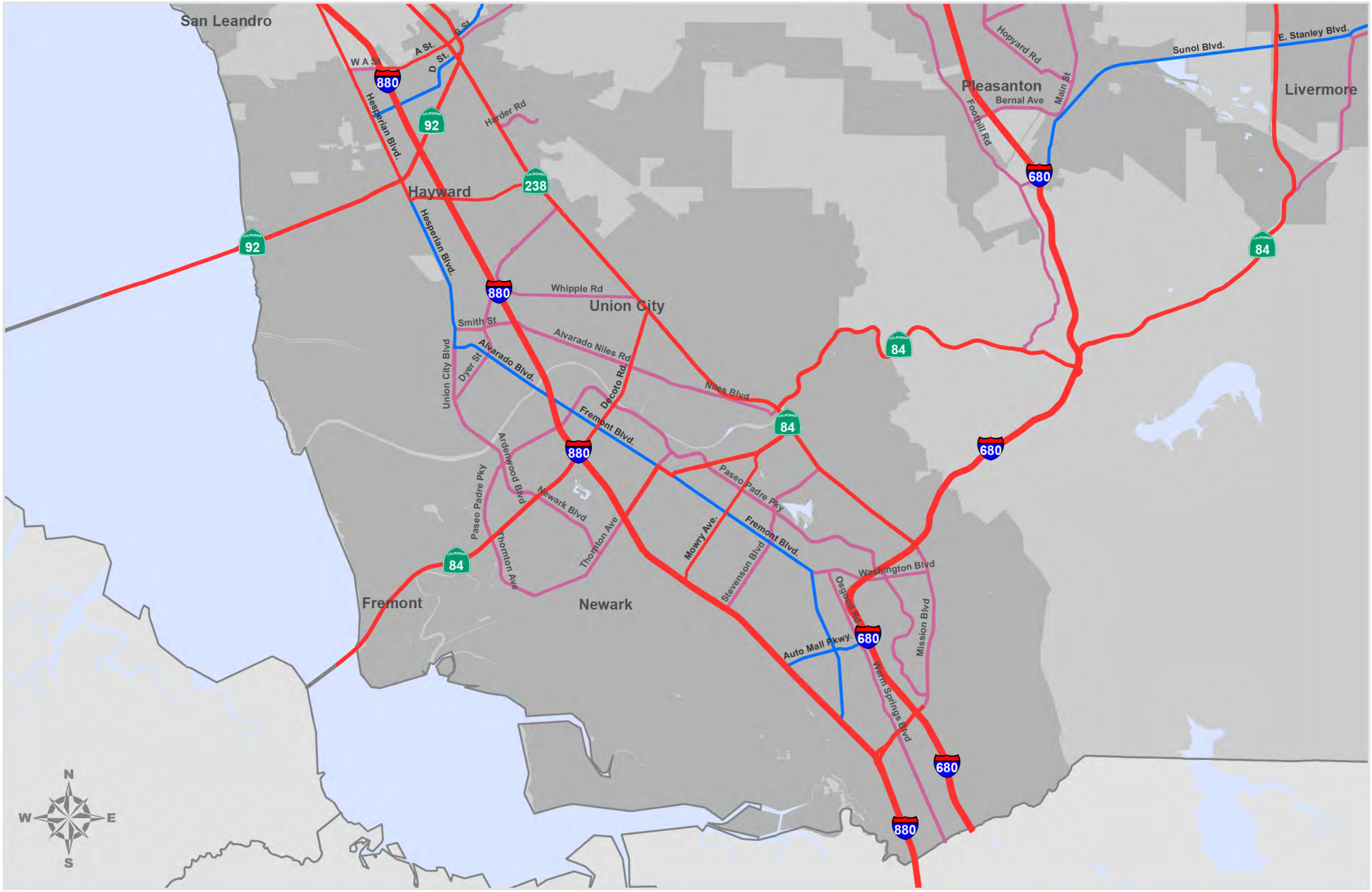
ALAMEDA County Transportation Commission

Figure 3: Designated System Map

Castro Valley, Hayward, San Leandro, and San Lorenzo

Legend

- Interstate/Freeway (CMP - Tier 1)
- State Highway (CMP - Tier 1)
- Principal Arterial (CMP - Tier 1)
- Principal Arterial (CMP - Tier 2)
- MTS Routes



ALAMEDA County Transportation Commission

Figure 4: Designated System Map

Fremont, Newark, and Union City

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes

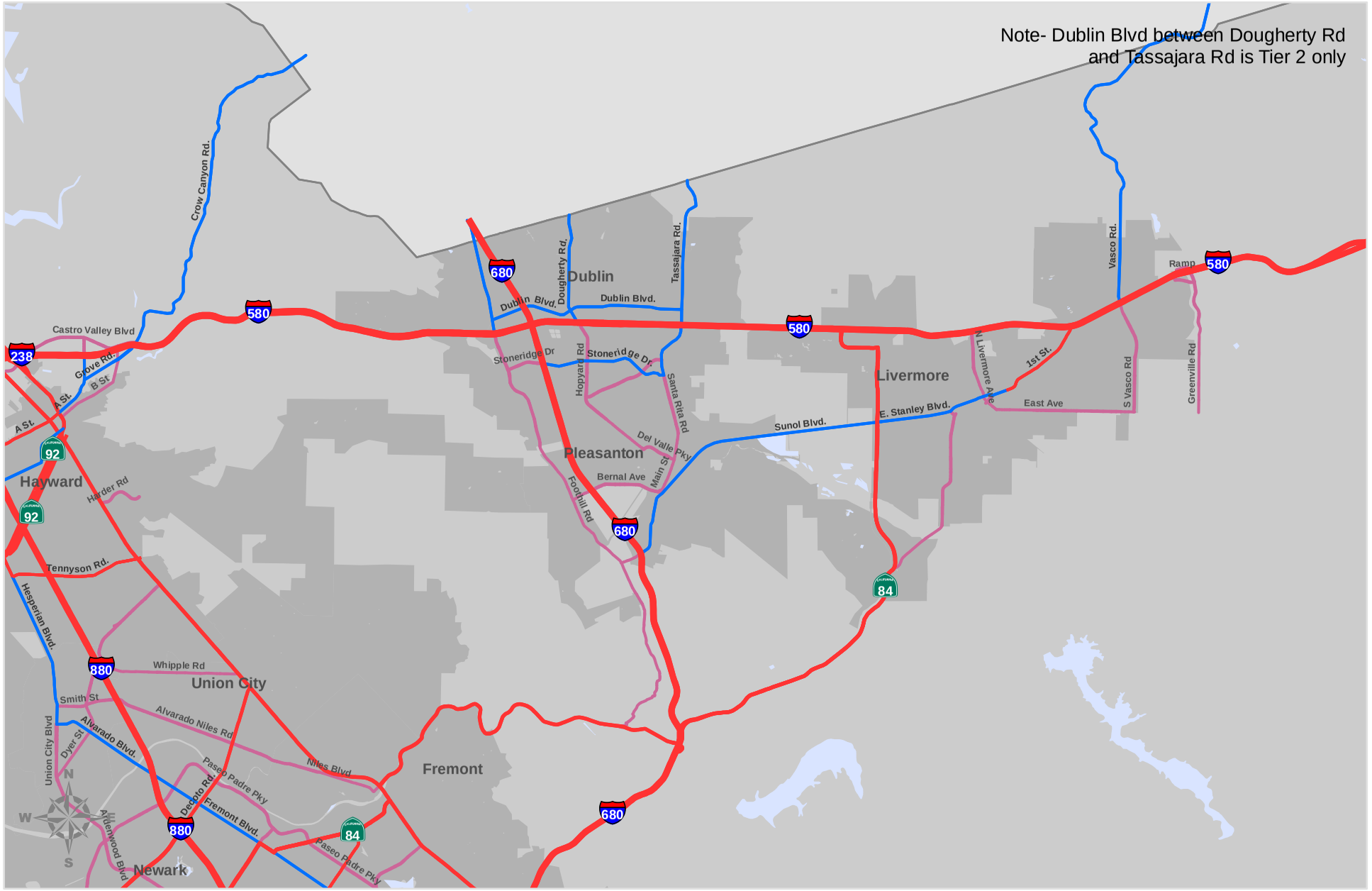
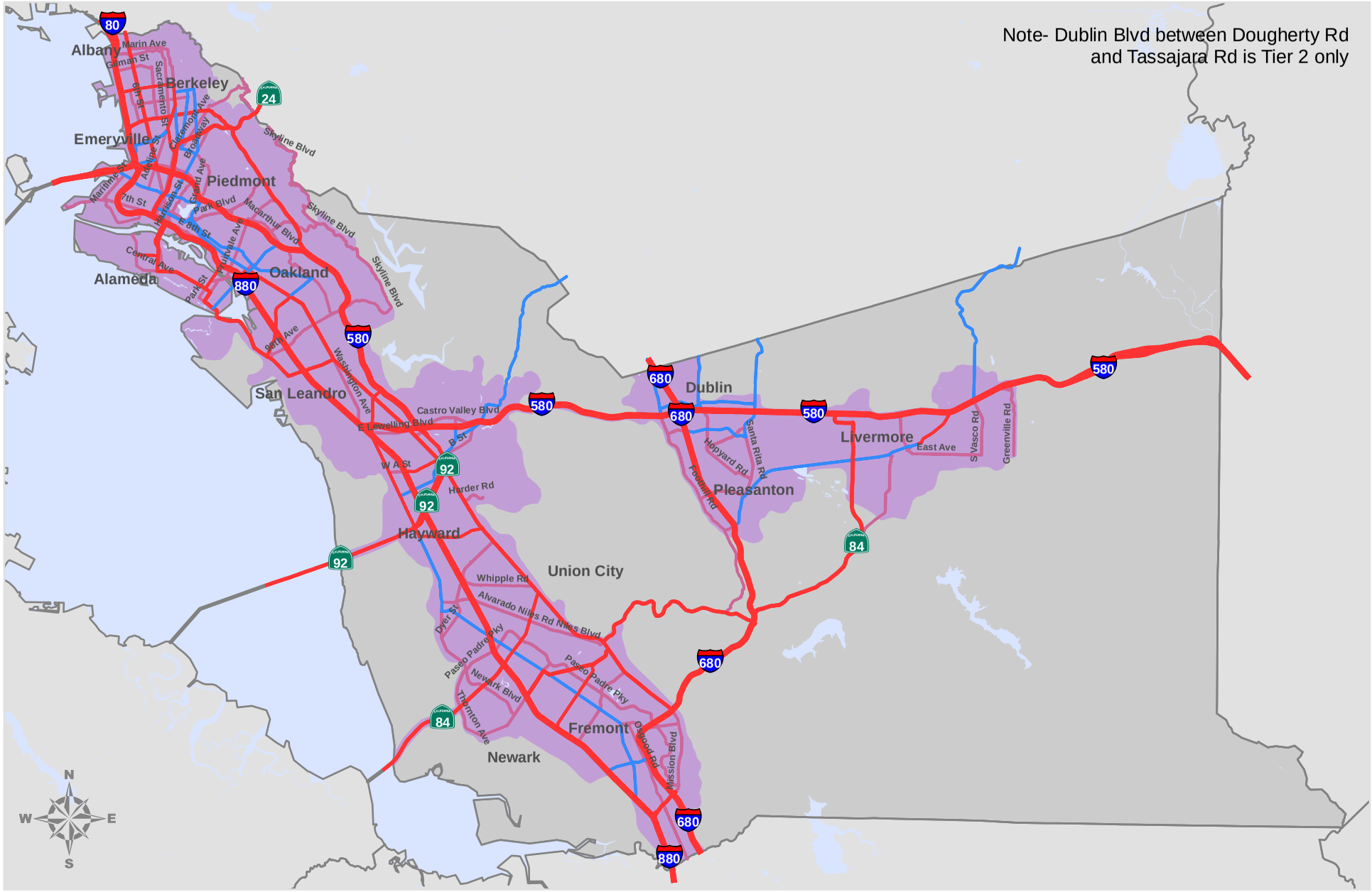


Figure 5 : Designated System Map

Dublin, Livermore, and Pleasanton

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



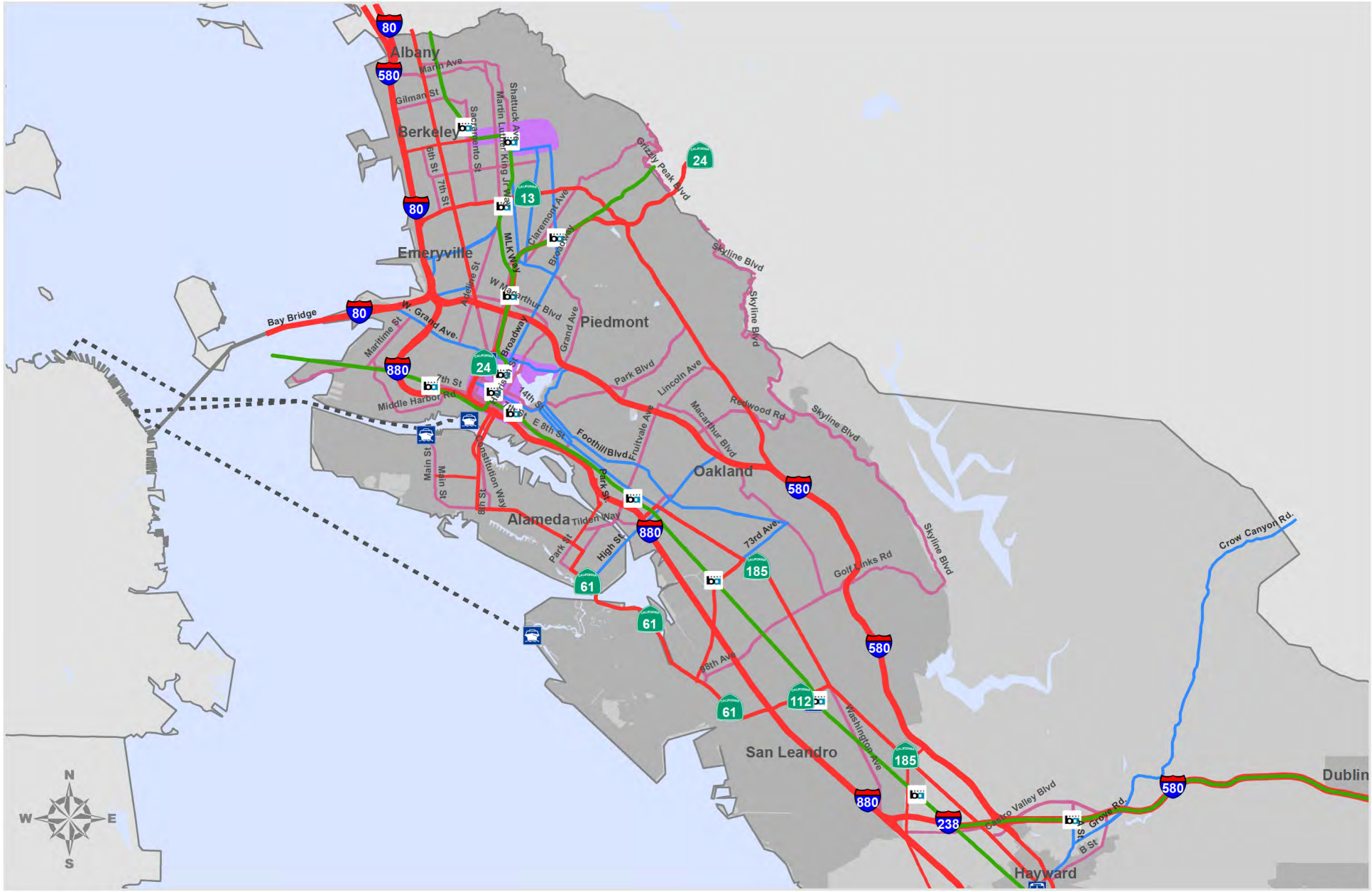
ALAMEDA County Transportation Commission

Figure 6 : Metropolitan Transportation System

Transit Corridors of Alameda County

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal/Other Arterial (CMP - Tier 2 & MTS)
- MTS Routes
- Transit Service Area BART/Transit Corridor



ALAMEDA County Transportation Commission

Figure 7: Metropolitan Transportation System

Transit Corridors of Northern Alameda County

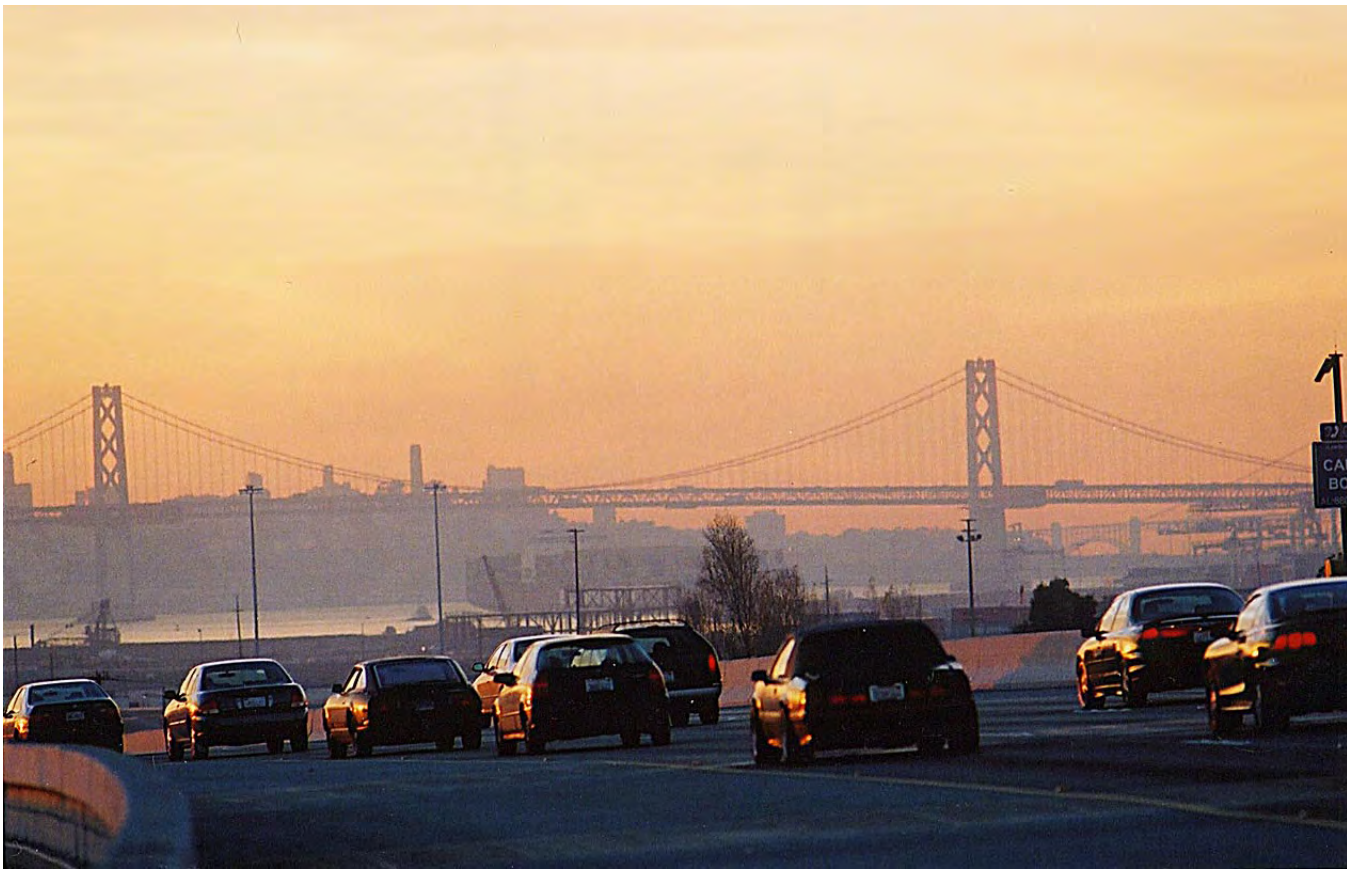
Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 &MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal/Other Arterial (CMP - Tier 2 & MTS)
- MTS Routes
- Rail Transit / BART
- Ferry
- Key Service Area

Next Steps

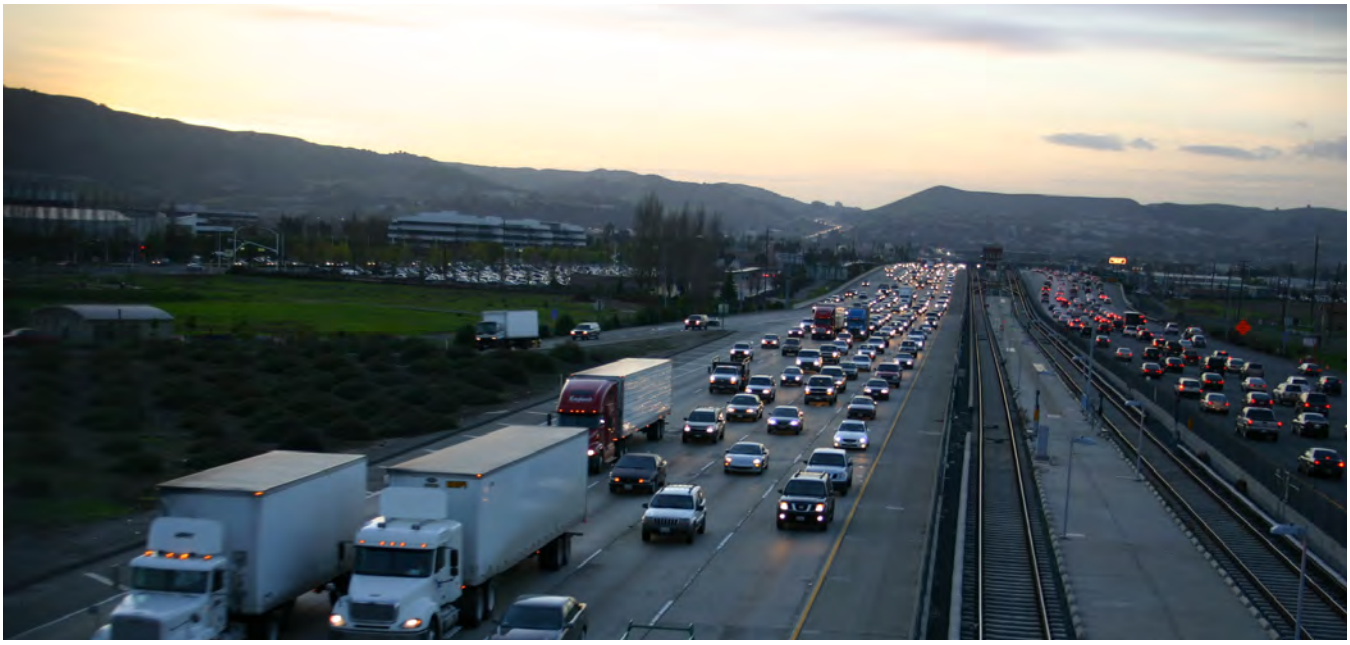
The 2015 CMP update identified the following next steps for the update of the Designated CMP Network System:

- Review and update the CMP network criteria in the 2017 CMP update in conjunction with the outcome of the three countywide modal plans—the Countywide Multimodal Arterial Plan, Countywide Transit Plan, and Countywide Goods Movement Plan—to expand the CMP network to include significant rural roadways in the county.



Level of Service Standards

3



State law requires that level of service (LOS) standards be established to monitor the CMP roadway network's LOS as part of the CMP process.[25] The legislation leaves the choice of LOS measurement methodology to the CMAs, but mandates that the LOS be measured by the most recent version of the Transportation Research Board's Highway Capacity Manual (HCM) or a uniform methodology adopted by the CMA, Alameda CTC for Alameda County, that is consistent with the HCM.

LOS definitions generally describe traffic conditions in terms of speed and travel time, volume and capacity, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is represented by letter designations, ranging from A to F, with LOS A representing the best operating conditions and LOS F representing the worst (see Appendix F for a graphic representation of LOS).

The purpose of setting LOS standards for the CMP network is to provide a quantitative tool to analyze the effects of land use changes on the transportation network's performance (i.e., congestion). If the actual network performance falls below the standard (i.e., congestion worsens below LOS E), actions must be taken to improve the LOS.

Alameda CTC contracts with a consultant to perform the necessary LOS monitoring for the CMP network.

[25] California Government Code Section 65089(b)(1)(A).

Initially, the CMP network was monitored annually, but in 1998 a policy was adopted to perform the LOS monitoring every two years, which has proven to be the most cost-effective approach. The next monitoring study will be performed in spring 2016.

Additionally, to provide a basis for more definitive strategies for maintaining LOS standards in subareas of Alameda County, Alameda CTC has completed the following corridor studies on high-priority corridors, such as:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- I-80/San Pablo Avenue and I-880 Smart Corridor Programs
- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

To comprehensively identify and address the multimodal transportation needs of the county as a

whole, Alameda CTC is undertaking development of comprehensive countywide modal plans, specifically development is underway for a Countywide Goods Movement Plan, a Countywide Multimodal Arterial Corridor Plan, and a Countywide Transit Plan.

Standards and Approach for LOS Monitoring

LOS is an indication of traffic growth trends using vehicular volumes, capacity, and measurement of average speed and delay. The goal is to develop a consistent approach for monitoring LOS that is easy to use, non-duplicative, and compatible with local government data and travel-demand models. Table 4, which follows, describes the approach for monitoring LOS in Alameda County and defines the facility classifications.



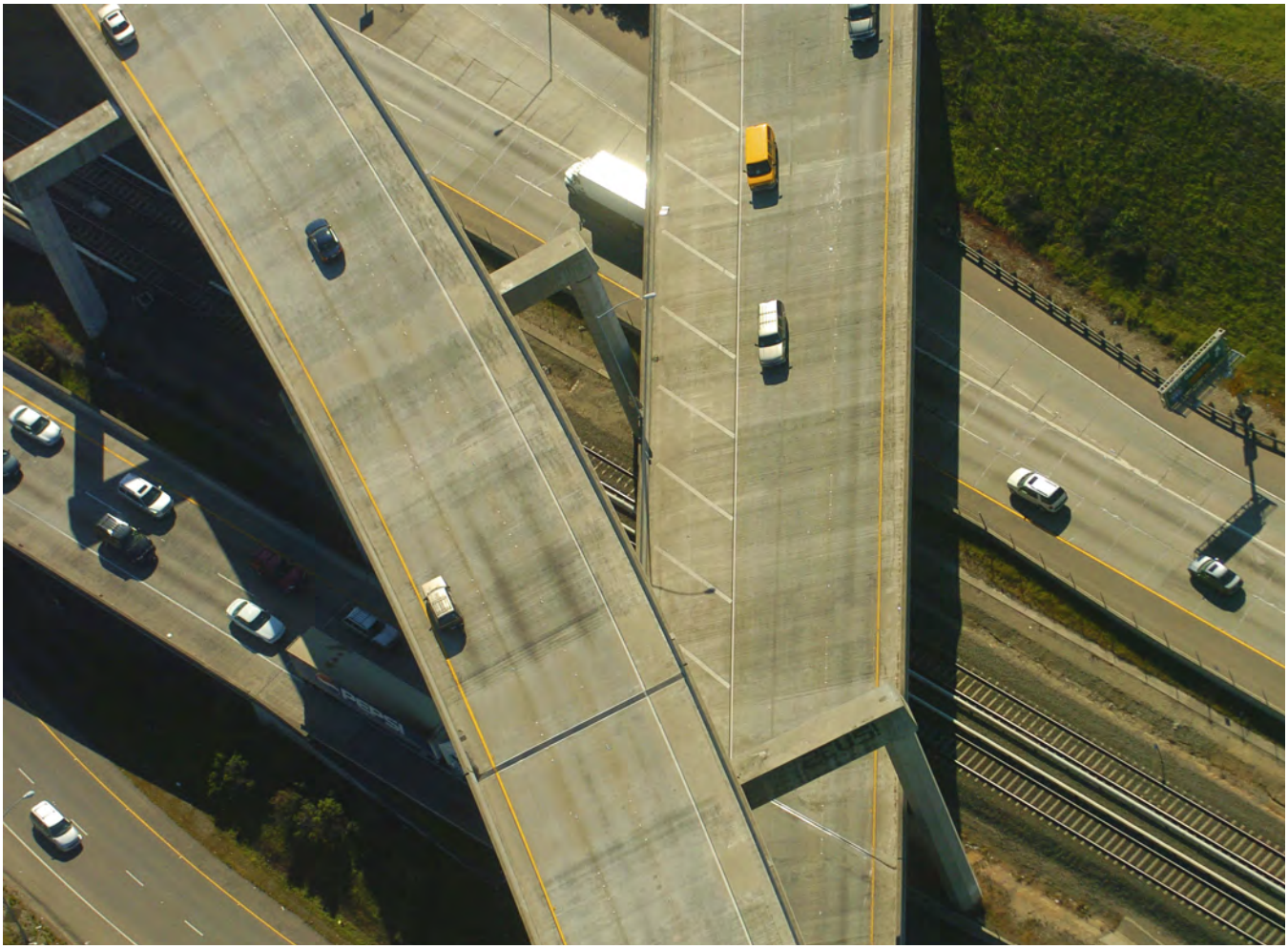


Table 4—Approach to LOS Monitoring

Element	Approach
Level of Service	As defined in the California Government Code Section 65089.3, the LOS standard is E, except where F was the LOS when originally measured, in which case the standard is F. The methods employed constitute a uniform methodology adopted that is consistent with the HCM1985 that includes speed-based LOS methodology. Methods described in HCM Chapter 8, "Two-Lane Highways" and Chapter 11, "Urban and Suburban Arterials" were the basis for establishing the LOS on the CMP network. LOS is assessed based on the average speed observed along a roadway segment (link speeds) or total volumes approaching an intersection (link volumes). These methods are not designed to replace the more detailed procedures that local agencies are likely to use for non-CMP purposes (such as local impact studies). Such procedures typically focus on an intersection's ability to handle individual turning movements rather than average speed on a roadway segment.
Facility Classifications	The HCM provides methods for determining LOS on several types of facilities. These facilities are grouped into "interrupted-flow" and "uninterrupted-flow" facilities. Interrupted-flow facilities include city streets and surface highways (for example, State Route 123/San Pablo Avenue) that are part of the state highway system. Freeways are uninterrupted-flow facilities. For the purposes of LOS monitoring, the CMP network can be classified into three functional types of facilities: 1) freeways; 2) two-lane roadways; and 3) urban/suburban arterials.
1) Freeways	Freeways are uninterrupted-flow facilities, since traffic never stops (except during the most congested periods or when incidents occur). The 1991 Alameda County CMP, in coordination with local jurisdictions, defined appropriate segments and performed the necessary "floating car" runs on the freeways to obtain travel speed data (refer to "Data Collection and Requirements" in this chapter for information on this data collection method). This allowed the establishment of a baseline LOS for the roadway network, including identification of segments operating at LOS F.
2) Two-Lane Roadways	Two-lane roadways are uninterrupted-flow facilities. The criteria for including principal arterials in the CMP network specify a minimum of four lanes; therefore, two-lane roadways are not included as principal arterials. However, since all state highways must be in the system, two-lane state highways located in the county are also included. These two-lane roads constitute a fairly small portion of the CMP network mileage. For two-lane roads without interruptions (signals or stop signs), the methodology in HCM Chapter 8 is used, based on average travel speed.
3) Urban and Suburban Arterials	Urban and suburban arterials are multilane streets that have traffic signals spaced no more than two miles apart on average. Urban and suburban arterials are characterized by platoon flows. Operational quality is controlled primarily by the efficiency of signal coordination and is affected by how individual signalized intersections operate along the arterial. LOS is primarily a function of travel speed along segments and is calculated from field data. Because the CMP legislation emphasizes systems-level planning, HCM Chapter 11 is used to estimate arterial LOS. Advantages include the need for relatively little input data, simple applied calculations, and the results of explicitly determined LOS (A, B, C, etc.).
Monitoring	Alameda CTC conducts LOS monitoring. The state statute[24] requires Caltrans to monitor LOS on the freeway network, unless Alameda CTC designates that responsibility to another entity. Monitoring is conducted biennially, recognizing that other surveys could be done for development impact studies (e.g., intersection turning movement counts). Alameda CTC uses two data collection methods for LOS monitoring: 1) commercial speed data based on aggregated traffic data from GPS-enabled vehicles and mobile devices, traditional road sensors, and other sources; and 2) the floating car technique of recording travel times between checkpoints based on actual travel time during the peak period. Refer to "Data Collection and Requirements" in this chapter for details on the two data collection methods.
Interregional Trips	As defined by the statute, "interregional travel means any trip that originates from outside" Alameda County. A trip means a one-direction vehicle movement. The origin of any trip is the starting point of that trip. In accordance with the Metropolitan Transportation Commission (MTC) guidelines, trips with no trip end in Alameda County (through trips) are not subtracted for monitoring reports.

Highway Capacity Manual (HCM) and LOS Standards

The Congestion Management Program legislation requires that the LOS monitoring on CMP roadways be measured by the most recent version of the HCM or by a uniform methodology adopted by the CMA consistent with the HCM. For LOS Monitoring and Deficiency Plan purposes, Alameda CTC uses speed-based LOS methods included in the HCM1985 to determine LOS for the CMP roadways, as shown in Table 5 (adopted in 1991 and updated in 2004).

To transition to using the most recent HCM for the purposes of LOS monitoring and Land Use Analysis Programs of the CMP, efforts were made in 2005 to use HCM2000 and in 2013 to use HCM2000 or HCM2010. Based on comparative analyses of the various HCMs, the following observations were made:

- **Different methodologies would hinder conformity.** For freeways, the differences between the HCM1985 and the HCM2000 and HCM2010 methodologies were significant. Specifically, the basis for determining LOS has changed from speed-based LOS in HCM1985 to density-based LOS in HCM2000 and HCM2010. This eliminates the ability to track previous LOS trends, monitoring of existing deficiency plans, and consistency in determining deficiency; hence, this affects conformity.

- **Classification changes would affect conformity.** For arterials, the roadway classifications changed after the HCM1985. Classifications were added in the HCM2000, and later classifications were eliminated in the HCM2010. Further, in the HCM2010, free-flow speed, which is the basis for estimating LOS in all HCM versions, requires additional facility-specific data that is excessive for large-scale use such as LOS monitoring on the countywide CMP network.

Using the later HCM2000 and HCM2010 versions would result in applying density-based LOS methodology for freeways and changed classifications for arterials. This would not provide any benefits and would hinder conformity and the ability to compare past performance trends. Based on this analysis for the Tier 1 network, which is subject to conformity, Alameda CTC will continue to use speed-based LOS methodology and arterial classifications in the HCM1985 to monitor freeways and arterials. For the Tier 2 network, which has been only monitored for informational purposes since 2012 and has no previous performance data available to compare, LOS was reported using both HCM1985 and HCM2000 methodologies starting in 2014. Accordingly, the 2014 LOS Monitoring Report developed different classifications for Tier 2 based on HCM1985 and HCM2000 and the reported LOS. Since the classification has already been established, the 2016 LOS monitoring cycle will continue to use the same approach.

As part of the 2013 CMP update, Alameda CTC identified LOS standards to monitor alternative modes in a comparable way to auto performance. Since the HCM2010 also included LOS standards for monitoring alternative modes, such as Multi Modal Level of Service (MMLOS), Alameda CTC evaluated MMLOS for monitoring performance of transit and bicycle and pedestrian modes. It was found that using the HCM2010-based MMLOS is data and resource intensive and costly for large-scale applications such as monitoring countywide performance of the alternative modes; therefore, it is not suitable for LOS monitoring purposes. Alameda CTC will assess how to best include the performance measurement metrics for monitoring alternative modal performance in the 2017 CMP, based on the outcomes of the following countywide modal plans—Goods Movement Plan, Multimodal Arterial Corridor Plan, and Transit Plan.

Table 5 shows the relationship between average travel speed and LOS. The range for LOS F for freeway sections is:

- F30 – Average Travel Speed < 30 mph
- F20 – Average Travel Speed < 20 mph
- F10 – Average Travel Speed < 10 mph

Table 5—Relationship Between Average Travel Speed and LOS

Arterials			
Arterial Class	**I**	**II**	**III**
Range of Free Flow Speeds (mph)	35 to 45	30 to 35	25 to 35
Typical Free Flow Speed (mph)	40	33	27
Level of Service	**Average Travel Speed (mph)**		
A	≥ 35	≥ 30	≥ 25
B	≥ 28	≥ 24	≥ 19
C	≥ 22	≥ 18	≥ 13
D	≥ 17	≥ 14	≥ 9
E	≥ 13	≥ 10	≥ 7
F	< 13	< 10	< 7

Freeway			
LOS	**Average Travel Speed (mph)**	**Volume-to-Capacity Ratio**	**Maximum Traffic Volume (vehicles/hour/lane)**
A	≥ 60	0.35	700
B	≥ 55	0.58	1,000
C	≥ 49	0.75	1,500
D	≥ 41	0.90	1,800
E	≥ 30	1.00	2,000
F	< 30	Variable	-

Note: *Highway Capacity Manual*, Transportation Research Board, 1985.

Traffic Monitoring Program

Alameda CTC currently conducts LOS monitoring on the Alameda County CMP network as described in Chapter 2. The CMP route segments were determined for travel-time analysis with input from the Alameda County Technical Advisory Committee (ACTAC) and appropriate local jurisdiction departments (traffic engineering, planning department, etc.). Data collection time periods were determined based on the general congested peak periods on most of the CMP roadway network.

Definition of Roadway Segments

Alameda CTC used the following guidelines to determine the segments:

- Segments should be at least one mile and not more than five miles in length; and
- Logical segment break-points include jurisdictional boundaries, points where the basic number of travel lanes change, locations where land use changes occur (e.g., commercial areas versus residential), and points where the posted speed

limit changes or where the number of adjacent driveways is significantly different.

Since the adoption of the CMP roadway segments in 1991, the intensity and location of congestion throughout the county has changed. In 2007, the CMP roadway segment lengths and criteria for designating the CMP roadway segments to develop new segments were updated to better reflect existing land use and travel patterns.

Many long segments were found to be operating at better levels of service because speeds were averaged over the length of longer segments. Splitting these segments using the approved criteria revealed congestion hot spots and more accurately identified congested segments. Because the original checkpoints were retained, all new segments nest within the pre-2007 roadway segments. This approach was important, so that trends can be evaluated over time. Many of the shorter segments were located on I-580 in the Tri-Valley area. During the 2009 CMP Update, SR 84 in East County was divided into shorter segments based on the same criteria. From a field and operating perspective, the CMP roadway segmentation criteria are still appropriate; therefore, no changes are recommended for this update.

Data Collection and Requirements

The traffic monitoring program requires information about average travel speed, which is the basis for measuring level of service on all facility types (i.e., freeways, two-lane highways, and urban/suburban arterials). For a given roadway segment, speed data must be collected and reported separately for each travel direction. Travel speed studies for this purpose are conducted using two methods—commercial speed data and floating car survey:

- Commercial speed data aggregates traffic data from GPS-enabled vehicles and mobile devices, traditional road sensors, and other sources. These data are reported using discrete roadway links known as Traffic Message Channels (TMCs). For the 2014 LOS monitoring, data at one-minute intervals was accessed for the selected monitoring times across all the identified TMCs in Alameda County. Use of commercial speed data was approved by the Commission in 2013 based on a validation exercise carried out by Alameda CTC. As a part of that exercise, it was determined that commercial speed data could be used for freeways (Tier 1), ramps (Tier 1), and part of the arterials (Tier 2), where commercial speed data is available (65 miles out of 90 miles of Tier 2 arterials).

- Floating car surveys are used where the coverage of commercial speed data is not adequate or results are not expected to be reliable. Floating car surveys use GPS technology to determine the travel time between the start and end of each CMP segment. A test car is driven six times in each direction on each CMP segment. If congested segments (LOS F) are experienced in the afternoon, and the route is subject to conformity, then two additional runs are generally completed on the entire route. Floating car surveys are conducted for Tier 1 arterials and for 25 miles out of 90 miles of Tier 2 arterials.

The data collection process also identifies the days and time periods to perform CMP network monitoring. For the 2014 LOS monitoring, monitoring days were reviewed and identified separately for commercial speed data and floating car surveys:

- Commercial speed data collection and floating car surveys are generally conducted in the months of March, April, and May when schools are in session. When additional floating car surveys are required, some data collection efforts can be extended into the first week of June, but need to be complete before the schools close for the summer.

- Data are collected on a Tuesday, Wednesday, and/or Thursday, because these days are most indicative of average weekday conditions.

- Monitoring time periods are 4:00 p.m. to 6:00 p.m. during the p.m. peak hours and 7:00 a.m. to

9:00 a.m. during the a.m. peak hours. Generally, p.m. peak-period monitoring is used for conformity purposes, with the exception of monitoring the Tier 2 network, where both morning and afternoon peak periods are monitored for informational purposes only. Monitoring during the a.m. peak period for all CMP roadways is for informational purposes only. Freeways (Tier 1) are also monitored separately on weekends from 1:00 p.m. to 3:00 p.m.

- Test car runs on a particular segment must span a range of days and time of day. This means that test car runs should not be bunched on the same day of the week or taken on separate days at the same time.
- Data collection during holidays, special events, when school is not in session, or when roadway construction is under way must be avoided.
- Consistent monitoring periods must be observed for each roadway segment. For example, a comparison between April 2010 and April 2011 is likely to be more valid than a comparison between January 2010 and August 2011.
- If special generators are located within a few miles of the monitoring location, it must be determined whether unusual or unwanted activity levels are occurring at the special generators. A call to a shopping center management company, for example, could be made to ascertain that the test days were reasonably close to average, and that no retailers were holding major sales.
- Incidents are generally expected to impact traffic conditions, and therefore data associated with incidents is excluded. For floating car surveys, where the driver observes an incident, the floating car survey run is repeated. For commercial speed data, freeway incident data sets from PeMS are reviewed, and the speed data records for the corresponding time period are removed across all the relevant CMP segments.

Grandfathered LOS F Roadway Segments

CMP legislation exempts congested CMP roadway segments that did not meet the minimum LOS standards (LOS E) when the CMP network was formed (in 1991 and 1992) from deficiency identification and preparing a deficiency plan. These grandfathered segments were identified based on the LOS monitoring performed in 1991 for the CMP roadway segments and in 1992 for the CMP freeway-to-freeway connectors during the p.m. peak period, which is used for conformity. According to the study results, a total of 15 freeway segments (excluding freeway to freeway connectors) and 15 arterial segments were operating at LOS F in 1991 and five freeway-to-freeway connectors were operating at LOS F in 1992. Tables 6, 7, 8, and Figure 8 show the grandfathered CMP segments including the freeway-to-freeway connectors.

Although these segments are grandfathered by statute, they are not exempt from analysis and mitigation for the purpose of satisfying the "Land Use Analysis Program" (Chapter 6), the California Environmental Quality Act (CEQA), and the federal National Environmental Protection Act. The CMP focuses on existing congestion; therefore, Alameda CTC will consider strategies and/or improvements to address grandfathered segments in corridor studies as well as the Countywide Transportation Plan and the CMP Capital Improvement Program.



Table 6—LOS F Freeways for Alameda County CMP-Designated Roadway Network

	Roadway		Limits	Jurisdiction	Average Speed (mph)
1	I-80	WB	From University to I-80/I-580 Split	Berkeley/Emeryville	16.6
2	I-80	WB	From I-80/I-580 Split to Bay Bridge Toll Plaza	Oakland	29.7
3	I-80	EB	From I-580/I-80 Split to University	Emeryville/Berkeley	25.8
4	I-80	EB	From University to Central	Berkeley/Albany	25.8
5	SR-24	EB	From I-580 to Fish Ranch Road	Oakland	28.5
6	I-580	SB	From I-80/I-580 to I-980/Hwy 24	Oakland	25.6
7	I-980	EB	From I-880 to SR-24/I-580	Oakland	28.5
8	I-238	EB	From I-880 to I-580	County/San Leandro	29.8
9	I-880	SB	From Hegenberger to Washington	San Leandro/Oakland	29.2
10	I-880	SB	From Washington to A Street	County/Hayward	24.3
11	I-880	NB	From Tennyson to SR-92 (Jackson)	Hayward	18.2
12	I-880	NB	From SR-92 to Lewelling	Hayward	23.2
13	I-880	NB	From Dixon Landing to SR-262/Mission	Fremont	29.3
14	SR-92	WB	From Clawiter to Toll Gate	Hayward/County	27.1
15	SR-92	EB	From Toll Gate to I-880	Hayward/County	27.5

Note: Data is based on surveys taken during the afternoon peak period in September/October, 1992.

Table 7—LOS F Freeway-to-Freeway Connectors, Alameda County CMP-Designated Roadway Network

	Freeway-to-Freeway Connectors	Jurisdiction	Length (miles)	Average Speed	Free Flow Speed
1	I-80 SB to I-580 EB[25]	Oakland	0.30	18.7	45.0
2	I-580 WB to I-80 NB[25]	Oakland	0.21	16.0	45.0
3	I-680 SB to I-580 EB	Pleasanton	0.67	16.3	35.0
4	SR-13 NB to SR-24 EB	Oakland	0.35	14.4	45.0
5	I-580 WB; SR-24 WB to I-80 NB	Oakland	0.69	22.1	45.0

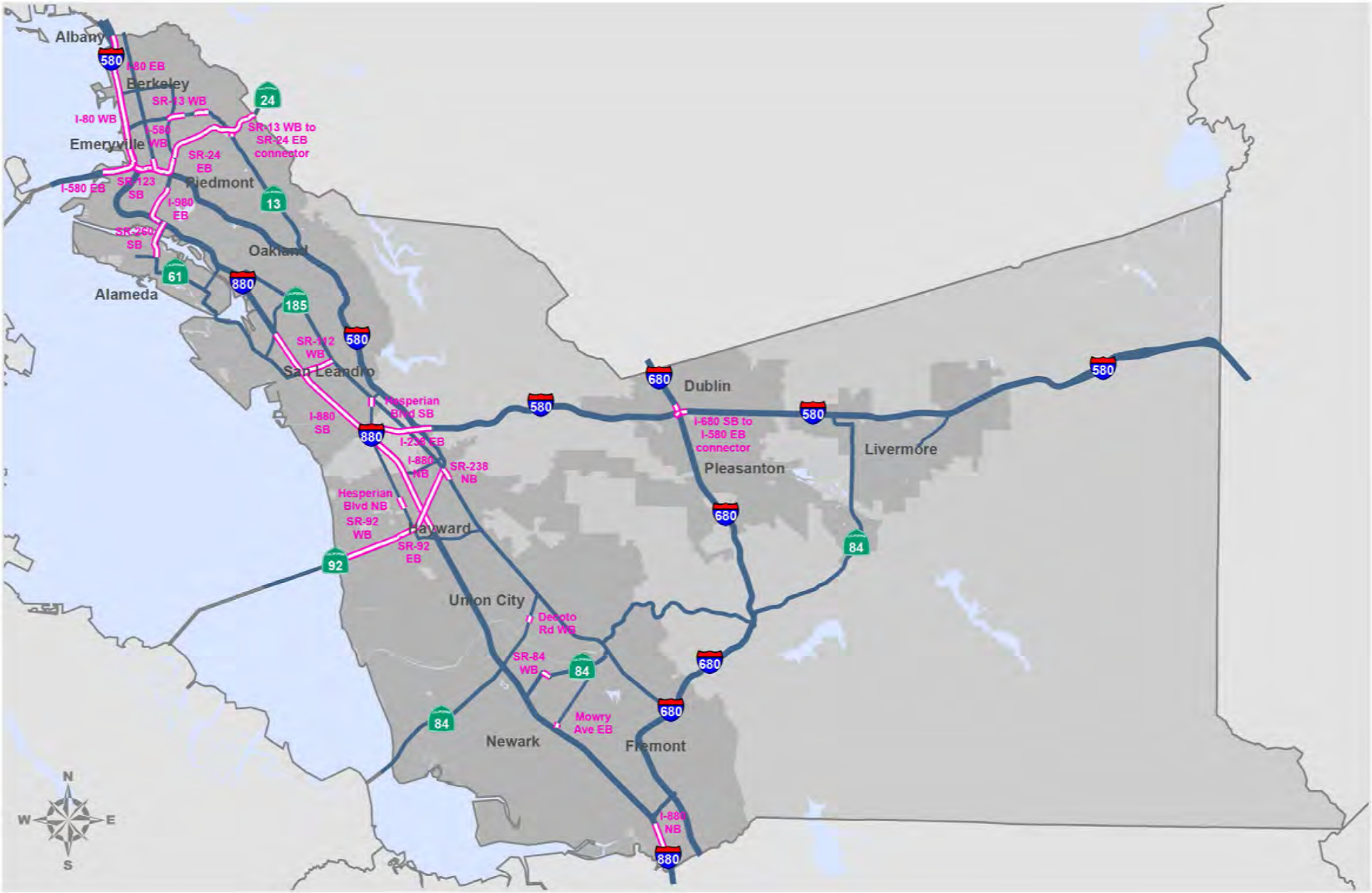
Note: Data is based on surveys taken during the afternoon peak period in September/October, 1992.

[25] LOS condition was first reported during the 1991 surveys.

Table 8—LOS F Arterial Segments, Alameda County CMP-Designated Roadway Network

	Roadway		Limits	Jurisdiction	Arterial Class	Average Speed (mph)
1	SR-13 (Ashby Avenue)	WB	From Telegraph Avenue to Shattuck Avenue	Berkeley	III	8.7
2	SR-13 (Ashby Avenue)	WB	From Shattuck Avenue to MLK, Jr. Way	Berkeley	III	9.3
3	SR-13 (Ashby Avenue)	EB	From College Avenue to Domingo Avenue	Berkeley	III	6.8
4	SR-123 (San Pablo Avenue)	SB	From Park Avenue to 35th Street	Emeryville/Oakland	II	9.4
5	SR-260	SB	From 7th/Webster Street to Atlantic Street	Oakland/Alameda	I	12.3
6	SR-238 (Mission Boulevard)	NB	From Sycamore Street to Jackson Street	Hayward	II	8.8
7	SR-92 (Jackson Street)	EB	From I-880 to Winton Avenue	Hayward	II	8.6
8	SR-92 (Jackson Street)	EB	From Winton Avenue to Mission Boulevard	Hayward	II	4.5
9	Hesperian Boulevard	NB	From La Playa to Winton Avenue	Hayward	I	11.1
10	Hesperian Boulevard	SB	From 14th Street to Fairmont Drive	San Leandro	II	9.9
11	Hesperian Boulevard	SB	From Spring Lake to Lewelling Boulevard	Unincorporated	II	9.6
12	SR-112 (Davis Street)	WB	From I-880 to San Leandro Boulevard	San Leandro	II	5.2
13	Decoto Road	WB	From Union Square to Alvarado-Niles Road	Union City	II	8.6
14	SR-84 (Fremont Boulevard)	WB	From Peralta Boulevard to Thornton Avenue	Fremont	II	7.2
15	Mowry Avenue	EB	From I-880 to Farwell Drive	Fremont	II	9.6

Note: Based on surveys during the afternoon peak period (4 p.m. to 6 p.m.) in July-August and October, 1991.



ALAMEDA County Transportation Commission

Figure 8: Congestion Management Program Roadway Network

Legend

- Level of Service "F" Segments
- Interstate/Freeway (CMP - Tier 1 & MTS)
- Other State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)

NB Northbound
WB Westbound
SB Southbound
EB Eastbound

Comparison with Previous LOS Results

The results of LOS monitoring over the last two decades for the key commute corridors in Alameda County appear in Table 9, which shows overall traffic conditions and comparisons of trends for long-distance trips on the CMP freeway network. The 2014 LOS Monitoring Study reported that congestion on the CMP network increased in 2014 as compared to 2012, as shown in the increased number of LOS F segments from 2012 and decreased average speed on freeways and arterials. Some areas that showed improvements appear to be related to the improvement projects completed since 2012, after the LOS monitoring was complete. Alameda CTC concluded that the congestion increase could be likely due to the improving economy, combined with many construction activities occurring across the county.

Analysis of performance trends since 1991 shows that congestion on the Alameda County CMP network is stable, while the number of vehicle miles traveled has increased. Further, as employment increases, freeway speed decreases, resulting in a corresponding increase in congestion. More details are available in the 2014 LOS Monitoring Study on the Alameda CTC website.

Table 9—LOS Trends on the CMP Network (afternoon peak period)

				Year/Miles Per Hour													
Road		Limits	mi.	Aug. 91	Oct. 91	92	94	96	98	00	02	04	06	08	10	12	13
I-80	EB	Bay Bridge Toll Plaza to Contra Costa line	6	-	23	20	22	21	20	27	19	32	23	21	29	22	23
I-80	WB	Contra Costa line to Bay Bridge Toll Plaza	6	26	25	24	23	25	28	18	22	28	28	36	27	26	26
I-580	EB	I-238 to I-205	31	-	56	55	55	55	na	41	31	34	36	35	31	40	41
I-580	WB	I-205 to I-238	31	-	57	56	57	61	na	55	55	60	58	61	66	65	63
I-580	EB	I-80 to I-238	16	-	53	52	44	53	60	63	55	43	34	47	42	41	40
I-580	WB	I-238 to I-80	16	-	58	55	51	52	61	63	60	57	55	63	60	54	60
I-680	NB	Scott Creek Road to Alcosta Boulevard	21	-	58	57	57	52	51	58	51	42	53	43	40	42	30
I-680	SB	Alcosta Boulevard to Scott Creek Road	21	-	59	58	55	61	67	63	62	66	58	63	66	66	67
I-880	NB	Dixon Landing Road to I-980	30	42	45	44	43	46	38	48	38	49	45	43	42	42	40
I-880	SB	I-980 to Dixon Landing Road	30	47	43	40	38	46	50	49	41	37	37	48	46	48	46
SR-13	NB	Mountain Boulevard to Hiller Drive	6	51	54	50	49	48	53	51	50	35	39	51	41	35	30
SR-13	SB	Hiller Drive to Mountain Boulevard	6	57	56	59	53	47	59	59	55	54	57	49	39	57	42
SR-24	EB	I-580 to Fish Ranch Road	5	29	30	29	30	24	39	33	21	40	25	24	18	17	15
SR-24	WB	Fish Ranch Road to I-580	5	53	54	58	54	50	60	57	61	59	59	58	67	66	56

Infill Opportunity Zones

Senate Bill 1636 (Figueroa), signed by the governor in 2002, established "infill opportunity zones" (IOZs) to encourage transit supportive and infill developments. The statute exempted infill opportunity zones from the requirements to maintain LOS E. None of the local jurisdictions within Alameda County established or adopted infill opportunity zones by the statute's sunset period of December 2009. However, Senate Bill 743 (Steinberg) passed in September 2013, instituted key changes to the CMP statute that will support infill development, including lifting the sunset date on designating IOZs and directing the governor's Office of Planning and Research to develop new metrics for assessment of transportation impacts to replace the LOS measure. Alameda CTC will continue to closely follow implementation of and provide input on this law. The 2017 CMP update will incorporate the outcome of implementation of SB 743 and how it impacts the CMP LOS monitoring element. Chapter 6, "Land Use Analysis Program," provides more information on Alameda CTC's efforts in supporting infill development.

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[26] Among the requirements, Alameda CTC must monitor compliance with the LOS standards. If a roadway segment does not conform to the LOS standards based on the biennial monitoring, Alameda CTC will notify the affected local jurisdiction that may elect to remedy the LOS problem or prepare a deficiency plan (see Chapter 10). If after 90 days the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." When a deficiency plan is adopted, status reports on the implementation of the deficiency plan showing progress must be submitted to Alameda CTC annually as part of the annual conformity process. The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

- Continue to use speed-based HCM1985 for auto LOS monitoring for the Tier 1 network. Apply both HCM2000 and HCM1985 to the Tier 2 network as appropriate and re-evaluate expanded HCM use in the 2017 CMP update after completion of the countywide modal studies.
- Use countywide modal studies to identify countywide facilities and metrics for monitoring alternative modes and incorporate these in the 2017 CMP for future LOS monitoring efforts.
- Closely follow and participate in the implementation of SB 743 including development of the replacement measure to assess the impact on the transportation system within and outside the infill development areas and identify the impact to the CMP LOS monitoring element and update it in the 2017 CMP.

[26] California Government Code Section 65089.3.

Multimodal Performance Element

4



State law requires CMAs to evaluate how well their transportation systems do in meeting their CMP objectives of reducing congestion and improving air quality.[27] Specifically, the CMP must contain performance measures that evaluate how highways and roads function, as well as the frequency, routing, and coordination of transit services. The performance measures should support mobility, air quality, land use, and economic objectives and be used in various components of the CMP.

Combined with LOS standards, the performance element provides a basis for evaluating whether the transportation network is achieving the broad mobility goals in the CMP. These include developing the Capital Improvement Program, analyzing land use impacts, and preparing deficiency plans to address problems. The legislation intends for the performance element to include multimodal performance measures, in addition to the required roadway and transit measures. However, only the roadway LOS standards will be used to trigger the need for a deficiency plan in Alameda County.

The CMP statute outlines minimum requirements in terms of 1) the modes that should be covered by the performance element, 2) the types of applications that performance measures should be used for, and 3) the goals/objectives with which the performance measures should align. Alameda CTC meets and exceeds the statutory minimums in terms of modes of transportation, range of applications, and goals/objectives:

- **Modes of transportation:** Alameda CTC uses performance measures for five major transportation modes including auto (highway and arterial/local roads), transit, bicycle, pedestrian, and goods movement. In addition, Alameda CTC uses performance measures that capture cross-cutting issues such as environmental, economic, and equity objectives.
- **Types of applications:** Alameda CTC uses performance measures in six distinct types of applications, as summarized in Table 10. These applications are distinct in the scales of analysis, data sources/considerations, and frequency of reporting. Three of them are CMP-required uses of performance measures (refer to Table 10 for these application types).
- **Goals and objectives:** Alameda CTC identifies goals and objectives as part of its Countywide Transportation Plan, as part of countywide modal plans that take a focused look at goods movement, transit, arterial, bicycle, and pedestrian systems and eventually feed into the CTP, and as a part of other documents such as Community-Based

[27] California Government Code Section 65089(b)(2).

Transportation Plans. The goals and objectives of all Alameda CTC plans are designed to be aligned with the CTP; therefore, this performance element only identifies which CTP goals are measured by different Alameda CTC performance metrics. The CTP goals encompass all CMP statutory goals (as well as other countywide goals such as state of good repair, equity, health, and others).

Principles for Selecting Performance Measures

Alameda CTC follows the principles below when identifying different performance measures for different applications:

- **Aligned with goals and objectives:** Performance measures should relate back to a goal from the CTP or CMP statute. The measures should also be based on MTC's multimodal programming criteria as a philosophical framework;
- **Presented in easy-to-understand and consumer/user-oriented terms:** Performance measures should be readily understandable by a member of the public. Measures should also strive to capture important aspects of the user experience;
- **Data availability, "dynamism" of measure, and level of effort to compute measure matched to reporting frequency:** Performance measures that require household travel survey data, applying a travel model, or performing complex mapping analysis are not feasible for annual reporting. Similarly, measures that do not change greatly from year-to-year are better for less frequent reporting (as an example, the percent of households living within a 20-minute walk of an elementary school is a critical accessibility measure; however, it depends greatly on land-use patterns that change over long time horizons and is not appropriate for annual monitoring; a measure such as percent of new development within a half-mile of transit is more dynamic and more appropriate for annual monitoring);
- **Scale of analysis matched to application type:** For instance, a performance measure that relies on a travel model for computation will generally not be well-matched to a highly-localized application (such as evaluating a signal timing project or a bicycle lane project), as model accuracy declines with finer geographic scale. Similarly, a measure that requires field data collection is not suitable for countywide analysis; and
- **Consideration of an array of measures:** Since one performance measure will not serve all needs, Alameda CTC considers an array of measures.

Table 10 on the next page describes Alameda CTC's use of performance measures for different applications.

Table 10—Alameda CTC Uses of Performance Measures

Application Type	Questions Answered	Geographic Scale	Temporal Scale	Reporting Documents
Evaluate Blueprint Scenarios*	• How much should be invested in different modes over a 30-year horizon? • How do different land use patterns affect transportation system outcomes?	County-level analysis	Long-range projections	• Countywide Transportation Plan (every 4 years) • Countywide Modal Plans (every 4 years or more) • Community-Based Transportation Plan (every 4 years or more)
Diagnose System Deficiencies*	• Which particular parts of the transportation system have needs/issues? • Where are new projects or programs needed?	Facility-level analysis	Regular monitoring cycles, existing conditions	• Level of Service Monitoring (biennial) • Speed/reliability analysis for key bus routes (possible future effort)
Prioritize Projects and Programs*	• Which projects or programs should be funded in the short-, mid-, and long-term?	Facility- or project-level analysis	Existing conditions and "with project" conditions	• Comprehensive Investment Plan (biennial) • Countywide Modal Plans (every 4 years or more)
Track Trends and Progress Toward Goals	• Is Alameda County making progress toward transportation goals?	County-level analysis	Regular monitoring cycles, existing conditions	• Performance Report (annual) • PDA Investment & Growth Strategy (annual) • Safe Routes to School Annual Report
Perform Project/ Program Before/ After Analysis	• Did a particular project or program achieve its desired outcomes?	Project-level analysis	Short-term without and with project	• Grant agreements • Before/after studies
Analyze Transportation Impacts*	• How will a development project affect the transportation system and what mitigations are needed?	Project-level analysis	Existing conditions and long-range projections	• Transportation Impact Analyses prepared pursuant to Land Use Analysis Element

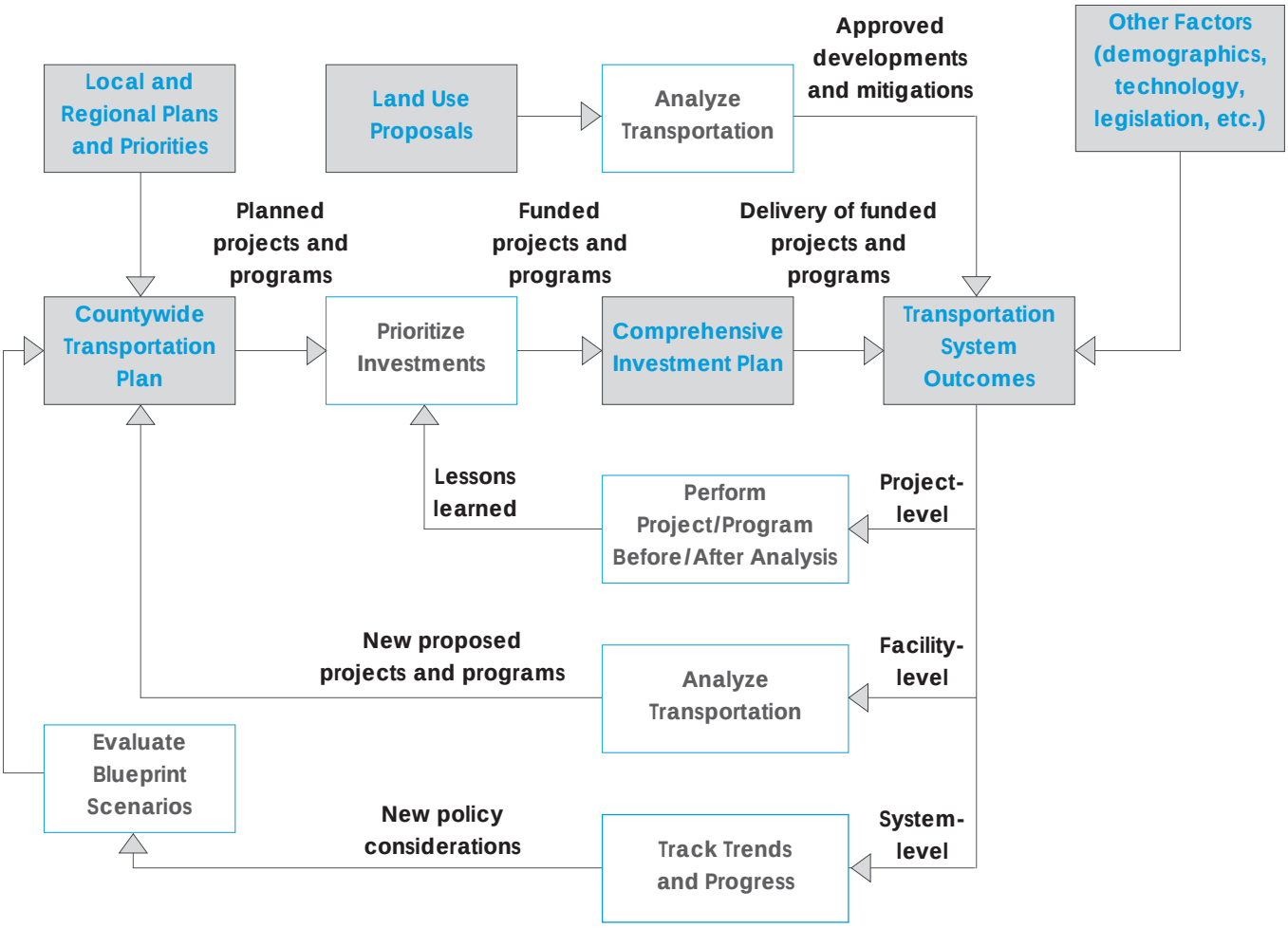
*Indicates CMP statute specifically refers to use of performance measures in this type of application.

Relationship of Performance-Based Planning Activities

Alameda CTC uses performance-based analysis through a variety of stages of its work program. Broadly, the use of performance-based analysis allows Alameda CTC to set high-level policy, to make smart investment decisions, and to monitor and react to transportation system outcomes. Figure 1 conceptually illustrates how these functions are interrelated. Key points of interface between activities include the following:

- Projects and programs from the Countywide Transportation Plan (a 25-year document) are prioritized for short-term funding decisions (2- to 5-year timeframe).
- Facility-level performance monitoring can help identify specific parts of the transportation system as underperforming, leading to the inclusion of new projects and programs in future Countywide Transportation Plans to improve these facilities. For instance, performance analysis may indicate that bus operations on a particular corridor are unacceptably slow, leading to a new project for bus signal priority.

Figure 9—Relationship of Performance-based Planning Activities



- Project-level before/after analysis can provide information as to the effectiveness of specific types of projects in specific contexts, which can help determine which projects should receive limited funding. For instance, counts taken before and after the installation of a bike lane may suggest that the bike lane led to an increase in levels of bicycling, which assists in the future evaluation of similar types of projects in similar contexts.
- Progress (or lack of progress) in achieving a goal, as illuminated through system-level trend analysis can give rise to new policy ideas for inclusion in future Countywide Transportation Plans. For instance, persistent congestion could lead to consideration of new demand management strategies as part of a future Countywide Transportation Plan.

Performance Measures

The performance measures listed in Tables 11 through 17 include the performance measures that Alameda CTC uses in various planning activities and reporting documents as described in Table 10. These measures, monitored over different timelines, are organized as follows:

- Multimodal Accessibility and Transportation/ Land Use Integration
- Roadway
- Transit
- Bicycle
- Pedestrian
- Goods Movement
- Environment, Equity, and Health

Table 11—Multimodal Accessibility and Transportation/Land Use Integration Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Mode Share – Work Trips	• Percent of work trips made by different travel modes	• Evaluate blueprint scenarios • Track trends	American Community Survey		Multimodal	Performance Report
Mode Share – School Trips	• Percent of school trips made by different travel modes	• Evaluate blueprint scenarios • Track trends	Household Travel Survey; Safe Routes to School Surveys		Multimodal.	Performance Report; Safe Routes to School Annual Report
Mode Share – Other Trip Purposes	• Percent of shopping, social/ recreation, work-based, or other trips by different travel modes	• Evaluate blueprint scenarios • Track trends	Household Travel Survey; travel models	• Data generally only available on infrequent basis	Multimodal	Performance Report
Mode Share – Transit Access Trips	• Percent of trips to transit stops by different travel modes		Transit On-Board Surveys	• Data generally only available on infrequent basis	Multimodal	Performance Report
VMT Per Capita	• VMT per person-trip • VMT per household • VMT per worker • VMT per service population • Other formulations depending on application	• Evaluate blueprint scenarios • Track trends • Analyze land use	Travel models; sketch planning tolls	• Captures both multimodal accessibility and driving trip lengths • Data limitations preclude annual monitoring at present • Many considerations regarding VMT accounting and attribution	Multimodal; connected; integrated; (land use)	CTP; Performance Report; Transportation Impact Analyses
Travel Time – Work Trips	• Average travel time to commute to work in minutes • Percent of workers with commute exceeding specified threshold (e.g., 1 hour)	• Track trends	American Community Survey		Affordable; efficient	Performance Report
Land Use Approvals in PDAs	• New housing units within PDAs • New retail, office, and government square footage within PDAs	• Track trends	Land use database populated by local jurisdictions		Integrated; healthy environment (land use)	Performance Report
Land Use Approvals Within Half-mile of Transit	• New housing units within half mile of high frequency transit • New retail, office, and government square footage within half mile of high-frequency transit	• Track trends	Land use database populated by local jurisdictions		Integrated; healthy environment (land use)	Performance Report

Table 12—Roadway Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Travel Times	• Average travel time per trip in minutes for representative origin-destination pairs	• Evaluate blueprint scenarios • Track trends • Diagnose deficiencies • Prioritize investments • Perform before/after analysis	Travel model; commercial speed data	• Most closely aligns to user experience and desired outcome	Connected	LOS Monitoring
Vehicle Throughput	• Average daily traffic • Peak-hour vehicle flows	• Evaluate blueprint scenarios • Track trends • Perform before/after analysis	Caltrans Performance Monitoring System (PeMS); Bay Area Toll Authority; project-level data collection		Connected	Before/after study - Express Lanes
Person Throughput	• Product of average daily traffic or peak-hour vehicle flows and average vehicle occupancy	• Evaluate blueprint scenarios • Track trends	Caltrans Performance Monitoring System (PeMS); Bay Area Toll Authority; vehicle occupancy counts or assumptions (could come from household travel surveys)		Efficient; cost-effective	Before/after study - Express Lanes
Travel Speeds/ Level of Service	• Speeds of segments • Number of segments with speeds below threshold • LOS of segments	• Evaluate blueprint scenarios • Diagnose deficiencies • Perform before/after analysis	Commercial speed data	• Measures congestion intensity at particular locations (mobility) but does not directly measure ability to get to destinations (accessibility)	Efficient; connected	LOS Monitoring; Before/after study - Express Lanes
HOV or HOT Lane Travel Time Competitiveness	• Ratio of speed in HOV/ HOT lane to general purpose lane	• Track trends • Diagnose deficiencies	Floating car surveys; Bay Area Toll Authority; commercial speed data in future		Efficient	Before/after study - Express Lanes
Person Hours of Delay	• Excess travel time due to facility operating below specified threshold	• Evaluate blueprint scenarios • Track trends	Commercial speed data and vehicle occupancy counts or assumption	• Threshold for delay should be grounded in operational and economic considerations • Consideration should be given as to whether to normalize by motorists or traveling public	Efficient	Performance Report

Table 12—Roadway Performance Measures (continued)

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Bottlenecks and Queues	• New housing units within PDAs • New retail, office, and government square footage within PDAs	• Track trends • Diagnose deficiencies • Perform before/after analysis	Commercial speed data		Efficient	Before/after study - Express Lanes
Pavement Condition Index	• Average PCI • Percent of lane-miles that are poor, failed, and at-risk • Unmet maintenance needs over 28 years assuming current paving conditions • Unmet maintenance needs over 28 years to get local roads to certain PCI	• Evaluate blueprint scenarios • Track trends	MTC StreetSaver		Well-maintained	Performance Report
Collision and Rate	• Collisions • Collisions per centerline mile • Collisions per million annual VMT	• Track trends • Diagnose deficiencies • Prioritize investments • Perform before/after analysis	Caltrans/California Highway Patrol Statewide Integrated Traffic Record System (SWITRS) database and PeMS		Safe	Performance Report
Travel Time Index	• Ratio of congested travel time to free-flow travel time for representative origin-destination pairs • Ratio of peak to off-peak travel time for representative origin-destination pairs	• Diagnose deficiencies • Perform before/after analysis	Commercial speed data	• Measures congestion intensity at particular locations (mobility) but does not directly measure ability to reach destinations	Reliable	Arterial Plan (anticipated)
ITS Infrastructure	• ITS index	• Diagnose deficiencies	Field observation; local jurisdictions	• Four-point index for level of ITS technology in a corridor	Connected; efficient	Arterial Plan (anticipated)

Table 13—Transit Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Travel Times	• Average travel time per trip in minutes for representative origin-destination pairs	• Evaluate blueprint scenarios • Track trends • Diagnose deficiencies • Prioritize investments • Perform before/after analysis	Travel model; automated passenger counter (APC)/ automated vehicle locator (AVL) data	• Most closely aligns to user experience • Should be assessed for representative travel markets	Connected (mobility, economic)	Potential future LOS monitoring report measure
Ridership	• Annual boardings • Average weekday or weekend boardings • Per capita transit use • Passenger miles traveled	• Evaluate blueprint scenarios • Track trends • Prioritize investments • Perform before/after analysis	National Transit Database; APC data		Multimodal	Performance Report
Service Utilization	• Boardings per revenue vehicle hour (RVH) or revenue vehicle mile (RVM)	• Evaluate blueprint scenarios • Track trends • Diagnose deficiencies • Prioritize investments	National Transit Database; APC data	• Can be measured at system- or line-level	Multimodal; efficient	Performance Report
Load Factor	• Passenger miles traveled per RVM • Passenger miles per seat-miles	• Track trends	National Transit Database	• A basic measure of vehicle occupancy	Efficient; reliable	Performance Report
Commercial Speed	• Average speed including delays from boarding/alighting, signals, and traffic congestion	• Track trends • Diagnose deficiencies • Prioritize investments • Perform before/after analysis	APC/AVL data	• Can be assessed at system- or line-level	Efficient; connected	Performance Report

Table 13—Transit Performance Measures (continued)

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
On-Time Performance	• Percent of time arriving at stops within specified window of scheduled time	• Track trends • Diagnose deficiencies • Prioritize investments • Perform before/after analysis	APC/AVL data	• Can be assessed at system- or line-level	Reliable	Performance Report
Cost Effectiveness	• Operating cost per RVH or RVM • Operating cost per rider • Farebox recovery ratio	• Evaluate blueprint scenarios • Track trends	National Transit Database		Cost-effective	Performance Report
Service Interruptions	• Mean time between service delays (rail) • Average miles between revenue vehicle failures (bus)	• Track trends	National Transit Database		Well-maintained; reliable	Performance Report
Transit Fleet Age	• Average age of fleet • Percent of useful life expended of vehicles • Number of facilities beyond expected useful life	• Track trends	National Transit Database		Well-maintained	Performance Report
Public Transit Accessibility	• Percent households by income level within 0.25 mile of a bus route or 0.5 mile of a rail transit stop • Number of households/jobs within 0.5 miles of transit station	• Evaluate blueprint scenarios	GIS analysis		Multimodal; accessible; equitable; connected	CTP
Environmental Quality	• Percent of stops with shelters, benches, travel information, lighting, etc. • Infrastructure index (accounting for bus stop amenities, location, and design)	• Diagnose deficiencies • Prioritize investments • Perform before/after analysis	Transit operators; project-level data collection		Accessible; safe	Arterial Plan (Anticipated)

Table 14—Bicycling Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Counts at Multiple Lcoations	• Total bicyclists counted in Alameda CTC count program (63 locations, designated time periods)	• Track trends	Alameda CTC Countywide Bicycle/Pedestrian Count Program	• Annual count program collects one-day counts, so disaggregation below planning area level is not advisable	Multimodal	Performance Report
Collisions Involving Bicyclists	• Total collisions involving bicyclists • Injury and fatal collisions involving bicyclists	• Track trends • Diagnose deficiencies	SWITRS	• Data typically 2 years out of date	Safe	Performance Report
Bicyclist Collision Severity	• Percent of fatal or severe injury collisions involving bicyclists	• Track trends • Diagnose deficiencies	SWITRS	• Data typically 2 years out of date	Safe	Performance Report
Local Master Plan Adoption	• Number of jurisdictions with local master plan adopted within last 5 years	• Track trends	Local jurisdictions		Integrated; connected	Performance Report
Miles of Network Built	• Miles of countywide facilities implemented • Percent of network mileage implemented • Miles of "innovative" facilities constructed (e.g., using design features recently adopted to Highway Design Manual)	• Track trends	Alameda CTC GIS database; local jurisdictions		Connected	Performance Report
Community Members Participating in Programs	• Community members participating in bicycle safety education • Community members counted at Bike to Work Day energizer stations • Number of schools with Safe Routes to Schools programs by type	• Track trends	Countywide program progress reports; Safe Routes to School Annual Report	• Countywide program progress reports • Safe Routes to Schools Annual Report	Connected; accessible	Performance Report
Countywide Funds Devoted to Bicycling	• Percent of countywide funds devoted to bicycle projects, programs, and plans	• Track trends	Alameda CTC programming action	• Programming actions may not correspond to allocation or project completion; assumptions needed about local road funds spent on biking	Multimodal; equitable	Identified in Countywide Bicycle Plan for future monitoring
Counts at a Single Location	• Number of bicyclists counted at a discrete location	• Perform before/after analysis	Project-level data collection	• Before counts not always feasible if facility did not exist • Many factors aside from project may influence counts	Multimodal	Capital project grant agreements
Environmental Quality	• Level of traffic stress	• Diagnose deficiencies	Field observation; aerial imagery	• Methodology that classifies facilities into one of four levels based on what level of cyclists would feel comfortable using the facility	Multimodal; accessible; safe	Arterial Plan (anticipated)

Table 15—Pedestrian/Walking Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Counts at Multiple Lcoations	• Total pedestrians counted in Alameda CTC count program (63 locations, designated time periods)	• Track trends	Alameda CTC Countywide Bicycle/Pedestrian Count Program	• Annual count program collects one-day counts, so disaggregation below planning area level is not advisable	Multimodal	Performance Report
Collisions Involving Pedestrians	• Total collisions involving pedestrians • Injury and fatal collisions involving pedestrians	• Track trends • Diagnose deficiencies	Caltrans/California Highway Patrol SWITRS database	• Data typically 2 years out of date	Safe	Performance Report
Pedestrian Collision Severity	• Percent of fatal or severe injury collisions involving pedestrians	• Track trends • Diagnose deficiencies	Caltrans/California Highway Patrol SWITRS database	• Data typically 2 years out of date	Safe	Performance Report
Local Master Plan Adoption	• Number of jurisdictions with local master plan adopted within last 5 years	• Track trends	Local jurisdictions		Integrated; connected	Performance Report
Number of Pedestrian Projects Complete	• Number of projects completed by type	• Track trends	Local jurisdictions		Connected	Performance Report
Countywide Funds Devoted to Walking/Pedestrians	• Percent of countywide funds devoted to pedestrian projects, programs, and plans	• Evaluate blueprint scenarios • Track trends	Alameda CTC programming actions	• Programming actions may not correspond to project completion; assumptions needed about local road expenditures on walking	Multimodal; equitable	Identified in Countywide Pedestrian Plan for future monitoring
Schools with SR2S Programs	• Number of schools with SR2S program by type	• Track trends	Safe Routes to School Annual Report		Connected; accessible	Performance Report
Counts at a Single Location	• Number of pedestrians counted at discrete location	• Perform before/after analysis	Project-level data collection	• Before counts not always feasible if facility did not exist • Many factors aside from project may influence counts	Multimodal	Capital project grant agreements
Environmental Quality	• Pedestrian comfort index	• Diagnose deficiencies	Field observation; aerial imagery	• Index accounting for factors including sidewalk width, presence of buffer between sidewalk and roadway, average crosswalk spacing, roadway classification, average annual daily traffic, number of lanes, speed limit, and percent heavy vehicle traffic	Multimodal	Arterial Plan (anticipated)

Table 16—Goods Movement Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
GHG Emmissions	• Tons of greenhouse gas (GHG) emissions from freight operations	• Prioritize investments • Evaluate blueprint scenarios	Travel model and Air Resource Board Emission Factor (EMFAC) model		Healthy environment (air quality)	Goods Movement Plan
Air Quality	• Tons of PM2.5 emissions from freight operations • Tons of NOx emissions from freight operations	• Prioritize investments • Evaluate blueprint scenarios	Travel model and EMFAC model		Healthy environment (air quality)	Goods Movement Plan
Equity	• Freight impacts such as light, noise pollution, safety, air pollution, and encroachment on specific, adjacent communities most affected	• Diagnose deficiencies • Prioritize investments	GIS analysis (to identify communities); qualitative assessment and project-level studies (to determine impacts)		Equitable	Goods Movement Plan
Travel-time Delay	• Excess time due to travel below specified threshold (trucks) • Excess time due to congestion (rail, terminals)	• Diagnose deficiencies • Prioritize investments • Perform before/after study • Evaluate blueprint scenarios	Commercial speed data; Caltrans PeMS; travel model; project-level studies (e.g., Project Study Reports, Environmental Impact Reports (EIRs))		Efficient (mobility)	Goods Movement Plan
Buffer Time Index	• Ratio of 95th percentile travel time to free-flow travel time for freight (truck) routes (freeway and some conventional highways)	• Prioritize investments	Commercial speed data; Caltrans PeMS		Reliable (mobility)	Goods Movement Plan
Truck-involved Crashes	• Crashes involving trucks	• Diagnose deficiencies • Track trends	Caltrans/California Highway Patrol SWITRS database		Safe	Goods Movement Plan
Rail Crashes	• Crashes at at-grade rail crossings	• Diagnose deficiencies	Federal Rail Authority Office of Safety Analysis		Safe	Goods Movement Plan
Freight Infrastructure Conditions	• PCI on truck routes • Bridge condition rating	• Diagnose deficiencies • Evaluate blueprint scenarios	MTC StreetSaver		Well-maintained	Goods Movement Plan

Table 16—Goods Movement Performance Measures (continued)

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Resiliency	• Addresses freight system vulnerability to major service disruptions due to major natural or other events	• Diagnose deficiencies	Qualitative assessment and project-level studies		Well-maintained	Goods Movement Plan
Use of Innovative Technology	• Use of ITS and other innovative technologies such as zero emissions	• Prioritize investments	Qualitative assessment		Efficient; cost-effective	Goods Movement Plan
Multimodal Connectivity and Redundancy	• Freight route access from/ to locations with significant freight activities	• Diagnose deficiencies • Prioritize investments	GIS analysis and qualitative assessment		Connected (land use)	Goods Movement Plan
Coordinates with Passenger Transportation	• Freight system element shared use with passenger system and addresses passenger/ freight conflicts	• Prioritize investments	Qualitative assessment		Connected; multimodal	Goods Movement Plan
Compatibility with Land-use Decisions	• Locations and corridors with significant freight activities in proximity to non-compatible land uses currently and in the future	• Diagnose deficiencies • Prioritize investments	GIS analysis and qualitative assessment		Integrated (land use)	Goods Movement Plan
Jobs and Economic Impact	• Jobs generated by project • Economic output generated by project • Jobs in goods movement-dependent industries	• Prioritize investments • Track trends • Perform before/ after study • Evaluate blueprint scenarios	IMPLAN model		Cost-effective (economic)	Goods Movement Plan
Truck Route Design Compatibility	• Truck Route Accommodation Index	• Diagnose deficiencies	Field observation; aerial imagery	• Index that takes into account curb lane width and on-street parking in urban environments	Connected	Arterial Plan (anticipated)

Table 17—Environment, Equity, and Health Performance Measures

Measure/Concept	Metric	Applications	Data Sources	Considerations	CTP Goals (CMP Goals)	Report/Document
Activity Center Accessibility	• Percent of low-income households (<$25,000 per year) within 20-minute drive or 30-minute transit ride of activity center • Percent of low-income households (<$25,000 per year) within 0.5 miles of elementary school	• Evaluate blueprint scenarios	American Community Survey and GIS analysis	• Best for less-frequent reporting as measure not highly dynamic	Equitable; integrated; connected (land use)	CTP
Physical Activity	• Daily hours spent walking or biking	• Evaluate blueprint scenarios • Track trends	Travel model and off-model tools; California Health Interview Survey		Multimodal; healthy environment	CTP
GHG Emissions	• Tons of daily GHG emissions (CO_2e) from passenger and freight transportation	• Evaluate blueprint scenarios	Travel model and Air Resource Board EMFAC mode	• Data limitations preclude annual monitoring	Healthy environment (air quality)	CTP
PM 2.5 Emissions	• Tons of daily particulate matter emissions from passenger and freight transportation	• Evaluate blueprint scenarios	Travel model and Air Resource Board EMFAC model	• Data limitations preclude annual monitoring	Healthy environment (air quality)	CTP

Alameda CTC monitors these performance measures with data collection or by using the Countywide Travel Demand Model. The measures encompass all modes of transportation. Measurements of current conditions rely primarily on available data and established data collection processes. Peak and off-peak travel periods are considered for typical weekdays. Additional details for the legislatively required highway and roadway system and transit performance measures appear in a separate section of this chapter.

System Definition

While the statute clearly requires designation of a CMP-network for purposes of LOS monitoring, it provides no guidance for selecting a system for the performance element. Alameda CTC will use the Metropolitan Transportation System (MTS) for the performance element. Alameda CTC also recognizes the MTS[27] in the Land Use Analysis Program as the focus of transportation analyses.

Sources and Aceeptability of Data

Alameda CTC uses a variety of data sources for its performance monitoring activities, as detailed in Tables 11 through 17. General rules regarding data sources used include:

- Alameda CTC uses data sources that have industry acceptability.
- New data sources are validated against established data sources when possible.
- Performance measures generated from travel demand models are not appropriate for annual or bi-annual monitoring (due to model's horizon years) or for localized measures (due to accuracy issues with applying a countywide model at such scales).
- Data sources requiring original data collection (e.g., GPS floating car speed surveys, bicycle and pedestrian counts) are generally used for localized applications or on specifically defined networks due to cost of data collection.

[28] MTS prior to 2005.

Legislatively Required Performance Measures

Highway and Roadway System Performance

Alameda CTC reports on level of service on the Congestion Management Program network as required by the CMP statute in its biannual LOS monitoring reports. Alameda CTC also reports on other highway and roadway performance measures such as pavement condition index, travel times, vehicle hours of delay, collisions, and gateway traffic volumes in its annual Performance Report.

Transit Service Performance Measures

The following transit service performance measures are legislatively required measures, and detailed information for these measures are provided by the transit operators in the county based on their service standards as expressed in their short-range transit plans or other policy documents.

Table 18 shows performance measures for bus and rail transit in Alameda County. These measures apply to both existing services and future year (proposed) services.

For ferry services from Alameda and Oakland to San Francisco, the frequency measure is one vessel per hour during the a.m. and p.m. peak periods.

Table 18—Performance Measures for Frequency of Transit Service (time of day)

Service Type	Peak	Midday	Night	Owl	Sat/Sun/Holiday
	(minutes between services)				
Bus					
Primary Trunk	15	15	30	60	15
Major Corridor	15	15	30	N/A	30
Local/Crosstown	30	30	60	N/A	60
Suburban Local/Crosstown	30-45	30	NA	N/A	N/A
Transbay Basic	15	30	60	N/A	N/A
Transbay Express	15-30	N/A	N/A	N/A	N/A
Transbay Owl	N/A	N/A	N/A	60	N/A
Rail					
BART	3.75-15	up to 20 (off-peak)			
Ferries	60	varies	N/A	N/A	varies

Note: Overlapping bus routes provide more frequent service on some corridors.

Routing

Performance measures for routing and area coverage vary by transit operator.

AC Transit has guidelines for route spacing. In the densest areas, with a population of more than 20,000 people per square mile, routes should be only one-quarter mile apart. In medium-density areas with 10,000-20,000 people per square mile, such as many of the grid sections of Oakland and Berkeley, routes should be between one-quarter and one-half mile apart. In low-density areas with 5,000-10,000 people per square mile, typical of sections in Castro Valley, Fremont, and Hayward, route spacing should be between one-half and three-quarters of a mile. For very low-density areas with less than 5,000 people per square mile, route spacing can be one mile or more.

In making specific route decisions, AC Transit uses these guidelines but also bases current- and future-year bus route spacing (the average distance between bus lines) on residential densities, the location of major activity centers, topography, and street patterns.

Route spacing in commercial areas is determined by location, level of activity, and layout of the development, on a case-by-case basis.

BART passenger loads are measured at selected "screenlines"—imaginary lines between two stations. Generally, screenlines are chosen at the points where maximum loads in a given direction are sustained for a significant duration—often on the edge of a central business district.

Based on its experience, BART employs the following average loading goals, which it attempts to achieve whenever possible. Identical goals and standards are applied to all lines.

- **Peak hour:** 107 passengers per car
- **Shoulder two hours of peak period:** 90 passengers per car
- **Off-peak periods:** One passenger per seat (currently 60 per car)

BART aims for a maximum peak-hour average car load of 107 passengers per car at critical screenlines in the system such as through the Transbay Tube (West Oakland/Embarcadero). In future years, headways and train lengths will be adjusted in a manner that strives to equalize passenger loading levels across all of its lines, while staying under the 107 passengers per car standard.

LAVTA proposes the following performance measures for existing and future services:

- Expand routes and services to meet current and future demand for timely and reliable transit service;
- Provide service with a time span sufficient to effectively serve the primary target markets for each route:
  - 4:00 a.m.-1:00 a.m. or 24 hours in backbone corridor(s);
  - 5:00 a.m.-12:00 a.m. on primary feeder lines;
  - 6:00 a.m.-9:00 a.m. and 4:00 p.m.-7:00 p.m. on secondary feeder lines and regional routes; and
  - Bell time for supplemental school lines.
- Provide trip frequencies sufficient to effectively serve the primary target markets for each route:
  - 15-30 minutes on backbone lines, 10-minute peaks if demand warrants;
  - 30-60 minutes on other primary lines;
  - 60-minute peak service on neighborhood, local feeder, and regional express lines; and
  - Single daily roundtrips for supplemental school lines.

Union City Transit uses the following performance measures for existing and future service:

- 90 percent of all land with three or more dwelling units per acre within one-quarter mile of a transit route; and
- 90 percent of major activity centers within one-eighth mile of a transit route.

Transit Service Coordination

A number of measures are in place to ensure coordination among transit operators, including Senate Bill 602 (Service/Fare Coordination, 1989), Senate Bill 1474 (Transit Coordination, 1996), Senate Bill 916 (RM2, including Transit Connectivity, 2003), MTC Resolution No. 3055 (Inter-operator Transit Coordination Implementation Plan) and others. All transit operators in Alameda County will continue to implement the coordination projects required under these guidelines. Annually, the projects are agreed on among the operators and MTC. They relate to coordinating the following:

- Fare
- Schedule
- Service
- Public information
- Marketing
- Administration

Review Process

Alameda CTC will prepare an annual transportation Performance Report that analyzes performance measures and documents Alameda County transportation network performance for review by local agencies and transit operators prior to publication. The report will include the most current available data from various agencies. (Alameda CTC will accept performance data that is up to two years old.) The Performance Report includes estimates of population growth during the preceding year, available from the State Department of Finance. As mentioned previously, the LOS Monitoring Report will document roadway performance for the CMP roadway network.

Local Government and Transit Agency Responsibilities and Conformance

To minimize cost, Alameda CTC relies on established data collection processes and regularly published

reports for data. A list of established data collection efforts, by agency, is listed below. In 2011, the Alameda CTC Commission recommended that in odd-number years, depending on funding availability, efforts be made to augment the data collection for all modes, as needed, for improved analysis of performance of the countywide transportation system.

Cities and County

- Pavement Management System data for the MTS
- Countywide Bicycle and Pedestrian Plans (Alameda County and cities' public works departments)

Transit Agencies

- Service schedules (on-time performance)
- Transit ridership routing (percentage of major centers served within one-quarter mile of a transit stop)
- Frequency (number of lines operating at each frequency level)
- Service coordination (number of transfer centers)
- Average time between off-loads (BART)
- Miles between mechanical road calls (AC Transit, LAVTA, and Union City Transit)
- Mean time between service delays (BART and ACE)
- Transit availability (frequency of transit and population within one-half mile of rail station or bus and ferry stops and terminals)
- Transit capital needs and shortfall (for high-priority, Score 16 transit projects for Alameda County transit operators)

MTC

- Roadway maintenance needs
- Freeway congestion monitoring data (if developed by MTC)

Caltrans

- Freeway speed runs, duration of freeway congestion (if developed by Caltrans)
- Accident rates on state freeways
- Roadway miles in need of rehabilitation

Alameda CTC

- Roadway speeds on CMP network
- Travel times for O-D pairs
- Countywide Bicycle and Pedestrian Plans
- Countywide Travel Demand Model analysis for mode share, activity center accessibility, etc.

Local agencies are encouraged to provide maintenance data to MTC or maintain their own database of maintenance needs on the MTS. However, there are no compliance requirements for local agencies or transit operators related to the multimodal performance element.

Next Steps

The performance measures identified in the multimodal performance element are based on measures established in a variety of plans and documents including the Countywide Transportation Plan, countywide modal plans (bicycle, pedestrian, arterial, transit, and goods movement) and the CMP document.

As part of the 2017 CMP update, Alameda CTC will reevaluate and identify multimodal performance measures that can be periodically monitored including documents and timelines for reporting those measures. The re-evaluation will ensure that the timeline for reporting on different measures is realistically aligned with data availability and potential changes in the measures. In addition, it will ensure that the various monitoring documents are complementary and non-duplicative. This will allow Alameda CTC to tailor its multimodal performance measures to project evaluation needs and inform programming decisions.

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Travel Demand Management Element 5



Continued population growth in the Bay Area and Alameda County places increasing demands on the region's transportation system. Investments in Alameda County transportation facilities and services will continue to help accommodate growing demand; however, to better manage this travel demand, a set of complementary strategies and measures are also necessary.

Travel demand management (TDM) measures seek to reduce pressure on existing roadway and parking capacity by using incentives and disincentives to influence travel choice. They reduce peak-period vehicle trips and total vehicle miles traveled. Related benefits include reducing congestion and carbon emissions, improving public health, and increasing transportation choice. The most effective TDM programs include some form of financial incentive, either through pricing parking or subsidizing transit, ridesharing, biking, or walking.

TDM strategies can provide cost-effective ways of meeting regional goals. By making the most efficient possible use of the available system capacity, they complement the region's investments in high-occupancy vehicle lanes, transit systems, and other alternatives to single-occupant driving.

State law requires that, at a minimum, the TDM element of the Congestion Management Program[29] accomplish the following:

- Promote alternatives to single-occupant vehicle travel, including but not limited to carpools, vanpools, transit, bicycles, and park-and-ride lots;
- Promote improvements in the balance between jobs and housing;
- Promote other strategies, including but not limited to flexible work hours, telecommuting, and parking management programs; and
- Consider parking "cash-out" programs.

Alameda CTC and the Bay Area Air Quality Management District are required to coordinate the development of trip-reduction responsibilities and avoid duplication of responsibilities between agencies. Cities and other local jurisdictions can establish their own TDM programs that go beyond what Alameda CTC and BAAQMD develop. To meet the intent of the CMP legislation, the CMP requires local governments to undertake certain TDM actions, known as the Required Program.

[29] California Government Code Section 65089(b)(3).

Alameda CTC has developed a framework for implementing TDM in Alameda County that defines the roles and responsibilities of public and private organizations, summarizes the funding approach, and details how local jurisdictions must demonstrate compliance with the TDM program requirements. Appendix G provides a menu of various TDM measures and is intended as a resource for organizations developing TDM plans.

Framework

Travel demand management in Alameda County is a collaborative and cooperative effort. Specific strategies are appropriate for the region as a whole, the county and local jurisdictions, and for individual employers or trip generators. Alameda CTC works to coordinate the activities of these types of organizations with the other elements of the CMP, so that capital investment, system management, and demand management work together to provide diverse transportation choices, contain congestion, and improve air quality. The county's approach to TDM includes the following major elements:

Regional actions: BAAQMD, Caltrans, and MTC take actions to support TDM throughout the San Francisco Bay Area. Alameda County's efforts work within the context of these broader regional initiatives.

Countywide actions: Alameda CTC takes actions to encourage, supplement, and support local governments in their TDM efforts, allocating funds for multimodal transportation improvements, providing guidance and technical assistance to localities in developing their own TDM programs, and monitoring compliance with the Required Program in the CMP. Alameda CTC also manages certain key TDM programs, such as Guaranteed Ride Home, that work most effectively at the countywide level.

Local jurisdiction actions: At the local level, local governments have primary responsibility for implementing TDM programs and encouraging and incentivizing TDM by private organizations. The CMP requires local governments to undertake certain TDM actions, known as the Required Program. The CMP also encourages local governments to undertake TDM efforts above and beyond these requirements.

Private TDM actions: Private employers, developers, homeowner associations, and nonprofit organizations can undertake TDM measures on a voluntary basis or as required by a city. Alameda CTC provides resources to support these actions, including guidance on best practices and other technical resources.

Regional Actions

The Regional TDM Program includes actions that MTC, BAAQMD, and Caltrans take to support TDM programs throughout the San Francisco Bay Area. While the primary role of these agencies is to provide the infrastructure and services that allow for transportation options, they also work to manage demand for those facilities. Key regional TDM efforts include:

- **Bay Area Commuter Benefits Program:** As of September 30, 2014, Bay Area employers with 50 or more full-time employees within the BAAQMD geographic boundaries are required to register and offer commuter benefits to their employees to comply with Air District Regulation 14, Rule 1. Employers must offer one of four commuter benefit options to their employees, each intended to reduce vehicle miles traveled and employee commute costs: 1) exclusion of employees' transit or vanpool costs from taxable income, to the maximum amount, as allowed by federal law (currently $130 per month); 2) employer-provided transit subsidy (or transit pass) or vanpool subsidy up to $75 per month; 3) employer-provided free or low-cost bus, shuttle, or vanpool operated by or for the employer; or 4) an alternative employer-provided commuter benefit that is as effective in reducing single-occupant vehicles as options 1-3.
- **511 Regional Rideshare Program:** MTC's 511 Regional Rideshare Program offers an online tool for commuters to find rideshare matches through its transportation information website, 511.org. MTC's website is designed to expand the range of

potential carpoolers and facilitate coordination between people with similar commutes who would not otherwise be aware of each other. MTC encourages users of the site to log their commutes, offering an incentive program with prizes of up to $500 for keeping track of carpool trips. In addition to offering travelers assistance with carpool ride matching, MTC's rideshare program also includes information on a network of free park-and-ride lots where carpools can meet.

- **511 Regional Bicycling and Transit Trip Planners:** The 511 program offers a bicycling trip planner with a regional bike mapper tool that provides turn-by-turn biking directions along the shortest and/or flattest route. The 511 Bicycling pages also provide information on safety, Bike to Work Day, taking bikes on transit, bicycle access on bridges, and bicycle parking options. The 511 program also offers a transit trip planner that provides point-to-point transit directions and real-time arrival information for all the Bay Area's transit agencies. The 511 Transit pages provide resources, important transit alerts, and other critical information for transit riders.

- **BAAQMD Spare the Air Resource Program:** The Bay Area Air Quality Management District's Spare the Air Resource Program engages the public through education and promotions to encourage changes in behavior that will reduce air pollution. BAAQMD provides "Air Alerts" when air quality is forecast to be unhealthy and to encourage people to alter their behavior on these days to prevent unhealthy air quality. The District works directly with employers by providing tools and resources to educate employees on reducing air pollution. As part of this program, BAAQMD has established local "resource teams" composed of local residents, civic groups, agencies, businesses, and environmental organizations that work together regularly to plan educational activities and programs that reduce air pollution in their communities. Two resource teams are located in Alameda County: the Southern Alameda Resource Team and the Tri-Valley Resource Team.

Countywide Actions

Alameda CTC's actions complement regionwide activities and support the efforts of local jurisdictions. Alameda CTC's activities include:

- **Funding for multimodal transportation infrastructure and services:** To shift trips away from single-occupant vehicles, travelers need other reliable transportation options. The 2012 Countywide Transportation Plan allocates approximately 40 percent of total project funding to transit projects and approximately 12 percent to bicycle and pedestrian projects. Similarly, the CTP allocates 53 percent of total programmatic funding to transit and 7 percent to bicycle and pedestrian programs. On November 4, 2014, more than 70 percent of Alameda County voters approved Measure BB, which increased the county's half-cent sales tax for transportation to a full cent. The Transportation Expenditure Plan, which outlines the projects and programs funded by Measure BB revenues, allocates 48 percent of revenues to BART, bus, senior, and youth transit and 8 percent of total revenues to bicycle and pedestrian paths and safety. An additional 4.5 percent of revenues will support bicycle and pedestrian paths and safety improvements on local streets and roads.

- **Planning for multimodal transportation infrastructure and services:** Making transit, bicycling, and walking more convenient and safer in more places enables these modes to be viable alternatives for an increasing number of people in the county. In 2012, Alameda CTC updated the Alameda County Countywide Bicycle and Pedestrian Plans. Alameda CTC is also developing a Countywide Transit Plan and a Countywide Multimodal Arterial Corridor Plan that will help the agency optimize investments in the transit system and identify any other actions the agency can take to improve transit service as well as pedestrian and bicycle facilities throughout the county.

- **Congestion pricing strategies:** In 2002, the Alameda County CMA secured funding from MTC, Caltrans,

and the Federal Highway Administration (FHWA) to conduct a feasibility study for a high-occupancy toll lane (now known as an express lane) in the I-680 corridor. The study evaluated a number of pricing options and analyzed key factors such as physical constraints, institutional opportunities and constraints, operational issues, and revenue potential. The study concluded in April 2003 and found that a smart carpool lane (express lane) would be operationally, physically, and financially feasible. Subsequently, Assembly Bill 2032 (Dutra, 2004) authorized implementation of the I-680 Express Lane. The project was completed and opened to traffic in September 2010. The legislation also approved a second express lane in the county. The CMA approved I-580 as a candidate corridor, and this project is currently under construction and will open in late 2015.

- **Guaranteed Ride Home:** The Alameda County GRH program, administered by Alameda CTC with funding from BAAQMD, gives commuters an "insurance policy" against being stranded at work if they need to make an unscheduled return trip home. By providing the assurance that commuters can get home in an emergency, GRH removes one of the greatest barriers to choosing an alternative to driving alone, addressing concerns such as, "What if I need to get home because my child is sick, or I have unscheduled overtime and miss my carpool ride home?" For employees, the availability of guaranteed rides home is an incentive to find an alternative to driving alone to work that avoids contributing to traffic congestion. The Alameda County GRH program has been in operation since April 1998. Over the last 15 years, the program has matured from a demonstration program with a handful of participating employers to a robust one with 2,275 registered employees and 472 registered employers throughout Alameda County as of January 2015.

- **Technical support for new and existing Transportation Management Associations:** Transportation Management Associations (TMAs) are an effective mechanism to reduce traffic congestion and improve use of non-drive-alone modes by employees and sometimes residents. Depending on available resources, Alameda CTC will support creation of new TMAs in the county and strengthen existing TMAs through financial support and a technical resources "how to" handbook.

- **Commute Choices website:** In 2015, Alameda CTC launched the Commute Choices website (http://commutechoices.alamedactc.org/) which inventories the full range of TDM programs available in Alameda County and provides guidance to employers, individual residents and employees, and other agencies and organizations, so they can better understand the range of available transportation programs and options.

- **Safe Routes to School:** The Alameda County Safes Routes to School (SR2S) program began in 2007 and is intended to reduce traffic congestion and promote health by working with educators, parents, and students to increase walking, biking, and carpooling to school.[30] Funded through a combination of Measure B and federal funds, the program is in place at over 100 schools and has held over 300 individual events in Alameda County. Activities supported by SR2S funds in Alameda County include walking school buses and bike trains, monthly Walk and Roll to School Day events, annual International Walk and Bike to School Day events, annual Bike to School Day events, family cycling workshops, safety courses, and educator guides on bike/pedestrian safety; school walk audit events to identify safety issues around schools; and carpool-to-school ride matching and promotional activities.

- **Walking and biking promotional programs and campaigns:** Alameda CTC funds and promotes active transportation modes through several related programs and advertising campaigns. The "I Walk!" and the "I Bike!" walking and bicycling campaigns promote and support active transportation in Alameda County. The I Walk! and "Step into Life

[30] Alameda County Safe Routes to Schools websites: http://www.alamedacountysr2s.org/; http://www.alamedactc.org/app_pages/view/8070.

Challenge!" websites provide information on walking routes, organized walks, and other walking tools and tips. The I Bike! website provides links to a wide range of existing bicycling information on the websites of Alameda County cities, 511.org's bicycle trip planner, and Bike East Bay. In addition to the I Bike! website, Alameda CTC has partnered with Bike East Bay since 2008 to run advertisements in advance of the annual Bike to Work Day events to promote bicycling as a lifestyle. These advertisements appear on buses, bus shelters, street poles, and in storefronts throughout Alameda County.

- **Bike safety and education classes:** Bike East Bay currently provides free bicycle safety classes in Alameda County with the financial support of Alameda CTC's Bicycle and Pedestrian Grant Program. Specialized classes are available that focus on urban cycling, adults learning to ride, and families. By training cyclists to ride safely and comfortably, the program is intended to reduce vehicle trips in Alameda County and facilitate active transportation.

- **Technical assistance:** Through its Transit Oriented Development Technical Assistance Program (TOD TAP), Alameda CTC has funded parking and TDM studies to assist local jurisdictions in developing parking-management policies and programs that complement investments in public transit and TOD as well as walking and bicycling infrastructure. The agency has funded two parking studies: a shared parking study at MacArthur BART and a parking and stormwater study at the Coliseum/Oakland Airport BART. Alameda CTC will continue to provide financial and technical support through two primary forms:

  1) *Technical resources*: Providing informational materials, case studies, and examples; model ordinance language; and other guidelines and information that can assist jurisdictions in implementing parking and TDM policies.

  2) *Planning grants*: Providing funds to cities to conduct studies and other planning efforts to overcome local parking and TDM challenges and move forward on adoption of parking management and TDM programs and policies, potentially including formation of new TMAs. Alameda CTC has already expanded its TOD technical assistance program into a Sustainable Communities Technical Assistance Program (SC-TAP) to support a wide range of planning and project development activities in priority development areas.

Prior Countywide Initiatives

Financial incentives: A parking cash-out program is defined as an employer-funded program under which an employer offers to provide a cash allowance to an employee, equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. Parking cash-out programs apply to employers of 50 or more persons in air basins, areas that generally have similar meteorological and geographical conditions, designated as "non-attainment" areas. The parking subsidy is the difference between the out-of-pocket amount paid by an employer on a regular basis to secure an employee parking space not owned by the employer and the price, if any, charged to an employee for use of that space.

A demonstration financial incentives program for public agencies was implemented in Alameda County in 1997 for one year. The purpose of the demonstration program was to provide an opportunity for employees to choose alternative ways to get to work other than driving alone, to study the effectiveness of the program, and to find out whether increasing the incentives available made a difference in program participation. The ultimate goal was to reduce single-occupant vehicle use.

The results showed a potential for changing commute choices if the county could find continuous sources of revenues. The report on the 1997 Parking Cash-out Program is available on request from Alameda CTC.

Dynamic ridesharing: An alternative to traditional ride-matching and carpool programs, dynamic ridesharing maximizes flexibility and accommodates last-minute requests for ride matches. Rather than commuters forming ongoing daily carpools, dynamic ridesharing participants request ride matches only on days when they want to share a ride. The major benefits are that ridesharing requires minimal advance planning and accommodates changing travel times; therefore, it reduces the barriers to carpooling.

In 2005 and 2006, the Alameda County Congestion Management Agency in collaboration with the Environmental Defense Fund/RideNow!, Inc., implemented the dynamic ridesharing pilot project, known as RideNow, at the Dublin/Pleasanton BART station. A grant from FHWA provided funding to implement, test, and evaluate a dynamic ridesharing pilot project designed by RideNow!, Inc.

RideNow was an automated system that enabled BART patrons to request carpool partners minutes before they left home in the morning or while returning home in the evening on the BART train. It provided both web and automated telephone ("interactive voice response") access for users. RideNow matched riders within a short time frame, providing "instant matches." The pilot project goals were to:

- Establish if dynamic ridesharing can provide a viable new travel option;
- Test the effectiveness of the program from a technical, administrative, marketing, cost, and operational perspective;
- Assess the level of interest and usage in the program and evaluate its benefits and limitations; and
- Determine the feasibility and applicability of expanding the program beyond the duration of the pilot project as well as to other locations within Alameda County or in the San Francisco Bay region.

Based on feedback from participants and the participating agencies, the program did have value for people who desire to carpool but have complex commutes that do not permit participation in more traditional carpool programs. However, more information is needed about how many people might be attracted to this type of flexible program compared to other ridesharing or TDM programs and whether or not the program would be cost effective.

In 2010, MTC approved a $1.5 million follow-up program currently underway for Contra Costa Transportation Authority, Solano County Transportation Authority, and Transportation Authority of Marin. Funded by MTC's Climate Initiatives Program, this program explores opportunities for more carpooling through the use of smart-phone applications ("apps") that can enable spontaneous ridesharing. As more ridesharing apps develop, Alameda CTC will work with MTC to identify opportunities for integrating these new services into the ridesharing program and assess future engagement.

Local Jurisdiction Actions

Local governments have the primary responsibility for implementing TDM programs at the local level, and for encouraging and incentivizing TDM by private actors. The CMP requires local governments to undertake certain TDM actions, known as the Required Program. Alameda CTC also encourages local governments to undertake TDM efforts above and beyond these requirements.

Required Program

The Required Program includes those actions local jurisdictions must take to be in compliance with the CMP and consists of two basic elements: 1) adopting design guidelines or comparable policies that enhance transit and pedestrian and bicycle access; and 2) implementing capital improvements that contribute to congestion management and greenhouse gas reduction.

1) *Adopt design guidelines or comparable policies*: The CMP requires local jurisdictions to adopt and

implement guidelines for site design that enhance transit, pedestrian, and bicycle access. To meet this requirement, local jurisdictions must carry out one of the following actions:

- Adopt and implement design strategies that encourage alternatives to single-occupant automobile use through local development review;
- Adopt and implement design guidelines that meet the individual needs of the local jurisdiction and maintain the intent of the TDM element to reduce the dependence on single-occupant vehicles;
- Demonstrate that existing policies meet the intent of the TDM element to reduce the dependence on single-occupant vehicles.

2) *Implement capital improvements*: Local jurisdictions are also required to implement capital improvements that contribute to congestion management and emissions and greenhouse gas reduction. This requirement can be satisfied by participating in the regional Transportation Fund for Clean Air program, and the federal Surface Transportation Program and Congestion Mitigation and Air Quality Improvement Program.

Refer to "Local Government Responsibilities and Conformance" in this chapter for a description of the steps required to demonstrate compliance with the Required Program.

Voluntary local actions

Alameda CTC also encourages local jurisdictions to undertake TDM efforts above and beyond the Required Program. To support these efforts, Appendix G provides a listing of potential local TDM program elements and the context in which each program is likely to be most effective.

Cities across Alameda County have already adopted plans and programs to address TDM. Every city in Alameda County has adopted a Climate Action Plan, as has Alameda County for its government operations and for unincorporated portions of the county. Nearly every city in Alameda County has some type of TDM program and/or has re-considered its parking management strategies at the city or neighborhood level.

Tools for developing a local TDM program

A variety of tools are available to local governments for facilitating TDM. The most effective programs integrate several of these elements as a comprehensive package.

- **Modify zoning codes:** Local governments can implement TDM requirements through changes to their zoning code. For example, they can reduce or eliminate minimum parking requirements or grant reductions in minimum parking requirements on the condition that trip reduction programs are implemented. While local governments cannot require employers to implement an employee trip-reduction program unless the program is required by federal law, TDM requirements are often implemented as a condition of approval for new development, or a city's zoning code can require certain measures to address traffic congestion and reduce greenhouse gas emissions.
- **Partner to form a Transportation Management Association (TMA):** Local governments often collaborate with business associations to facilitate creation of a TMA. Actions can include requiring TMA membership as a condition of development approval; or providing staff time, office space, or start-up funding to the TMA.
- **Fund or manage programs directly:** Some local governments directly fund or manage TDM programs. For example, the local government may fund universal transit passes or contract with a private organization to provide bike-sharing services.
- **Implement capital projects:** A variety of capital investments can support TDM. For example, local governments can invest in updated parking meters to facilitate smart parking management, wayfinding

signage, or bicycle and pedestrian facility improvements.

- **Offer a TDM program for local government employees:** Local governments can offer trip reduction incentives directly to their employees. These steps can reduce peak period trips while serving as a model to other employers.

TDM program principles

Whatever the implementing mechanism, Alameda CTC encourages local jurisdictions implementing new or expanded TDM programs and requirements to adhere to the following principles:

- **Outcome-based TDM, with specific performance targets:** Utilize performance-based strategies with specific project-level, corridor-level, or citywide targets, because these types of programs have potential to be the most effective and the easiest to implement and administer.
- **Effectiveness at achieving local and regional goals:** Invest in strategies that research has proven to be effective and to provide a good return on investment.
- **Well-balanced and thorough:** Develop a comprehensive program. The most effective TDM programs have varied and mutually supportive demand-management measures. For example, a TDM program that includes subsidized transit passes and a guaranteed ride home program has the potential to reduce vehicle trips to a greater degree than one of those measures alone.
- **Effective marketing and public outreach:** Develop programs through open communication with all stakeholders and tailor the programs to their needs, since the manner in which TDM programs are introduced is crucial to their success. Perform marketing and public outreach to encourage participation.
- **User friendly:** Ensure TDM programs are easy for the public to understand and use. Policies and objectives should be clearly articulated and supported with data. New technologies, such as parking meters, should be designed for straightforward public usage.
- **Financially feasible and cost-effective:** Strategies that are low cost or no cost should be prioritized and provide the biggest return on the investment.
- **Easy and efficient to administer:** Place a priority on programs that can be easily and efficiently administered, relying on data that is collected in the normal course of business for the city. Where possible, cities should seek to collaborate with neighboring cities to reduce administrative burdens for all.

Private Sector Actions

The private sector also has an important role to play in managing travel demand. While the CMP does not require private organizations to undertake any specific TDM actions, private organizations can take a number of steps, either on a voluntary basis or in response to local jurisdiction requirements. A full menu of potential TDM actions appears in Appendix G.

Examples of existing private TDM efforts in Alameda County include:

- **Emeryville Transportation Management Association** is a nonprofit organization funded through Business Improvement District fees paid by all commercial and industrial property owners in the city. The Emeryville TMA funds the Emery Go-Round shuttle, a free service which runs from the MacArthur BART station along two routes that serve the Amtrak station, Bay Street, and major employers in Emeryville. The TMA also provides information and referral services, coordination with local and regional government and transit agencies, the Alameda CTC GRH program, and car-sharing spaces.
- **Hacienda Business Park** in Pleasanton provides a "Commute Solutions" program that offers a comprehensive suite of commute services to encourage commuting by non-drive-alone modes. For these efforts, the Hacienda Business Park is

recognized by the Best Workplaces for Commuters program.

- **Berkeley Gateway TMA** funds the West Berkeley shuttle that provides free service from the Ashby BART station to major employment centers in West Berkeley. The shuttle service is operated under a partnership with the Emeryville TMA.
- **The Broadway "B Line"** is a free shuttle that operates between Jack London Square and the Uptown/ Lake Merritt districts of Oakland. It is funded through a public-private partnership between the City of Oakland, business associations throughout the areas it serves, and a BAAQMD grant, and has received Vehicle Registration Fee funding distributed by Alameda CTC. AC Transit operates the shuttle.
- **Bishop Ranch Office Park**, located in the San Ramon valley in Contra Costa County, provides nine free shuttle routes for employees, four of which serve Dublin/Pleasanton BART and the Pleasanton ACE station, along with a variety of other commute services for employees.
- **Other free shuttles for employees** are provided by the following employers and campuses in Alameda County: Alta Bates Summit Medical Center, CSU East Bay, Heald College, Kaiser Oakland Medical Center, Mills College, Lawrence Berkeley National Laboratory, and University of California Berkeley "Bear Transit."

Menu of TDM measures

Appendix G provides a set of tables describing TDM activities that can reduce automobile trips in Alameda County. Table G-1 describes actions that public agencies, including local governments and transit agencies can carry out. Table G-2 describes complementary actions that local governments or private organizations such as employers or developers can carry out in response to local government requirements or on a voluntary basis.

Funding Approach

TDM programs are often extremely cost-effective ways to meet regional congestion management and mobility goals and offer incentives to maximize use of existing facilities. Even when TDM programs place requirements on the private sector, well-designed programs may be cost-neutral or even save money for private organizations. For example, by shifting commuters away from single-occupant vehicle travel, TDM programs can reduce an employer's need to build or lease costly parking facilities, which partially or wholly offsets program costs.

Despite these advantages, many programs do require a public subsidy. Key funding sources for TDM programs and activities include:

- **Transportation Fund for Clean Air (TFCA):** The TFCA legislation permits BAAQMD to collect a fee (up to $4 per vehicle per year) for reducing air pollution from motor vehicles and for related planning and programs. It requires the BAAQMD to allocate 40 percent of the revenue to an overall program manager(s) in each county. Alameda CTC has been designated as the overall program manager in Alameda County and has developed a program that allocates the funds as follows:
  - A maximum of 5 percent of the funds goes toward program implementation and administration;
  - Approximately 70 percent of the remaining funds goes to cities/county based on population with a minimum of $10,000 to each jurisdiction; city/ county population is updated annually based on State Department of Finance estimates.
  - Approximately 30 percent of the remaining funds are allocated to transit-related projects; all eligible applicants may apply for these funds for transit-related projects.
- **Surface Transportation Program (STP):** MTC and Alameda CTC both perform administrative functions for programming STP funds. For TDM purposes, the following projects are eligible for STP funds:

highway projects including HOV lanes, signalization, transit projects, station area and transit-oriented development planning activities that result in the location of housing and/or jobs near high-frequency transit, and bicycle and pedestrian projects.

- **Congestion Mitigation and Air Quality Program (CMAQ):** MTC and Alameda CTC both perform administrative functions for programming CMAQ funds. For TDM purposes, eligible projects include those types of transportation projects that improve air quality, such as ridesharing and bicycle and pedestrian projects.

Local Government Responsibilities and Conformance

Alameda CTC is required to monitor local jurisdictions' conformance with the adopted CMP. To meet this responsibility, Alameda CTC requires annual reporting to determine if each city and the county has adopted and implemented a trip-reduction and travel-demand ordinance. The following monitoring policies are in place.

Local Government Responsibilities

The Required Program includes actions local jurisdictions must take to comply with the CMP. Local jurisdictions have until September 1 of each year to adopt and implement the Required Program.

To be found in conformance with the CMP, local jurisdictions must certify to Alameda CTC that they have adopted and implemented site design guidelines that enhance transit and pedestrian and bicycle access. To ensure consistency among all jurisdictions, Alameda CTC prepared and approved a TDM Checklist that identifies components to include in local design guidelines (Appendix H).

Local jurisdictions are also required to implement capital improvements that contribute to congestion management and reduce carbon emissions and greenhouse gases. This requirement can be satisfied by participating in the regional TFCA and the federal STP and CMAQ Programs. Refer to Chapter 8, "Capital Improvement Program" (CIP) for more information on the CIP, which incorporates numerous project types and programs identified in the Transportation Control Measures (TCM) Plan (see Appendix I).

Procedures for Non-conformance

If Alameda CTC finds a local jurisdiction has not adopted and implemented the Required Program, it may find the local jurisdiction in "non-conformance." At the time of the finding, Alameda CTC will provide recommendations for corrective actions. If after 90 days the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." This could impact the non-conforming jurisdiction's ability to receive its increment of subventions from the fuel tax made available by Proposition 111, and the jurisdiction's ability to receive funding for projects through the federal STP and CMAQ Program.

Next Steps

Following are next steps for the CMP TDM element to increase the impact of existing TDM programs, incentivize expansion of TDM offerings throughout the county, and ultimately increase the likelihood that individuals throughout the county will utilize TDM programs and travel by non-drive alone modes.

- Encourage the formation of new Transportation Management Associations (TMAs) and strengthen existing TMAs by providing financial support (as possible) as well as technical resources such as a "how to" handbook.

- Provide technical assistance to support jurisdictions in implementing parking reforms and TDM policies and programs. Technical support for jurisdictions can take two primary forms:

  1) *Technical resources:* Providing informational materials, case studies and examples, model ordinance language, and other guidelines

and information that can assist jurisdictions in implementing parking and TDM policies.

2) *Planning grants:* Providing funds to cities to conduct studies and other planning efforts to overcome local parking and TDM challenges and move forward on adoption of parking management and TDM programs and policies, potentially including formation of new TMAs. Alameda CTC has already expanded its TOD technical assistance program into a Sustainable Communities Technical Assistance Program to support a wide range of planning and project development activities in PDAs.

- Provide a robust Guaranteed Ride Home Program.
- Maintain and update the Commute Choices website (http://commutechoices.alamedactc.org/).
- Consider adopting future TDM/parking requirement policies as part of funding eligibility requirements for local jurisdictions.

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Land Use Analysis Program

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As part of the CMP, Alameda CTC must develop a program to analyze the impacts of land use decisions made by local jurisdictions on regional transportation systems. The program must generally be able to estimate the costs associated with those impacts, as well as provide credits for local public and private contributions to improve regional transportation systems.

The CMP statute does not change the role of local jurisdictions in making land use decisions or in determining the responsibilities of project proponents to mitigate possible negative effects of projects. However, Alameda CTC has the ability to apply certain sanctions, as described in Chapter 9, "Program Conformance and Monitoring," if the local agency does not comply with the requirements of the law.

At least three legislative actions through Senate Bill 743 and Assembly Bills and 1098 and 779 are proposing to make changes to either all or part of the Congestion Management Program. Until SB 743 is implemented or AB 1098 or AB 779 is passed, any major update to the CMP or one of the five required elements will not be productive. As mentioned in Chapter 1, "Program Overview," assuming that one of these actions will occur prior to the next CMP update in 2017, Alameda CTC only made basic changes during this update to the "Land Use Analysis Program" chapter.

The intent of the Land Use Analysis Program is to:

- Better integrate local land use and regional transportation investment decisions;
- Better assess the impacts of development in one community on another community; and
- Promote information sharing between local governments when the decisions made by one jurisdiction will impact another.

The Land Use Analysis Program works best when Alameda CTC is involved at the very early stages of the development process, maximizing intergovernmental contacts before major decisions are complete. The process is intended to work in a positive, cooperative fashion that supports the needs of local, county, regional, and state governments. Proactive responses to potential impacts can occur during environmental review of specific land developments, corridor, or areawide studies, and preparation of local or regional CIPs.

Since the passage of the CMP legislation in 1991, a variety of other state and regional legislative and regulatory actions have strengthened the need for a Land Use Analysis Program. These policies share the common theme that they coordinate transportation planning and investment decisions with existing and future land use patterns.

While Alameda CTC's Land Use Analysis Program was initially conceived as a program to meet a particular state legislative mandate, the growing interest in coordinating land use and transportation planning has resulted in the program's evolution. The program now also serves as an opportunity for strategic thinking about how to plan for development that efficiently uses the transportation system, while ensuring that the mobility and access needs of residents and workers in Alameda County are fulfilled. Refer to Table 19 for legislative and regulatory actions. As such, the program includes:

- Legislatively required review of:
  - Land use actions of local jurisdictions by Alameda CTC; and
  - Land use projections for use in countywide model database by local jurisdictions;
- Planning initiatives and programs that foster transportation and land use connections; and
- Strategic monitoring of transportation-land use coordination performance measures.

Review of Land Use Actions

A major component of the Alameda CTC Land Use Analysis Program is the legislatively required review of land use development projects. The review of development projects allows Alameda CTC to assess impacts of individual development actions on the regional transportation system and ensures that significant impacts are appropriately mitigated.

Alameda CTC also plays a key interjurisdictional facilitation role, and when disputes arise between two agencies as a result of the potential impacts of a land use project, Alameda CTC may act as a mediator, if requested by one of the parties involved.

Table 19—Legislative and Regulatory Actions

Legislation/Regulatory Action	Description
California Assembly Bill 32 (AB 32)	The California Global Warming Solutions Act of 2006 requires the State of California to meet aggressive Greenhouse Gas emissions reduction targets.
California Senate Bill 375 (SB 375)	Redesigning Communities to Reduce Greenhouse Gas of 2008 synchronizes long-range regional transportation and land use planning and requires regional preparation of a Sustainable Communities Strategy that details how a region will house its population.
Metropolitan Transportation Commission (MTC) Resolution 4035	This resolution establishes the One Bay Area Grant Program, which links federal transportation funding to location in or proximate access to locally designated Priority Development Areas.
MTC Resolution 3434	The Transit Oriented Development (TOD) Policy for Regional Transit Expansion Projects of 2005 links the expenditure of regional capital funding for transit expansion to the density of households allowed around future mass transit systems.
Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA) Guidelines	These 2010 guidelines set low thresholds of significance for acceptable exposure to toxic air contaminants for residents and other users of new developments.
San Francisco Bay Conservation and Development Commission (BCDC) Sea Level Rise Estimates	These estimates identify many key development areas and transportation assets as being vulnerable to sea-level rise and needing adaption planning.

Scope of Review

Alameda CTC reviews two types of land use actions.[31]

- **Projects requiring General Plan Amendments:** These projects require a change to the text or map of a city or unincorporated planning area's general plan. General Plan Amendments (GPAs) can be performed in conjunction with a General Plan update, a specific plan, or an area plan. GPAs can also be adopted for an individual development project that is not consistent with current land use designations and therefore requires a GPA.
- **Projects consistent with General Plan:** These plans or projects do not require any modification of the general plan text or map.

Alameda CTC limits the scope of its review of land use actions to those with the potential to cause countywide or regional scale impacts. Projects are reviewed if they will cause a net increase of 100 p.m. peak-hour vehicle trips. The evening peak period is used, as this period generally experiences the highest travel demands. This threshold is applied differently, depending on whether a project requires a GPA or is consistent with existing general plan. Mitigated Negative Declarations (MNDs) are also considered differently, depending on whether a GPA is required or not. Table 20 summarizes the application of the 100 p.m. peak-hour trip threshold and consideration of MNDs.

Alameda CTC performs project trip generation calculations to determine whether CMP Land Use Analysis Program review is required. Project trip generation is computed using an approved trip generation methodology (see the following "Methodologies and Standards" section). The threshold for CMP review is based on net change in trips, meaning that trips from reclassified uses or existing redeveloped buildings are subtracted out of the total.

Alameda CTC reviews all large development projects and plans for which a city or the unincorporated county in Alameda County is the lead agency.[32] Alameda CTC may also review large development projects from institutions, federal agencies, or neighboring counties if these are likely to impact the regional transportation system in Alameda County.

Review Process

Consistent with the CMP statute, Alameda CTC's review of plans and development projects through its Land Use Analysis Program is designed to occur alongside the CEQA review process to avoid duplication of effort. Alameda CTC strives to perform its review on the same timeline to offer early and proactive input that can aid in refining project design. A project is considered "complete" from a CMP review perspective once Alameda CTC notifies the project sponsor that the project is exempt or that CMP requirements have been met and that it has no further comments on the project.

Table 20—Exemption from CMP Land Use Analysis Project Review

	Project Requiring General Plan Amendment	Project Consistent with General Plan
100 P.M. Peak-hour Trip Threshold Assessed Relative to:	Existing General Plan land use designation(s)	Existing use(s) at project site
Mitigated Negative Declarations	Considered (if trip generation threshold exceeded)	Not considered

[31] Previous versions of Alameda CTC CMPs referred to Plans and Development Projects as Tier 1A and Tier 1B. The "Tier" nomenclature has been discontinued to avoid confusion with the Tiers of the CMP network arterials.

[32] For purposes of compliance with the Land Use Analysis Program, the Port of Oakland is considered a governmental subdivision of the City of Oakland. Therefore, the Port is required to submit environmental documents to Alameda CTC for review and comment.

Figure 10 illustrates the typical review process. Once Alameda CTC receives a GPA or Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR), it issues a response within 30 days. This response either indicates that the project is exempt from CMP Land Use Analysis Program review (if it does not exceed the 100 p.m. peak-hour trip threshold) or provides comments on the scope of analysis to be performed in the DEIR to satisfy CMP requirements. If a project is not exempt, then once Alameda CTC receives a DEIR, it issues a response within 45 days. This response either indicates that the analysis contained within the DEIR adequately addresses CMP requirements or provides comments on changes or additional analysis needed to adequately address CMP requirements.

Use of the Alameda Countywide Travel Demand Model

The CMP statute assigns responsibility to CMAs to develop a travel demand model "that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system." The Alameda Countywide Travel Demand Model is typically used to determine traffic volumes, transit ridership, and other information for future years. Jurisdictions are required to use the most current version of the Countywide Travel Demand Model for the CMP Land Use Analysis Program. Alameda CTC amended the CMP requirements in 1998, so that local jurisdictions are responsible for applying the travel model. All local jurisdictions have signed Master Use Agreements with Alameda CTC that outline the procedure for requesting the model for a specific application.

Per the CMP statute, jurisdictions may also use an approved subarea travel demand model. Alameda CTC has responsibility for approving subarea models based on whether these models demonstrate adequate consistency with the countywide model. Appendix J describes Alameda CTC's policy on subarea models and required documentation for approval.

Methodologies and Standards

Project sponsors should use the following methodologies and standards when conducting Transportation Impact Analyses for the CMP Land Use Analysis Program. Guidance on methodologies and standards may also be given as part of Alameda CTC's GPA or NOP response to the particular project.

During this 2015 CMP update, rulemaking was underway for revised CEQA guidelines pursuant to SB 743, which eliminates auto delay-based measures as a criteria for significance for transportation impacts within Transit Priority Areas (and potentially outside of Transit Priority Areas); Alameda CTC's required and preferred methodologies for its Land Use Analysis Program will be revisited when revised CEQA guidelines are adopted.

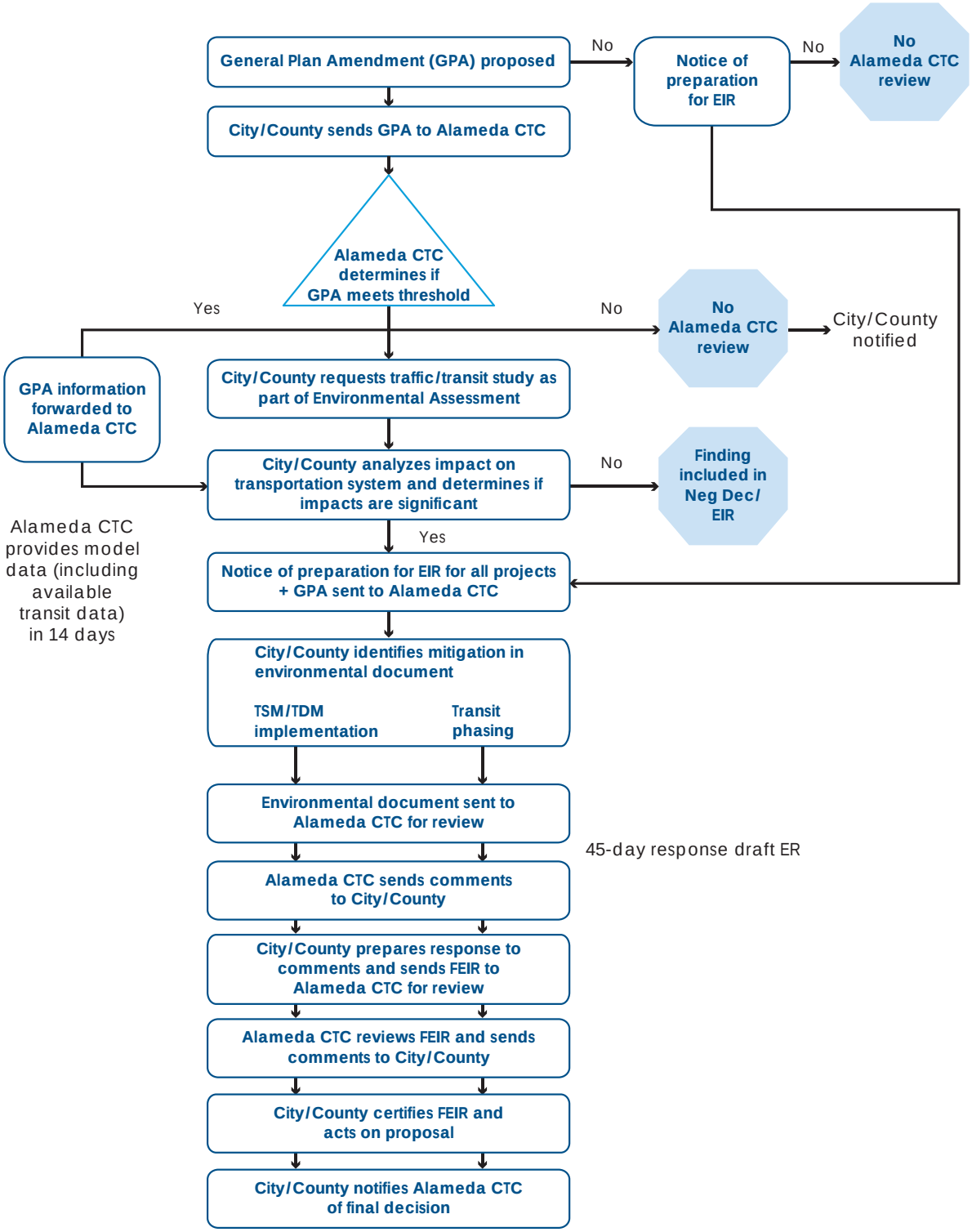
Transportation networks

The CMP statute requires analysis of impacts of land use actions on regional transportation systems. For Alameda CTC's CMP analyses, "regional transportation systems" is interpreted as follows:

- **Autos:** Study impacts to roadway segments on the 2002 Metropolitan Transportation System;[33]
- **Transit:** Study impacts to Metropolitan Transit System (MTS) transit operators (ACE, AC Transit, BART, Capitol Corridor, LAVTA, Union City Transit, and WETA);
- **Bicycles:** Study impacts to cyclists on the Countywide Bicycle Network; and
- **Pedestrians:** Study impacts to pedestrians within the Areas of Countywide Significance identified in the Alameda Countywide Pedestrian Plan.

[33] With the passage of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, MTC was required to develop an MTS that included transit and highways. MTC contracted with the CMAs in the Bay Area to develop the MTS and to use the CMPS to link land use decisions to the MTS. Therefore, a distinction is made between the CMP network, which is used for monitoring conformance with LOS standards, and the MTS, which is used for the Land Use Analysis Program. In 2005, MTC updated the MTS to include Rural Major Collector classified streets and higher classifications based on the Federal Functional Classification System. MTC uses the updated MTS for the purposes of funding and programming as well as in estimating roadway maintenance needs. The Alameda County Technical Advisory Committee reviewed the updated MTS during the 2009 CMP update to determine its usefulness and applicability to the Land Use Analysis Program. Based on input from local jurisdictions and discussion with MTC, Alameda CTC determined that the updated MTS was not appropriate for the Land Use Analysis Program, because it was too detailed for planning purposes, and the previous version of the MTS would continue to be used.

Figure 10—CMP Land Use Analysis Program Project Review Process



Use of the MTS network for the Land Use Analysis Program ensures that impacts on the CMP network will continue to be identified, since it is a subset of the MTS. The broader definition of regional transportation systems encourages early identification of impacts on a larger system of roadways and explicitly includes transit, bicycle, and pedestrian system impacts.

Trip generation estimates

Alameda CTC conducts a trip-generation calculation to estimate how many new trips will be on the transportation network due to a development project or plan. Project trip generation is used to determine whether a project meets the threshold for CMP review and to assess impacts on the transportation system.

The Institute of Transportation Engineers *Trip Generation Manual* is an acceptable method for estimating project trip generation. This methodology, which works by relating a variable describing the size of the project (e.g., square feet, number of units, number of gas pumps, etc.) to trips generated, is an established methodology widely used for CMP and other purposes in the transportation industry.

In addition, three trip-generation methodologies designed to capture trip-making characteristics in dense or transit-rich areas such as infill development sites are acceptable to apply in Alameda County for CMP analyses. Project sponsors have the option of using one of the following adopted alternative trip generation methodologies (or others, if the EIR justifies why it is being used):

- EPA's Mixed Use Development (MXD) model
- Caltrans/UC Davis Smart Growth Trip Generation rates
- MTC's Station Area Residents Study (STARS) mode-share adjustment method (household travel survey-based adjustments)

Appendix K contains guidance on how to apply the rate adjustments.

Projects in areas with travel demand management (TDM) programs may also experience lower vehicle trip generation, as these programs provide information, incentives/disincentives, and other mechanisms to shift auto trips to other modes, times of day, or closer destinations. Project sponsors may adjust trip-generation estimates to reflect the presence of TDM programs. The TDM element of the Alameda CTC CMP contains a menu of TDM programs with research-based expected ranges of trip reduction benefits that project analysts may use to adjust trip-generation estimates. Assumptions should be clearly documented and justified.

Types of impacts and impact assessment methodologies

Project sponsors should consider impacts to all modes as described below. Appendix K provides full information on impact types and impact assessment methodologies.

- **Autos:** Vehicle delay using the HCM2000 methodology (or HCM2000 methodology, if required for consistency with local requirements) and consistency with adopted plans;
- **Transit:** Effects of vehicle traffic on mixed-flow transit operations, transit capacity, transit access/egress, need for future transit service, consistency with adopted plans, and Circulation Element needs;
- **Bicycles:** Effects of vehicle traffic on bicyclists conditions, site development, and roadway improvements, and consistency with adopted plans;
- **Pedestrians:** Effects of vehicle traffic on pedestrian conditions, site development, and roadway improvements, and consistency with adopted plans; and
- **Other impacts and opportunities:** Noise impacts for projects near state highway facilities and opportunities to clear access improvements for transit oriented development projects.

Thresholds of significance

Alameda CTC has not adopted thresholds of significance for CMP land use analysis purposes.[34] Project sponsors should use professional judgment to 1) define a threshold that is appropriate for the project context; and 2) use this threshold to determine if segments are impacted.

Mitigation measures

Alameda CTC vs. local roles

The CMP statute requires that a Land Use Analysis Program assess the costs of mitigating impacts to the regional transportation system from local land use decisions. This authority must be balanced with the responsibility that local governments hold in the development review process under CEQA. Local governments have lead agency responsibility for preparing EIRs including transportation impact analysis. In addition, the decision of whether to implement a mitigation measure or to adopt a statement of overriding considerations is a local decision.

Alameda CTC's role is to provide comments through the EIR process on the adequacy of analysis. Alameda CTC has authority under the CMP statute to require disclosure of impacts and mitigation measures, and to require local agencies to establish a program for securing funding to mitigate transportation impacts of land use decisions. The CMP statute does not grant Alameda CTC authority to require implementation of a mitigation measure.

Adequacy of mitigation measures

Inadequate and/or underfunded transportation mitigation measures may have significant implications for the regional transportation system. Either might result in failure to meet LOS standards, triggering potential non-conformance and the need for a deficiency plan. Furthermore, an environmental document may rely on state or federal funding of mitigation measures. Such funding may not be consistent with Alameda CTC's project funding priorities.

Alameda CTC's policy regarding mitigation measures is that to be considered adequate they must be:

- Adequate to sustain CMP roadway and transit service standards;
- Fully funded; and
- Consistent with project funding priorities established in the Capital Improvement Program of the CMP, the Countywide Transportation Plan, and the Regional Transportation Plan or the federal Transportation Improvement Program, if the agency relies on state or federal funds programmed by Alameda CTC.

Types of mitigations

A project can propose mitigation measures of several types to address CMP impacts, including but not limited to:

- **Transportation network changes** including changes to roadway geometry (e.g., adding lanes, adding turn pockets, adding mid-block crossings) and intersection control (e.g., adding stop control or signalizing an intersection).
- **Transportation demand management measures and programs** including amenities, information, incentives, and disincentives designed to influence demand for peak-hour auto trip making. The TDM element of the Alameda County CMP contains a menu of TDM programs (see Appendix G) with research-based expected ranges of trip reduction benefits that project analysts may use to estimate the effectiveness of TDM mitigation measures.
- **In lieu mitigations** including implementing a part of an Areawide Deficiency Plan or paying into a Transportation Impact Fee program.

In the case of smaller projects, local governments may wish to require project proponents to enter an agreement to provide a "fair share" portion for mitigating a cumulative impact. This addresses the

[34] Note that the LOS E threshold used to determine deficiency as part of the LOS monitoring CMP element does not apply to the Land Use Analysis Program. This threshold is used for biennial monitoring, not to determine whether impacts will be caused over the long term by an individual land use action.

legislative requirement that the CMP must be able to estimate costs associated with mitigating transportation impacts.

Multimodal tradeoffs

In certain settings, mitigation measures designed to resolve an impact to one mode may cause undesirable secondary impacts to other modes. These secondary impacts may be contrary to adopted policy objectives. A typical example is adding a turn pocket at an intersection, to address an auto circulation impact in a downtown or infill development area, which may increase crossing distances and exposure to vehicles for cyclists, pedestrians, and transit riders.

Jurisdictions are encouraged to discuss multimodal tradeoffs associated with mitigation measures that involve changes in roadway geometry, intersection control, or other changes of the transportation network. This analysis should identify whether the mitigation will result in an improvement, degradation, or no change in conditions for automobiles, transit, bicyclists, and pedestrians. The HCM2010 MMLOS methodology is encouraged as a tool to evaluate these tradeoffs, but project sponsors may use other methodologies as appropriate for particular contexts or types of mitigations.

Review of Land Use Projections[35]

Alameda CTC has responsibility for developing a database of housing and jobs projections utilized in the Alameda Countywide Travel Demand Model (more detail on the countywide model is available in Chapter 7). The CMP statute prescribes that this land use database must be consistent with the regional land use database and assumptions of the regional travel demand model. The Association of Bay Area Governments (ABAG) develops the regional land use database for the nine-county Bay Area. This database (formerly referred to as the *Projections* series) includes numbers of households and jobs by sector for existing and future planning horizon years. Alameda CTC works with local jurisdictions to develop the countywide database by allocating ABAG's housing and job projections to a refined-scale zone system for countywide model traffic analysis. For this reallocation to be deemed "consistent" in the sense of the CMP statute, the county-level totals from the two allocations must be within plus or minus 1 percent, per MTC's established guidelines as described in Chapter 9.

Alameda CTC's land use database development process typically happens as part of a Countywide Travel Demand Model update. During this process, local jurisdictions are required to review a draft allocation of ABAG totals to the Countywide Travel Demand Model transportation analysis zones (TAZs). Local jurisdictions then have 60 days to provide input on this draft allocation.

Alameda CTC completed work to incorporate ABAG projections adopted as part of Plan Bay Area, the region's RTP and Sustainable Communities Strategy, into the Alameda Countywide Travel Demand Model in June 2014.

Fostering Transportation-Land Use Connections

Alameda CTC oversees a variety of programs and planning activities that strengthen connections between transportation and land use.

SB 375 and Sustainable Communities Strategy

Climate change awareness and the urgency to reduce greenhouse gases has become a driving force in the transportation realm. Adopted in 2008, SB 375 mandates an integrated regional land use and transportation-planning approach to achieve targets for reducing greenhouse gas emissions from automobile/light trucks. The purpose of SB 375 is to define more concrete implementation requirements for the emission reductions expected from the land use sector in Assembly Bill 32. The focus of SB 375 is on reducing vehicle miles traveled (VMT) and reducing greenhouse emissions by 7 percent by 2020 and 15 percent by 2035.

[35] The review of housing and job projections was referred to as Tier 2 review in previous versions of the Alameda CTC CMP. This nomenclature has been eliminated to avoid confusion with the tiers of the CMP arterial network.

To comply with SB 375, development of *Plan Bay Area* by MTC and ABAG was a joint planning process. The SCS component of *Plan Bay Area* is designed to:

- Lay out how development patterns and the transportation network can be integrated to help reduce greenhouse gas emissions;
- Identify how the region's housing needs will be met;
- Improve modeling of land use and transportation; and
- Be congruent with local general plans, specific plans, and zoning.

Adopted in July 2013, *Plan Bay Area* is a 28-year plan, and the SCS component of *Plan Bay Area* focuses on promoting compact, mixed-use commercial and residential development that is walkable and bikable and close to mass transit, jobs, schools, shopping, parks, recreation, and other amenities. Through P*lan Bay Area,* for the first time the region has simultaneously addressed its long range transportation planning and strategy for meeting its Regional Housing Needs Allocation (RHNA), in anticipation that the synchronization of these planning tasks will result in better transportation-land use coordination.

A key feature of the SCS is the designation of Priority Development Areas (PDAs), which are locally-nominated areas near planned or existing transit designed to accommodate significant housing and job growth over the life of *Plan Bay Area*. PDAs represent 4 percent of the land mass of the Bay Area but are designed to take on 80 percent and 66 percent of housing and jobs, respectively. If successful, *Plan Bay Area* will give people more transportation choices, create more livable communities, and reduce the pollution that causes climate change.

Alameda CTC participated in the Plan Bay Area process through its 2012 CTP update process. Land use considerations played a more direct role in the CTP process than in past updates to this plan in two primary ways:

- The goals, objectives, and performance measures explicitly addressed land use.
- The demographic forecasts used in the evaluation process were based on the Alameda County Draft Land Use Scenario Concept developed locally through an extensive 18-month process coordinated by Alameda CTC and city planning directors. The local land use scenario was developed in coordination with ABAG and MTC's efforts and helped to inform the SCS process. Ultimately, the land use scenario used for CMP analysis purposes is the same as the land use alternative adopted by ABAG and MTC in the final RTP/SCS.

The *Plan Bay Area 2040* and Alameda Countywide Transportation Plan updates have commenced. The regional plan update is expected to have a "limited and focused" scope, while the CTP update will leverage work already completed through a Countywide Goods Movement Plan, Countywide Multimodal Arterial Plan, and Countywide Transit Plan. It is not anticipated that these long-range planning efforts will result in significant modifications to the adopted land use from existing regional and countywide transportation plans, as there is no new Regional Housing Needs Allocation being conducted with these updates. Alameda CTC will work to ensure that the land use scenarios in these plans balance state mandates, regional planning objectives, local preferences, and market realities.

Priority Development Area Investment and Growth Strategy

PDAs are designated infill sites where greater housing and commercial density can be accommodated near transit stops. They were identified by local governments as part of the regional Focusing Our Vision (FOCUS) program, a regional development and conservation strategy led by ABAG and MTC in partnership with the BAAQMD and BCDC, that promoted a more compact land use pattern for the Bay Area. The FOCUS program subsequently became the basis for the region's current SCS.

Alameda CTC worked with local jurisdictions through the FOCUS process to designate 43 PDAs. These PDAs represent a wide range of place types and land use contexts. This process occurred in parallel to MTC/ABAG's regional planning work to inform the regional SCS for Alameda County. The FOCUS process also identified Growth Opportunity Areas (GOAs), which are additional areas that can accommodate growth and may one day be able to transition to PDAs and Priority Conservation Areas (PCAs), which are environmentally sensitive areas needing protection.

MTC and ABAG adopted the One Bay Area Grant Program (OBAG) as Resolution 4035 on May 17, 2012. OBAG provides guidance for the allocation of the Cycle 2 Federal Surface Transportation Program (STP) and CMAQ funds for fiscal year 2012-2013 (FY2012-13) through FY2015-16. CMAs are responsible for distribution of these funds to local jurisdictions and other eligible project sponsors. OBAG includes specific policy objectives and implementation requirements that CMAs must meet as a condition of the receipt of OBAG funds.

With the OBAG funding cycle, MTC implemented a new approach that links the region's federal transportation funding program with the Bay Area's first SCS efforts. In large counties, such as Alameda County, 70 percent of OBAG funding must be programmed to transportation projects or programs that support PDAs.

To ensure that CMAs have a transportation project priority-setting process for OBAG funding that supports and encourages development in the region's PDAs, MTC Resolution 4035 requires that Alameda CTC work with Alameda County jurisdictions to develop a Priority Development Area Investment and Growth Strategy. Alameda CTC's Commission adopted the *Alameda County PDA Investment and Growth Strategy* in March 2013.

The *Alameda County PDA Investment and Growth Strategy* fulfills the regional requirement and will guide the agency in supporting PDA development including facilitating implementation of PCAs over a longer time horizon than the current four-year funding cycle. The *Alameda County PDA Investment and Growth Strategy* describes existing conditions in the county's PDAs (including current level of market activity), explains how PDAs and projects were prioritized for the first OBAG cycle, and sets up a framework for additional work that the agency will undertake in the future to improve the link between transportation and land use within its PDAs.

The PDA Investment and Growth Strategy is designed to align with the Alameda CTP. The most recent update of the CTP included a goal of better coordinating transportation investments with the county's land use patterns. The PDA Investment and Growth Strategy will have the same time horizon as the current CTP, through 2040, and will be updated every four years.

The PDA Investment and Growth Strategy contains an inventory of Alameda County's PCAs. Under the OBAG, MTC has also allocated $5 million between five counties for distribution through a competitive application process to fund projects that promote open space preservation and access, land conservation, and habitat protection in PCAs.

Based on the recommendations made during the 2013 CMP update, Alameda CTC will continue to work with MTC and ABAG to identify ways to support improvements to rural roadways that facilitate agricultural operations and agricultural tourism in East County and to develop more comprehensive approach to mitigating impacts from rural roadway improvements and efforts that support PCA goals and objectives.

In September 2014 and May 2015, Alameda CTC updated its PDA Investment and Growth Strategy, which incorporates the latest information on housing production across income levels and progress toward meeting RHNA targets.

Areawide Transportation Impact Mitigation Fees

An areawide transportation impact fee and/or revenue measure such as establishing an assessment district could generate funds necessary to plan and implement transportation mitigation measures related

to land development. Transportation impact fees are addressed in the CMP statute as a proactive method of addressing transportation needs arising from land development.

At present, Alameda CTC and most local jurisdictions in Alameda County review development projects and determine required mitigation measures on a project-by-project basis. If found to be feasible, a transportation impact fee could be designed to supplement current project-by-project review, in which case the fee would raise additional revenue to fund multi-jurisdictional mitigations. Another option is that a transportation impact fee could be designed to replace project-by-project review. In this case, the fee would be designed to generate revenues to fund both localized and multi-jurisdictional mitigations.

Alameda CTC conducted feasibility studies in 1997 and 2007 for a countywide traffic mitigation fee. These feasibility studies investigated a fee that would supplement the project review and mitigations required by local jurisdictions. These previous studies recommended that Alameda CTC not proceed with an areawide traffic impact fee due to concerns about discouraging development, particularly in urban areas where redevelopment projects already face higher costs than in suburban areas. The studies also recommended that Alameda CTC adopt the following policies:

- Support agreement among local jurisdictions to adopt an areawide fee within a planning area;
- Identify projects of countywide significance; and
- Consider integrating adoption of a countywide fee with a campaign for a sales tax extension or gas tax increase, so the development community and the voters see a benefit in sharing costs with each other.

As part of the 2011 CMP update, Alameda CTC considered pursuing an areawide traffic impact fee, similar to the Tri-Valley Transportation Council Fee, for the other three planning areas in the county. Alameda CTC concluded that, given the weak local and national economic conditions at that time, an areawide traffic impact fee could adversely affect local development. As an alternative to a new areawide traffic impact fee, the 2011 CMP proposed exploring a fee based on automobile trip generation, such as San Francisco County is implementing. San Francisco's Fee, the Transportation Sustainability Program (formerly referred to as the Automobile Trip Generated, or ATG, measure) is an areawide fee unique in that it is designed to replace the city's current practice of reviewing individual development projects using auto LOS.

Rather than require individual project sponsors to study their impacts to intersection LOS and devise mitigations on a case-by-case basis, San Francisco has devised a countywide program of mitigations designed to accommodate all anticipated development over the next 20 years.

Developers will then pay for their portion of this full program of mitigations, according to a fee schedule based on motorized trips generated.[36] San Francisco is currently preparing an EIR for the Transportation Sustainability Program and, once completed, individual development projects will no longer be required to conduct cumulative transportation studies, as payment of the fee will constitute mitigation for their cumulative effects on the transportation system.



[36] The fee was initially based on Automobile Trips Generated. Nexus analysis revealed that the fee should also be extended to cover transit trips due to concerns with transit crowding in San Francisco. This finding resulted in the fee being restructured as the Transit Sustainability Fee, which is based on the projected generation of all types of motorized trips by development projects. Review of housing and job projections was referred to as Tier 2 review in previous versions of the Alameda CTC CMP. This nomenclature has been eliminated to avoid confusion with the tiers of the CMP arterial network.

The 2011 CMP recommended that, pending availability of funding, Alameda CTC conduct a feasibility study for an areawide impact fee based on automobile trips generated. The study was postponed, while Alameda CTC sought passage of an extension and augmentation of its local transportation sales tax, but it will be carried forward as a next step for the 2017 CMP update.

The passage of Senate Bill 743 in September 2013 could heighten the importance of an areawide transportation impact fee feasibility study. This bill directs OPR to revise CEQA guidelines such that transportation impact analysis will no longer be based on automobile LOS. OPR is directed to develop alternative metrics for transportation impacts in transit priority areas, and the bill explicitly makes reference to metrics such as automobile trip generation and VMT per capita.

In addition to a feasibility study, an areawide transportation impact fee would likely require a nexus study in accordance with the Mitigation Fee Act as well as significant coordination and consensus building with the jurisdictions in Alameda County. In particular, a nexus study would be required to determine what share of transportation improvements are needed to correct issues associated with new development (as opposed to existing transportation system deficiencies) and to determine appropriate fee levels.

While it entails significant up-front study and coordination, an areawide transportation impact fee offers several key benefits:

- **Consistency with multimodal planning focus:** A variety of policy goals point to the need to respond to growing travel demand with mitigation measures such as improved transit service and non-motorized travel facilities. It is difficult for project sponsors to demonstrate how these improvements will fix a highly localized transportation system impact, which can lead to developers pursuing mitigations such as roadway capacity improvements that may be contrary to Alameda CTC's multimodal planning focus.
- **Adequately addresses regional impacts:** Project-by-project review of developments often results in underfunding of multi-jurisdictional improvements because Alameda CTC has no authority to require cities or developers to actually implement a mitigation measure, and local jurisdictions may not fully perceive the benefits of requiring a developer to pay for a mitigation measure outside of their boundaries.

If an areawide transportation impact fee is designed to replace project-by-project review that uses intersection LOS to determine impacts, additional benefits could accrue:

- **Simplicity, transparency, and predictability:** Transportation impact analysis is typically one of the most costly and time-consuming parts of developing and reviewing environmental impact reports. Under an areawide transportation impact fee, all of this analysis is conducted up front. Furthermore, developers can easily predict how much they will be required to pay for transportation system improvements.
- **Fixes "last-in pays" principle:** One feature of the project-by-project, LOS-based method of assessing transportation impacts used by most jurisdictions is that only projects that actually cause an intersection or a roadway segment to fall below a specified LOS threshold are forced to pay for mitigations. This fact results in a single project sponsor bearing the entire burden of mitigating a cumulative impact to an intersection or segment, or the jurisdiction adopting a statement of overriding considerations.

The Tri-Valley Transportation Council has adopted an areawide traffic fee. The fee is applied to regional transportation improvements in the Tri-Valley Transportation Expenditure Plan. Many local jurisdictions have also adopted transportation mitigation fees, some of which partially fund multi-jurisdictional mitigations. If such an areawide transportation impact fee is adopted in the future at a countywide level,

it would include a system of credits, so that fees for developments paid once for regional improvements are not unfairly "double billed" for contributions to the same improvement. Credits for some local impact improvements may also be considered.

Community Design and Transportation Program

The Santa Clara Valley Transportation Authority (SCVTA) has adopted a Community Design and Transportation (CDT) program as part of its CTP to better integrate transportation and land use and augment its CMP Land Use Analysis Program. This program was developed in partnership with member agencies and communities and is endorsed by their elected bodies. The SCVTA Board promotes the CDT program as its policy tool and primary program to integrate transportation and land use. It includes a comprehensive toolkit for member agencies to use in all aspects of transportation and land use planning and for both public and private development projects. The CDT program also includes two grant-funded programs and an incentive program designed to encourage better coordination of transportation and land use planning. One of the objectives of the CDT program is to support concentrated development in selected locations of the county.

In the 2011 CMP, Alameda CTC recommended exploring a similar approach to better integrating land use and transportation in Alameda County. Before the next update of the CMP, Alameda CTC will identify the level of interest from local jurisdictions and transit operators for implementing a similar program in Alameda County. Alameda CTC will develop a scope of work and the steps involved including the cost of developing and implementing the program.

Complete Streets Policy Development and Implementation

Complete streets are streets designed to accommodate all modes and all users. Complete streets can look different, depending on the local context, but broadly speaking, creating complete streets entails planning, funding, designing, and maintaining and operating transportation facilities and networks that drivers, transit users, pedestrians, bicyclists, and goods movement providers can use, regardless of age or ability.

The Complete Streets Act of 2008 (Assembly Bill 1358) stipulates that during the next major update of their General Plan's Circulation Element, all jurisdictions in California are required to incorporate complete streets principles. Alameda CTC required jurisdictions to adopt complete streets policies by June 30, 2013 as part of the Master Program Funding Agreements signed in 2012. All jurisdictions have now met this requirement, either in the form of a city council or Board of Supervisors resolution or an update to the Circulation Element of their General Plan that incorporates complete streets principles. Alameda CTC provides technical assistance to its jurisdictions, including identifying best practice examples, strong language, and recommended components to meet the General Plan component of this legislative requirement.

Implementation of complete streets policies is a multi-year process requiring organizational culture shift, participation from numerous city departments and other external stakeholders, and new levels of collaboration. Alameda CTC held a workshop in June 2012 on complete streets policy development and a workshop in July 2013 in which it provided information to local jurisdictions on implementing complete streets and highlighted examples of best practices. Alameda CTC will continue this effort by developing a series of targeted resources around specific complete streets implementation challenges.

Alameda CTC also implements the Complete Streets Checklist from MTC. All projects that apply for federal funds programmed by Alameda CTC must complete this checklist, which provides information when Alameda CTC evaluates projects for funding.

All Alameda CTC jurisdictions are working to make sure that their circulation elements comply with AB 1358 by January 2016 to ensure eligibility for future One Bay Area Grant funding, and Alameda CTC has provided technical assistance in conducting these updates.

In addition, Alameda CTC is leading a pilot project focused on implementing complete streets policies in Central Alameda County. This pilot project, which will include the cities of San Leandro and Hayward as well as the unincorporated areas of the county, will conduct activities such as those that will provide an understanding of constraints to implementing complete streets across city departments, update design guidelines, and develop checklists to guide project managers.

In addition, Master Programs Fund Agreements and project evaluation procedures for Alameda CTC's Comprehensive Investment Plan may include complete streets considerations.

Corridor Planning

In 1994, Alameda CTC adopted a corridor/areawide transportation management planning process described in the CTP. The process is based on cooperative planning and coordinated action by local governments, Caltrans, transit agencies, and MTC. Alameda CTC uses the corridor/areawide management planning process to identify needed mitigation measures and for linking its funding decisions to needed mitigations. In a corridor/areawide management planning effort, participants address strategies to:

- Reconcile the competing demands that local and long-distance traffic make on the capacity of the freeway system;
- Reconcile continuing population and employment growth with the finite capacity of the freeway system;
- Reconcile the movement of people and goods;
- Prevent pass-through traffic from using local streets;
- Reconcile high occupancy vehicle and express lanes with plans to meter freeway ramps;
- Pair ramp metering with geometric metering at gateways to the metropolitan area; and
- Coordinate the operation of freeways and parallel arterials and to specify when and where to rely on transit as a corridor's primary strategy of traffic management.

As defined in the Alameda CTP, the underlying principles for the planning process are based on the following:

- Alameda CTC should support, where appropriate, local plans to enhance the productivity of transit investment through such measures as supportive zoning, urban design/planning, and development approvals.
- Alameda CTC should give investment priority to those highway and transit operational improvements and major capital projects identified in the corridor/areawide management planning process.
- Alameda CTC recognizes that land use planning is solely the purview of local governments.

As part of the 2011 and 2013 CMP updates, Alameda CTC reviewed additional options for improving mobility and identifying and funding mitigation measures along travel corridors, specifically ones that cross county boundaries. The following approaches were recommended as next steps.

- For congested cross-county corridors, explore developing partnerships for sharing the costs of implementing mitigation measures in the corridor.
- For long-term corridor improvements, explore establishing cross county partnerships to identify mutually agreeable strategies for developing and implementing improvements. As a first step in this direction, a county line development study in partnership with either San Joaquin or Santa Clara counties could be considered.
- Explore developing corridor improvement strategies as part of Countywide Transit Plan and Countywide Arterial Mobility Plan.

Examples of corridor/areawide management planning efforts include:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- San Pablo and I-880 SMART Corridor Programs
- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

Alameda CTC is also conducting three countywide modal plans including a goods movement plan, an arterial plan, and a transit plan. These long-range modal plans are intended to feed into the CTP and will identify projects, funding priorities, and future corridor planning priorities. The Countywide Multimodal Arterial Plan, in particular, is developing typologies for the arterial network within Alameda County that take into account its existing role in providing auto mobility, the adjacent land uses, and the multimodal role of facilities. These typologies will inform modal priorities, improvements needs for each mode, potential new cross-sections within the existing right of way, and management strategies for arterial corridors.

State-level CEQA Modernization Advocacy

Public agencies have gained decades of experience in applying CEQA rules. As new issues (such as global warming) emerge that were unanticipated by the original legislation, a variety of actors show growing interest in modernizing CEQA. Ideas for modernizing CEQA focus on a number of aspects of how the law works including reducing the scope of which types of projects must conduct intensive analysis, eliminating duplication between CEQA and other environmental laws and standards, and containing litigation generated by CEQA. OPR has already issued regulations to implement Senate Bill 226, which seeks to streamline environmental review for eligible infill development projects. SB 743 will also streamline and modernize transportation analysis, particularly for projects in transit priority areas.

Much can be done within the existing CEQA legislation to streamline the review of development projects and to reduce the greater likelihood of causing impacts from infill development projects. Strong specific plans and area plans with thorough program EIRs can reduce the analytic burden of future development projects that implement those plans, and Alameda CTC will support these specific plans through its Sustainable Communities Technical Assistance Program (SC-TAP). The recently adopted *Plan Bay Area* discusses the potential for projects in Transit Priority Project (TPP) eligible areas that meet certain other conditions to receive CEQA relief under SB 375, and Alameda CTC will assist jurisdictions in understanding this eligibility.[37] As previously discussed, Alameda CTC has made some modifications to its review of EIRs through the Land Use Analysis Program that will benefit infill projects, and will continue to support local jurisdictions in revising their own CEQA thresholds as appropriate through information sharing and other technical assistance.

Even with the passage of SB 743, there are other aspects of the CEQA statute that may require modernization (e.g., limiting litigation, strengthening tiering provisions). These aspects of CEQA generally require legislative action. Alameda CTC will continue to monitor CEQA modernization-related bills and consider whether it is appropriate to take positions on these as part of its legislative platform.

Parking Standards and Policies

Parking for automobiles is a significant but underrecognized factor in the relationship between land use and transportation. It has been customary for local jurisdictions to require development projects to provide a minimum number of parking spaces. Moreover, most parking is underpriced. These two factors encourage driving, leading to inefficient land use and more congestion. With the support of local jurisdictions, Alameda CTC plans to explore and review parking policies and standards as a way to develop

[37] Plan Bay Area, p. 58

parking management strategies as a land use tool for local jurisdictions to promote alternative modes and reduce greenhouse gases.

Alameda CTC is currently funding parking management studies in the cities of Albany and San Leandro. Several other cities have locally funded parking management studies underway. In addition, several Alameda County jurisdictions have implemented flexible- and demand-based parking strategies (e.g., Berkeley's GoBerkeley program and Oakland's Montclair Parking District) which seek to raise or lower parking prices according to demand for the spaces, thereby achieving high utilization of a scarce asset.

Regional Transit Expansion Program

The Regional Transit Expansion Program, originally adopted by MTC in 2001 as Resolution 3434 and updated as part of *Plan Bay Area,* identifies the regional commitment to transit investments in the Bay Area. Resolution 3434 identified $18 billion in transit expansion investment projects. It includes a TOD policy to condition transit expansion projects funded under Resolution 3434 on supportive land use policies. There are three key elements of the regional TOD policy:

- Corridor-level thresholds to quantify appropriate minimum levels of development around transit stations along new corridors;
- Local station area plans that address future land use changes, station access needs, circulation improvements, pedestrian-friendly design, and other key features of TODs; and
- Corridor working groups that bring together CMAs, city and county planning staff, transit agencies, and other key stakeholders to define expectations, timelines, roles, and responsibilities for key stages of the transit project development process.

This policy is relevant within Alameda County for the following Resolution 3434 transit expansion projects:

- AC Transit Bus Rapid Transit in Berkeley/Oakland/San Leandro
- AC Transit Enhanced Bus/Bus Rapid Transit: Grand-MacArthur corridor
- BART Oakland Airport Connector
- BART Warm Springs Extension to San Jose
- Dumbarton Rail
- Ferry service expansions in Alameda and Berkeley
- Tri-Valley transit access improvements to/from BART

Alameda CTC is working with the local jurisdictions, transit providers, congestion management agencies in adjoining counties, ABAG, and MTC to address the policy in these corridors.

As part of *Plan Bay Area*, the region's $660 million in federal new and small starts funding will be directed to Resolution 3434 projects that ranked highly in the RTP Project Performance Assessment. These include several Alameda County projects including BART Warm Springs Extension to San Jose, AC Transit Berkeley/Oakland/San Leandro Bus Rapid Transit, and AC Transit Enhanced Bus: Grand-MacArthur corridor.

A companion resolution, Resolution 3357, articulates rail extension and improvement criteria and regional express bus and rapid bus program criteria. These criteria will be considered during the funding process for the identified transit projects.

Strategic Monitoring of Transportation-Land Use Coordination

A core part of Alameda CTC's activities is monitoring trends in performance measures and transportation land use connections, and using this monitoring to inform planning and funding decisions.

Tracking New Development Activity

The 2011 CMP revealed that several other large Bay Area CMAs have created a database of land use approvals, and recommended that Alameda CTC explore creating such a database. As part of the 2013

CMP update process, creating and implementing a database of land use approvals in Alameda County was included and continued in the 2015 update. Beginning with the 2014 Conformity Findings process, Alameda CTC required local jurisdictions to submit:

1) a list of land use development projects approved during the previous fiscal year; and

2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development.

This information will be used to populate a database of development approvals in Alameda County. This development approvals database will prove invaluable for a variety of applications. It will provide:

- Enhanced monitoring of how well transportation investments are being coordinated with new developments and demands for mobility;
- The ability to compare land use projections with historic trends;
- The ability to comply with new requirements that CMAs assess local jurisdiction efforts at approving sufficient housing for all income levels from the OBAG Program (see PDA monitoring below); and
- A consistent database for multi-jurisdictional planning efforts.

Alameda CTC began collecting this information in 2014 and will report on development activity through the annual Performance Report.

Livable Communities Performance Measures

The 2012 Alameda CTP identified a series of performance measures related to transportation-land use connections. These measures were used to compare different long-range transportation investment scenarios during CTP analysis. The measures were also incorporated in the CMP multimodal performance element and reported on as part of the FY2011-12 Alameda County Performance Report in the "Livable Communities" chapter.

For the 2017 CMP update, Alameda CTC will perform a comprehensive review of its performance measures and consider opportunities to streamline measures and to strategically align reporting timelines with data availability. Some of the livable communities measures (e.g., activity center accessibility and public transit accessibility) are not based on annually published, longitudinal data. These measures are most suitable for comparing different long-range scenarios rather than annual monitoring. The comprehensive review of performance measures performed for the 2017 CMP will explore identifying shorter-term measures of transportation-land use coordination that could leverage the database of new development activity. For example, Alameda CTC could monitor performance measures such as what percent of new dwelling units or commercial square footage is within a half-mile of transit or within a walkable neighborhood.

Priority Development Area Performance Monitoring

The *Alameda County PDA Investment and Growth Strategy* outlines a preliminary PDA monitoring plan developed both to fulfill MTC and ABAG requirements and as a step toward implementing the land use and sustainability goals of the 2012 CTP. Collecting and assessing data on the county's PDAs will help Alameda CTC gauge progress on meeting the objectives of the 2012 CTP and *Plan Bay Area*, identify what might need to be modified or improved, help gauge the impacts of policies and investments, and inform the agency's future policy and investment decisions. A more robust information set will also help inform decisions about adjusting the boundaries of existing PDAs and designating new PDAs in the future.

Alameda CTC conducted an extensive PDA Inventory in 2012. Over the course of the next several years, the agency will build on this inventory to create a more robust baseline dataset that Alameda CTC can update over time. Some of the data will be updated annually or biennially as new data is generated by the jurisdictions and then compiled and released by ABAG or MTC. The frequency of updates to the data will also be determined by the pace of change in

the county's PDAs and MTC and ABAG requirements. Alameda CTC will work closely with ABAG and other regional agencies to ensure that the data provided is best suited to Alameda CTC's monitoring needs. The agency's goal is to minimize data collection work for Alameda CTC and the county's jurisdictions and avoid duplicative data collection efforts.

Alameda CTC intends to analyze the following types of data for each PDA (or potential PDA) in Alameda County, though Alameda CTC may make some alterations to existing categories to include different data points.

- Current housing, jobs, and population data
- Growth projections for housing, jobs, and population
- RHNA allocations
- Market strength and development activity
- Transit orientation, urban form and bicycle/pedestrian connectivity
- Policies (land use, housing, parking, and TDM)
- Impact of OBAG investments

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[38] While Alameda CTC does not have the authority to approve or deny local land use projects, it may find the local jurisdiction in non-conformance. If it fails to comply with the requirements of the land use analysis program, a jurisdiction risks losing Proposition 111 funds. The detailed process for finding of non-conformance and resulting withholding of Proposition 111 funds is described in Chapter 9.

The following describes special circumstances related to conformance to the Land Use Analysis Program requirements. If a proposed development was specified in a development agreement entered into prior to July 10, 1989, then it is not subject to any action taken to comply with the CMP, with the exception of those actions required for the trip-reduction and travel-demand element of the CMP.[39]

In some cases, Alameda CTC may find that additional mitigation measures are necessary to prevent certain segments of the CMP network from deteriorating below the established LOS standards, before a conformance finding is made. In such cases, Alameda CTC will require the local jurisdiction to determine whether the additional mitigation measures will be undertaken as a condition of project approval, or whether they will be implemented as part of a deficiency plan for the CMP network segments affected.

Local jurisdictions have the following specific responsibilities under the Alameda CTC Land Use Analysis Program.

Throughout the year

Local jurisdictions are required to do the following to ensure conformity with the CMP Land Use Analysis Program requirements:

- Forward to Alameda CTC all notices of preparation, draft and final Environmental Impact Reports and Environmental Impact Statements, and final dispositions of General Plan amendment and development requests.
- Analyze large development projects according to the guidelines in this chapter, including the use of the Alameda Countywide Travel Demand Model or an approved subarea model and disclosure of impacts to the MTS, if Alameda CTC determines the project exceeds the threshold for which CMP review is required.
- Work with Alameda CTC on the mitigation of development impacts on the regional transportation system.

[38] California Government Code Section 65089.3.
[39] California Government Code Section 65089.7.

During annual conformity findings process
Local jurisdictions are required to do the following to ensure conformity with the CMP Land Use Analysis Program requirements during the annual conformity findings process which occurs from September to November:

- Review the record of Alameda CTC responses to Environmental Impact Report documents for completeness and accuracy.
- Provide Alameda CTC with:
  1) a list of land use development projects approved during the previous fiscal year; and
  2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development.

As needed according to Alameda Countywide Travel Demand Model development schedule
During travel model updates, provide an update (prepared by the jurisdiction's planning department) of the anticipated land use changes likely to occur using ABAG's most recent forecast for a near-term and far-term horizon year. This land use information should be provided in a format compatible with the Countywide Travel Demand Model.

Next Steps

The following are next-step items for the CMP Land Use Analysis Program to strengthen the connection between land use and transportation.

- Monitor potential updates to CMP legislation and revise the Land Use Analysis Program to align with the new requirements while still keeping it an effective tool to monitor the impact of land use development on the countywide multimodal transportation system.
- Monitor SB 743 rulemaking and revise transportation impact analysis methodology requirements and procedures to reflect new CEQA guidelines.
- In view of the significant implications of the above legislative actions on the CMP as a whole, particularly the Land Use Analysis Program, until the legislative actions finalized, the following next steps identified in prior updates of the CMP, which are still important, can be postponed, so they can be realigned with the potential legislative outcomes.
  - Develop a policy regarding tiering off of CMP analysis conducted as part of a Specific Plan or other Area Plan, if that analysis was conducted using a version of the Alameda Countywide Travel Demand Model that is no longer the most current version.
  - Pending availability of funding, conduct a Feasibility Study for implementing an ATG-based areawide transportation impact fee.
  - Continue to provide technical assistance to local jurisdictions on potential options to revise CEQA thresholds to reduce barriers to infill development approvals.

Additionally, the CMP will continue to pursue the following depending on available resources:

- Determine if there is interest from local jurisdictions and transit operators for a program similar to the SCVTA's CDT program in Alameda County, and develop a scope of work, schedule, and budget for developing and implementing the program.
- Implement the Sustainable Communities Technical Assistance Program including matching project applicants with technical assistance for planning efforts designed to advance the readiness of PDAs.
- Identify ways to address rural roadway improvement needs and efforts that support PCA goals.
- Consider establishing a means for projects that impact long travel corridors and traverse multiple jurisdictions within Alameda County to contribute their fair share of required mitigation measures throughout the corridor.

- Explore development of partnerships for sharing the costs for implementing related mitigation measures for congested cross-county corridors.
- Explore establishing cross-county partnerships with adjacent counties to develop mutually agreeable strategies for cross-county-corridor improvements.
- Explore developing corridor improvement strategies as part of Countywide Transit Plan and Countywide Arterial Mobility Plan.

Database and Travel Demand Model 7



The CMP legislation requires every CMA, in consultation with the regional transportation planning agency (the Metropolitan Transportation Commission (MTC) in the Bay Area), cities, and the county, to develop a uniform database on traffic impacts for use in a countywide travel demand model.[36] Further, the legislation mandates the countywide model to be consistent with the assumptions of the regional travel demand model developed by MTC and the most current land use and socioeconomic database adopted by the Association of Bay Area Governments (ABAG) for Alameda County. In its role as the CMA, Alameda CTC must approve computer models used for sub-areas, including models used by local jurisdictions for land use impact analysis. All models must be consistent with the countywide model and standardized modeling assumptions.

The purpose of this requirement is to bring a uniform technical basis for analysis to congestion management decisions. This includes consideration of the benefits of transit service and travel demand management (TDM) programs, as well as projects that improve congestion on the CMP-designated network. The modeling requirement is also intended to assist local agencies in assessing the impacts of new development on the transportation system.

Use of the Alameda Countywide Travel Demand Model is essential for the CMP planning process. The Alameda County CMP is a forward-looking program, promoting a philosophy of early action to prevent conditions from deteriorating. The countywide model allows Alameda CTC to anticipate and forecast the potential impacts of local land development decisions on the Metropolitan Transportation System network.

2014 Updated Countywide Travel Demand Model Features

Alameda CTC updated its Countywide Travel Demand Model in December of 2014. The updated model includes the following key features:

- It uses Cube software.
- The base year of the model is 2010, and the future years are 2020 and 2040.
- Five time periods are included in the model: a.m. peak 1-hour (7:30-8:30 a.m.); p.m. peak 1-hour (4:30-5:30 p.m.); a.m. peak 4-hour (6:00-10:00 a.m.; new in 2014 update); p.m. peak 4-hour (3:00-7:00 p.m.); and daily.

[40] California Government Code Section 65089(c).

- This updated model has 1,580 traffic analysis zones (TAZs) in Alameda County (175 new TAZs were added in the 2014 update), 1,256 TAZs outside of Alameda County, and 31 gateway zones. The model added 175 new TAZs based on five principles:
  - To maintain TAZ consistency with the US Census 2010 tract boundaries;
  - To create smaller zones near major rail stations, ferry stops, and bus stops;
  - To have MTC's proposed micro analysis zones (MAZs) nest within the TAZs;
  - To add TAZs around transit park-and-ride lots to allow the model to assign park-and-ride vehicles to the roadway network; and
  - To create smaller TAZs caused by the definition of the CMP roadway network.
- The updated model maintains the use of MTC's zone system in the remaining six Bay Area counties but enlarges the full model region and zones to include San Joaquin County. The model also created 85 smaller zones near rail stations and ferry terminals to better delineate walk access to transit markets.
- The Alameda CTC model was revised to produce an updated base year 2000 calibration and 2010 validation with selected model enhancements, including:
  - Calibration of the auto ownership models to American Community Survey (ACS) 2005-2009 county-level data;
  - Addition of bicycle network infrastructure (bike lanes and paths) in the network's travel time skims, mode choice, and bicycle assignments;
  - Development of a toll-modeling procedure to estimate express lane vehicle volumes; and
  - Performance of a 2010 validation task including validating for screen-line volumes for the a.m. and p.m. peak hours, peak periods, and daily; and to year 2010 observed transit boardings.
- The Alameda CTC model assumes all projects included in the 2040 Plan Bay Area. Further, the model roadway network includes additional detail in Alameda County and in adjacent parts of Santa Clara and Contra Costa counties. The model also includes stop, station, and route detail in the transit network for Alameda County and maintains the MTC roadway and transit networks in the remaining Bay Area counties.
- Alameda CTC socioeconomic data inputs are consistent at both the MTC zone level and the ABAG census tract level for the Plan Bay Area scenario for the year 2040. Data at the MTC zone level in Alameda was allocated to the smaller Alameda CTC model zones using local land use development patterns, working within the constraint of 1 percent deviation from the ABAG control totals for the county. Alameda CTC also incorporated the updated San Joaquin County land use dataset developed as a part of the San Joaquin Council of Governments Transportation Regional Plan 2011.
- The Alameda CTC model used US Census 2010 population and households for the model base year 2010.

Documentation of specific features and assumptions for various components of the updated 2014 model are available on the Alameda CTC website.

Land Use Database Development

The database included in the updated 2014 countywide travel model is based on three sets of inputs:

- The 2013 Sustainable Communities Strategies (SCS) employment, population, and household projections provided by ABAG at the census tract level for all model future years (2020 and 2040). ABAG and MTC converted these tract level projections to the regional TAZ (RTAZ) level.

- The US Census 2010 dataset served as the source of the household and population data for the model base year 2010. Census blocks are typically smaller than the countywide TAZs; therefore, households in Census blocks can be aggregated to TAZs used in the Countywide Travel Demand Model.
- The distribution factor in the *Projections 2009* dataset was used to distribute the SCS data for allocation of households and jobs from the larger MTC model RTAZs to the smaller Alameda CTC model TAZs.

The process of developing the land use and socioeconomic database for the countywide model allocated ABAG's SCS land use and socioeconomic data from MTC's regional TAZs to Alameda CTC's countywide model TAZs review and redistribution by the Alameda County jurisdictions. The jurisdictions totals are requested to stay within a 1 percent variation from the ABAG totals, but they are permitted to redistribute them if appropriate. Countywide totals after redistribution will remain within plus or minus 1 percent of ABAG county totals, as required by MTC. By aggregating the projections made for each zone, Alameda CTC can produce projections of socioeconomic characteristics for unincorporated areas of the county, the 14 cities, and the four Alameda County planning areas.

For the 175 newly added TAZs to the countywide model TAZ system, all SCS land use data for all model years were further disaggregated to distribute the data to the newly added zones. The proportion of employment in each TAZ compared to the parent TAZ (from which it is split) is assumed to be equal to the proportion of the new TAZ's size compared to the parent TAZ's size.

Model Development

The framework established for the model encompasses the following components:

- Trip generation (number of trips forecast by traffic analysis zone);
- Trip distribution (distribution of forecast trips between each traffic analysis zone);
- Modal split of inter-zonal trips (distribution of trips by mode within each traffic analysis zone); and
- Assignment (forecast of trips originating or destined to external zones).

These are typical model components found in any model that produces simulations of travel demand, based on different assumptions about land use and demographic and transportation characteristics.

The countywide model was developed using Cube software developed by Citilabs, which is an interactive transportation planning program that produces numerical and graphic representations of travel supply and demand. The model is structured to provide forecasting detail that adequately addresses the evaluation needs of both countywide and corridor-specific transportation strategies. The countywide model has been developed and validated by:

- Defining a traffic analysis zone structure detailed enough to depict changes in land use and demographics that would affect travel demand on arterials and intra-county transit systems; and
- Establishing highway and transit networks detailed enough for those types of travel demand.

Development and validation of the model were based on the following concepts:

- Consistency with the assumptions and procedures established and used by MTC to produce regional travel demand forecasts. Specifically, the model maintains the same variables in the equations that comprise the trip-generation, trip-distribution, and mode-split components of MTC's previous travel demand model framework based on the MTC BAYCAST-90 model.
- Where necessary to produce validated forecasts of travel on arterials or intra-county transit services, enhance the capacity of MTC's models by

incorporating the simulation of certain types of travel not modeled by MTC. Specifically, this includes the addition of new transit sub modes.

The 2014 model update validated the model to 2010 traffic and transit count data and includes the enhanced ability to forecast bicycle and pedestrian volumes by adding more detailed TAZs and more detailed roadway, transit, and non-motorized networks.

In addition, the currently active model incorporates land use and demographics of the nine-county Bay Area based on the ABAG's SCS projections, US Census 2010, and the San Joaquin County Travel Model for San Joaquin County. This allows the model to produce travel demand forecasts that incorporate influences of regional travel demand on transportation facilities in Alameda County. Travel originating or terminating outside the nine-county Bay Area and San Joaquin County is also taken into account, based on the data from the Caltrans statewide model.

Planning Areas

Alameda County has been subdivided into four areas of analysis, or planning areas. Planning areas are analogous to the five MTC super districts in Alameda County,[41] as part of the traffic analysis zone structure MTC uses[42] for its nine-county regional travel model. Traffic analysis zones are small geographical subdivisions of a region. Socioeconomic variables, such as households and employment data, are collected at the traffic analysis zone level for input into the travel demand models. Ultimately, the auto vehicle trips and number of individual trips on transit ("person trips") are assigned from each traffic analysis zone onto the highway and transit networks.

The countywide model required disaggregating or splitting the MTC zones into more, smaller traffic analysis zones. Within Alameda County, MTC's zone system was refined to better suit the more detailed highway and transit networks in the countywide model. The traffic analysis zones nest within the larger MTC zones. This ensures accurate disaggregation of MTC's person trip tables to the traffic zones, and allows direct comparisons between the Alameda countywide model outputs and those of the MTC model. As a result of this zone refinement effort, the model contains:

- 1,580 TAZs within Alameda County
- 159 TAZs in buffer areas (52 in West Contra Costa County, 48 in South Contra Costa County, 26 in San Joaquin County, and 33 in Santa Clara County)
- 1,097 TAZs in the remainder of the Bay Area same as the MTC's RTAZs
- 31 gateway zones

Maps of the 1,580 TAZs within Alameda County, grouped by the four planning areas, are available on the Alameda CTC website.

Transportation System Network

The countywide model roadway network includes the following road types:

- Freeways
- Freeway ramps and metered ramps
- State routes
- Arterial streets
- Collector streets that carry traffic through neighborhoods to adjacent neighborhoods
- Streets likely to be analyzed in a local traffic study

The transit network in the countywide model was developed from the MTC model network with refinements to match the additional zonal detail within Alameda County. The 2014 model update added bicycle network infrastructure (bike lanes and paths) to support the model enhancements to estimate bicycle trips.

[41] MTC superdistricts 18 and 19 comprise North County Planning Area, while superdistricts 17, 16 and 15 equate to Central County, South County and East County Planning Areas, respectively.

[42] MTC is in the process of updating its zone system to expand the TAZs and to add a Micro Analysis Zone (MAZ) to better capture local bike and walk trips.

Model Results

The model produces the following countywide travel information:

- Trip generation
- Trip distribution
- Modal split of inter-zonal trips for home-based work trips and total trips
- Forecast of trips originating or destined to external zones
- Peak-hour LOS and traffic-volume projections by segment (2010, 2020, and 2040)
- Directional miles of congestion by type of facility (arterial, freeway)
- Mean highway speed
- Transit accessibility
- VMT by facility and by LOS
- Travel times for selected origin-destination (O-D) pairs
- Greenhouse gas emission for primary pollutants

Model output traffic volumes for all roadway segments for all horizon years and all time periods by planning areas are posted on the Alameda CTC website.

Model Adequacy

The model has been tested and validated for 2010[43] conditions. The validation procedure compared the model outputs to observed traffic volumes and transit ridership data. During validation, adjustments were primarily made to model inputs, such as the road network and base-year land uses, rather than calibrated parameters such as trip-generation rates or distribution factors. Based on the model calibration, MTC consistency check, and the model validation, Alameda CTC made the following conclusions:

- The countywide model is generally consistent with the MTC model in terms of numbers and types of trips, distribution between the Bay Area counties, and travel modes;
- The model estimates reasonable numbers of vehicles and transit riders to and from Alameda County; and
- The countywide model estimates 2010 base year traffic on most screen lines and major regional facilities at a level of accuracy sufficient to support evaluation of peak-hour traffic patterns on the CMP network; for example, select link analysis.

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[44] Among those requirements, Alameda CTC must find compliance with the development of the land use and socioeconomic database in the Countywide Travel Demand Model, which must be consistent with the regional land use database and assumptions of the regional travel demand model. Alameda CTC works with local jurisdictions to develop the countywide database by allocating ABAG's housing and job projections to a refined-scale zone system for countywide model traffic analysis. The county-level totals from the two allocations must be within plus or minus 1 percent, per MTC's established guidelines as described in Chapter 9.

Alameda CTC's land use database development process typically happens during the Countywide Travel Demand Model update. During this process, local jurisdictions are required to review a draft allocation of ABAG totals to the Countywide Travel Demand Model TAZs. Local jurisdictions then have 60 days to provide input on this draft allocation. The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

[43] During the next model update, the model base year is anticipated to be updated to 2010 to be consistent with the most recent US Census.
[44] California Government Code Section 65089.3.

Next Steps

Alameda CTC will further refine the Alameda County Travel Demand Model as part of the requirements to update the database to the latest ABAG Projections database. Further, Alameda CTC will update the database using the land use information and network characteristics submitted periodically by local jurisdictions as part of the land development impact analysis process of the Alameda CTC. Updates to the countywide model will include:

- Coordinating with MTC and ABAG on its Plan Bay Area 2040 update and incorporating the land use and transportation assumptions into the next Alameda CTC Countywide Travel Demand Model update; and
- Ensuring improved consistency with the regional model requirements.

Capital Improvement Program

8



As part of the CMP, Alameda CTC must develop a Capital Improvement Program to maintain or improve the performance of the multimodal transportation system in Alameda County, to move people and goods, and to mitigate regional transportation impacts identified through the land-use analysis program.[45] Capital improvement projects must conform to the Regional Transportation Plan (RTP), Alameda Countywide Transportation Plan (CTP), and air quality mitigation measures[46] for transportation-related vehicle emissions.

Additionally, the Metropolitan Transportation Commission (MTC) will incorporate the list of projects and programs proposed for Alameda County in the CMP Capital Improvement Program into the Regional Transportation Improvement Program (RTIP). As the Regional Transportation Planning Agency for the Bay Area, MTC is responsible for developing regional project priorities for the RTIP for the nine counties of the Bay Area. The RTIP is then submitted to the California Transportation Commission for inclusion in the State Transportation Improvement Program.

In 2013, Alameda CTC adopted a Strategic Planning and Programming Policy to consolidate existing planning and programming processes to improve the efficiency and effectiveness of future policy decisions on transportation investments in Alameda County. This policy resulted in the Comprehensive Investment Plan (CIP) that the Commission adopted in June 2015. The CIP translates long-range plans into a short-range investment strategy by establishing a list of near-term priority improvements to enhance and maintain Alameda County's transportation system.

Alameda CTC's CIP serves as the CMP Capital Improvement Program. The CIP has three objectives:

- Translate long-range plans into short-range implementation by focusing on project/program delivery over a five-year programming window with a two-year allocation plan.
- Serve as Alameda CTC's strategic plan for voter-approved transportation funding (such as the 1986 Measure B, the 2000 Measure B, 2010 Vehicle Registration Fee, and the 2014 Measure BB) as required by the respective legislation for each funding program. The revenue and expenditure assumptions for each fund source are confirmed annually and serve as the basis for the financial management of each fund source.
- Establish a comprehensive and consolidated programming and allocation plan for fund sources under Alameda CTC's authority for capital

[45] California Government Code Section 65089(b)(5).
[46] The Air Quality Mitigation Measures are contained in the BAAQMD's 2010 Bay Area Clean Air Plan.

improvements, operations and maintenance projects and programs. The CIP integrates all fund sources into one programming document that ensures coordinated programming and allocation of funds to maximize the effectiveness of transportation investments

Each year, Alameda CTC's CIP financial assumptions are updated to include the latest revenue projections. New projects and programs are considered every two years as part of the full CIP update cycle.

Relationship of CIP to Plans and Studies

Projects included in the Capital Improvement Plan must be consistent with the RTP and the CTP. Since the RTP is required to be in conformance with the State Implementation Plan (SIP) for air quality, the CMP is also required to be in conformance with the SIP. To identify transportation needs and improvements to include in the CIP, Alameda CTC performs periodical monitoring and uses various areawide/corridor studies or plans.

Regional Transportation Plan

Since the CMP ultimately will be incorporated into the RTP action element, projects selected for the Capital Improvement Program must be consistent with the assumptions, goals, policies, and actions identified in that plan. The RTP, prepared by the MTC, is the basic statement of the Bay Area transportation investment policy. Because of the interdependence of transportation planning and other regional planning, the regional plan strives to adopt policies that complement and support programs of federal, state, and regional agencies. The most recently adopted RTP, *Plan Bay Area 2013*, integrated land use and transportation by developing a Sustainable Communities Strategy to reduce greenhouse gas emissions from the transportation sector as required by Senate Bill 375.

MTC adopted an investment policy for *Plan Bay Area*[47], which sets forth MTC's approach to investment in the transportation system. This approach diverged from the prior approach and focused more on preserving and maintaining the existing transportation infrastructure, supporting priority development areas and priority conservation areas, and investing in transit. Specifically, the adopted investment strategies were:

1. maintain the existing transportation system;
2. support focused growth;
3. build next-generation transit;
4. boost freeway and transit efficiency;
5. county investment priorities; and
6. protecting Bay Area climate.

The most recently adopted *Plan Bay Area* included seven specific goals and related specific targets (see Chapter 9, "Program Conformance and Monitoring"). Out of the seven goals, two were legislatively required housing and climate protection with mandated targets.

MTC is currently in the process of updating its RTP by developing *Plan Bay Area 2040*. This plan is scheduled for adoption in 2017, and any updates relevant to the CIP will be incorporated into the 2017 CMP.

Countywide Transportation Plan

Alameda CTC will continue to use its CMP as the primary vehicle for implementing the long-range CTP. The CMP Capital Improvement Plan guidelines and other funding policies adopted by Alameda CTC require projects seeking federal or state funding to be consistent with the CTP.

Each county within the jurisdiction of MTC can prepare a long-range transportation plan (countywide transportation plan) in cooperation with the respective cities, county, and transit operators.[48] The CTP is the basis for the county's component of the RTP.

[47] MTC Resolution 4111.
[48] Assembly Bill 3705 (Eastin), Statutes of 1988.

The Commission adopted the most recent CTP for Alameda County in June 2012 that resulted from a major comprehensive effort and coordination with various regional and local agencies. Alameda CTC coordinated development of the 2012 CTP with MTC's development of *Plan Bay Area* and focused on identifying projects to meet the long-term transportation needs to better integrate land use and transportation to reduce greenhouse gas emissions in Alameda County. Performance-based planning was used for the first time to develop the 2012 CTP. This approach effectively identified projects and programs that meet the adopted vision and goals for the plan. Alameda CTC used a set of performance measures to provide an objective and technical means to measure how well projects and programs performed together to meet the goals.

The 2012 CTP's vision and goals for Alameda County are as follows:

Alameda County will be served by a premier transportation system that supports a vibrant and livable Alameda County through a connected and integrated multimodal transportation system promoting sustainability, access, transit operations, public health and economic opportunities.

To achieve this vision, our transportation system will be:

- Multimodal
- Accessible, Affordable and Equitable for people of all ages, incomes, abilities and geographies
- Integrated with the land use patterns and local decision-making
- Connected across the county, within and across the network of streets, highways and transit, bicycle and pedestrian routes
- Reliable and Efficient
- Cost effective
- Well Maintained
- Safe
- Supportive of a Healthy and Clean Environment

Alameda CTC is currently developing its 2016 CTP update, which will serve as a performance-based, long range plan for Alameda County's multimodal transportation network through 2040. As part of this plan development, Alameda CTC has readopted the 2012 CTP vision and goals for their continuing relevance and applicability. Alameda CTC is scheduled to adopt the CTP update in June 2016, and any updates relevant to the CIP will be incorporated in the 2017 CMP.

Air Quality Attainment Plans

The Capital Improvement Plan is closely related to federal and state air quality attainment plans. Because the Bay Area failed to attain national ambient air quality standards before the 1977 Federal Clean Air Act Amendments' 1987 deadline, a revised State Implementation Plan was developed. The purpose of this plan is to show the measures to be taken to reduce air pollution and maintain compliance with federal requirements for annual emission reductions. The RTP is required by federal law to conform to the SIP. Because CMPs are required to be consistent with the RTP, CMPs must also conform to the programs and policies outlined in the SIP.

State air quality legislation, specifically the California Clean Air Act of 1988, requires the Bay Area Air Quality Management District (BAAQMD) to prepare a Clean Air Plan designed to bring the Bay region's air basin into compliance with state air quality standards by the earliest practicable date. The Clean Air Plan must include transportation control measures as well as stationary (e.g., oil refinery) source controls to achieve and maintain the respective standards for ozone and carbon monoxide. Other legislation established a joint process between the MTC and BAAQMD for preparing the transportation control measures plan as part of the state Clean Air Plan.[49] BAAQMD adopted the most recent Clean Air Plan in 2010.

[49] Assembly Bill 3971 (Cortese).

To respond to air quality and climate protection challenges in the years ahead with a comprehensive planning approach, BAAQMD developed the 2010 Clean Air Plan to be a dual plan—to include the required update to the Bay Area's state ozone plan as well as to serve as a multi-pollutant action plan to protect public health and the climate. The 2010 Clean Air Plan Control Strategy component builds on a solid foundation established by the 2005 Ozone Strategy and previous ozone plans prepared in the 1991-2005 period. It includes revised, updated, and new measures in the three traditional control measure categories: Stationary Source Measures, Mobile Source Measures, and Transportation Control Measures. In addition, the Clean Air Plan identifies two new categories of control measures: Land Use and Local Impact Measures, and Energy and Climate Measures. Out of the total 55 control measures in the 2010 Clean Air Plan, 17 are transportation control measures.

The federal and state transportation control measures listed in the attainment plans have implications for county CMPs. MTC will give priority to proposed projects that support or help implement any of the transportation control measures outlined in this revised plan (see Appendix I for federal and state transportation control measures).

Areawide and Corridor Studies

Alameda CTC identified a need for areawide/corridor management multimodal planning in the 2012 CTP, re-emphasizing the prior policy on corridor/areawide transportation management planning, which is described in Chapter 6, "Land Use Analysis Program." As part of the 2012 CTP, Alameda CTC developed a Briefing Book and many issue papers on key transportation issues. These collectively identified transportation issues to address, potential focused plans/studies to develop and strategies to explore as part of those plans, and studies to develop an accessible, reliable, and safe multimodal transportation system in Alameda County that is well connected and better integrated with land use.

As part of the next steps identified in the 2012 CTP, Alameda CTC developed a comprehensive TDM strategy that the Commission adopted and embarked on developing a Countywide Goods Movement Plan, Countywide Multimodal Plan, and Countywide Transit Plan, along with updates to the Community Based Transportation Plans. These modal plans are currently ongoing and anticipated to:

- Provide valuable information and performance measures to assess short-and long-term impacts to roadways, alternative modes, land use, and goods movement, as well as possible solutions;
- Identify comprehensive approaches to congestion management that can aid in the development of deficiency plans, particularly areawide deficiency plans that offer improvement options to a larger multimodal network, where level-of-service standards have been or are expected to be exceeded; and
- Provide support that allows each community within the corridor/area to demonstrate how the community's share of cumulative/regional transportation impacts could be mitigated through cooperative planning and investment.

The three modal plans are scheduled for completion in 2016, and relevant information from these plans will be incorporated in the 2017 CMP.

Alameda CTC has also completed corridor studies for the following corridors:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- San Pablo and I-880 SMART Corridor Programs

- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

A New Diversified Investment Strategy

The 2012 CTP points to a new, integrated and diversified investment strategy for congestion management and environmental sustainability through connecting land use and transportation investment, and improving multimodal options. The following findings highlight this need for a strategy, which includes all reasonable options:

- The 2012 CTP includes $9.5 billion in projects, programs and planning studies.
- Even with this extensive investment, the countwide travel model forecasts congestion to become severe by 2035. Therefore, Alameda County cannot rely solely on investment in facilities as a way out of the congestion problem.
- The transportation needs in Alameda County outweigh the available revenues over the 28-year period.
- The Briefing Book and issue papers developed for the 2012 CTP make it apparent that all available diverse and multimodal options must be considered to sustain an acceptable level of mobility, improved connectivity, and environmental sustainability in Alameda County—these options include land use strategies, pricing strategies, managing the existing multimodal system better to stretch its capacity, better TDM options for trip reduction, carefully selected transportation investments, new and/or expanded revenue sources, and other approaches which may surface, including strategies to reduce vehicle miles traveled and reduce greenhouse gas emissions.
- Any single approach by itself is unlikely to be successful.

Through a performance-based evaluation in the development of the CTP, Alameda CTC has considered operational improvements intended to efficiently use existing facilities, improve transit investment and coordination, and support transit oriented developments (PDAs), intermodal freight facilities, non-motorized facilities, as well as other investment strategies to address all transportation issues. The CIP includes projects and programs that reinforce the diversified strategy identified in the CTP.

Funding Sources

Various federal, state, and local funding sources fund the projects and programs identified in the CIP, which relate to the projects and programs identified in the CTP. To obtain funding from these sources, projects and programs must meet specific requirements.

Federal Surface Transportation Act

As Alameda County's congestion management agency, Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for a portion of the federal Surface Transportation Program (STP). The STP provides funding from the reauthorization of federal funding for surface transportation, the legislation by which Alameda CTC receives federal monies. MTC currently allocates these funds through its One Bay Area Grant Program (OBAG).

Congestion Mitigation & Air Quality Program

Similar to STP funding, Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for a portion of the federal Congestion Mitigation & Air Quality Program (CMAQ). These funds are used on projects that will provide an air quality benefit. MTC currently allocates these funds through OBAG.

State Transportation Improvement Program

Under state law, Alameda CTC works with project sponsors, including Caltrans, transit agencies, and local jurisdictions to solicit and prioritize projects that will be programmed through the Regional Transportation Improvement Program that makes up 75 percent of funds (county share) in the State

Transportation Improvement Program. The remaining 25 percent of STIP funds are programmed at the state level and are part of the Interregional Transportation Improvement Program (ITIP). Therefore, STIP is made up of RTIP and ITIP. During each STIP cycle, the California Transportation Commission adopts a fund estimate that serves as the basis for financially constraining STIP proposals from counties and regions.

Transportation Fund for Clean Air Program

State law permits the BAAQMD to collect a fee of $4 per vehicle per year to reduce air pollution from motor vehicles through its Transportation Fund for Clean Air (TFCA) Program. Of these funds, the BAAQMD directly programs 60 percent and annually allocates the remaining 40 percent to the designated overall program manager for each county, which for Alameda County is Alameda CTC. Projects and programs that receive funding under this program must result in vehicle emission reductions and meet BAAQMD requirements for project cost effectiveness.

Lifeline Transportation Program

Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for the Lifeline Transportation Program (LTP). The LTP provides funds for transportation projects that serve low-income communities using a mixture of state and federal fund sources. Funding sources typically include State Transit Assistance (STA), Federal Job Access Reverse Commute (JARC), and state Proposition 1B funds.

Regional Measure 2 and Future Regional Measures

In 2004, voters passed Regional Measure 2 (RM2), raising the toll on the seven state-owned toll bridges in the San Francisco Bay Area by $1. This extra dollar funds various transportation projects within the region determined to reduce congestion or to make improvements to travel in the toll-bridge corridors, as identified in Senate Bill 916 (Chapter 715, Statutes of 2004). Another round of programming, commonly referred to as "RM3," either from the existing bridge toll revenues or from a new bridge toll, is anticipated to be considered by MTC.

Measure B Program Funds

In 1986, Alameda County voters approved the Measure B half-cent transportation sales tax, which was reauthorized in November 2000. Approximately 60 percent of Measure B transportation sales tax dollars are allocated to 20 separate organizations via direct local distribution (DLD) funds or discretionary grant programs.

The funds allocated to jurisdictions include:

- Local transportation, including local streets and roads projects (22.33 percent)
- Mass transit, including express bus service (21.92 percent)
- Special transportation (paratransit) for seniors and people with disabilities (10.5 percent)
- Bicycle and pedestrian safety (5 percent)
- Transit-oriented development (0.19 percent)

The remaining 40 percent of the transportation sales tax dollars are allocated to specific projects as described in the voter-approved 2000 Transportation Expenditure Plan (2000 TEP). Funds are allocated through an annual strategic planning process that identifies project readiness and funding requirements. Project-specific funding allocations are made via specific recommendations approved by the Commission.

Measure BB Program Funds

In November 2014, Alameda County voters approved the 2014 Transportation Expenditure Plan (2014 TEP). This plan distributes approximately 65 percent of the net sales tax revenues to essential programs in Alameda County through DLD funds and discretionary grant awards. The DLD funds are distributed as prescribed in the 2014 TEP as follows:

- Transit Operations, Maintenance, and Safety Program (21.55 percent)
- Local Streets Maintenance and Safety (20 percent)

- Bicycle and Pedestrian Infrastructure and Safety (3 percent)
- Affordable Transit for Seniors and People with Disabilities (9 percent)

The discretionary programs are distributed based on the percentage or amounts specified in the 2014 TEP:

- Affordable Student Transit Pass Program ($15 million)
- Affordable Transit for Seniors and People with Disabilities/Coordination and Service Grants (1 percent)
- Bicycle and Pedestrian Program (2 percent)
- Community Investments That Improve Transit Connections to Jobs and Schools (4 percent)
- Congestion Relief, Local Bridge Seismic Safety ($639 million)
- Freight and Economic Development Program (1 percent)
- Technology, Innovation and Development Program (1 percent)
- Transit Innovation Program (2.24 percent)

The remaining transportation sales tax dollars (approximately 35 percent) are identified for specifically named projects as described in the 2014 TEP. Alameda CTC distributes sales tax funds for capital projects on a reimbursement basis in accordance with funding agreements between Alameda CTC and the recipient agency, or for eligible project costs incurred directly by Alameda CTC.

Vehicle Registration Fee

The Measure F Alameda County Vehicle Registration Fee (VRF) Program was approved by the voters on November 2, 2010. The $10 per year vehicle registration fee generates approximately $12 million in annual net revenue. Each year, Alameda CTC distributes 60 percent of these funds to the 14 cities and the county as DLD funds to support Local Road Improvement and Repair Programs. The remaining 40 percent are used to support the following programs:

- Transit for Congestion Relief Discretionary Program (25 percent)
- Local Transportation Technology Program (10 percent)
- Pedestrian and Bicycle Access and Safety Discretionary Program (5 percent)

Proposition 1B

As approved by the voters in the November 2006 general elections, Proposition 1B enacted the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, authorizing $19.9 billion of state general obligation bonds for specified purposes. Proposition 1B includes funding for multiple programs, including the Corridor Mobility Improvement Account (CMIA), the Trade Corridors Improvement Fund (TCIF), and the Traffic Light Synchronization Program (TLSP).

Alameda CTC has successfully secured approximately $420 million in Proposition 1B Bond funding to complete the $800 million Alameda CTC I-Bond construction program. The seven projects that use Proposition 1B funds are complete or under construction.

Project Delivery

In light of the focus on project delivery, Alameda CTC has adopted a "Timely Use of Funds Policy" which applies to funds allocated by Alameda CTC. For delivery of projects with funding from multiple sources, Alameda CTC incorporates its Timely Use of Funds Policy with the timely use of funds requirements for other funding, including STIP, federal STP/CMAQ, and TFCA funding. In addition, projects are also subject to regional deadlines outlined in MTC Resolution 3606.

2016 STIP

The projects identified for STIP funding are consistent with the CTP and RTP. Compared to prior cycles, the statewide revenue estimate for the 2016 STIP is approximately $46 million. Based on the low statewide amount, the California Transportation Commission

(CTC) has not calculated individual county shares. Once the CTC releases the estimate, if funding is available for the county, Alameda CTC will develop a list of proposed projects for approval by the Commission in fall of 2015. On approval by the Commission, Alameda CTC will forward the proposed projects, if any, to MTC and will update the CMP accordingly.

The CIP

Alameda CTC is responsible for planning, programming, and allocating local, regional, state, and federal funding from a number of sources for transportation investments throughout Alameda County. The investments approved by Alameda CTC result in a wide range of transportation improvements and services that facilitate safe, efficient, and accessible travel for all types of transportation in all parts of Alameda County.

As mentioned previously, Alameda CTC updates the CTP every four years, which matches the 30-year horizon of the RTP and establishes the Alameda County vision and goals for transportation over the planning horizon. Alameda CTC also prepares short- and long-range plans to address needs and priorities for transit, highways, roads, goods movement, transportation for seniors and people with disabilities, bicycle and pedestrian facilities and programs, and community based transportation improvements that link transportation, housing, and jobs countywide.

The CIP brings the long-range and countywide plans into the near term by focusing on investments over a five-year programming and allocation window. The CIP identifies a list of short-range priority transportation improvements to enhance and maintain Alameda County's transportation system in accordance with the objectives established in the CTP. The CIP identifies anticipated transportation funding over a five-year horizon and strategically matches the funding sources to targeted investments in Alameda County's transportation system. The five-year horizon includes a two-year allocation plan (i.e., the first two years). Once funds are allocated, they become subject to the Alameda CTC Timely Use of Funds Policy to ensure timely implementation of the intended improvements or services funded by the allocation.

Five-Year CIP and Two-Year Allocation Plan

The project and program selection process for the initial CIP, from FY (Fiscal Year) 2015-16 through FY2019-20, was abbreviated to allow for the development of policies related to Measure BB implementation. Projects and programs included in the CIP funded by fund sources aside from Measure BB were selected through the specific guidelines associated with those funding sources. The total revenue programmed over the five-year CIP horizon is $1,222,410 from a variety of sources at the federal, state, regional, and local levels. The two-year allocation plan total is over $478 million. Table 21 shows the projects identified for the initial CIP from FY 2015-16 through FY 2019-20.

									Programming ($ x 1,000)			5-Year CIP Programming Window ($ x 1,000)					
												2-Year Allocation Plan					
CIP ID	PA	Funding Type	Funding Agency	Fund Source	Fund Subset	Sponsor	Project Title	Mode	Phase	Programmed Amount	Pre FY2015-16	FY2015-16	FY2016-17	FY2017-18	FY2018-19	FY2019-20	TOTAL PROGRAMMED AMOUNT (Thru FY 19-20)
00001	Multiple	State	CTC	STIP	RIP	MTC	Planning, Programming and Monitoring	Multi	CON-CAP	532		126	131	135	140		532
00002	Multiple	State	CTC	STIP	RIP	AlaCTC	Planning, Programming and Monitoring	Multi	CON-CAP	2,201			886	750	565		2,201
00003	1-North	State	CTC	STIP	RIP	BART	Downtown Berkeley BART Plaza/Transit Area Improvements	TR	CON-CAP	3,726			3,726				3,726
00004	Multiple	State	MTC	Lifeline	STA	AC Transit	Preservation of Existing Services in Communities of Concern	TR	O&M	3,583		3,583					3,583
00004	Multiple	Federal	MTC	Lifeline	JARC	AC Transit	Preservation of Existing Services in Communities of Concern	TR	O&M	1,417		1,417					1,417
00005	Multiple	Federal	MTC	Lifeline	STA	BART	A Quicker, Safer Trip to the Library to Promote Literacy (Oakland Public Library)	TR	O&M	250		250					250
00006	Multiple	Federal	MTC	Lifeline	STA	AC Transit	Ashland and Cherryland Transit Access Improvements (Ala. County)	TR	CON-CAP	450		450					450
00007	Multiple	Federal	MTC	Lifeline	STA	AC Transit	Additional Preservation of Existing Services in Communities of Concern	TR	O&M	1,741		1,741					1,741
00008	Multiple	Federal	MTC	Lifeline	STA	LAVTA	WHEELS Route 14 Operating Assistance	TR	O&M	388		388					388
00008	Multiple	Federal	MTC	Lifeline	JARC	LAVTA	WHEELS Route 14 Operating Assistance	TR	O&M	129		129					129
00009	Multiple	Federal	MTC	Lifeline	JARC	AC Transit	City of Oakland Broadway Shuttle	TR	O&M	405		405					405
00010	Multiple	Federal	MTC	Lifeline	STA	UC Transit	Operations Support for Route 2	TR	O&M	220		220					220
00011	Multiple	Federal	MTC	Lifeline	STA	TBD	Lifeline Cycle 5 (Estimated)	TR	Var.	8,500				8,500			8,500
00012	1-North	State	CTC	STIP	RIP	MTC	Improved Bike/Ped Access to East Span of SFOBB (Alameda Share)	BP	CON-CAP	3,063			3,063				3,063
00013	Multiple	Regional	BAAQMD	TFCA	Prog Mgr	AlaCTC	FY 15-16 Program Manager Funds - Cities/County Shares	Multi	Var.	2,038		2,038					2,038
00014	Multiple	Regional	BAAQMD	TFCA	Prog Mgr	Var.	FY 16-17 Through FY 19-20 Program Manager Funds - Cities/County Share	Multi	Var.	4,788			1,197	1,197	1,197	1,197	4,788
00015	Multiple	Regional	BAAQMD	TFCA	Prog Mgr	Var.	FY 16-17 Through FY 19-20 Program Manager Funds - Transit Discretionary	TR	Var.	2,052			513	513	513	513	2,052
00016	Multiple	Local	AlaCTC	2000 MB	DLD	Var.	2000 MB Local Streets and Roads - Direct Local Distributions	LSR	Var.	140,870		27,506	27,836	28,171	28,507	28,850	140,870
00017	Multiple	Local	AlaCTC	2000 MB	DLD	Var.	2000 MB Bicycle/Pedestrian - Direct Local Distributions	BP	Var.	24,142		4,714	4,770	4,828	4,886	4,944	24,142
00018	Multiple	Local	AlaCTC	2000 MB	Disc-BP	Var.	2000 MB Bicycle/Pedestrian - Discretionary Program	BP	Var.	7,992		1,516	1,590	1,609	1,629	1,648	7,992
00019	Multiple	Local	AlaCTC	2000 MB	Disc-BP	Var.	Countywide Bicycle Pedestrian Planning	BP	Var.	75		75					75
00020	Multiple	Local	AlaCTC	2000 MB	DLD	Var.	2000 MB Paratransit - Direct Local Distributions	PT	Var.	58,067		11,338	11,474	11,612	11,751	11,892	58,067
00021	Multiple	Local	AlaCTC	2000 MB	Disc-PT	ASEB	Special Transportation Services for Individuals with Dementia	PT	O&M	300	200	100					300
00022	Multiple	Local	AlaCTC	2000 MB	Disc-PT	BORP	Accessible Group Trip Transportation for Youth and Adults with Disabilities	PT	O&M	420	272	148					420
00023	Multiple	Local	AlaCTC	2000 MB	Disc-PT	CIL	Mobility Matters Project	PT	O&M	490	350	140					490
00024	Multiple	Local	AlaCTC	2000 MB	Disc-PT	Emeryville	8-To-Go Demand Response Door to Door Shuttle	PT	O&M	140	106	34					140
00025	Multiple	Local	AlaCTC	2000 MB	Disc-PT	Fremont	Tri-City Mobility Management and Travel Training Program	PT	O&M	325	200	125					325

Table 21—FY2015-16 Initial Comprehensive Investment Plan

									Programming ($ x 1,000)			5-Year CIP Programming Window ($ x 1,000)					
												2-Year Allocation Plan					
CIP ID	PA	Funding Type	Funding Agency	Fund Source	Fund Subset	Sponsor	Project Title	Mode	Phase	Programmed Amount	Pre FY2015-16	FY2015-16	FY2016-17	FY2017-18	FY2018-19	FY2019-20	TOTAL PROGRAMMED AMOUNT (Thru FY 19-20)
00026	3-South	Local	AlaCTC	2000 MB	Disc-PT	Fremont	Tri-City Volunteer Driver Programs	PT	O&M	400	250	150					400
00027	3-South	Local	AlaCTC	2000 MB	Disc-PT	Fremont	Tri-City Taxi Voucher Program	PT	O&M	300	150	150					300
00028	Multiple	Local	AlaCTC	2000 MB	Disc-PT	Oakland	Taxi-Up & Go Project	PT	O&M	278	185	93					278
00029	4-East	Local	AlaCTC	2000 MB	Disc-PT	Pleasanton	Downtown Route Shuttle (DTR)	PT	O&M	128	86	42					128
00030	Multiple	Local	AlaCTC	2000 MB	Disc-PT	SHS	Rides for Seniors	PT	O&M	210	150	60					210
00031	Multiple	Local	AlaCTC	2000 MB	Disc-PT	SSPTV	Volunteer Assisted Senior Transportation Program	PT	O&M	225	150	75					225
00032	Multiple	Local	AlaCTC	2000 MB	Disc-PT	TBD	Gap funds for Capital Purchases and Grant Matching	PT	Var.	200	100	100					200
00033	Multiple	Local	AlaCTC	2000 MB	Disc-PT	AlaCTC	Transportation Services for Hospital Discharge and Wheelchair/Scooter Breakdown	PT	O&M	490	140	70	70	70	70	70	490
00034	Multiple	Local	AlaCTC	2000 MB	Disc-PT	Var.	2000 MB Paratransit - Discretionary (Estimated)	PT	Var.	5,600			1,400	1,400	1,400	1,400	5,600
00035	Multiple	Local	AlaCTC	2000 MB	DLD	Var.	2000 MB Mass Transit - Direct Local Distributions	TR	Var.	136,610		26,674	26,994	27,318	27,646	27,978	136,610
00036	Multiple	Local	AlaCTC	2000 MB	Disc-EB	Var.	2000 MB Express Bus - Discretionary	TR	Var.	4,506		880	890	901	912	923	4,506
00037	Multiple	Local	AlaCTC	2000 MB	Disc-TCD	Var.	2000 MB Transit Center Development - Discretionary Program	TR	Var.	1,225		239	242	245	248	251	1,225
00038	Multiple	Local	AlaCTC	VRF	DLD	Var.	2010 VRF Local Streets and Roads - Direct Local Distributions	LSR	Var.	34,200		6,840	6,840	6,840	6,840	6,840	34,200
00039	Multiple	Local	AlaCTC	VRF	Disc-Transit	Var.	2010 VRF Mass Transit - Discretionary	TR	Var.	14,250		2,850	2,850	2,850	2,850	2,850	14,250
00040	Multiple	Local	AlaCTC	VRF	Disc-BP	Var.	2010 VRF Bicycle/Pedestrian Safety - Discretionary Funds	BP	Var.	2,850		570	570	570	570	570	2,850
00041	Multiple	Local	AlaCTC	VRF	Disc-Tech	Var.	2010 VRF Local Transportation Techology - Discretionary	TECH	Var.	5,700		1,140	1,140	1,140	1,140	1,140	5,700
00042	Multiple	Local	AlaCTC	2014 MBB	DLD	Var.	2014 MBB Local Streets and Roads - Direct Local Distributions	LSR	Var.	130,025		25,388	25,693	26,001	26,314	26,629	130,025
00043	Multiple	Local	AlaCTC	2014 MBB	DLD	Var.	2014 MBB Mass Transit Services - Direct Local Distributions	TR	Var.	141,604		27,650	27,980	28,317	28,657	29,000	141,604
00044	Multiple	Local	AlaCTC	2014 MBB	Disc-Transit	Var.	2014 MBB Transit Innovative Grants - Discretionary	TR	Var.	14,865		2,903	2,937	2,973	3,008	3,044	14,865
00045	Multiple	Local	AlaCTC	2014 MBB	DLD	Var.	2014 MBB Bicycle/Pedestrian Safety - Direct Local Distributions	BP	Var.	19,712		3,849	3,895	3,942	3,989	4,037	19,712
00046	Multiple	Local	AlaCTC	2014 MBB	Disc-BP	Var.	2014 MBB Bicycle/Pedestrian Safety - Discretionary	BP	Var.	13,273		2,592	2,623	2,654	2,686	2,718	13,273
00047	Multiple	Local	AlaCTC	2014 MBB	DLD	Var.	2014 MBB Transit - Direct Local Distributions	TR	Var.	140,101		27,356	27,683	28,016	28,353	28,693	140,101
00048	Multiple	State	CTC	STIP	RIP	TBD	2016 STIP - Alameda County Share (Estimated)(50% for 1-Year)	Multi	Var.	13,000						13,000	13,000
00049	Multiple	Federal	MTC	OBAG	STP/CMAQ	TBD	OBAG Cycle 2 (Estimated)	Multi	Var.	38,000				10,000	14,000	14,000	38,000
00050	Multiple	Regional	BAAQMD	TFCA	Prog Mgr	AC Transit	AC Transit: East Bay Bus Rapid Transit	TR	CON-CAP	925	925						925
00050	Multiple	State	CTC	STIP	RIP	AC Transit	AC Transit: East Bay Bus Rapid Transit	TR	CON-CAP	7,995		7,995					7,995
00050	Multiple	Local	AlaCTC	2000 MB	07A	AC Transit	AC Transit: East Bay Bus Rapid Transit	TR	Var.	11,510	11,510						11,510
00050	Multiple	Local	AlaCTC	2014 MBB	13	AC Transit	AC Transit: East Bay Bus Rapid Transit	TR	CON-CAP	10,000			10,000				10,000

									Programming ($ x 1,000)		5-Year CIP Programming Window					
											2-Year Allocation Plan		($ x 1,000)			
CIP ID	PA	Funding Type	Funding Agency	Fund Source	Fund Subset	Sponsor	Project Title	Mode	Phase	Programmed Amount	Pre FY2015-16	FY2015-16	FY2016-17	FY2017-18	FY2018-19	FY2019-20	TOTAL PROGRAMMED AMOUNT (Thru FY 19-20)
00051	Multiple	Local	AlaCTC	2000 MB	01	SJRRC	ACE Capital	TR	Var.	13,184	11,184	2,000					13,184
00052	4-East	Local	AlaCTC	2000 MB	09	Dublin	Iron Horse transit Route - Dougherty Drive	Multi	CON-CAP	6,267		6,267					6,267
00053	Multiple	Local	AlaCTC	2014 MBB	008	AlaCTC	Affordable Student Transit Pass Programs	TR	O&M	2,000		2,000					2,000
00054	Multiple	Local	AlaCTC	2014 MBB	012	AlaCTC	Affordable Transit for Seniors and People with Disabilities - Needs Assessment	PT	Scoping	500		500					500
00055	Multiple	Local	AlaCTC	2014 MBB	014	Alameda	Alameda to Fruitvale BART Rapid Bus	TR	Scoping	100		100					100
00056	Multiple	Local	AlaCTC	2014 MBB	015	AC Transit	Grand/MacArthur BRT	TR	Scoping	100		100					100
00057	Multiple	Local	AlaCTC	2014 MBB	016	AC Transit	College/Broadway Corridor Transit Priority	TR	Scoping	100		100					100
00058	Multiple	Local	AlaCTC	2014 MBB	017	BART	Irvington BART Station	TR	Scoping	100		100					100
00059	Multiple	Local	AlaCTC	2014 MBB	018	BART	Bay Fair Connector/BART METRO	TR	Scoping	100		100					100
00060	Multiple	Local	AlaCTC	2014 MBB	019	BART	BART Station Modernization and Capacity Program	TR	Scoping	100		100					100
00061	Multiple	Local	AlaCTC	2014 MBB	021	Multi	Dumbarton Corridor Area Transportation Improvements	Multi	Scoping	100		100					100
00062	Multiple	Local	AlaCTC	2014 MBB	022	Union City	Union City Intermodal Station	TR	Scoping	100		100					100
00063	Multiple	Local	AlaCTC	2014 MBB	023	AlaCTC	Railroad Corridor Right of Way Preservation and Track Improvements	TR	Scoping	100		100					100
00064	Multiple	Local	AlaCTC	2014 MBB	024	Oakland	Oakland Broadway Corridor Transit	TR	Scoping	100		100					100
00065	Multiple	Local	AlaCTC	2014 MBB	025	CCJPA	Capitol Corridor Service Expansion	TR	Scoping	100		100					100
00066	Multiple	Local	AlaCTC	2014 MBB	026	Multi	Congestion Relief, Local Bridge Seismic Safety	LSR	Scoping	1,500		1,500					1,500
00067	Multiple	Local	AlaCTC	2014 MBB	026	San Leandro	San Leandro Streets Rehabilitation	LSR	CON-CAP	3,000			3,000				3,000
00068	Multiple	Local	AlaCTC	2014 MBB	027	Multi	Countywide Freight Corridors	FR	Scoping	250		250					250
00069	Multiple	Local	AlaCTC	2014 MBB	029	AlaCTC	I-80 Gilman Street Interchange Improvements	HWY	PA-ED	3,000		3,000					3,000
00070	Multiple	Local	AlaCTC	2014 MBB	030	TBD	I-80 Ashby Interchange Improvements	HWY	Scoping	100		100					100
00071	Multiple	Local	AlaCTC	2014 MBB	031	AlaCTC	SR-84/I-680 Interchange and SR-84 Widening	HWY	PA-ED	4,000		4,000					4,000
00072	Multiple	Local	AlaCTC	2014 MBB	032	AlaCTC	SR-84 Expressway Widening (Pigeon Pass to Jack London)	HWY	CON-CAP	10,000			10,000				10,000
00073	Multiple	Local	AlaCTC	2014 MBB	033	AlaCTC	I-580/I-680 Interchange Improvements (Study Only)	HWY	Scoping	100		100					100
00074	Multiple	Local	AlaCTC	2014 MBB	034	Multi	I-580 Local Interchange Improvement Program	HWY	Scoping	300		300					300
00075	Multiple	Local	AlaCTC	2014 MBB	035	AlaCTC	I-680 HOT/HOV Lane from SR-237 to Alcosta	HWY	Design	5,000		5,000					5,000
00076	Multiple	Local	AlaCTC	2014 MBB	036	AlaCTC	I-880 NB HOV/HOT Extension from A Street to Hegenberger	HWY	Scoping	100		100					100
00077	Multiple	Local	AlaCTC	2014 MBB	038	AlaCTC	I-880 Whipple Road/Industrial Parkway Southwest Interchange Improvements	HWY	Scoping	100		100					100

Table 21—FY2015-16 Initial Comprehensive Investment Plan

									Programming ($ x 1,000)		5-Year CIP Programming Window ($ x 1,000)					
											2-Year Allocation Plan					
CIP ID	PA	Funding Type	Funding Agency	Fund Source	Fund Subset	Sponsor	Project Title	Mode	Phase	Programmed Amount	Pre FY2015-16	FY2015-16	FY2016-17	FY2017-18	FY2018-19	FY2019-20	TOTAL PROGRAMMED AMOUNT (Thru FY 19-20)
00078	Multiple	Local	AlaCTC	2014 MBB	039	AlaCTC	I-880 Industrial Parkway Interchange Improvements	HWY	Scoping	100		100					100
00079	Multiple	Local	AlaCTC	2014 MBB	040	Multi	I-880 Local Access and Safety Improvements	HWY	Scoping	300		300					300
00080	Multiple	Local	AlaCTC	2014 MBB	042	Multi	Gap Closure on Three Major Trails	BP	Scoping	600		600					600
00081	Multiple	Federal	CTC	ATP	State	AlaCTC	East Bay Greenway	BP	PA-ED	2,656	2,656						2,656
00081	Multiple	Local	AlaCTC	2014 MBB	042	AlaCTC	Eastbay Greenway	BP	PA-ED	3,500		3,500					3,500
00082	Multiple	Local	AlaCTC	2014 MBB	045	Multi	Community Investments That Improve Transit Connections to Jobs and Schools	CD	Scoping	1,500		1,500					1,500
00083	Multiple	State	CTC	STIP	RIP	BART	Downtown Berkeley BART Plaza/Transit Area Imps.	TR	CON-CAP	3,726			3,726				3,726
00084	3-South	State	CTC	STIP	RIP	AlaCTC	East-West Connector in Fremont & Union City	LSR	CON-CAP	12,000					12,000		12,000
00085	4-East	State	CTC	STIP	RIP	Caltrans	SR 84 Expressway Widening	HWY	CON-CAP	39,480	39,480						39,480
00086	4-East	State	CTC	STIP	RIP	Caltrans	SR 84 Expressway Widening	HWY	CON-SUPP	7,550	7,550						7,550
00087	2-Central	Federal	MTC	OBAG	STP	Alameda	Alameda City Complete Streets	BP	CON-CAP	505	505						505
00088	Multiple	Federal	MTC	OBAG	STP	Ala. County	Alameda Co-Various Streets and Roads Preservation	LSR	CON-CAP	1,565	1,565						1,565
00089	1-North	Federal	MTC	OBAG	STP	Berkeley	Shattuck Complete Streets and De-couplet	BP	CON-CAP	2,777	2,777						2,777
00090	4-East	Federal	MTC	OBAG	STP	Dublin	Dublin Boulevard Preservation	LSR	CON-CAP	470	470						470
00091	3-South	Federal	MTC	OBAG	STP	Fremont	Fremont City Center Multi-Modal Improvements	Multi	CON-CAP	1,288	1,288						1,288
00092	2-Central	Federal	MTC	OBAG	STP	Hayward	Hayward - Industrial Boulevard Preservation	LSR	CON-CAP	1,265	1,265						1,265
00093	1-North	Federal	MTC	OBAG	STP	Oakland	Lake Merritt BART Bikeways	BP	CON-CAP	571	571						571
00094	1-North	Federal	MTC	OBAG	STP	Oakland	Oakland Complete Streets	LSR	CON-CAP	3,384	3,384						3,384
00095	1-North	Federal	MTC	OBAG	STP	Oakland	Lakeside Complete Streets and Road Diet	BP	CON-CAP	4,446	4,446						4,446
00095	1-North	Federal	MTC	OBAG	CMAQ	Oakland	Lakeside Complete Streets and Road Diet	BP	CON-CAP	2,554	2,554						2,554
00096	1-North	Federal	MTC	OBAG	STP	San Leandro	San Leandro Boulevard Preservation	LSR	CON-CAP	804	804						804
00097	1-North	Federal	MTC	OBAG	STP	Berkeley	Hearst Avenue Complete Streets	BP	CON-CAP	2,156		2,156					2,156
00098	1-North	Federal	MTC	OBAG	STP	Emeryville	Emeryville - Hollis Street Preservation	LSR	CON-CAP	100		100					100
00099	3-South	Federal	MTC	OBAG	STP	Newark	Enterprise Drive Complete Streets and Road Diet	BP	CON-CAP	454		454					454
00100	1-North	Federal	MTC	OBAG	CMAQ	Oakland	Oakland - Peralta and MLK Blvd Streetscape Phase I	BP	CON-CAP	5,452		5,452					5,452
00101	1-North	Federal	MTC	OBAG	STP	Piedmont	Piedmont Complete Streets (CS)	BP	CON-CAP	129		129					129
00102	Multiple	Federal	MTC	OBAG	STP	MTC	Regional Planning Activities and PPM - Alameda	Multi	PA-ED	1,034			1,034				1,034
00103	1-North	Federal	MTC	OBAG	CMAQ	Oakland	7th Street West Oakland Transit Village, Phase II	BP	CON-CAP	3,288			3,288				3,288

									Programming ($ x 1,000)			5-Year CIP Programming Window ($ x 1,000)					
												2-Year Allocation Plan					
CIP ID	PA	Funding Type	Funding Agency	Fund Source	Fund Subset	Sponsor	Project Title	Mode	Phase	Programmed Amount	Pre FY2015-16	FY2015-16	FY2016-17	FY2017-18	FY2018-19	FY2019-20	TOTAL PROGRAMMED AMOUNT (Thru FY 19-20)
00104	4-East	Federal	MTC	OBAG	STP	Pleasanton	Pleasanton Complete Streets	BP	CON-CAP	832			832				832
00105	1-North	State	CTC	ATP	Reg	Alameda	Cross Alameda Trail (includes SRTS component)	BP	Design	226	226						226
00105	1-North	Federal	CTC	ATP	Reg	Alameda	Cross Alameda Trail (includes SRTS component)	BP	CON-CAP	2,005		2,005					2,005
00106	1-North	Federal	CTC	ATP	Reg	Ala. County	Be Oakland, Be Active	BP	CON-CAP	988	988						988
00107	1-North	Federal	CTC	ATP	Reg	Berkeley	LeConte Elementary Safe Routes to School Imps	BP	Design	82	82						82
00108	1-North	Federal	CTC	ATP	Reg	Berkeley	LeConte Elementary Safe Routes to School Imps	BP	CON-CAP	600		600					600
00109	4-East	Federal	CTC	ATP	Reg	Livermore	Livermore Marylin Avenue Safe Routes to School	BP	Design	83	83						83
00110	4-East	Federal	CTC	ATP	Reg	Livermore	Livermore Marylin Avenue Safe Routes to School	BP	CON-CAP	275		275					275
00111	1-North	Federal	CTC	ATP	Reg	Oakland	Lake Merritt to Bay Trail Bike/Ped Bridge	BP	Design	2,885		2,885					2,885
00112	1-North	Federal	CTC	ATP	Reg	Oakland	Lake Merritt to Bay Trail Bike/Ped Bridge	BP	ROW-CAP	325		325					325
00113	1-North	Federal	CTC	ATP	State	Albany	Complete Streets for San Pablo Ave/Buchanan St.	BP	Design	335		335					335
00114	1-North	Federal	CTC	ATP	State	Oakland	International Boulevard Improvement Project	BP	CON-CAP	2,481		2,481					2,481
00115	1-North	Federal	CTC	ATP	State	Oakland	Laurel Access to Mills, Maxwell Park and Seminary	BP	CON-CAP	3,598		3,598					3,598
00116	3-South	Local	AlaCTC	2000 MB	025	Newark	Central Avenue Overpass	LSR	Design	2,765	2,765						2,765
00116	3-South	Local	AlaCTC	2000 MB	025	Newark	Central Avenue Overpass	LSR	CON-CAP	13,289				13,289			13,289
00117	Multiple	Local	AlaCTC	2000 MB	08A	AlaCTC	I-680 Sunol S/B Express Lane	HWY	O&M	4,500	4,500						4,500
00118	Multiple	Local	AlaCTC	2000 MB	08B	AlaCTC	I-680 Sunol N/B Express Lane	HWY	Design	4,500	4,500						4,500
00119	4-East	Regional	MTC	RM2	Reg	TBD	I-580 Transit Improvements	TR	Var.	12,000		12,000					12,000
																	0
									Totals	1,222,410	108,417	259,221	218,873	213,841	209,871	212,187	1,222,410
									2-Year Allocation Plan (FY 2015-16 & FY 2016-17) Total				$478,094				
									5-Year Programming Window (Fy 2015-16 - FY 2019-20) Total								$1,113,993

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Summary of Investments by Fund Type (DLD, capital, programmatic) and Source

The initial five-year CIP includes funding for the following three fund types:

- **Direct local distributions** to local jurisdictions and transit agencies based on percentages of actual Measure B and Measure BB sales tax receipts and percentages of Vehicle Registration Fee receipts;
- **Capital project funds** disbursed on a reimbursement basis to implementing agencies that incur eligible project costs for projects named in the 1986 Measure B, 2000 Measure B, 2014 Measure BB, or Vehicle Registration Fee transportation expenditure plans and in the CTP;
- **Program funds** disbursed on a reimbursement basis to implementing agencies that incur eligible program costs, which may include operations, maintenance, service provisions, or capital projects, in accordance with specific allocation, discretionary fund award, and funding agreement requirements.

Figure 11 summarizes the investments by fund type. More than two-thirds of the investments are direct local distributions to local jurisdictions and transit agencies. These agencies determine what their local priorities are within the following programs: bicycle and pedestrian safety, local streets and roads, paratransit, and transit. Figure 12 summarizes investments by fund sources.

Figure 11—Summary of CIP Investments by Fund Type

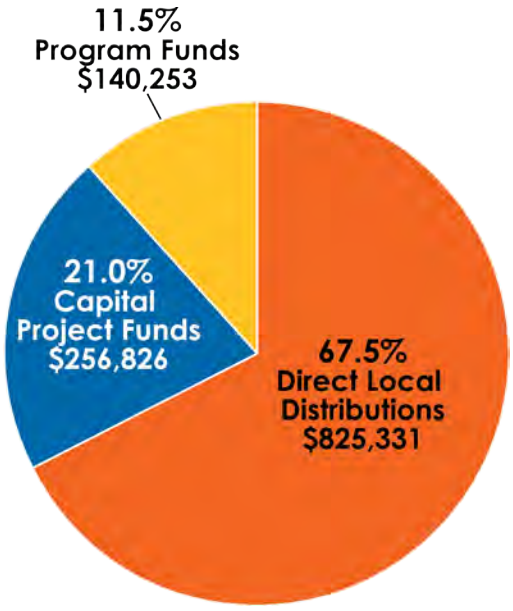
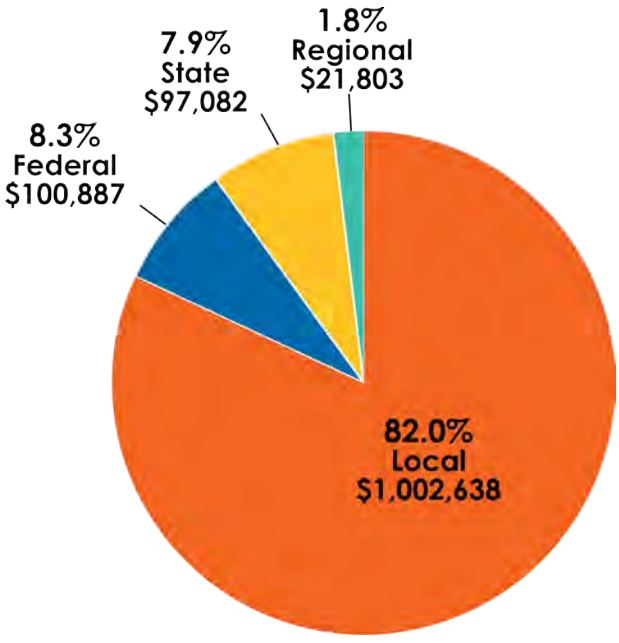


Figure 12—Summary of CIP Investments by Fund Source



Summary of CIP Investments by Transportation Mode

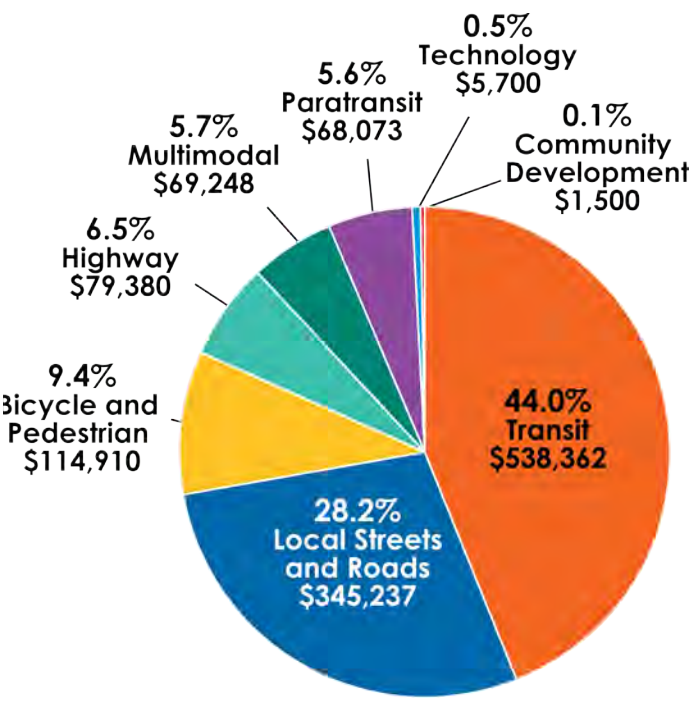
The initial five-year CIP includes funding for the following transportation modes: goods movement, bicycle and pedestrian safety, community development, highways, local streets and roads, paratransit, and transit, which includes capital projects, operations, and express bus services. The multimodal category signifies more than one mode.

Figure 13 summarizes the investments by transportation mode. The majority of investments fund transit ($538 million). The next two largest investments are in local streets and roads ($345 million) and in bicycle and pedestrian safety ($114 million). These investments cover a programming window of FY2015-16 through FY2019-20.

Summary of CIP Investments by Phase

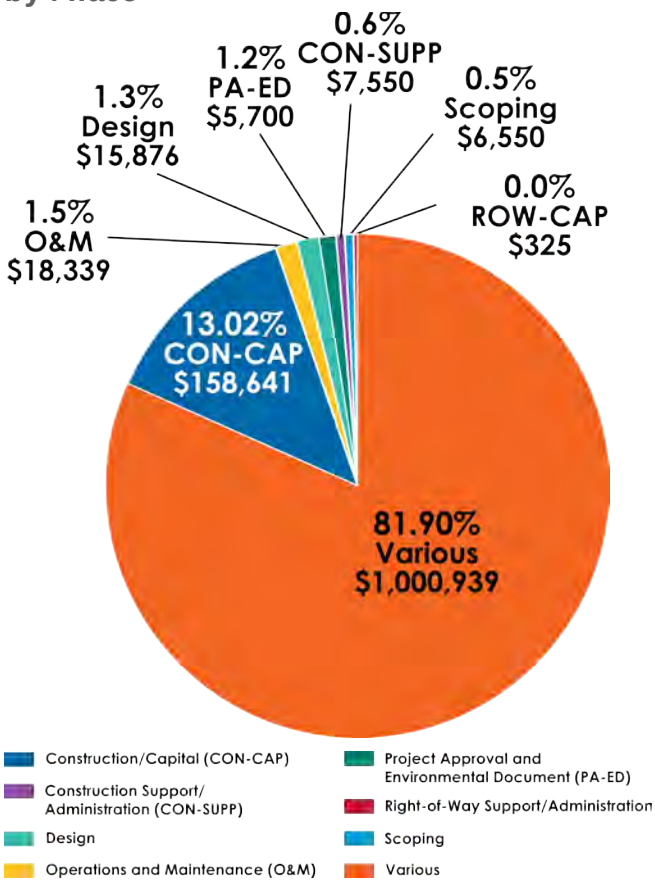
The initial five-year CIP includes funding for seven project and program phases. Over the five-year time period, some of the projects and programs will go through various development phases, and therefore, the CIP lists "various" as an additional phase. Figure 14 summarizes the investments by phase.

Figure 13—Summary of CIP Investments by Transportation Mode



Note: Highway includes freight valued at $250 million or 0.02 percent.

Figure 14—Summary of CIP Investments by Phase



Note: The right-of-way support/administration actual value is $325 million or 0.03 percent.

CIP Update Process

Alameda CTC will update annually the expenditure and revenue assumptions included in the CIP, which will serve as the basis of the Alameda CTC financial models and annual budget. The annual updates will also serve to satisfy any annual strategic plan requirements for the fund sources that Alameda CTC administers. The annual updates will afford Alameda CTC the opportunity to review the first year and confirm the allocations for the second year of the two-year allocation plan. The annual update process will include a status update on the first year and any recommended adjustments or amendments for the second year.

A full update of the CIP will occur every two years, including a comprehensive review of the remaining three years of the five-year CIP horizon and the addition of two new years of programming for a five-year programming window. The full update will involve notifying project sponsors of the enrollment period for adding new projects and programs to the CIP, and the subsequent review and approval of project and program submittals to be included in the updated CIP.

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[50] Among the requirements, Alameda CTC must develop a Capital Improvement Program that includes projects and programs to improve or maintain the performance of the countywide multimodal transportation system. The Comprehensive Investment Plan that will be updated every two years in coordination with the local jurisdictions and transit agencies will serve as the Capital Improvement Program for the CMP. The CTP updated every four years will inform the CIP development process.

Next Steps

Through the next 2017 CMP update, Alameda CTC will continue its coordination of long-range planning documents with short-range implementation via the Alameda CTC CIP. The first CIP (FY2015-16 through FY2019-20) was adopted by Alameda CTC in June 2015 and incorporated herein in part for this CMP Capital Improvement Program chapter. In June 2017, the CIP will receive a full update, including new revenue projections and project/program allocations for FY2017-18 through FY2021-22. The 2017 CIP for the CMP will reflect a combination of near-term transportation investments to achieve the vision and goals of Alameda CTC's modal plans (Countywide Goods Movement Plan, Countywide Multimodal Arterial Plan, and Countywide Transit Plan) and the 2016 CTP.

[50] California Government Code Section 65089.3.

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Program Conformance and Monitoring 9



Alameda CTC is responsible for ensuring local government conformance with the Congestion Management Program. [51]Alameda CTC compares the monitoring information the local governments provide to the requirements of the adopted CMP. Reasons for non-conformance could include inadequate monitoring information, inadequate deficiency plan development, or failure to follow through with the program requirements for level of service standards, site design guidelines, capital improvements, and land use analysis. In addition to these requirements, each city and the county must contribute its apportioned share of Alameda CTC's administrative costs as membership dues.

The CMP legislation also requires that the Regional Transportation Planning Agency, the Metropolitan Transportation Commission in the Bay Area, evaluate the CMP for consistency with the Regional Transportation Plan and compatibility of programs within the region. Once MTC finds consistency with the RTP, it will incorporate the Comprehensive Investment Plan, which is the Capital Improvement Program of the CMP, into the Regional Transportation Improvement Program.

As mentioned in prior CMP chapters, at least three potential legislative actions (AB 1098, AB 779, and the potential outcome from implementation of SB 743) seek to reform the CMP to be more in line with GHG reduction goals. The CMP conformance requirements will significantly change to align with the reform to the current CMP.

Conformance

If Alameda CTC finds a local jurisdiction in non-conformance, it will notify the local jurisdiction, which then has 90 days to remedy the area(s) of non-conformance. If the local jurisdiction fails to provide a remedy within the stipulated time, Alameda CTC will notify the state controller, and the notice will include the reasons for the finding and evidence that Alameda CTC correctly followed procedures for making the determination. The state controller would then withhold the non-conforming jurisdiction's increment of subventions from the fuel tax made available by Proposition 111, and the jurisdiction will not be eligible to receive funding for projects through the federal Surface Transportation Program or Congestion Mitigation and Air Quality Program, or the State Transportation Improvement Program.

If over the next 12 months Alameda CTC determines that the jurisdiction is in conformance, the withheld

[51] If the City of Oakland is found to be out of conformance, the Port of Oakland's projects will be treated as City of Oakland projects for purposes of the CMP requirements and state statutes.

Proposition 111 funds will be released to the jurisdiction. If after the 12-month period the city or county has not conformed, the withheld Proposition 111 funds will be released to Alameda CTC for other projects of regional significance in Alameda County and included in the CMP or deficiency plans.

Alameda CTC is responsible for ensuring local government conformance with four elements of the CMP:

- LOS standards[52]
- Trip Reduction Program
- Land Use Analysis Program
- Payment of membership dues

Level of Service Standards

Local governments are accountable for meeting LOS standards as described in Chapter 3, "Level of Service Monitoring." If they do not meet the established LOS standards, they must develop a deficiency plan that describes how the jurisdiction will meet the adopted LOS standards at the deficient segment or intersection, and how it will achieve LOS and air quality improvements.[53]

Travel Demand Management Element

Local jurisdictions must adopt site design guidelines as described in Chapter 5, "Travel Demand Management Element" to meet TDM requirements. The site design guidelines must enhance transit/pedestrian/bicycle access. Each jurisdiction must submit a complete Site Design Guidelines Checklist that meets the annual conformity timeline each year and specifies that they have adopted and are implementing such guidelines to encourage the use of alternative travel modes.

Further, they must undertake capital improvements that contribute to congestion management and emissions reduction. Each jurisdiction is required to participate in the Transportation Fund for Clean Air, Surface Transportation Program, Congestion Mitigation and Air Quality Program, and other funding programs and to submit projects that support bicycle, pedestrian, transit, or carpool use. Chapter 5 provides more detail. See Appendix H for the TDM Checklist.

[52] California Government Code Section 65089.3.
[53] California Government Code Section 65089.3(d).

Land Use Analysis Program

Alameda CTC is required to develop a program that will analyze impacts and determine mitigation costs of land use decisions on the Regional Transportation System. Local governments are responsible for implementation of the program. The program approach is described in Chapter 6, "Land Use Analysis Program."

Local jurisdictions are responsible for approving, denying, or altering projects and land-use decisions and are required to determine land-development impacts on the Metropolitan Transportation System and formulate appropriate mitigation measures commensurate with the magnitude of the expected impacts.

Capital Improvement Program

Alameda CTC is required to prepare and biennially update a Capital Improvement Program (CIP) aimed at maintaining or improving transportation service levels as described in Chapter 8, "Capital Improvement Program." Each city, the county, transit operators, and Caltrans provide input to these biennial updates.

Monitoring

Monitoring provides feedback to determine whether the CMP's objectives are being met. The CMP network performance and Priority Development Area (PDA) implementation data collected in the monitoring process can be used to verify and update either the CMP or the actions of the local governments to meet legislative requirements. Monitoring also provides information that can be used to:

- Update the countywide travel model and database;
- Develop and update land development approval database;
- Update the travel demand management measures, transit standards, and LOS standards;
- Determine whether a local government is required to develop a deficiency plan; and

- Determine how well transportation investments are being coordinated with new developments and demands for access and mobility, and general congestion management.

Table 22 on the next page outlines the schedule and basic requirements for monitoring that each jurisdiction should undertake to document to Alameda CTC that the jurisdiction conforms to CMP requirements. Further action by Alameda CTC may be necessary to develop rules, procedures, and other data requirements for monitoring and conformance.

LOS Standards

Alameda CTC currently monitors LOS standards. If the cities, county, or Caltrans assume this responsibility, monitoring may be accomplished through a self-certification process involving the local jurisdictions and/or Caltrans and the Alameda CTC. In this event, the responsible agency will annually monitor the LOS on segments of the CMP network under its jurisdiction. Where a segment falls within two or more jurisdictions, the jurisdiction with the greatest segment mileage is responsible for monitoring the segment. Local jurisdictions that choose to conduct monitoring of LOS on CMP roadways must follow the process described below.

The jurisdiction must conduct p.m. peak period (4 p.m. to 6 p.m.) and a.m. peak period (7 a.m. to 9 a.m.) travel-speed sampling on a non-holiday Tuesday, Wednesday, or Thursday and analyze LOS based on that data consistent with the methods for determining LOS outlined in the Chapter 3, "Level of Service Standards." Studies on the impact of proposed developments and commercially available data may supply some of the data (provided the sampling is done during the timeframes specified above), thereby reducing the need for data collection.

Performance Measures

Although no statutory requirements regulate performance element monitoring, Alameda CTC prepares a transportation performance report annually. The report summarizes current performance data, highlights any significant changes in transportation system performance, and provides broad analyses of the results and any implications for policy and investment decisions made by Alameda CTC.

Table 22—Conformance and Monitoring

CMP Element	Responsible Agency	Requirement	Conformance/ Monitoring Deadline
Designated CMP Roadway Network	Cities/County	Submit a list of potential CMP-designated routes based on 24-hour traffic data collected in the spring for Tier 1 CMP network and meeting the criteria for Tier 2 CMP network.	By end of the May 31 during the CMP update year (odd-numbered year)
LOS Standards[54]	Alameda CTC	Monitor the level of service on the CMP-designated network and report consistency with the LOS standards.	In even-numbered years, by July 31, incurring data collection in the spring and identification of potential deficiency by July 31
Performance Element	Alameda CTC/ Transit Operators/ Cities/County	Submit available transportation performance measurement data to Alameda CTC for use in the Annual Transportation Performance Report. Submit short-range transit plan and report to Alameda CTC relative to attainment of the established standards. As part of this report, identify the resources necessary to continue to maintain this transit performance level during the succeeding five years.	Annually as required for developing the Performance Report by October 1 of each year
Travel Demand Management	Cities/County	Submit the completed Site Design Guidelines Checklist to Alameda CTC certifying that the guidelines were adopted and implemented.	In response to annual conformity findings by October 1
Land Use Analysis Program	Cities/County	Demonstrate that the program is being carried out by submitting land development project information. Starting in year 2014, provide information on development approvals that occurred in the prior calendar year for developing countywide land use approvals data base and a copy of the most recent Housing Element Annual Progress Report submitted to the State Department of Housing and Community Development.	In response to annual conformity findings by October 1
Capital Improvement Program	Cities/County/ Transit Operators/ Caltrans/Port of Oakland/Others	Submit a list of projects intended to maintain or improve the level of service on the designated system and to maintain transit performance standards. The TDM element requires that local jurisdictions consider including projects that support alternative modes in the CIP.	In response to call for projects during the biennial CMP update by July 31 open enrollment process for the Comprehensive Investment Plan

[54] On completion of the Countywide Arterial Plan that will define an arterial network of countywide significance, the CMP network will be updated appropriately.

Consistency with the Regional Transportation Plan

Since both the MTC's RTP and Alameda CTC's CTP are currently being updated, the 2015 CMP was reviewed for consistency with the currently adopted plans, which are the *Plan Bay Area* adopted by MTC and ABAG in 2013 and the 2012 CTP adopted by Alameda CTC.

The CMP must be consistent with the RTP related to the following:

- Goals and objectives established in the RTP;
- System definition with adjoining counties;
- Federal and state air quality plans;
- MTC travel demand modeling database and methodologies; and
- RTP financial assumptions.

Plan Bay Area incorporates the land use and housing component, the Sustainable Communities Strategy, for the first time as required by SB 375. Plan Bay Area includes the following goals, of which "Climate Protection" and "Adequate Housing" are mandatory:

- Climate Protection
- Adequate Housing
- Healthy and Safe Communities
- Open Space and Agricultural Preservation
- Equitable Access
- Economic Vitality
- Transportation System Effectiveness

The 2012 Countywide Transportation Plan adopted by Alameda CTC was developed based on principles of *Plan Bay Area* with the intent to support the RTP by meeting the mandatory and voluntary goals.

Additional consistency requirements are identified in the appropriate chapters in the CMP:

- Chapter 2, "Designated CMP Roadway Network" demonstrates 2015 CMP conformance with the CMP/MTS network;
- Chapter 4, "Multimodal Performance Element" also addresses RTP goals with the increased number of multimodal performance measures;
- Chapter 5, "Travel Demand Management Element" identifies trip-reduction measures in the Air Quality Plan Transportation Control Measures;
- Chapter 6, "Land Use Analysis Program" acknowledges the Resolution 3434 Regional Transit Expansion Program and PDA Investment and Growth Strategy per OBAG requirements in Resolution 4035;
- Chapter 7, "Database and Travel Demand Model" discusses travel demand model consistency;
- Chapter 8, "Capital Improvement Program" identifies projects and programs in the BAAQMD's Air Quality Plans' Transportation Control Measures as well as regional programming policies and principles; and
- Chapter 11, "Conclusions and Future Considerations" summarizes consistency requirements and the 2015 CMP's compliance with them.

Next Steps

- Based on the completion of the three countywide plans (Multimodal Arterial Plan, Transit Plan, and Goods Movement Plan), any change in related conformance requirements will be updated in the 2017 CMP.
- Based on the legislative actions/decisions for the CMP reform, the conformity requirements will be modified for the 2017 CMP, as needed.

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Deficiency Plans

10



Congestion Management Program legislation requires preparation of deficiency plans when a CMP roadway segment does not meet the adopted level of service standard, which is LOS E for Alameda County CMP roadways. Deficiency plans provide an opportunity to analyze the causes of the problems and determine whether localized improvements can address them or if it would be best to employ measures that will improve overall system efficiency and air quality. Deficiency plans also provide local governments the opportunity to give priority to system-wide and non-capital mitigation methods to relieve congestion. The statutes specifically point to improved public transit service and facilities, improved non-motorized transportation facilities, high occupancy vehicle (HOV) facilities, parking cash-out programs, and transportation control measures.

In view of the lack of availability of funds for transportation improvements, this deficiency plan requirement places hardship on local jurisdictions. Therefore, as part of the 2011 CMP update, Alameda CTC considered this issue and explored options to provide support to improve deficient segments. Based on Commission approval and input received from the jurisdictions, Alameda CTC aims to give priority consideration to projects during the evaluation process for funding that would improve the performance of deficient segments through approaches such as awarding additional points to those projects.

Requirements

The need for deficiency plans is identified following the biennial LOS monitoring of the CMP roadway network. Deficiency plans are required when a CMP segment does not meet the adopted LOS standard, after allowable exemptions. At a minimum, deficiency plans must include:

- Identification and analysis of the causes of the deficiency;
- A list of improvements necessary for the deficient segment or intersection to maintain the minimum LOS required and the estimated costs of the improvements;
- A list of improvements, programs, or actions (and estimates of their costs) that will measurably improve multimodal performance of the system and contribute to significant improvements in air quality; and
- An action plan of the most-effective implementation strategies to maintain the minimum LOS standards on the deficient segment, or to improve the current and future LOS, and contribute to significant air-quality improvements. The action plan must include implementation strategies, a specific

implementation schedule, and a description of funding and implementation strategies. Special consideration for state or federal requirements must be taken into account when determining the feasibility of the action plan. Improvements funded through the CMP Capital Improvement Program, whether having local or system impact, must not degrade air quality.

Deficiency Plan Types

Two types of deficiency plans can be developed, depending on the needs of the local jurisdiction(s) and how and whether the deficiency can be mitigated. If more than one local jurisdiction is responsible for causing a deficient segment, all responsible local jurisdictions must participate in development and approval of a multi-jurisdictional deficiency plan. Local jurisdictions outside Alameda County that contribute significantly to a deficiency plan will be invited to participate but cannot be compelled to do so.

Localized Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to a single CMP segment or roadway identified as or anticipated to become deficient based on LOS monitoring. The Localized Deficiency Plan focuses on analyzing the cause of deficiency by including the immediate surrounding area as the project area and identifying the list of improvement or mitigation measures in the action plan.

Areawide Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to more than one CMP roadway in a larger geographic area not able to be mitigated back to conformance within the CMP LOS standards if considered individually within a localized area. The Areawide Deficiency Plan focuses on offsetting the deficiency by including the broader surrounding area as the project area and identifying a list of improvements, programs, or actions to improve the performance of the larger multimodal network.

Guidelines

As part of the 2013 CMP update, Alameda CTC updated the deficiency plan guidelines to include more details and procedures for developing Areawide Deficiency Plans. The guidelines, developed with input from the Alameda County Technical Advisory Committee, describe the approval process, timelines, and acceptable methodologies for jurisdictions to use in development and approval of deficiency plans. The updated guidelines are in Appendix D.

Conflict Resolution

CMP legislation requires each congestion management agency to establish a conflict-resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities.

The intent of Alameda CTC's conflict-resolution process is to help local jurisdictions resolve conflicts that arise during multi-jurisdictional deficiency plan development or implementation that could impact the CMP conformance of one or more jurisdictions. The conflict resolution process is intended to be an effective and flexible process that responds to the issues and concerns of the respective jurisdictions.

Alameda CTC's conflict resolution process is based on the following principles.

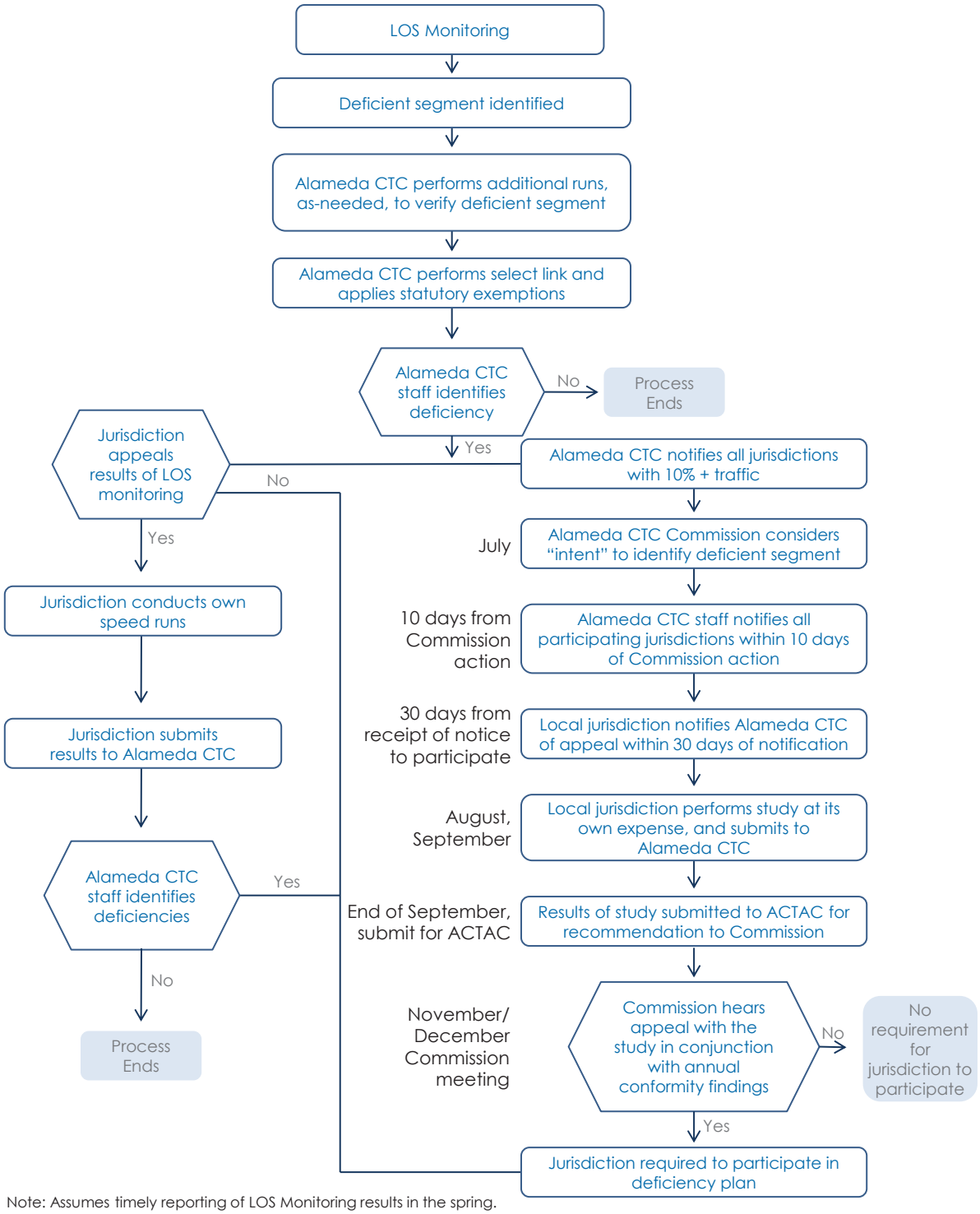
- First, consensus at the local level on the resolution of conflicts is encouraged through the Alameda County Technical Advisory Committee (ACTAC).
- Second, when the ACTAC is unable to reach consensus, Alameda CTC will look for evidence of "good faith" efforts among the parties involved when determining CMP conformance.
- Finally, any determination by Alameda CTC with respect to CMP conformance will not affect local agencies' land use authority or require programs that conflict with a community's fundamental socioeconomic or environmental character.

The conflict resolution process has the following four phases:

1. **Process initiation:** The lead jurisdiction requests Alameda CTC to initiate the conflict resolution process and outlines the issues needing resolution.
2. **Assessment of issues**: Alameda CTC staff meets with the parties involved to assess the issues in the dispute and its appropriateness for the conflict resolution process.
3. **Settlement sessions and agreement:** This phase involves holding/facilitating settlement sessions among the parties involved, facilitated by Alameda CTC staff (if appropriate), and the development of a settlement agreement, and obtaining all approvals that may be required from the governing bodies of the involved jurisdictions and/or Alameda CTC.
4. **Implementation and monitoring:** The final phase involves the implementation and monitoring of the agreement and Alameda CTC's assessment of good faith effort by the parties involved.

The conflict-resolution process outlined here is a general process that can be adjusted to meet the respective needs of local jurisdictions and/or the specific situation including identifying another mutually agreed upon conflict resolution process. See Figure 15, which describes the multi-jurisdictional deficiency plan appeal process.

Figure 15—Multi-jurisdictional Deficiency Plan Appeal Process



Note: Assumes timely reporting of LOS Monitoring results in the spring.

Completed and In-Progress Deficiency Plans

Tables 23 and 24 show the status and progress of the most recent deficiency plans. Table 23 shows the roadway orramp segments that have completed implementation of the required deficiency plans. Table 24 shows the roadways segments with deficiency plans being implemented.

Table 23—Completed Deficiency Plans

Segment	Jurisdiction	Year Required/ Approval	Implementation Status
Westbound I-580, from Center Street to I-238	Alameda County (participant jurisdictions: Dublin, Livermore, Oakland, Pleasanton, San Leandro)	2000/2001	Implementation completed in 2010 and LOS restored.
Northbound San Pablo Avenue, from Allston Way to University Avenue	Berkeley (participant jurisdictions: Albany, Emeryville, Oakland)	1998/1999	Deficiency plan has been implemented, LOS standard restored.
Southbound University Avenue, from San Pablo Avenue to 6th Street	Berkeley	1998/1999	Deficiency plan has been implemented, LOS standard restored.

Table 24—Deficiency Plans Under Implementation

Segment	Jurisdiction	Year Required/ Approval	Implementation Status
Eastbound Mowry Avenue, from Peralta Boulevard to SR-238/ Mission Boulevard	Fremont (participating jurisdiction: Newark)	2000/2001	Short-term mitigation, widening Mission Boulevard from four lanes to six lanes, was completed in 2005.
The freeway connection between SR-260 Eastbound (Posey Tube) and Northbound I-880	Oakland (participating jurisdictions: Alameda, Berkeley)	1998/1999	Deficiency plan is being implemented.
Northbound SR 185 (14th Street) between 46th and 42nd Avenues	Oakland (participating jurisdiction: Alameda)	2008/2009	Deficiency plan is being implemented.

Future Deficiency Plans

Other corridor plans or strategic plans developed by Alameda CTC can also inform future deficiency plans. When existing corridor or strategic plans are considered as a basis for developing a deficiency plan, appropriateness of the plan reflecting current conditions should be verified so that any improvement measure identified in the plan is still applicable. On completion of three modal plans (the Countywide Goods Movement Plan, Countywide Transit Plan, and Countywide Multimodal Arterial Plan), Alameda CTC may use them as a basis for future deficiency plans, including the San Pablo/I-80 Corridor Plan described below.

San Pablo Avenue/I-80 Corridor Plan

On April 24, 1997, the San Pablo/I-80 Corridor Plan was recognized as a basis for future deficiency plans. It applies to the CMP network within the following sub-area of the San Pablo corridor study limits, including the freeway ramps and future University Avenue/I-80 HOV ramp: Alameda/Contra Costa County line (north); 14th Street to western boundary of Mandela Parkway, extending north to the eastern I-80 right-of-way (south); Martin Luther King Jr. Way/San Pablo Avenue, Marin, east side of San Pablo Avenue (east); and the eastern boundary of the I-80 right-of-way (west).

I-880 Strategic Plan

On January 20, 2000, the I-880 Strategic Plan was similarly recognized as a basis for a future deficiency plan. The plan applies to the CMP network within the study limits of the I-880 Cypress Freeway connection (north); SR-237 in Milpitas (south); I-580/SR-238 and I-680 (east); and the San Francisco Bay (west).

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP[55]. Among these requirements, Alameda CTC must find compliance with the implementation of approved deficiency plans to maintain LOS standards on the CMP network. When a deficiency plan is adopted and active, the lead jurisdiction must submit status reports on the implementation of the deficiency plan showing progress and concurrence from the participating jurisdictions to Alameda CTC annually as part of the annual conformity process. If after 90 days of the conformity timeline the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

- Based on the legislative actions/decisions regarding the CMP reform, the deficiency plan and related conformity requirements will be modified for the 2017 CMP, as appropriate.
- Alameda CTC will also explore recognizing the Countywide Goods Movement Plan, Countywide Transit Plan, and Countywide Multimodal Arterial Plan or components of those plans and any other plans once they are complete and adopted as a basis for potential future deficiency plans.

[55] California Government Code Section 65089.3.

Conclusions and Future Considerations 11



The CMP contains several interrelated elements intended to foster better coordination and decision-making about transportation, land development, and air quality. Over the years, the CMP has evolved from being a program focused on meeting the legislative intent of congestion management to a program that uses the legislative mandate as an opportunity to develop and provide an integrated multimodal transportation system for all users of Alameda County that better integrates land use and transportation and reduces greenhouse gas emissions. However, as mentioned previously, at least three legislative actions through Senate Bill 743 and Assembly Bills and 1098 and 779 are proposing to make changes to either all or part of the Congestion Management Program. Until SB 743 is implemented or AB 1098 or AB 779 is passed, any major update to the CMP or one of the five required elements will not be productive. Therefore, Alameda CTC only made focused, basic changes to reflect the updates to the CMP elements as part of the 2013 CMP implementation and retained many recommendations identified as next steps in the 2013 CMP. The following conclusions highlight how the 2015 CMP meets the legislative requirements. During the update process in 2013 and 2015, Alameda CTC also identified implementation issues and future considerations.

Conclusions

Based on the CMP updates in 2013 and 2015, several conclusions can be reached about the CMP relative to the requirements of law and its purpose and intent. The CMP fulfills the spirit, purpose, and intent of the legislation because it:

1. Contributes to maintaining or improving transportation service levels.

The projects and programs contained in the CMP are a subset of the transportation investments adopted in the Alameda County 2012 Countywide Transportation Plan. The CMP can be viewed as the short-range implementation program for the CTP. As the first step toward transportation investment in Alameda County over the next 25 years, the CMP is making progress toward maintaining or improving transportation service levels.

2. Conforms to MTC's criteria for consistency with *Plan Bay Area*.

Table 25 on the following page lists the Metropolitan Transportation Commission's consistency requirements for CMPs in the Bay Area region. The CMP has met all these requirements.

Table 25—MTC's Regional Consistency Requirements for CMPs

RTP Consistency
Have the RTP goals and objectives been included in the CMP?
Does the CMP include references to Resolution 3434?
CMP System
Have all state highways and principal arterials been included?
Are all state highways identified?
Has the CMA developed a clear, reasonable definition for "principal arterials" as part of its submittal plan?
Has this definition been consistently applied in the selection of arterials to include in the designated system? If not, why?
How does the CMP-designated system relate to MTC's MTS in *Plan Bay Area*?
Does the CMP system connect to the CMP systems in adjacent counties?
Air Quality Requirements
Does the CMP include locally implementable federal and state TCMs, as previously documented and included in MTC's *Plan Bay Area*, MTC Resolution 2131, and the BAAQMD's Bay Area 2010 Ozone Strategy?
Modeling Consistency (on completion of the current update to the countywide model)
Is the "base case" forecasting network limited to the approved TIP?
Are "ABAG consistent" demographics used? If alternative demographics have been used in addition to the "ABAG consistent" forecasts, have the demographic inputs and travel forecasts been compared to the "ABAG consistent" based travel forecasts?
Are the regional "core" assumptions for auto operating costs, transit fares and bridge tolls being used, or are reasons to the contrary documented?
Does the forecasting model include transit and carpool use (through either a person trip generation model or a "borrowed share" approach)?
Does the model produce trip distribution results that are reasonably consistent with those of MTC?
Is the modeling methodology documented?
LOS Consistency
Is LOS assessed using a methodology agreeable to MTC?
RTIP/TIP Requirements
Are the proposed RTIP projects consistent with the RTP?
Do the projects proposed for inclusion in the RTIP meet the minimum screening requirements established by MTC for the RTIP?
Process
Has the CMP been developed in cooperation with all concerned agencies (i.e., transit agencies, applicable air quality district(s), MTC, adjacent counties, etc.)?
Has the CMP been formally adopted according to the requirements of the legislation?

Note: Detailed requirements for regional consistency are outlined in MTC Resolution 3000, revised July 12, 2013.

3. Provides a travel model consistent with MTC's regional model.

The Alameda Countywide Travel Demand Model was updated to include the land uses and projects and programs in *Plan Bay Area* adopted by MTC in July 2013. This update ensures that the countywide model meets the MTC regional modeling consistency requirements. MTC approved the model conformance.

4. Is consistent with MTC's adopted Transportation Control Measures.

The transportation control measures in the Regional Transportation Plan for the Bay Area based on the federal and state air quality plans are shown in Appendix I. The CMP includes many project types and programs identified in the plan. Alameda CTC will continue to work with the Bay Area Air Quality Management District and project sponsors to define appropriate responsibility and timely implementation of these measures.

5. Specifies a method for estimating roadway level of service consistent with state law.

Two approaches are permitted by the law for assessing LOS. The Alameda County CMP specifies using the 1985 Highway Capacity Manual (HCM1985) for LOS monitoring and conformity purposes and the HCM2000 for the Land Use Analysis Program. As part of the 2013 CMP update, Alameda CTC performed a comparative analysis of use of HCM1985 and HCM2000 to use of the most recent HCM2010. Based on the evaluation, as reported in the "Level of Service Standards" and "Land Use Analysis Program" chapters, a speed-based LOS measure as used in the HCM1985 will continue to be applied for LOS monitoring and conformity purposes. This approach is recommended to avoid loss of ability to track trends and for deficiency plan implementation. Use of HCM2010 will be encouraged in the CMP Land Use Analysis Program transportation impact analyses as specified in the MTC CMP guidance, but flexibility to use HCM2000 will be permitted if deemed necessary by local jurisdictions or project sponsors.

6. Identifies candidate projects for the RTIP and federal TIP that meet MTC's minimum requirements.

The Regional Transportation Improvement Program and federal Transportation Improvement Program candidates listed in the CMP's Capital Improvement Program have been evaluated, and all candidate projects conform to MTC's screening criteria for the respective projects and programs.

7. Was developed in cooperation with jurisdictions and other interested parties.

The 2015 CMP update process included working with interested parties through meetings and regular mailings for the Alameda County Technical Advisory Committee; the Planning, Policy and Legislation Committee; and Alameda CTC Commission meetings, as well as notifications on the Alameda CTC website. The mailing lists included technical representatives of all cities in Alameda County, the County of Alameda, transit operators, the Port of Oakland, ABAG, BAAQMD, Caltrans, and MTC. In addition, any future additions to the designated CMP network will be coordinated with adjacent counties within the MTC region and are expected to be consistent with those CMPs.

8. Provides a forward-looking approach to the impactof local land use decisions on transportation.

The Land Use Analysis Program allows consultation with Alameda CTC early in the land development process. Early input will help ensure a better linkage between land use decisions and transportation investment. The 2015 CMP update retained the expanded discussion of Alameda CTC's activities identified during the 2013 update to fulfill the legislative requirements of Senate Bill 375 and Assembly Bill 32 to better integrate transportation and land use and to reduce greenhouse gas emissions by curtailing VMT. Several enhancements were made to the Land Use Analysis Program in this context to meet these objectives including:

- Incorporated the recommendations of the *Alameda County Priority Development Area Investment and Growth Strategy*;

- Established a development approvals database that will be populated using information provided by local jurisdictions as part of the annual conformity process starting in 2014;
- Modified the agency's guidelines for environmental review by identifying standards to evaluate impacts on auto and alternative modes; and
- Identified an alternative trip generation methodology for use in transportation impact analyses to support in-fill development.

9. Considers the benefit of greenhouse gas reductions in developing the CIP.

The CMP considers the benefits of greenhouse gas reductions in the Land Use Analysis Program and in developing the CIP. The 2015 CMP continues to include the *Alameda County Priority Development Area Investment and Growth Strategy* recommendations and options for alternative trip-generation rates to promote infill development in the Land Use Analysis Program that will help support the reduction of VMT and greenhouse gas emissions. Similarly the most recent long-range plan, the 2012 CTP, with which the CIP projects and programs are consistent, was developed for the first time to meet the county's share of greenhouse gas reduction targets for the region and better integrate transportation and land use through development of a closely coordinated land use component for the plan.

Implementation Issues

During the development and update of the 2015 CMP for Alameda County, several long-standing issues continue to need further action by Alameda CTC. Some of these issues may also require action by the legislature.

1. Cost exceeds funding

Alameda CTC has identified the cost of maintaining or improving transportation service levels over the 25-year period as part of the 2012 CTP to exceed $30 billion. This cost is large and well beyond existing and anticipated funding sources, which the 2012 CTP projects to be $9.5 billion. Further statewide attention to transportation funding is necessary, if the CMP law is to achieve its intended goal.

With the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991, the Transportation Efficiency Act in 1997, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users in 2005; and Moving Ahead for Progress in the 21st Century Act, new requirements have been placed on MTC relative to congestion management. MTC is passing funds through to the CMAs in the San Francisco Bay Area region to assist in implementing the federal acts related to transportation funding. These funds, however, do not fully cover Alameda CTC's congestion management administration costs.

2. Limited CMA authority

It is difficult for Alameda CTC to fulfill the intent of the CMP legislation, because so many programs are beyond its authority. Funding programs, such as transit operating funds, most transit capital funding, the interregional road program, the highway rehabilitation program, and the toll-bridge program are outside the scope of the CMP. Caltrans administers the interregional road program and highway rehabilitation program.

3. LOS responsibility

CMP law indicates that Caltrans is responsible for monitoring LOS standards on the state highway system, if the CMA designates responsibility to Caltrans.[56] As state-owned facilities, it is reasonable to assume that the state is responsible. However, Alameda CTC will continue to perform monitoring activities until Caltrans establishes a monitoring program that can provide data to ensure consistent LOS results on Alameda County state highways.

The CMP law also recognizes that responsibility for sustaining LOS standards on local roadways and the state highway system should be shared between the local governments where other local jurisdictions contribute a significant percentage of traffic to the roadway. This change in state law recognizes that other jurisdictions may be partially responsible for the

[56] Katz, Statutes of 1995.

roadway exceeding the standards and that local government has little authority over the state highway system. Some exemptions, such as interregional trips, have been built into the current law, but these exemptions do not sufficiently address the problem. Corridor-level planning may offer a reasonable approach to this multi-jurisdictional problem and has been used successfully in the past to identify deficiencies and strategies to improve them. In this context, the 2015 CMP continues to recommend that corridor management strategies be explored as part of the Countywide Goods Movement Plan, Countywide Transit Plan, and Multimodal Arterial Corridor Plan, all of which are underway.

4. Scope of the CMP network

The CMP network is reviewed every four years; the next review is scheduled for 2017. However, state law does not provide incentives to local jurisdictions to add roadways to the CMP network. In fact, there are significant disincentives to add roadways that may in the future deteriorate to LOS F. In these cases, jurisdictions would be required to prepare a deficiency plan or risk losing Proposition 111 gas tax funds. Alameda CTC addressed this issue by adding a network that will be monitored only for informational purposes and not for conformity. In 2011, 90 miles of arterial roadways across the county were added to the CMP network, which will be monitored for informational purposes.

5. Transportation revenue shortfalls

State and federal transportation funding continues to be inadequate to address both capital and transit operating costs. The shortfalls may jeopardize the ability to maintain and improve transportation LOS. Worsening traffic congestion on the CMP network will trigger requirements for local jurisdictions to prepare and adopt deficiency plans or risk losing Proposition 111 gas tax funds for local projects. This will be compounded by the requirements to implement SB 375, Redesigning Communities to Reduce Greenhouse Gases, which is currently an unfunded mandate.

Future Considerations

The 2015 CMP update provides recommendations for next steps in addressing issues related to new and existing legislative requirements, monitoring standards, and other efforts related to congestion management and better integrating transportation and land use. The following highlight key areas identified for follow-up (see individual chapters for detailed next steps):

1. Legislative efforts for CMP reform

As discussed earlier, three legislative efforts underway will impact the scope of the Congestion Management Program partly or fully. SB 743 was signed into law in 2013 and will modify the metric used to measure the land development impacts on transportation system in the CEQA process from a delay-based metric such as LOS to another metric such as VMT. Alameda CTC has been actively participating in this process by leading the Bay Area Working Group. More details on SB 743 are included as follows. AB 1098 and AB 779 are two-year bills that aim to fully revise CMP legislation and, therefore, revamp the program scope to be more current and in line with supporting the environment, particularly GHG reduction. In this regard, Alameda CTC is actively working with other CMAs in the region and regional partners to be proactive and inform the development of the bills, so that the resulting CMP is more meaningful while supporting environmental goals at all levels of government. Based on the legislative outcomes, Alameda CTC's CMP will be modified to align with the new legislative requirements while continuing to be a forward-looking program.

2. CMP roadway network Tier 1 and Tier 2 additions

No new roadways were proposed in the 2015 CMP update. The next update to the CMP network will occur in 2017. Jurisdictions will review their roadway systems for routes that may meet the criteria for inclusion as roadways in the Tier 1 and Tier 2 CMP network. For potential routes, each jurisdiction will conduct 24-hour traffic counts for a period including a Tuesday through Thursday of a typical week. Traffic counts should be taken around the first week of spring 2017. To be in compliance with the CMP, each jurisdiction must

submit potential CMP-designated routes to the CMA by June 30, 2017. In addition, based on the final outcome of three countywide modal plans, Alameda CTC will identify potential new routes for the CMP network, likely for Tier 2, as part of the 2017 CMP update.

3. Congestion-pricing strategies

Congestion-pricing strategies are considered one of the tools to manage congestion along the most congested corridors. The revenue collected from congestion pricing is invested back into the corridor to improve transit. Alameda CTC implemented the first express lane in the Bay Area on southbound I-680, which opened to traffic in fall 2010. Express lane work on northbound I-680 is in the design stage. Legislation that approved the I-680 Express Lane also approved a second express lane along the I-580 corridor in East County. Both express lanes in the eastbound and westbound directions are currently under construction and are expected to be open to traffic in winter 2015/2016. Currently, MTC is implementing a Bay Area Express Lane network of 550 miles across the region, first converting the existing HOV lanes and later expanding lanes to close gaps in the carpool network. This will add about 90 additional miles to the express lane network in Alameda County along the I-80, I-680, and I-880 corridors and on the Bay Bridge, San Mateo Bridge, and Dumbarton Bridge. Phase 1, the conversion of existing carpool lanes into express lanes on the Regional Express Lane Network, is scheduled to be operational in 2017.

Other pricing strategies include:

- Off-peak transit fare discounts;
- Parking ticket surcharges by the Alameda County jurisdictions, with revenues devoted to transit; and
- Parking pricing in Berkeley.

4. Senate Bill 743 (SB 743), CEQA reform, and infill development areas

SB 743, passed in September 2013, institutes key changes to the CMP statute that will support infill development, including lifting the sunset date on designating Infill Opportunity Zones and directing the governor's Office of Planning and Research (OPR) to develop new metrics for assessment of transportation impacts to replace vehicle delay-based measures such as LOS. SB 743 also directs OPR to revise California Environmental Quality Act guidelines to eliminate automobile LOS as a significant impact on the environment and to develop new criteria for determining the significance of transportation impacts in transit priority areas that use metrics such as automobile trips generated or VMT per capita. Alameda CTC has been actively working with OPR to inform the process for the last two years, in collaboration with the local jurisdictions and regional agencies, by leading the Bay Area Working Group. While the alternative metric has been identified as VMT, OPR is still in the process of developing the legislative language and finalizing the guidelines on how to apply the metric. An updated guidelines draft is anticipated in the winter of 2015 for public review, which will be followed by a rule-making process.

As part of the 2013 CMP update, Alameda CTC implemented several short- and long-term strategies to promote infill development, prior to the enactment of SB 743. They include approved alternative trip generation methodologies for traffic impact analysis to support infill developments, focused guidance on CMP impact assessment and monitoring for alternative modes, and adopting areawide deficiency plan procedures for developing a multimodal improvement plan over a larger area where localized improvements are not feasible (for more details, see Chapter 6, "Land Use Analysis Program"). Monitoring implementation of these measures will continue.

5. Improving the land use and transportation connection in Alameda County and implementing SB 375

Since the adoption of the 2011 CMP, Alameda CTC has completed several major planning efforts to better integrate transportation and land use and to implement SB 375 to achieve reduced VMT and greenhouse gas emission reductions. The 2012 CTP was one such major effort developed in close coordination with the regional and local agencies and included a land use

component for the first time to contribute to the county's share of regional greenhouse gas reduction targets. The adopted *Alameda County Priority Development Area Investment and Growth Strategy* outlines a preliminary PDA monitoring plan developed both to fulfill MTC and ABAG requirements and is a step toward implementing the land use and sustainability goals of the 2012 CTP. In May 2015, Alameda CTC updated its PDA Investment and Growth Strategy, which incorporates the latest information on housing production across income levels and progress toward meeting RHNA targets.

Alameda CTC also has been providing enhanced information sharing/support for the local jurisdictions in implementing the complete streets policy.

The 2015 CMP update includes the outcome of the expanded review of Alameda CTC's activities as part of the 2013 CMP update to fulfill the legislative requirements of SB 375 to better integrate transportation investment and land use, and made the following key enhancements to the Land Use Analysis Program to meet these objectives:

- Implement the *Alameda County Priority Development Area Investment and Growth Strategy*.
- Identify ways to address rural roadway improvement needs and efforts that support Priority Conservation Area goals.
- Develop a land use development database based on annual land development approvals data from the jurisdictions to track land development approvals from local jurisdictions for use in various planning efforts, and to analyze how and whether the land development and transportation investments are coordinated.
- Track local jurisdiction housing element progress by local jurisdictions providing Alameda CTC a copy of the most recent Housing Element Annual Program Report submitted to the State Department of Housing and Community Development.
- Develop a comprehensive program, similar to VTA's Community Design and Transportation Program that promotes better integration of land use development and transportation in Alameda County and is supported by financial incentives. Such a program could be developed in partnership with the member agencies and communities and endorsed by their elected bodies. As a next step, Alameda CTC will identify interest from local jurisdictions and transit operators for implementing a similar program in Alameda County and develop a scope of work that details the steps involved, including costs of developing and implementing the program.
- Explore and review parking policies and standards as a way to develop parking management strategies as a land use tool for local jurisdictions to promote alternative modes and reduce greenhouse gases. Parking for automobiles is a significant but under-recognized factor in the relationship between land use and transportation.

6. Mitigating impacts on cross-county corridors or long corridors traversing jurisdictions

Currently, the CMP Land Use Analysis Program does not have a mechanism in place for "fair share" contributions for projects that would impact long travel or cross-county corridors that traverse several Alameda County jurisdictions. Since improvement measures to mitigate the cumulative impact will be too expensive for one agency or jurisdictions, Alameda CTC continues to carry forward the following recommendations.

- For congested cross-county corridors, explore developing partnerships for sharing the cost of implementing related mitigation measures. Also, for long-term corridor improvements in such corridors, explore establishing cross-county partnerships to develop mutually agreeable strategies for improvements. A first step in this direction is consideration of a county line development study.
- For projects that may impact long travel corridors that traverse multiple jurisdictions within the county, explore establishing a means for the project to contribute their fair share of required mitigation measures.

7. LOS standards and HCM for assessing performance of auto and alternative modes

During the 2013 CMP update, Alameda CTC evaluated the application of HCM2010 to monitor LOS for auto and other modes, specifically transit, bicycling, and walking. Results for auto LOS monitoring showed that the HCM2010 methodology's shift from measuring speed to measuring density to assign auto LOS would result in the loss of Alameda CTC's ability to track network performance trends and conformity, particularly for the Tier 1 network that is subject to conformity. Therefore, speed-based HCM1985 will continue to be used for auto LOS monitoring for the Tier 1 network. For Tier 2 arterials not subject to conformity, both the HCM1985 and HCM2000 were applied in 2014, when the LOS monitoring was performed, and this will continue for future monitoring cycles.

Evaluation results for LOS monitoring of alternative modes showed that HCM2010 Multi Modal LOS (MMLOS) is not well-designed for annual monitoring application, as it is data-intensive and costly to implement. For assessing performance of alternative modes, countywide modal studies will be used to identify countywide facilities and metrics for monitoring alternative modes, and will be incorporated in the 2017 CMP for future LOS monitoring efforts.

For application of HCM2010 in the Land Use Analysis Program, using HCM2010 to perform the impact analysis for autos was found to be consistent with the current data requirements; therefore, use of HCM2010 is encouraged per regional direction, but flexibility to use HCM2000 is permitted where consistency is needed by local jurisdictions. Evaluation results for LOS monitoring of alternative modes showed that HCM2010 MMLOS is suitable to identify multimodal trade-offs in mitigation measures, and use of HCM2010 is encouraged.

8. Review of performance measures and identification of monitoring periods and related measures aligned with data availability

The performance measures identified in the multimodal performance element are based on measures established in a variety of plans and documents including the Countywide Transportation Plan, Countywide Bicycle and Pedestrian Plans, and the CMP document. The Bicycle and Pedestrian Counts Report includes several additional measures, and "existing conditions" analyses were performed for the CTP.

Therefore, as part of the 2015 CMP update, Alameda CTC re-evaluated and consolidated the performance measures and monitoring reports. On completion of the three modal plans, which will produce additional performance measures, the 2017 CMP update will review and identify multimodal performance measures and timelines for reporting those measures. This comprehensive re-evaluation will ensure that the timeline for reporting on different measures is realistically aligned with data availability and potential changes in the measures. In addition, it will ensure that the various monitoring documents are complementary and non-duplicative. This will allow Alameda CTC to tailor its multimodal performance measures to project evaluation needs and inform programming decisions, as outlined in the Comprehensive Investment Plan.

9. Funding priority for deficient segments

Based on the biennial LOS Monitoring Study, if any of the CMP roadway segment fails to meet the required minimum LOS standard of E and is declared deficient, a localized or areawide deficiency plan is required that identifies mitigation measures including funding to improve the performance of that segment or study area. Given the lack of availability of funds for transportation improvements, this requirement places a hardship on local jurisdictions. The 2011 CMP provided direction to develop a policy for giving funding priority to the CMP segments declared deficient based on LOS monitoring results.

The evaluation process for determining funding priority should consider projects and programs that would improve the performance of deficient segments/areas through approaches such as awarding additional

points to those projects. The ongoing development of the CIP for Alameda County is expected to address this issue and determine an approach to provide additional consideration to projects that would improve the performance of existing and future deficient segments/areas.

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Congestion Management Program Legislation

Government Code Section 65088—65089.10

65088.

The Legislature finds and declares all of the following:

(a) Although California's economy is critically dependent upon transportation, its current transportation system relies primarily upon a street and highway system designed to accommodate far fewer vehicles than are currently using the system.

(b) California's transportation system is characterized by fragmented planning, both among jurisdictions involved and among the means of available transport.

(c) The lack of an integrated system and the increase in the number of vehicles are causing traffic congestion that each day results in 400,000 hours lost in traffic, 200 tons of pollutants released into the air we breathe, and three million one hundred thousand dollars ($3,100,000) added costs to the motoring public.

(d) To keep California moving, all methods and means of transport between major destinations must be coordinated to connect our vital economic and population centers.

(e) In order to develop the California economy to its full potential, it is intended that federal, state, and local agencies join with transit districts, business, private and environmental interests to develop and implement comprehensive strategies needed to develop appropriate responses to transportation needs.

(f) In addition to solving California's traffic congestion crisis, rebuilding California's cities and suburbs, particularly with affordable housing and more walkable neighborhoods, is an important part of accommodating future increases in the state's population because homeownership is only now available to most Californians who are on the fringes of metropolitan areas and far from employment centers.

(g) The Legislature intends to do everything within its power to remove regulatory barriers around the development of infill housing, transit-oriented development, and mixed use commercial development in order to reduce regional traffic congestion and provide more housing choices for all Californians.

(h) The removal of regulatory barriers to promote infill housing, transit-oriented development, or mixed use commercial development does not preclude a city or county from holding a public hearing nor finding that an individual infill project would be adversely impacted by the surrounding environment or transportation patterns.

65088.1.

As used in this chapter the following terms have the following meanings:

(a) Unless the context requires otherwise, "regional agency" means the agency responsible for preparation of the regional transportation improvement program.

(b) Unless the context requires otherwise, "agency" means the agency responsible for the preparation and adoption of the congestion management program.

(c) "Commission" means the California Transportation Commission.

(d) "Department" means the Department of Transportation.

(e) "Local jurisdiction" means a city, a county, or a city and county.

(f) "Parking cash-out program" means an employer-funded program under which an employer offers to provide a cash allowance to an employee equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. "Parking subsidy" means the difference between the out-of-pocket amount paid by an employer on a regular basis in order to secure the availability of an employee parking space not owned by the employer and the price, if any, charged to an employee for use of that space.

A parking cash-out program may include a requirement that employee participants certify that

they will comply with guidelines established by the employer designed to avoid neighborhood parking problems, with a provision that employees not complying with the guidelines will no longer be eligible for the parking cash-out program.

(g) "Infill opportunity zone" means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, zoned for new compact residential or mixed use development within one-third mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor, in counties with a population over 400,000. The mixed use development zoning shall consist of three or more land uses that facilitate significant human interaction in close proximity, with residential use as the primary land use supported by other land uses such as office, hotel, health care, hospital, entertainment, restaurant, retail, and service uses. The transit service shall have maximum scheduled headways of 15 minutes for at least 5 hours per day. A qualifying future rail station shall have broken ground on construction of the station and programmed operational funds to provide maximum scheduled headways of 15 minutes for at least 5 hours per day.

(h) "Interregional travel" means any trips that originate outside the boundary of the agency. A "trip" means a one-direction vehicle movement. The origin of any trip is the starting point of that trip. A roundtrip consists of two individual trips.

(i) "Level of service standard" is a threshold that defines a deficiency on the congestion management program highway and roadway system which requires the preparation of a deficiency plan. It is the intent of the Legislature that the agency shall use all elements of the program to implement strategies and actions that avoid the creation of deficiencies and to improve multimodal mobility.

(j) "Multimodal" means the utilization of all available modes of travel that enhance the movement of people and goods, including, but not limited to, highway, transit, nonmotorized, and demand management strategies including, but not limited to, telecommuting. The availability and practicality of specific multimodal systems, projects, and strategies may vary by county and region in accordance with the size and complexity of different urbanized areas.

(k) "Performance measure" is an analytical planning tool that is used to quantitatively evaluate transportation improvements and to assist in determining effective implementation actions, considering all modes and strategies. Use of a performance measure as part of the program does not trigger the requirement for the preparation of deficiency plans.

(l) "Urbanized area" has the same meaning as is defined in the 1990 federal census for urbanized areas of more than 50,000 population.

(m) "Bus rapid transit corridor" means a bus service that includes at least four of the following attributes:

(1) Coordination with land use planning.

(2) Exclusive right-of-way.

(3) Improved passenger boarding facilities.

(4) Limited stops.

(5) Passenger boarding at the same height as the bus.

(6) Prepaid fares.

(7) Real-time passenger information.

(8) Traffic priority at intersections.

(9) Signal priority.

(10) Unique vehicles.

65088.3.
This chapter does not apply in a county in which a majority of local governments, collectively comprised of the city councils and the county board of supervisors, which in total also represent a

majority of the population in the county, each adopt resolutions electing to be exempt from the congestion management program.

65088.4.

(a) It is the intent of the Legislature to balance the need for level of service standards for traffic with the need to build infill housing and mixed use commercial developments within walking distance of mass transit facilities, downtowns, and town centers and to provide greater flexibility to local governments to balance these sometimes competing needs.

(b) Notwithstanding any other provision of law, level of service standards described in Section 65089 shall not apply to the streets and highways within an infill opportunity zone. The city or county shall do either of the following:

(1) Include these streets and highways under an alternative areawide level of service standard or multimodal composite or personal level of service standard that takes into account both of the following:

(A) The broader benefits of regional traffic congestion reduction by siting new residential development within walking distance of, and no more than one-third mile from, mass transit stations, shops, and services, in a manner that reduces the need for long vehicle commutes and improves the jobs-housing balance.

(B) Increased use of alternative transportation modes, such as mass transit, bicycling, and walking.

(2) Approve a list of flexible level of service mitigation options that includes roadway expansion and investments in alternate modes of transportation that may include, but are not limited to, transit infrastructure, pedestrian infrastructure, and ridesharing, vanpool, or shuttle programs.

(c) The city or county may designate an infill opportunity zone by adopting a resolution after determining that the infill opportunity zone is consistent with the general plan and any applicable specific plan. A city or county may not designate an infill opportunity zone after December 31, 2009.

(d) The city or county in which the infill opportunity zone is located shall ensure that a development project shall be completed within the infill opportunity zone not more than four years after the date on which the city or county adopted its resolution pursuant to subdivision (c). If no development project is completed within an infill opportunity zone by the time limit imposed by this subdivision, the infill opportunity zone shall automatically terminate.

65088.5.

Congestion management programs, if prepared by county transportation commissions and transportation authorities created pursuant to Division 12 (commencing with Section 130000) of the Public Utilities Code, shall be used by the regional transportation planning agency to meet federal requirements for a congestion management system, and shall be incorporated into the congestion management system.

65089.

(a) A congestion management program shall be developed, adopted, and updated biennially, consistent with the schedule for adopting and updating the regional transportation improvement program, for every county that includes an urbanized area, and shall include every city and the county. The program shall be adopted at a noticed public hearing of the agency. The program shall be developed in consultation with, and with the cooperation of, the transportation planning agency, regional transportation providers, local governments, the department, and the air pollution control district or the air quality management district, either by the county transportation commission, or by another public agency, as designated by resolutions adopted by the county board of supervisors and the city councils of a majority of the cities representing a majority of the population in the incorporated area of the county.

(b) The program shall contain all of the following elements:

(1) (A) Traffic level of service standards established for a system of highways and roadways designated by the agency. The highway and roadway system shall

include at a minimum all state highways and principal arterials. No highway or roadway designated as a part of the system shall be removed from the system. All new state highways and principal arterials shall be designated as part of the system, except when it is within an infill opportunity zone. Level of service (LOS) shall be measured by Circular 212, by the most recent version of the Highway Capacity Manual, or by a uniform methodology adopted by the agency that is consistent with the Highway Capacity Manual. The determination as to whether an alternative method is consistent with the Highway Capacity Manual shall be made by the regional agency, except that the department instead shall make this determination if either (i) the regional agency is also the agency, as those terms are defined in Section 65088.1, or (ii) the department is responsible for preparing the regional transportation improvement plan for the county.

(B) In no case shall the LOS standards established be below the level of service E or the current level, whichever is farthest from level of service A except when the area is in an infill opportunity zone. When the level of service on a segment or at an intersection fails to attain the established level of service standard outside an infill opportunity zone, a deficiency plan shall be adopted pursuant to Section 65089.4.

(2) A performance element that includes performance measures to evaluate current and future multimodal system performance for the movement of people and goods. At a minimum, these performance measures shall incorporate highway and roadway system performance, and measures established for the frequency and routing of public transit, and for the coordination of transit service provided by separate operators. These performance measures shall support mobility, air quality, land use, and economic objectives, and shall be used in the development of the capital improvement program required pursuant to paragraph (5), deficiency plans required pursuant to Section 65089.4, and the land use analysis program required pursuant to paragraph (4).

(3) A travel demand element that promotes alternative transportation methods, including, but not limited to, carpools, vanpools, transit, bicycles, and park-and-ride lots; improvements in the balance between jobs and housing; and other strategies, including, but not limited to, flexible work hours, telecommuting, and parking management programs. The agency shall consider parking cash-out programs during the development and update of the travel demand element.

(4) A program to analyze the impacts of land use decisions made by local jurisdictions on regional transportation systems, including an estimate of the costs associated with mitigating those impacts. This program shall measure, to the extent possible, the impact to the transportation system using the performance measures described in paragraph (2). In no case shall the program include an estimate of the costs of mitigating the impacts of interregional travel. The program shall provide credit for local public and private contributions to improvements to regional transportation systems. However, in the case of toll road facilities, credit shall only be allowed for local public and private contributions which are unreimbursed from toll revenues or other state or federal sources. The agency shall calculate the amount of the credit to be provided. The program defined under this section may require implementation through the requirements and analysis of the California Environmental Quality Act, in order to avoid duplication.

(5) A seven-year capital improvement program, developed using the performance measures described in paragraph (2) to determine effective projects that maintain or improve the performance of the multimodal system for the movement of people and goods, to mitigate regional transportation impacts identified pursuant to paragraph (4). The program shall conform to transportation-related vehicle emission air quality mitigation measures, and include any project that will increase the capacity of the multimodal system. It is the intent of the Legislature that, when roadway projects are identified in the program,

consideration be given for maintaining bicycle access and safety at a level comparable to that which existed prior to the improvement or alteration. The capital improvement program may also include safety, maintenance, and rehabilitation projects that do not enhance the capacity of the system but are necessary to preserve the investment in existing facilities.

(c) The agency, in consultation with the regional agency, cities, and the county, shall develop a uniform data base on traffic impacts for use in a countywide transportation computer model and shall approve transportation computer models of specific areas within the county that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system that are based on the countywide model and standardized modeling assumptions and conventions. The computer models shall be consistent with the modeling methodology adopted by the regional planning agency. The data bases used in the models shall be consistent with the data bases used by the regional planning agency. Where the regional agency has jurisdiction over two or more counties, the data bases used by the agency shall be consistent with the data bases used by the regional agency.

(d) (1) The city or county in which a commercial development will implement a parking cash-out program that is included in a congestion management program pursuant to subdivision (b), or in a deficiency plan pursuant to Section 65089.4, shall grant to that development an appropriate reduction in the parking requirements otherwise in effect for new commercial development.

(2) At the request of an existing commercial development that has implemented a parking cash-out program, the city or county shall grant an appropriate reduction in the parking requirements otherwise applicable based on the demonstrated reduced need for parking, and the space no longer needed for parking purposes may be used for other appropriate purposes.

(e) Pursuant to the federal Intermodal Surface Transportation Efficiency Act of 1991 and regulations adopted pursuant to the act, the department shall submit a request to the Federal Highway Administration Division Administrator to accept the congestion management program in lieu of development of a new congestion management system otherwise required by the act.

65089.1.

(a) For purposes of this section, "plan" means a trip reduction plan or a related or similar proposal submitted by an employer to a local public agency for adoption or approval that is designed to facilitate employee ridesharing, the use of public transit, and other means of travel that do not employ a single-occupant vehicle.

(b) An agency may require an employer to provide rideshare data bases; an emergency ride program; a preferential parking program; a transportation information program; a parking cash-out program, as defined in subdivision (f) of Section 65088.1; a public transit subsidy in an amount to be determined by the employer; bicycle parking areas; and other noncash value programs which encourage or facilitate the use of alternatives to driving alone. An employer may offer, but no agency shall require an employer to offer, cash, prizes, or items with cash value to employees to encourage participation in a trip reduction program as a condition of approving a plan.

(c) Employers shall provide employees reasonable notice of the content of a proposed plan and shall provide the employees an opportunity to comment prior to submittal of the plan to the agency for adoption.

(d) Each agency shall modify existing programs to conform to this section not later than June 30, 1995. Any plan adopted by an agency prior to January 1, 1994, shall remain in effect until adoption by the agency of a modified plan pursuant to this section.

(e) Employers may include disincentives in their plans that do not create a widespread and substantial disproportionate impact on ethnic or racial minorities, women, or low-income or disabled employees.

(f) This section shall not be interpreted to relieve any employer of the responsibility to prepare a plan that conforms with trip reduction goals specified in Division 26 (commencing with Section 39000) of the Health and Safety Code, or the Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(g) This section only applies to agencies and employers within the South Coast Air Quality Management District.

65089.2.

(a) Congestion management programs shall be submitted to the regional agency. The regional agency shall evaluate the consistency between the program and the regional transportation plans required pursuant to Section 65080. In the case of a multicounty regional transportation planning agency, that agency shall evaluate the consistency and compatibility of the programs within the region.

(b) The regional agency, upon finding that the program is consistent, shall incorporate the program into the regional transportation improvement program as provided for in Section 65082. If the regional agency finds the program is inconsistent, it may exclude any project in the congestion management program from inclusion in the regional transportation improvement program.

(c) (1) The regional agency shall not program any surface transportation program funds and congestion mitigation and air quality funds pursuant to Section 182.6 and 182.7 of the Streets and Highways Code in a county unless a congestion management program has been adopted by December 31, 1992, as required pursuant to Section 65089. No surface transportation program funds or congestion mitigation and air quality funds shall be programmed for a project in a local jurisdiction that has been found to be in nonconformance with a congestion management program pursuant to Section 65089.5 unless the agency finds that the project is of regional significance.

(2) Notwithstanding any other provision of law, upon the designation of an urbanized area, pursuant to the 1990 federal census or a subsequent federal census, within a county which previously did not include an urbanized area, a congestion management program as required pursuant to Section 65089 shall be adopted within a period of 18 months after designation by the Governor.

(d) (1) It is the intent of the Legislature that the regional agency, when its boundaries include areas in more than one county, should resolve inconsistencies and mediate disputes which arise between agencies related to congestion management programs adopted for those areas.

(2) It is the further intent of the Legislature that disputes which may arise between regional agencies, or agencies which are not within the boundaries of a multicounty regional transportation planning agency, should be mediated and resolved by the Secretary of Business, Housing and Transportation Agency, or an employee of that agency designated by the secretary, in consultation with the air pollution control district or air quality management district within whose boundaries the regional agency or agencies are located.

(e) At the request of the agency, a local jurisdiction that owns, or is responsible for operation of, a trip-generating facility in another county shall participate in the congestion management program of the county where the facility is located. If a dispute arises involving a local jurisdiction, the agency may request the regional agency to mediate the dispute through procedures pursuant to subdivision (d) of Section 65089.2. Failure to resolve the dispute does not invalidate the congestion management program.

65089.3.

The agency shall monitor the implementation of all elements of the congestion management program.

The department is responsible for data collection and analysis on state highways, unless the agency designates that responsibility to another entity. The agency may also assign data collection and analysis responsibilities to other owners and operators of facilities or services if the responsibilities are specified in its adopted program. The agency shall consult with the department and other affected owners and operators in developing data collection and analysis procedures and schedules prior to program adoption. At least biennially, the agency shall determine if the county and cities are conforming to the congestion management program, including, but not limited to, all of the following:

(a) Consistency with levels of service standards, except as provided in Section 65089.4.

(b) Adoption and implementation of a program to analyze the impacts of land use decisions, including the estimate of the costs associated with mitigating these impacts.

(c) Adoption and implementation of a deficiency plan pursuant to Section 65089.4 when highway and roadway level of service standards are not maintained on portions of the designated system.

65089.4.

(a) A local jurisdiction shall prepare a deficiency plan when highway or roadway level of service standards are not maintained on segments or intersections of the designated system. The deficiency plan shall be adopted by the city or county at a noticed public hearing.

(b) The agency shall calculate the impacts subject to exclusion pursuant to subdivision (f) of this section, after consultation with the regional agency, the department, and the local air quality management district or air pollution control district. If the calculated traffic level of service following exclusion of these impacts is consistent with the level of service standard, the agency shall make a finding at a publicly noticed meeting that no deficiency plan is required and so notify the affected local jurisdiction.

(c) The agency shall be responsible for preparing and adopting procedures for local deficiency plan development and implementation responsibilities, consistent with the requirements of this section. The deficiency plan shall include all of the following:

(1) An analysis of the cause of the deficiency. This analysis shall include the following:

(A) Identification of the cause of the deficiency.

(B) Identification of the impacts of those local jurisdictions within the jurisdiction of the agency that contribute to the deficiency. These impacts shall be identified only if the calculated traffic level of service following exclusion of impacts pursuant to subdivision (f) indicates that the level of service standard has not been maintained, and shall be limited to impacts not subject to exclusion.

(2) A list of improvements necessary for the deficient segment or intersection to maintain the minimum level of service otherwise required and the estimated costs of the improvements.

(3) A list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.

(4) An action plan, consistent with the provisions of Chapter 5 (commencing with Section 66000), that shall be implemented, consisting of improvements identified in paragraph (2), or improvements, programs, or actions identified in paragraph (3), that are found by the agency to be in the interest of the public health, safety, and welfare. The action plan shall include a specific implementation schedule. The action plan shall include implementation strategies for those jurisdictions that have contributed to the cause of the deficiency in accordance with the agency's deficiency plan procedures. The action plan need not mitigate the impacts of any exclusions identified in subdivision (f). Action plan strategies shall identify the most effective implementation strategies for improving current and future system performance.

(d) A local jurisdiction shall forward its adopted deficiency plan to the agency within 12 months of the identification of a deficiency. The agency shall hold a noticed public hearing within 60 days of receiving the deficiency plan. Following that hearing, the agency shall either accept or reject the deficiency plan in its entirety, but the agency may not modify the deficiency plan. If the agency rejects the plan, it shall notify the local jurisdiction of the reasons for that rejection, and the local jurisdiction shall submit a revised plan within 90 days addressing the agency's concerns. Failure of a local jurisdiction to comply with the schedule and requirements of this section shall be considered to be nonconformance for the purposes of Section 65089.5.

(e) The agency shall incorporate into its deficiency plan procedures, a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within the boundaries of the agency.

(1) If, according to the agency's methodology, it is determined that more than one local jurisdiction is responsible for causing a deficient segment or intersection, all responsible local jurisdictions shall participate in the development of a deficiency plan to be adopted by all participating local jurisdictions.

(2) The local jurisdiction in which the deficiency occurs shall have lead responsibility for developing the deficiency plan and for coordinating with other impacting local jurisdictions. If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements of paragraph (a) of this section, that jurisdiction shall be considered in nonconformance with the program for purposes of Section 65089.5.

(3) The agency shall establish a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities of this section.

(f) The analysis of the cause of the deficiency prepared pursuant to paragraph (1) of subdivision (c) shall exclude the following:

(1) Interregional travel.

(2) Construction, rehabilitation, or maintenance of facilities that impact the system.

(3) Freeway ramp metering.

(4) Traffic signal coordination by the state or multi-jurisdictional agencies.

(5) Traffic generated by the provision of low-income and very low income housing.

(6) (A) Traffic generated by high-density residential development located within one-fourth mile of a fixed rail passenger station, and

(B) Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station, if more than half of the land area, or floor area, of the mixed use development is used for high density residential housing, as determined by the agency.

(g) For the purposes of this section, the following terms have the following meanings:

(1) "High density" means residential density development which contains a minimum of 24 dwelling units per acre and a minimum density per acre which is equal to or greater than 120 percent of the maximum

residential density allowed under the local general plan and zoning ordinance. A project providing a minimum of 75 dwelling units per acre shall automatically be considered high density.

(2) "Mixed use development" means development which integrates compatible commercial or retail uses, or both, with residential uses, and which, due to the proximity of job locations, shopping opportunities, and residences, will discourage new trip generation.

65089.5.

(a) If, pursuant to the monitoring provided for in Section 65089.3, the agency determines, following a noticed public hearing, that a city or county is not conforming with the requirements of the congestion management program, the agency shall notify the city or county in writing of the specific areas of nonconformance. If, within 90 days of the receipt of the written notice of nonconformance, the city or county has not come into conformance with the congestion management program, the governing body of the agency shall make a finding of nonconformance and shall submit the finding to the commission and to the Controller.

(b) (1) Upon receiving notice from the agency of nonconformance, the Controller shall withhold apportionments of funds required to be apportioned to that nonconforming city or county by Section 2105 of the Streets and Highways Code.

(2) If, within the 12-month period following the receipt of a notice of nonconformance, the Controller is notified by the agency that the city or county is in conformance, the Controller shall allocate the apportionments withheld pursuant to this section to the city or county.

(3) If the Controller is not notified by the agency that the city or county is in conformance pursuant to paragraph (2), the Controller shall allocate the apportionments withheld pursuant to this section to the agency.

(c) The agency shall use funds apportioned under this section for projects of regional significance which are included in the capital improvement program required by paragraph (5) of subdivision (b) of Section 65089, or in a deficiency plan which has been adopted by the agency. The agency shall not use these funds for administration or planning purposes.

65089.6.

Failure to complete or implement a congestion management program shall not give rise to a cause of action against a city or county for failing to conform with its general plan, unless the city or county incorporates the congestion management program into the circulation element of its general plan.

65089.7.

A proposed development specified in a development agreement entered into prior to July 10, 1989, shall not be subject to any action taken to comply with this chapter, except actions required to be taken with respect to the trip reduction and travel demand element of a congestion management program pursuant to paragraph (3) of subdivision (b) of Section 65089.

65089.9.

The study steering committee established pursuant to Section 6 of Chapter 444 of the Statutes of 1992 may designate at least two congestion management agencies to participate in a demonstration study comparing multimodal performance standards to highway level of service standards. The department shall make available, from existing resources, fifty thousand dollars ($50,000) from the Transportation Planning and Development Account in the State Transportation Fund to fund each of the demonstration projects. The designated agencies shall submit a report to the Legislature not later than June 30, 1997, regarding the findings of each demonstration project.

65089.10.

Any congestion management agency that is located in the Bay Area Air Quality Management District and receives funds pursuant to Section 44241 of the Health

and Safety Code for the purpose of implementing paragraph (3) of subdivision (b) of Section 65089 shall ensure that those funds are expended as part of an overall program for improving air quality and for the purposes of this chapter.

Assessment of HCM2010 and MMLOS

B.1—Assessment of HCM2010

Background

Alameda CTC, as a Congestion Management Agency (CMA), must prepare a Congestion Management Program biennially.

Two required CMP elements—level of service (LOS) monitoring and the Land Use Analysis Program—use Highway Capacity Manual methodologies.

Overview of Current CMP Practice

	Auto	Other Modes
LOS Monitoring	Track LOS on CMP network using HCM1985	Limited study of transit travel times and bicycle counts
Land Use Analysis Program	Require study of roadway segments using HCM2000 in Transportation Impact Analyses (TIAs)	Require analysis of impacts on transit operators in TIAs

What Is New in the HCM2010?

- Updated auto LOS methodologies
- Multi Modal LOS (MMLOS)—ability to assign LOS letter grades for transit, bicyclists, and pedestrians, based on quality of user experience.

Why Investigate HCM2010 Adoption?

The 2011 CMP recommended investigating use of HCM 2010 as a key next step. This recommendation was motivated by three considerations:

- *Legislative mandate*—The CMP statute advises CMAs to use the most recent HCM in LOS monitoring activities.
- *Regional guidance* — MTC's CMP guidance encourages use of the HCM 2010.
- *Increasing multimodal focus*—There is interest in whether HCM 2010's MMLOS techniques were suitable for CMP applications.

Assessment Activities

Staff conducted a technical evaluation of HCM 2010 including:

- Comparing the inputs required to assign auto LOS in the 1985, 2000, and 2010 HCMs.
- Sensitivity testing of how HCM2010 MMLOS grades respond to key inputs using a spreadsheet model
- Consultation with other CMAs regarding plans for use of HCM2010 (both auto LOS and MMLOS)

Assessment Findings

Auto LOS	HCM2010 MMLOS
• Cannot assign freeway segment LOS based on speed post-HCM1985	• Strong at illustrating effects of roadway design changes
• Arterial segment free flow speed classifications change after HCM 1985	• Grades not strongly sensitive to operational changes (e.g., speed for transit or vehicle volumes for bike/ped)
• New data needed for arterials in HCM2010—okay for project-level application, but excessive for larger scale use	• Can be difficult to tell why scores change
	• Very data-intensive

Considerations for recommendations

- *Current and future data availability (auto LOS)*: Can the methodology be applied with data available? Is it cost-effective/feasible to collect the data? What about future data collection methods?

- *Ability to track trends (auto LOS)*: Would the new methodology enable results to be compared to previous years (e.g., to assess CMP conformance in LOS).
- *Suitability (MMLOS)*: Does the methodology respond to the appropriate parameters (will it show change from year-to-year or from no project-to-project)?

Recommendations

	Auto	Other modes
LOS Monitoring	• Continue to use HCM1985 for deficiency purpose • Apply HCM 2000 and 1985 to Tier 2 arterials to make determination on future application in 2015 CMP	• Leverage modal plans to develop networks and metrics for enhanced multi-modal monitoring
Land Use Analysis Program	• Encourage use of HCM 2010 to study segment impacts; permit flexibility if analysts need to conform to local requirements	• Adopt more robust language describing types of impacts to transit, bicyclists, and pedestrians to be considered • Encourage use of MMLOS to evaluate multi-modal tradeoffs from mitigation measures

Table B1—Rationale for Recommended Use of HCM2010 for LOS Monitoring

Auto		Other Modes	
Recommendation	**Reasons for recommendation**	**Recommendation**	**Reasons for recommendation**
Continue to use HCM 1985 for deficiency purposes	• Change of methodology would result in loss of ability to track trends (and CMP conformance) • Post-1985 HCM freeway segment methodology not compatible with current (GPS-floating car) and possible future (commercially collected) data collection methods which provide speed data (LOS methodology based on density).	Leverage modal plans outcome to develop networks and metrics for enhanced multimodal monitoring	• Modal plans provide opportunity to look at ways to monitor critical network and metrics for non-auto modes (e.g., speed and reliability of key lines for transit) • HCM 2010 MMLOS mostly responds to changes in schedule (for transit) or roadway design (for bike and ped) but these do not change greatly from year-to-year • Would not be clear why HCM 2010 MMLOS grades change if multiple input variables change at the same time (black box)
Apply HCM 1985 and 2000 to Tier 2 arterials and make a determination on future application in the 2015 CMP update	• No new data needed • New CMP roadways and no LOS estimated yet, so can be applied to 2012 and 2014 monitoring results • Monitored only for informational purposes, so no conformity issue • Provides opportunity to compare results based on different methodologies, and determine future application		

Table B2—Rationale for Recommended Use of HCM 2010 for Land Use Analysis Program

Auto		Other Modes	
Recommendation	**Reasons for recommendation**	**Recommendation**	**Reasons for recommendation**
Encourage use of HCM 2010 to study segment impacts; permit flexibility if analysts need to conform to local requirements	• No change in data needs for freeway segments; additional data needs for arterials within scope of what is generally collected for TIAs	Adopt more robust language describing types of impacts to transit, bicyclists, and pedestrians to be considered	• HCM 2010 MMLOS is not strong at illustrating how transit, bicyclists, or pedestrians are affected by operational changes; for many projects, the primary impact to these modes is via increased project vehicle traffic
		Encourage use of HCM 2010 MMLOS to evaluate multimodal tradeoffs from mitigation measures	• HCM 2010 MMLOS is strong at illustrating modal tradeoffs from design changes (e.g., adding a turn pocket or retiming a signal) • Most TIAs propose mitigation measures for only a few segments, so scope of application would be limited

B.2—Approach to Use of HCM2010 and MMLOS at Other CMAs

Detailed information follows on other comparable Bay Area CMAs' (San Francisco County Transportation Authority, Valley Transportation Authority, and Contra Costa Transportation Authority) current and future plans for use of HCM methodologies in their CMPs. Specifically, information is provided on:

- Use of HCM 2010 for the auto based roadway LOS methodology
  - As part of LOS monitoring activities, since adoption of HCM 2010 is related to current and future plans for data collection
  - As a required methodology to study auto impacts in Transportation Impact Analyses reviewed for Land Use Analysis element
- Use of MMLOS methodologies
  - To provide increased monitoring for alternative modes in the LOS monitoring
  - As part of the guidelines for Transportation Impact Analyses reviewed for the land use analysis element

HCM 2010 Application for Auto-Based Roadway LOS

Table B3—Other CMA Approaches to Applying HCM Auto-based Roadway LOS Methodology for LOS Monitoring Data Collection

	SFCTA	VTA	CCTA	Alameda CTC
Data Collection	• Historically: GPS-based floating car runs • 2013 onwards: private, commercially available data (speed)	• Historically: Aerial photography • Testing in 2014: Private, commercially available data (speed) & PeMS data (flow)	• Historically: GPS-based floating car runs, PeMS • 2013 onwards: PeMS, private, commercially available (Bluetooth™) data (speed)	• Currently: GPS-based floating car runs • Interest in testing private, commercially available data (speed)
Freeway HCM Methodology (Auto)	• HCM 1985 (decided in 2011 CMP to continue to use speed as the LOS measure based on 1985 HCM to maintain historical comparisons, monitor exempt segments and identify potential deficiencies)	• HCM 2000 (since density data was collected historically, it was easy to move to using HCM 2000) • Testing in 2014—use of HCM 2010.	• Historically: HCM 1985 • Currently testing HCM 2010	• Currently: HCM 1985 • Proposed: maintain HCM 1985
Arterial HCM Methodology (Auto)	• HCM 1985 for deficiency purposes • HCM 2000 for informational purposes (segments)	• HCM 2000 (intersections) • Testing in 2014—HCM 2010 (intersections)	• Historically: CCTALOS (planning method based on Circular 212) • Currently testing HCM 2010 (HCM 2000 used at intersections where configuration does not allow use of HCM 2010)	• Currently: HCM 1985 • Proposed: maintain HCM 1985

Table B4—Other CMA Approaches to Applying HCM Auto-based Roadway LOS Methodology for Land Use Analysis Program Data Collection Related to Transportation Impact Analysis

	San Francisco Planning Department*	VTA	CCTA	Alameda CTC
Freeway	• HCM 2000	• Current: HCM 2000 • Under consideration: HCM 2010	• HCM 2010	• Current: HCM 2000 • Proposed: HCM 2010 encouraged
Non freeway	• HCM 2000 (intersections)	• Current: HCM 2000 (intersections) • Under consider-ation: HCM 2010 (intersections)	• HCM 2010 (intersections)	• Current: HCM 2000 (segments) • Proposed: HCM 2010 encouraged

* San Francisco's Planning Department reviews Traffic Impact Analyses on behalf of the CMA; however, considerations may be different as this review serves as both a city- and CMA-level review.

Table B5—Other CMA Approaches to Applying HCM 2010 MMLOS for LOS Monitoring

	SFCTA	VTA	CCTA	Alameda CTC
Overall	• No plans to adopt MMLOS	• Pilot analysis of MMLOS bike/ped methodologies	• Exploring applying multimodal LOS measures that may not be HCM 2010 MMLOS as part of Action Plan update	• Current: Limited multimodal reporting in LOS monitoring; extensive county-wide multimodal reporting in Performance Report
Transit	• Report on transit travel time; exploring reporting on transit reliability measures; utilizing data obtained from SFMTA APC and AVL units	• No facility-specific reporting • Exploring use of big data approach to study transit speed, reliability, and causes of delay on key corridors	• As above	• Proposed: Use countywide modal studies to identify monitoring network, metrics, and data sources
Bike/Ped	• No facility specific reporting • Report on bike/ped counts, network build-out (miles built), and collisions	• No facility specific reporting • Report bike/ped counts biannually	• As above	• Current: Annual bike/ped count program • Proposed: Use countywide modal studies to identify monitoring network, metrics, and data sources

APC: Automated Passenger Counter
AVL: Automatic Vehicle Locater (i.e., GPS)

Table B6—Other CMA Approaches to Applying HCM 2010 MMLOS in Land Use Analysis Program Related to Transportation Impact Analysis

	San Francisco Planning Department*	VTA	CCTA	Alameda CTC
Overall	• TIA guideline document • No plans to adopt MMLOS	• TIA guideline document • Pilot analysis of MMLOS bike/ped methodologies. • Continuing to study to determine role in TIAs.	• TIA guideline document • MMLOS encouraged but not required	• Current: No TIA guideline document; flexible NOP response • Proposed: TIA guidelines with expanded list of multimodal impacts; encourage MMLOS for evaluating mitigation measures
Transit Impact Requirements	• Custom methodology for studying transit impacts that looks at capacity • Consideration of access to transit and delays to transit from site-related activities also required	• TIA guidelines include list of specific effects on transit that should be considered • List includes capacity, congestion that affects transit services, and access/egress	• No language in TIA Guidelines about how to study transit, impacts	• Proposed: Require study of effects on transit operations, capacity, and access/egress; no required methodology and qualitative analysis sufficient
Bicycle/ Pedestrian Impact Requirements	• TIA guidelines state that impacts on pedestrians and bicycles should be analyzed qualitatively or quantitatively depending on project size and circumstances • HCM 2000 used if quantitative analysis required • Planning Dept. determines required analysis on case-by-case basis	• TIA guidelines name specific effects on bicycles and pedestrians that should be considered • List includes effects of vehicle trips on existing bike and pedestrian conditions, consistency with adopted plans, and if project or mitigations would impede current connections	• No language in TIA Guidelines about how to study bike or pedestrian impacts	• Proposed: Require study of effects of vehicles on bike and ped conditions, site development and roadway conditions, and consistency with adopted plans

B.3—Overview of MMLOS and Sensitivity Testing

Overview of MMLOS

The HCM 2010 introduced a series of new methodologies for assigning LOS scores for transit, bicycles, and pedestrians. Consistent with LOS for autos, these methodologies focus on the quality of experience for a user of a facility. However, unlike auto LOS for which a single variable (speed or density) determines LOS, transit, bicycle, and pedestrian LOS scores are composites based on a series of variables. For instance, transit LOS takes into account the frequency of vehicle arrivals, the on-time percentage, the travel time, the presence of covered shelters, and crowding, among other factors.

A key aspect of the research to develop MMLOS is the calibration of the various inputs – the determination of how much one factor should influence the overall modal LOS score, relative to other factors. The calibration was based on user surveys. For pedestrian and bicycle modes, participants in video labs in four cities watched footage of street segments and rated conditions on a 1-6 scale. For transit, national traveler response data to changes in transit service quality were used.

The MMLOS models can be applied at different scales, as illustrated in Figure B1. Pedestrian and cyclist LOS can be assessed at the link, signalized intersection, segment, or facility scale; transit LOS can be assessed at the segment or facility scale. The Alameda CTC applications of HCM methodologies involve application at a segment scale, the MMLOS scores for segments are based on scores for the link and intersection that comprise that segment.

Table B7 summarizes all of the different factors that the MMLOS model takes into account in its computation of a modal LOS score at a given scale. The plus or minus signs indicate whether this factor positively or negatively influences the LOS. It is difficult to generalize about the magnitude of influence of different factors on an LOS score. As the table indicates, larger scale applications (e.g., segment or facility) tend to make use of the LOS score from component units (e.g., the segment LOS combines the link and intersection LOS, plus a few additional factors).

Figure B1—Scales of Application of MMLOS

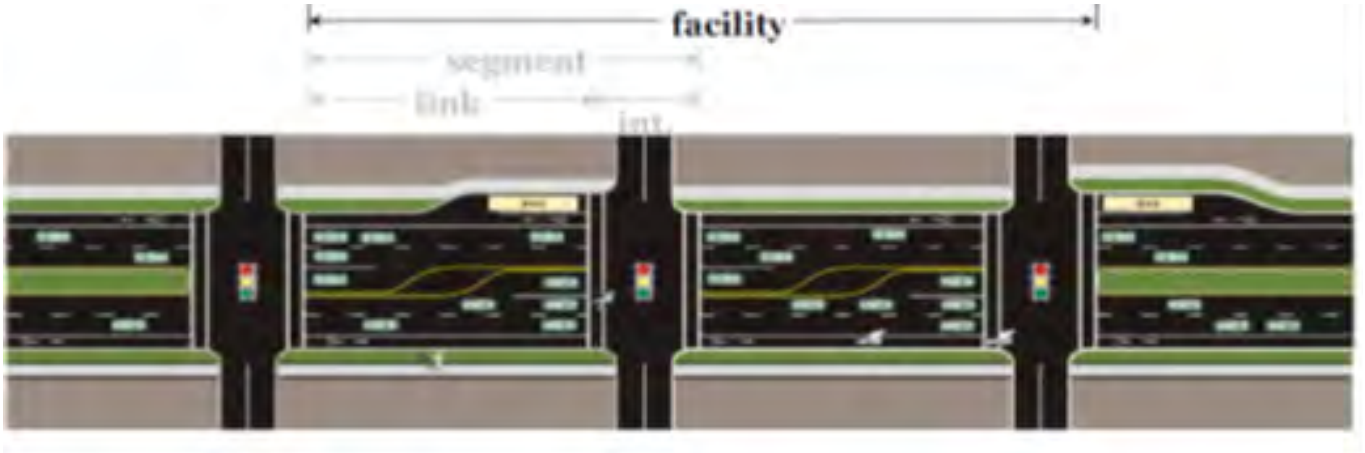


Table B7—Variables Used in MMLOS

Mode	Link	Signalized Intersection	Segment	Facility
Pedestrian	Outside travel lane width (+) Bicycle lane/ shoulder width (+) Buffer presence (e.g., on-street parking, street trees) (+) Sidewalk presence and width (+) Volume and speed of motor vehicle traffic in outside travel lane (–)	Permitted left turn and right-turn-on-red volumes (–) Cross-street motor vehicle volumes and speeds (–) Crossing length (–) Average pedestrian delay (–) Right-turn channelizing island presence (+)	Pedestrian link LOS (+) Pedestrian intersection LOS (+) Street-crossing difficulty (–/+) Delay diverting to signalized crossing Delay crossing street at legal unsignalized location	Length weighted average of component segment LOS
Bicycle	Volume and speed of traffic in outside travel lane (–) Heavy vehicle percent (–) PCI (+) Bicycle lane presence (+) Bicycle lane, shoulder, and outside lane widths (+) On-street parking use (–)	Width of outside through lane and bicycle lane (+) Cross-street width (–) Motor vehicle traffic volume in the outside lane (–)	Bicycle link LOS (+) Bicycle intersection LOS, if signalized (+) Number of access points on right side (–)	Length weighted average of component segment LOS
Transit (mixed flow vehicles)	N/A	N/A	Access to transit (uses pedestrian link LOS) Wait for transit (frequency) Actual bus travel speed (+) Stop amenities (+) Excess wait time due to late bus/train arrival (–) Crowding (–)	Length weighted average of component segment LOS

Source: Kittelson Associates, Inc. (2012) HCM 2010: Urban Street Concepts: Pedestrian, Bicycle, and Transit. Presentation to MTC Arterial Operations Committee. March 21, 2012.

Sensitivity Testing

Alameda CTC staff performed sensitivity testing of the MMLOS methodologies by implementing the MMLOS equations in a spreadsheet model, and then observing how the MMLOS score changed when key variables were allowed to change within reasonable ranges.[1] Sensitivity testing is performed for the following applications:

Table B8—Variables Considered for MMLOS Sensitivity Testing

Methodology	Variables Tested
Transit (Segment)	On-time percentage
	Bus speed (including delays)
	Frequency of Bus Arrivals
Bicycle (Link)	Automobile volumes
	Automobile speeds
	On-street parking occupancy
	Outside lane effective width
Pedestrian (Link)	Automobile volumes
	Automobile speeds
	Effective walkway width

General findings of sensitivity testing for (mixed flow) transit include the following:

- Transit LOS is highly sensitive to the frequency of bus arrivals (headway), though this sensitivity diminishes when headways reach 10 min or less.
- Transit LOS is not highly sensitive to on-time percentage. On-time percentage can decline by 20-30 percent without dropping an LOS grade. A substantial body of research[2] shows that poor reliability is a common reason why transit riders stop riding transit, so this attribute may be undervalued in the MMLOS transit score.
- Transit LOS is not highly sensitive to commercial speed[3] (i.e., speed that a transit vehicle actually achieves, when factoring in delays from boarding, signals, etc.). The commercial speed can drop by 5 mph or more without dropping an LOS grade. Many AC Transit routes operate at commercial speeds between 10 mph and 15 mph, so a 5 mph change in commercial speed is quite significant.

General findings of sensitivity testing for bicycles and pedestrian include the following:

- Bicycle and pedestrian LOS are both most sensitive to roadway space allocation. For bicycles, adding effective width to the outer lane—either through a wider lane or a bike lane—improves LOS by at least a letter grade. For pedestrians, adding on-street parking or items that provide a physical barrier from autos (e.g., trees, street furniture) greatly increase LOS.
- Bicycle and pedestrian LOS are not very sensitive to auto flow rates or speeds. For instance, flow rates can increase by several hundred veh/hr without seeing a change in bicycle or pedestrian LOS. Similarly, speeds can increase by 10 mph or more without registering a change in bicycle or pedestrian LOS. The lack of emphasis on traffic volumes and speeds in bicycle and pedestrian LOS seems contrary to some research on why people choose to use active transportation modes (e.g., a 2010 Alameda CTC survey found that safety concerns were the second most common reason why residents chose not to bicycle).[4]
- Bicycle LOS is highly sensitive to pavement quality.

1 This spreadsheet model uses the equations from the HCM 2010 MMLOS methodologies and computes the MMLOS "score" (which is used to determine letter grade) for a given set of inputs.

2 Carrell, A., A. Halvorsen, J. Walker (2012). Passengers Perceptions of and Behavioral Adaptation to Unreliability in Public Transportation. Submitted for presentation at the 92nd Transportation Research Board Annual Meeting.

3 When elasticity of demand to travel time set at its default value for urban areas.

4 Alameda CTC (2012). Bike to Work Day and Get Rolling Advertisement: Assessment Report. Prepared by EMC Research, February 2012.

Illustration of Sensitivity Testing

Figure B2 and Table B9, which follows, provide an illustration of the sensitivity testing Alameda CTC staff performed of MMLOS. Similar graphs were produced for the variables in Table B4, and are available on request.

Figure B2 illustrates how bicycle LOS score changes in response to variations in the automobile flow rate, when all other inputs are set to the typical values indicated in Table B9. The figure shows that at auto flow rates less than 100 vehicles per hour per lane (vphpl), bicycle LOS is A, from 100 vphpl to roughly 400 vphpl, bicycle LOS is at B, and above 400 vphpl bicycle LOS is at C. While most users would expect cyclist conditions to degrade if a facility handles hundreds of additional vehicle trips per hour (e.g., goes from 600 vphpl to 1100 vphpl), this analysis indicates that bicycle LOS can remain at C, even with significant added vehicle traffic.

Figure B2—Illustration of MMLOS Sensitivity Testing

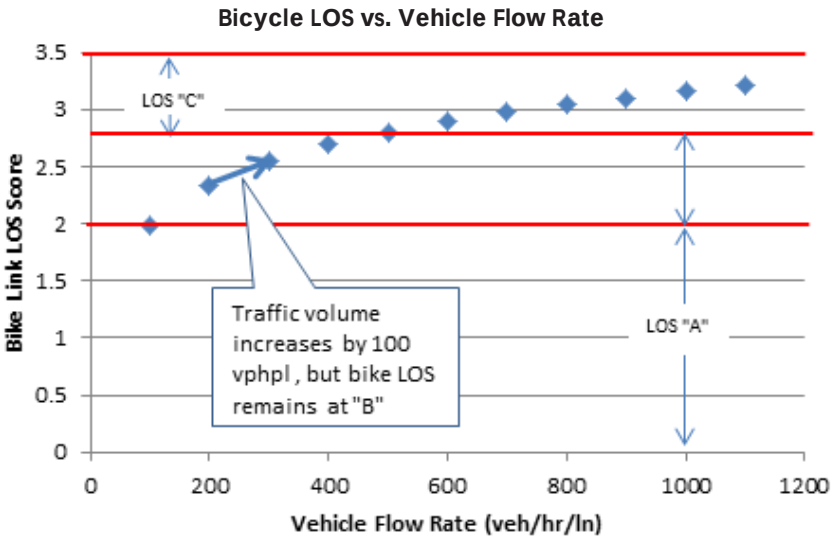


Table B9—Values Used in Illustration of MMLOS Sensitivity Testing

Input Variable	Value	Units
Segment length	500	ft
Bike running speed	13	mi/hr
Bike control delay	10	sec
Number through lanes (direction of travel)	2	#
Pavement condition rating	3	1-6 scale
On-street parking occupancy	50	%
Width outside through lane	10	ft
Width outside shoulder (can be parked in)	8	ft
Width bike lane	6	ft
Percent Heavy Vehicles	3	%
Automobile Flow Rate (direction of travel)	Allowed to vary	veh/hr/ln
Motorized vehicle running speed	25	mi/hr
Curb present?	Y	

Deficiency Plan Guidelines

Background and Purpose

Deficiency Plans include various measures to improve transportation conditions on a Congestion Management Program (CMP) roadway that does not meet the established CMP level of service standard set forth in the California Government Code Section 65089 (b)(1)(B). The state legislation requires:

> *In no case shall the LOS standards for roads established be below the LOS E or at the current level, whichever is further from LOS A. When the LOS on a segment or at an intersection fails to attain the established LOS standard, a Deficiency Plan shall be adopted pursuant to Section 65089.4.*

Deficiency Plans are a way for jurisdictions to remain in compliance with the CMP. Deficiency Plans should be developed with consideration of the countywide transportation planning process, including forecasts of travel needs and planned capital improvements. Likewise, existing deficiencies should influence future countywide transportation planning and programming decisions. If the Deficiency Plan involves system-wide improvements, Alameda CTC staff, transit agencies, the Bay Area Air Quality Management District (BAAQMD), and the California Department of Transportation may also be involved.

Process Overview

When the LOS on a given CMP-network segment deteriorates below the established state standard, the responsible jurisdictions(s) must prepare a Deficiency Plan, or additional gasoline tax subventions (pursuant to Section 2105 of the Streets and Highways Code) will be withheld. During even number years, when the LOS Monitoring is performed, the Alameda CTC Commission determines whether a jurisdiction is required to prepare a Deficiency Plan based on the LOS Monitoring results. If any CMP segment is identified to be deficient, the respective jurisdiction(s) must prepare a Deficiency Plan within 12 months of the determination to prevent its forfeiting of additional gasoline tax subventions. Pages 5-8 herein include the relevant sections of the CMP legislation related to the Deficiency Plan requirements.

Deficiency Identification

Biennially, the Alameda CTC identifies potentially deficient roadway segments based on LOS monitoring. Only trips originating inside Alameda County in the p.m. peak period are included in determining LOS conformity with the established LOS standard exempting many types of travel. After applying the required exemptions, if a CMP roadway segment is still found to operate at LOS F, it will be determined as deficient and the respective local jurisdiction(s) will be informed.

Exemptions

The State statute requires several types of travel to be exempted from the deficiency determination, including:

- Interregional travel;
- Construction, rehabilitation, or maintenance of facilities that impact the system;
- Freeway ramp metering;
- Traffic signal coordination by the state or a multi-jurisdictional agency;
- Traffic generated by the provision of low and very low income housing;
- Traffic generated by high-density residential development within one-fourth mile of a fixed rail passenger station; and
- Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station; and if more than half of the land area or floor area of the mixed use development is used for high density residential housing.

Roadway Capacity Standards

For the purposes of determining deficiency, the following standards for roadway capacity will be used unless a local jurisdiction can demonstrate an alternative capacity:

- Freeways: 2,000 vehicles per lane per hour

- Two-lane: 1,400 vehicles per lane per hour highways
- Arterials: 800 vehicles per lane per hour

Jurisdictional Participation

If a deficient CMP roadway segment is located entirely in one jurisdiction and all other jurisdictions contribute less than 10% traffic, then the deficiency should be addressed through a local single-jurisdiction deficiency plan. However, if a deficient CMP roadway segment crosses jurisdiction boundaries, borders two jurisdictions, or if the following conditions are met that are considered to be contributing to the deficiency or for effective planning purposes, then the deficiency should be addressed through a multi-jurisdictional deficiency plan.

- A jurisdiction shall participate in a deficiency plan if traffic to or from that jurisdiction, either an origin or destination at the deficient segment, represents ten percent (10 percent) of the capacity of the freeway/roadway, as estimated by the countywide travel demand model.
- In some cases, (in order to eliminate any gaps and to ensure continuity in the planning process) a jurisdiction that does not meet the 10 percent threshold shall be required to participate in the deficiency plan process if it is surrounded by jurisdictions which meet the threshold for participation.

Additional features of the multi-jurisdictional deficiency plan in terms of participation are:

- All owners/operators of a deficient segment of freeway or roadway along with transit operators shall be invited to participate in the deficiency plan process
- The percent contribution of traffic specifically does not imply a commensurate financial share of the Deficiency Plan actions identified.
- All participating jurisdictions shall adopt identical deficiency plan action plans. A local jurisdiction shall have the right to appeal as depicted in the Multi-jurisdictional Deficiency Plan Appeal Process, (Figure D1) or to invoke the established Conflict Resolution Process to address conflicts or disputes that arise between the local jurisdictions in developing the multi-jurisdictional Deficiency Plan.
- If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements outlined above, that jurisdiction shall be considered in non-conformance with the CMP.

Types of Deficiency Plans

The Deficiency Plan process allows a local jurisdiction to choose one of two types of Deficiency Plans.

Localized Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to a single CMP segment or roadway that has been identified as or is anticipated to become deficient based on the LOS Monitoring. This plan focuses on analyzing the cause of deficiency by including the immediate surrounding area as the project area and identifying the list of improvements or mitigation measures that are necessary to meet LOS standards, and estimates the costs and implementation schedule of the proposed improvements.

Areawide Deficiency Plan

An Areawide Deficiency Plan is appropriate when a CMP segment or roadway has been identified as or is anticipated to become deficient based on the LOS Monitoring and it cannot be improved to meet LOS standards and mitigated back to conformance if considered solely within a localized area. The jurisdiction must designate the segment as deficient, and develop and implement actions to measurably improve the performance of the larger network LOS in the study area and contribute to significant air quality improvements. Such actions may not necessarily directly pertain to or have a measurable impact on the deficient segment itself but must show system-wide improvement. This plan focuses on offsetting the deficiency by including the broader surrounding

area as the project area and identifying a list of improvements, programs or actions to improve the performance of the larger multimodal network. The plan should contain an estimate of the costs and implementation schedule of the proposed improvements, programs or actions.

The study area for an Areawide Deficiency Plan should generally be an area where improvements made to the multimodal network in one place of the study area provide improved overall performance of the larger network in that area. The study area should include or be served by one or more alternative transportation modes. The study area can be:

- An administrative jurisdiction such as a city/county or a part of a city/county
- An area comprising parts of multiple adjacent jurisdictions in which case it will be a multi-jurisdiction deficiency plan

Plan Development and Approval

Required Components

The scope of a Deficiency Plan should match the severity of the problem. Extreme deficiencies will need more significant actions. Action plans must be incorporated into future CMP documents. State law requires a Deficiency Plan contain the following:

- an analysis of the deficiency
- a list of improvements and related costs to mitigate the deficiency in that facility itself;
- a list of possible actions and costs that would result in improvements to the CMP system's LOS and be beneficial to air quality; and
- an action plan, including a schedule, to implement improvements from one of the two above lists.

In developing the deficiency plan addressing the required components, the following format should be used:

- *Introduction and Setting.* A short description of the facility, including a map showing its location.
- *Deficiency Analysis.* Analysis and assessment of deficiency in terms of likely causes and the magnitude.
- *Screening of Actions.* An array of suitable actions evaluated at a sketch-planning level for potential effects on system-wide traffic congestion and air quality (traffic operations analyses or model forecasts may be required). For this purpose, actions listed in the BAAQMD guidelines (described in more detail in the following section) and other actions identified and approved by the BAAQMD should be used.
- *Evaluation of Suitable Actions.* Selected actions from the screening process further evaluated to demonstrate how these actions when implemented contribute to improving the CMP network LOS conditions.
- *Implementation.* A detailed implementation plan should be developed, including description of the selected actions, anticipated costs, related funding sources and schedule.

Suitable Implementation Actions

Implementation actions fall into one of two categories:

- *Mitigation of Deficiency.* These types of improvements are designed to directly mitigate the specific deficiency such as highway, transit and other mode improvements, typically included in the localized deficiency plan.
- *Overall System Performance and Air Quality Improvement.* These actions are intended to provide overall measurable improvements to system performance and air quality, in cases where deficiencies cannot be mitigated directly. This will occur from implementing an areawide deficiency plan.

Areawide deficiency plans facilitate implementation of coordinated improvements to the multimodal transportation network and promote reduction of overall percentage of trips made by the single occupant vehicles while increasing the percentage of trips made

by transit, pedestrian and bicycle and resulting in improvements to air quality. For these types of plans, the legislation requires identifying an array of actions improving multimodal performance. In addition, the legislation requires the air quality management district, which is Bay Area Air Quality Management District (BAAQMD) for the Bay Area, to develop a list of improvements, programs and actions for this purpose as follows:

> *The deficiency plan shall include….a list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.*

The BAAQMD has developed a list of actions in Table D-1, which are considered beneficial for air quality and congestion management and includes measures to improve use of alternative modes, improved traffic flow and reducing trips. Jurisdictions may include actions other than those on this list, provided the BAAQMD reviews and approves the list prior to plan adoption. The most current BAAQMD list of actions should always be consulted.

In addition, the proposed improvement measures and actions for the Action Plan of the Deficiency Plan in Alameda County can be coordinated with the outcome of the upcoming countywide modal plans – (i.e., Countywide Goods Movement Plan, Countywide Transit Plan, and Countywide Multimodal Arterial Corridor Mobility Plan) and the adopted Comprehensive Countywide Travel Demand Management (TDM) Strategy to effectively improve the multimodal transportation network performance. This could support measures including but not limited to the potential improvement measures related to the priority transit routes, bicycle and pedestrian locations, priority roadways, and freight as identified in the modal plans. Alameda CTC will develop a list of multimodal improvement measures based on the outcome of these modal plans and work with the Air District to get their approval, so that more improvement options are readily available should an areawide deficiency plan be required.

Review and Evaluation

An acceptable Deficiency Plan will contain all of the required components listed above and will be evaluated on the following technical criteria:

- Completeness as required in California Government Code Section 65089.5;
- Appropriateness of the Deficiency Plan actions in relation to the magnitude of the deficiency;
- Reliability of the funding sources;
- Ability to implement the proposed actions (including jurisdictional control issues); and
- Reasonableness of the implementation plan schedule.

Alameda CTC staff and ACTAC members will review the draft Deficiency Plan and provide technical input to assist the respective local jurisdiction(s) in developing and finalizing the Deficiency Plan.

Adoption

A final plan must be adopted by the affected local jurisdiction(s) at a noticed public hearing no later than 12 months following identification of Deficiency by Alameda CTC. The Alameda CTC Commission will approve or reject a Deficiency Plan within 60 days of receipt of the Deficiency Plan from the local jurisdiction(s). If the plan is rejected, Alameda CTC will notify the local jurisdiction(s) of the reasons for that rejection, and the local jurisdiction must submit a revised plan within 90 days. Once a plan is adopted, written notification of the conformance findings of the Alameda CTC Commission (presently scheduled to occur at the November/December Alameda CTC Commission meeting) is required annually.

Updates

To facilitate the implementation process, the Alameda CTC Commission will accept minor updates to Deficiency Plans. The affected jurisdictions(s) may submit a notice to the Alameda CTC stating the reason for and content of the update. The Alameda CTC Commission will approve or reject the request for the update. Should the Alameda CTC Commission reject the request, the existing Deficiency Plan will remain in place.

Monitoring

Annually, the Alameda CTC will monitor implementation of the Deficiency Plans prior to the annual conformance determination, to establish whether:

- They are being executed according to the schedule detailed in the implementation plan; or
- Changes have occurred that require modifications of the original Deficiency Plan or schedule.

Jurisdictions that have prepared and are implementing a Deficiency Plan must prepare annual status report updates for the Annual Conformity Findings. Participating jurisdictions that did not prepare the Deficiency Plan must also review the annual status report updates and submit a letter to the Alameda CTC stating they are in concurrence with the annual update from the lead jurisdiction. This information is required for the Commission to make a determination whether the jurisdictions are in conformance with the CMP.

Compliance

Once the action plan identified in the Deficiency Plan is implemented, the local jurisdiction determines whether a measurable improvement in LOS has occurred or whether the plan needs to be further updated. Evaluation of the action plan may result in recommended changes to other elements of the CMP, such as the Capital Improvement Program or Travel Demand Management Element, if related improvement measures are included in these elements

A jurisdiction (lead or participating), which is either not implementing the actions or not adhering to the stated schedule in the approved Deficiency Plan may be found in non-conformance, if the deficiency still exists.

California Code Sections 65089.4 and 65089.5 Regarding the Congestion Management Program Deficiency Plan Process

65089.4.

(a) A local jurisdiction shall prepare a deficiency plan when highway or roadway level of service standards are not maintained on segments or intersections of the designated system. The deficiency plan shall be adopted by the city or county at a noticed public hearing.

(b) The agency shall calculate the impacts subject to exclusion pursuant to subdivision (f) of this section, after consultation with the regional agency, the department, and the local air quality management district or air pollution control district. If the calculated traffic level of service following exclusion of these impacts is consistent with the level of service standard, the agency shall make a finding at a publicly noticed meeting that no deficiency plan is required and so notify the affected local jurisdiction.

(c) The agency shall be responsible for preparing and adopting procedures for local deficiency plan development and implementation responsibilities, consistent with the requirements of this section. The deficiency plan shall include all of the following:

(1) An analysis of the cause of the deficiency. This analysis shall include the following:

(A) Identification of the cause of the deficiency.

(B) Identification of the impacts of those local jurisdictions within the jurisdiction of the agency that contribute to the deficiency. These impacts shall be identified only if the calculated traffic level of service following exclusion of impacts pursuant to subdivision (f) indicates that the level of service standard has not been maintained, and shall be limited to impacts not subject to exclusion.

(2) A list of improvements necessary for the deficient segment or intersection to maintain the minimum level of service otherwise required and the estimated costs of the improvements.

(3) A list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.

(4) An action plan, consistent with the provisions of Chapter 5 (commencing with Section 66000), that shall be implemented, consisting of improvements identified in paragraph (2), or improvements, programs, or actions identified in paragraph (3), that are found by the agency to be in the interest of the public health, safety, and welfare. The action plan shall include a specific implementation schedule. The action plan shall include implementation strategies for those jurisdictions that have contributed to the cause of the deficiency in accordance with the agency's deficiency plan procedures. The action plan need not mitigate the impacts of any exclusions identified in subdivision (f). Action plan strategies shall identify the most effective implementation strategies for improving current and future system performance.

(d) A local jurisdiction shall forward its adopted deficiency plan to the agency within 12 months of the identification of a deficiency. The agency shall hold a noticed public hearing within 60 days of receiving the deficiency plan. Following that hearing, the agency shall either accept or reject the deficiency plan in its entirety, but the agency may not modify the deficiency plan. If the agency rejects the plan, it shall notify the local jurisdiction of the reasons for that rejection, and the local jurisdiction shall submit a revised plan within 90 days addressing the agency's concerns. Failure of a local jurisdiction to comply with the schedule and requirements of this section shall be considered to be nonconformance for the purposes of Section 65089.5.

(e) The agency shall incorporate into its deficiency plan procedures, a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within the boundaries of the agency.

(1) If, according to the agency's methodology, it is determined that more than one local jurisdiction is responsible for causing a deficient segment or intersection, all responsible local jurisdictions shall participate in the development of a deficiency

plan to be adopted by all participating local jurisdictions.

(2) The local jurisdiction in which the deficiency occurs shall have lead responsibility for developing the deficiency plan and for coordinating with other impacting local jurisdictions. If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements of paragraph (a) of this section, that jurisdiction shall be considered in nonconformance with the program for purposes of Section 65089.5.

(3) The agency shall establish a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities of this section.

(f) The analysis of the cause of the deficiency prepared pursuant to paragraph (1) of subdivision (c) shall exclude the following:

(1) Interregional travel.

(2) Construction, rehabilitation, or maintenance of facilities that impact the system.

(3) Freeway ramp metering.

(4) Traffic signal coordination by the state or multi-jurisdictional agencies.

(5) Traffic generated by the provision of low-income and very low income housing.

(6)

(A) Traffic generated by high-density residential development located within one-fourth mile of a fixed rail passenger station.

(B) Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station, if more than half of the land area, or floor area, of the mixed use development is used for high density residential housing, as determined by the agency.

(g) For the purposes of this section, the following terms have the following meanings:

(1) "High density" means residential density development which contains a minimum of 24 dwelling units per acre and a minimum density per acre which is equal to or greater than 120 percent of the maximum residential density allowed under the local general plan and zoning ordinance. A project providing a minimum of 75 dwelling units per acre shall automatically be considered high density.

(2) "Mixed use development" means development which integrates compatible commercial or retail uses, or both, with residential uses, and which, due to the proximity of job locations, shopping opportunities, and residences, will discourage new trip generation.

65089.5.

(a) If, pursuant to the monitoring provided for in Section 65089.3, the agency determines, following a noticed public hearing, that a city or county is not conforming with the requirements of the congestion management program, the agency shall notify the city or county in writing of the specific areas of nonconformance. If, within 90 days of the receipt of the written notice of nonconformance, the city or county has not come into conformance with the congestion management program, the governing body of the agency shall make a finding of nonconformance and shall submit the finding to the commission and to the Controller.

(b)

(1) Upon receiving notice from the agency of nonconformance, the Controller shall withhold apportionments of funds required to be apportioned to that nonconforming city or county by Section 2105 of the Streets and Highways Code.

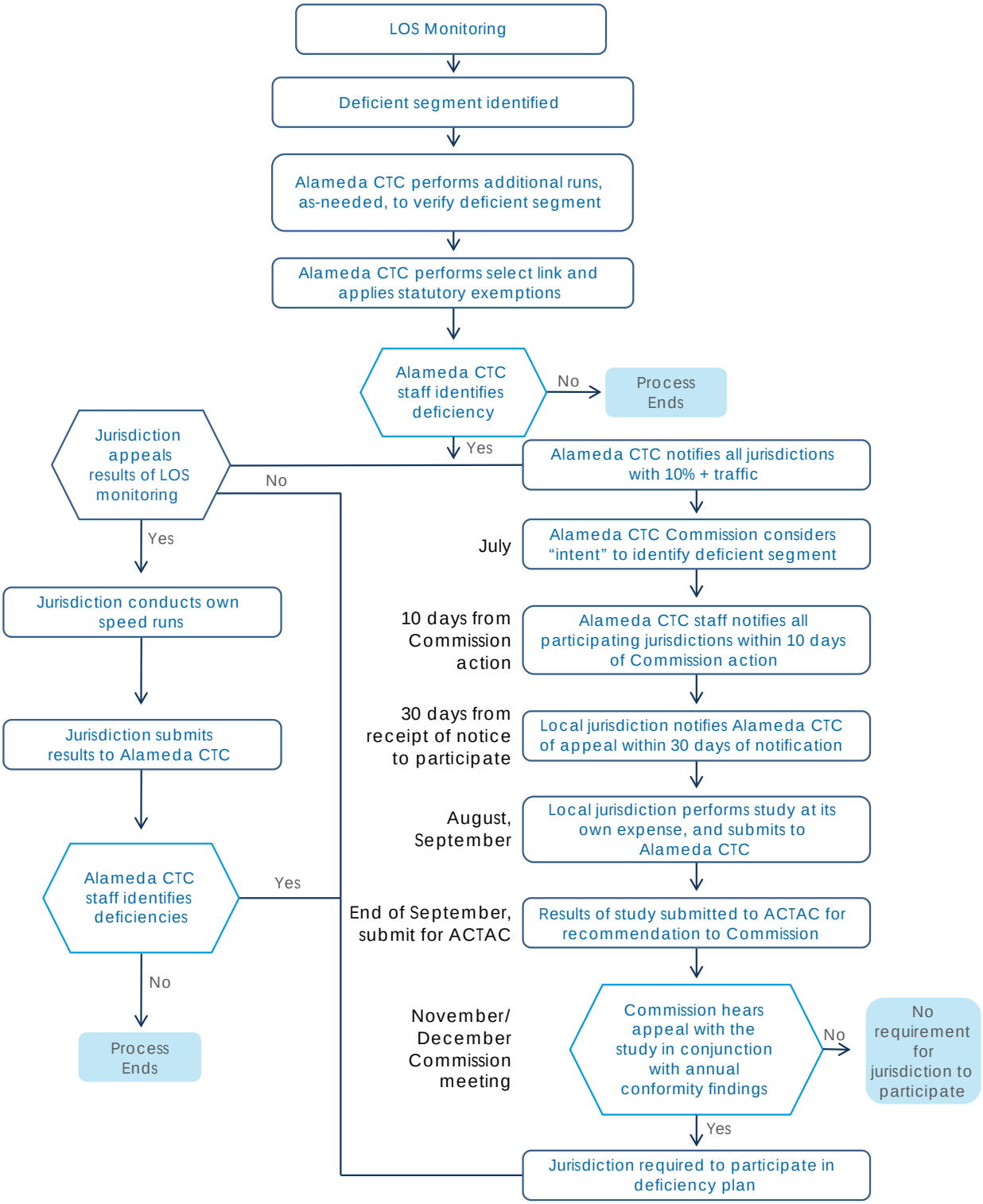
(2) If, within the 12-month period following the receipt of a notice of nonconformance, the Controller is notified by the agency that the city or county is in conformance, the Controller shall

allocate the apportionments withheld pursuant to this section to the city or county.

(3) If the Controller is not notified by the agency that the city or county is in conformance pursuant to paragraph (2), the Controller shall allocate the apportionments withheld pursuant to this section to the agency.

(c) The agency shall use funds apportioned under this section for projects of regional significance which are included in the capital improvement program required by paragraph (5) of subdivision (b) of Section 65089, or in a deficiency plan which has been adopted by the agency. The agency shall not use these funds for administration or planning purposes.

Figure D1—Multi-jurisdictional Deficiency Plan Appeal Process



Note: Assumes timely reporting of LOS Monitoring results in the spring.

Table D1—System-wide Deficiency Plan Actions List from BAAQMD*

TCM	Description
Action A—Bicycle and Pedestrian Measures	
A1	Improved Roadway Bicycle Facilities and Bike Paths
A2	Transit and Bicycle Integration
A3	Bicycle Lockers and Racks at Park and Ride Lots
A4	Bicycle Facilities and Showers at Developments
A5	Improved Pedestrian Facilities
A6	Pedestrian Signals
A7	Lighting for Pedestrian Safety
Action B—Transit	
B1	Improvement of Bus, Rail, and Ferry Transit Service
B2	Expansion of Rail Transit Service
B3	Expansion of Ferry Services
B4	Preferential Treatment for Buses and In-Street Light Rail Vehicle (LRVs)
B5	Transit Information and Promotion
B6	Transit Pricing Strategies to Encourage Ridership and Reduce Transit Vehicle Crowding
B7	Transit Fare Subsidy Programs
B8	Transit Centers
B9	Improved and Expanded Timed Transfer Programs
B10	Improved and Expanded Fare Coordination
B11	Signal Preemption by Transit Vehicles
B12	Bus Stop Bulbs
B13	School Bus Transit Service
Action C—Carpooling, Buspooling, Vanpooling, Taxipooling, Jitneys, Casual Carpooling and Other Shared Rides (Ridesharing)	
C1	Preferential Treatment for Shared Ride Vehicles
C2	Increased Use of Commuter/Employer Services

Table D1—System-wide Deficiency Plan Actions List from BAAQMD*, Continued

TCM	Description
Action D—High Occupancy Vehicle (HOV) Facilities	
D1	Preferential Treatment for HOVs
D2	Bus and Carpool/Buspool/Vanpool/Taxi-pool Priority Lanes on Local Arterials
D3	Accelerated Implementation of the 2005HOV Master Plan
D4	HOV to HOV Facilities
D5	Direct HOV Lane Entrance/Exit Ramps to Arterials and Space Generators
Action E—Other TCMs, Related Measures	
E1	Stricter Travel Demand Management/Trip Reduction Ordinance
E2	Expanded Public Education Programs
E3	Child Care Facilities at or close to Employment Sites, Transit Centers and Park and Ride Lots
E4	Retail Services at or close to Employment Sites, Transit Centers and Park and Ride Lots
E5	Telecommuting Centers and Work-at-Home Programs
E6	Parking Management
Action F—Traffic Flow Improvements	
F1	Preferential Treatment of HOVs (See measures B4 and C1)
F2	Ramp Metering
F3	Auxiliary Lanes
F4	Signalization Improvements
F5	Computerized Traffic and Transit Control/Management on Arterials
F6	Turn Lanes at Intersections
F7	Turn Restrictions at intersections
F8	Reversible Lanes
F9	One-Way Streets
F10	Targeted Traffic Enforcement Programs
F11	Restrictions on Curb Side Deliveries and On-Street Parking

* BAAQMD has not updated the list since November 1992. Staff will work with the Air District to develop an expanded and appropriate list of actions based on the outcome of the countywide modal plans.

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Alameda CTC Committees and Administration

Committees

The Alameda CTC Board has three standing committees: the Finance and Administration Committee (FAC), the Programs and Projects Committee (PPC), and the Planning, Policy and Legislation Committee (PPLC). Alameda CTC is also advised by the Alameda County Technical Advisory Committee (ACTAC).

Finance and Administration Committee

The functions and authority of the FAC are agency operations and performance; human resources and personnel policies and procedures; administrative code; salary and benefits; procurement policies and procedures; procurement of administrative contracts; contract preference programs for entities such as local business enterprises, small business enterprises and disabled business enterprises; bid protests and complaints related to administrative contract procurement; annual budget and financial reports; investment policy and reports; audit reports, financial reporting, internal controls and risk management; and the annual work program.

Programs and Projects Committee

The functions and authority of the PPC are local, state, CMA Transportation Improvement Program, Transportation Fund for Clean Air, Vehicle Registration Fee (VRF) programs and Expenditure Plan programs and projects; local, state and federally funded projects and funding programs; the annual strategic plan for programs and projects; funding requests from project sponsors and other eligible recipients; paratransit services programs and projects; bicycle and pedestrian projects and programs; funding allocations to various transportation programs and projects; eminent domain proceedings; environmental evaluations; contract procurement; good faith efforts policies and procedures; and bid protests and complaints regarding engineering and construction contract procurement.

Planning, Policy, and Legislation Committee

The functions and authority of the PPLC are the CMP; Countywide Transportation Plan; federal, state, regional, and local transportation and land-use planning policies and studies; amendments to the 1986 Expenditure Plan or the 2000 Expenditure Plans; amendments to the VRF Expenditure Plan; transit-oriented development and priority development area projects and programs; the annual legislative program; state and federal legislative matters; general and targeted outreach programs; and advisory committee performance and effectiveness.

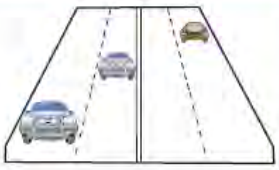
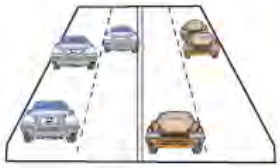
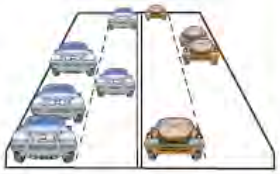
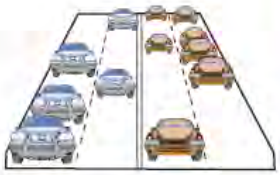
Technical Advisory Committee

ACTAC functions as the technical advisory committee to the Alameda CTC. ACTAC is comprised of one staff representative, preferably from a planning or public works department, from each of the following: Alameda CTC, each city, the county, BART, AC Transit, the Livermore Amador Valley Transit Agency, the Port of Oakland, the Metropolitan Transportation Commission, and Caltrans. Alameda CTC's executive director is the chairperson of ACTAC.

Administrative Costs

Alameda CTC's administrative costs regarding administration of the CMP-related activities are paid from levies on each city and the county in proportion to the fuel tax subventions under Proposition 111. The levies are based on the annual congestion management agency budget, which is adopted by April 1 of each year. MTC has entered into contracts with the Bay Area CMAs to assist in meeting the requirements of Moving Ahead for Progress in the 21st Century (MAP-21). These revenues have reduced the levy to the cities and county for support of congestion management activities. Alameda CTC will continue to advocate legislative measures that provide funding for these administrative costs so that fuel tax subventions to local government can be fully employed to address local transportation needs.

Levels of Service

Level of Service		Flow Conditions	Delay	Service Rating
A		Highest quality of service. Free traffic flow with low volumes. Little or no restriction on maneuverability or speed.	None	Good
B		Stable traffic flow, speed becoming slightly restricted. Low restriction on maneuverability.	None	Good
C		Stable traffic flow, but less freedom to select speed or to change lanes.	Minimal	Adequate
D		Approaching unstable flow. Speeds tolerable but subject to sudden and considerable variation. Less maneuverability and driver comfort.	Minimal	Adequate
E		Unstable traffic flow and rapidly fluctuating speeds and flow rates. Low maneuverability and low driver comfort.	Significant	Poor
F		Forced traffic flow. Speed and flow may drop to zero.	Considerable	Poor

Source: Highway Congestion Manual, 1985, Transportation Resource Board

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Appendix F1—Menu of Travel Demand Management Measures, Alameda County TDM Program: City and Public Agency Measures

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Trip Reduction Requirements							
Set trip reduction requirements for multifamily residential or commercial development	Require as a condition of approval for developments (either commercial, multifamily residential, or both) that certain TDM measures are implemented on an ongoing basis, or that specified vehicle trip reduction requirements are met.	Cities	Planning code or other municipal ordinance	Any urban area with good transit service; suburban downtowns, commercial and mixed use areas; transit stations. (particularly in high-growth areas)	5%-15%; Enables other strategies	Effects of this strategy depend on the location/accessibility of the development site(s), demographics of the project's residential/commercial occupants/ tenants and the type of measures required. The US EPA notes that "reasonable initial targets for the programs established under a trip reduction ordinance (TRO), might be a 5-10 percent reduction in single occupant vehicle (SOV) trips, with somewhat larger reductions (perhaps 15 percent) if substantial fees for parking are imposed."	http://www.epa.gov/otaq/stateresources/policy/transp/tcms/trip_reduction.pdf
Establish a Transportation Management Association	Establish an organization to assist businesses in reducing vehicle trips, either by administering programs, providing services (such as shuttle service), or providing technical assistance to businesses. Often implemented together with a trip reduction requirement.	Cities or business associations	Planning code or other municipal ordinance; or voluntary action by business association	Commercial area or other major business or employment districts	6%-7%	The TDM Resource Center (1996) estimated that just by improving coordination, and providing information on travel alternatives, establishment of a TMA can reduce commute-related vehicle trips by 6%-7%, with greater impact when implemented in concert with other trip reduction, TDM and parking management programs and services.	TDM Resource Center (1996), Transportation Demand Management; A Guide to Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov), as cited in the Victoria Transportation Policy Institute's TDM Encyclopedia (http://www.vtpi.org/tdm/tdm44.htm).
Implement an employee-trip reduction program for municipal employees.	Appoint an employee commute coordinator, and implement incentive programs to reduce single-occupant vehicle commuting among municipal employees. Elements may include: Subsidized transit passes; employee parking and/ or parking cash-out programs; commuter checks; Direct financial incentives to bike, walk, carpool or take transit; Ride sharing; Shuttles; Vanpools	Cities	Modify agency procedures	Any	4-20%	Management support and the presence of an on-site employee transportation corridor are important factors in the success of a program. Mandatory employee/ commute trip reduction (CTR) ordinances often require employers with more than 50 or 100 employees at a given employment site to implement a CTR program. This reduces the costs of administering TDM programs and compliance with survey and reporting requirements, but prevents such programs from reaching the majority of employees in a given city/region who work for small to mid-sized firms and organizations with less than 50 employees.	Marlon G. Boarnet, Hsin-Ping Hsu and Susan Handy (2010), Draft Policy Brief on the Impacts of Employer-Based Trip Reduction Based on a Review of the Empirical Literature, for Research on Impacts of Transportation and Land Use-Related Policies, California Air Resources Board http://arb.ca.gov/cc/sb375/policies/policies.htm); Philip Winters and Daniel Rudge (1995), Commute Alternatives Educational Outreach, National Urban Transit Institute, Center for Urban Transportation Research, University of South Florida; Tom Rye (2002), "Travel Plans: Do They Work?," Transport Policy, Vol. 9, No. 4 (www.elsevier.com/locate/tranpol), Oct. 2002, pp. 287-298.
Safety Net							
Guaranteed/ Emergency Ride Home program	Provide a guaranteed ride home for people who do not drive to work alone to ensure they are not stranded if they need to go home in the middle of the day due to an emergency, or stay late for work unexpectedly.	GRH in Alameda County is provided by Alameda CTC		Any	9%-38%	Coupled with active program marketing by employers, including marketing of other TDM programs and financial incentives, such as parking pricing, the Alameda County Guaranteed Ride Home program has been shown to reduce drive alone vehicle trips to participating employment sites by as much as 38% (Draft Alameda County Guaranteed Ride Home Program Evaluation (Nelson\Nygaard 2012).	Draft Alameda County Guaranteed Ride Home Program Evaluation (Nelson\Nygaard 2012)

Appendix F1—Menu of Travel Demand Management Measures, Alameda County TDM Program: City and Public Agency Measures, Continued

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Parking Management							
Demand-responsive pricing of on-street spaces	Set on-street parking prices based on parking demand in area to achieve parking availability targets.	Cities	Municipal code; capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	4%-18%	One of the most significant factors affecting motorists' choice of whether to drive or travel by another mode is the price of parking at the destination. Moreover, up to 28% of traffic in mixed-use districts is attributable to cruising for parking. By encouraging use of alternative modes and reducing parking search related delays for transit, demand responsive pricing can significantly reduce vehicle trips to major destinations/districts. The impact of parking pricing depends on the overall supply and availability of both on-street and off-street parking and the extent to which employers subsidize such parking.	Low-end estimate per Harvey and Deakin (1997), who estimated that parking pricing for work and non-work trips would reduce regional vehicle trips by 2.8% (Greig Harvey and Elizabeth Deakin (1997), "The STEP Analysis Package: Description and Application Examples," Appendix B, in Apogee Research, Guidance on the Use of Market Mechanisms to Reduce Transportation Emissions, US EPA (Washington DC; www.epa.gov/omswww/market.htm)). High end estimated based on the Victoria Transportation Policy Institute, Trip Reduction Tables (http://www.vtpi.org/tdm/tdm41.htm). Additional resource: http://www.spur.org/publications/library/report/critical_cooling/option27
Use of new meter technologies to allow multiple forms of payment and dynamic pricing	Install parking meters that allow payment by credit card or phone, and that connect to a central system in real-time, allowing for remote programming and management of parking prices.	Cities	Capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Enables demand responsive parking pricing	Installation of new parking management technologies, including new meters and infrastructure to support payment by cell phone and real-time monitoring of parking space utilization and turnover enable implementation of demand responsive parking pricing, which in turn reduces vehicle travel (see Demand Responsive Parking Pricing).	San Francisco Planning and Urban Research (2009). "Critical Cooling," The Urbanist, Issue 482, May, 2009 (http://www.spur.org/publications/library/report/critical_cooling/option27
Use of parking revenue to support other mobility/ neighborhood programs	Dedicate meter revenue from designated area to uses such as mobility improvements, neighborhood or business improvement programs, potentially through the creation of a parking benefit district.	Cities	Form dedicated Transportation Management District to receive funds	Any area with paid parking	Enables investment in Multimodal Infrastructure and TDM Programs.	Creation of parking benefit district can directly support vehicle trip reduction by providing funding for investments in other multimodal access programs and services that increase opportunities for access by non-auto modes. The establishment of such districts and provisions requiring meter and permit revenues to be spent within the district can also indirectly support vehicle trip reduction by increasing local political support for demand responsive, market-based pricing of on-street and off-street parking.	
Require "Unbundling" of parking costs from rents and leases	Separate the charge for leasing or buying a unit or square footage in multifamily residential or commercial buildings from charges for parking spaces.	Cities	Modify planning code	Any	6%-16%	"Charging separately for parking is among the most effective strategies to encourage households to own fewer cars, and subsequently reduce vehicle trips. Parking costs are generally subsumed into the sale or rental price of housing and commercial real estate. For residential development, unbundled parking may prompt some residents to dispense with one of their cars and to make more of their trips by other modes. The elasticity of vehicle ownership with respect to price is typically -0.4 to -1.0. Assuming total annual vehicle spending of $7,788 (BLS Consumer Expenditure Survey, 2011), unbundling of an average of $100/month in parking costs would increase perceived transportation costs/vehicle by 15%/year for the typical hh, which in turn is expected to result in a decline in vehicle ownership of 6% (at a price elasticity of -0.4) to 16% (at -0.10), with corresponding declines in vehicle trips."	Victoria Transport Policy Institute (2009), Transportation Elasticities, http://www.vtpi.org/tdm/tdm11.htm; Bureau of Labor Statistics (2012), Consumer Expenditure Survey, 2011, www.bls.gov.

Appendix F1—Menu of Travel Demand Management Measures, Alameda County TDM Program: City and Public Agency Measures, Continued

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/ Context	% Trip Reduction	Factors	Source
Parking Management, Continued							
Reduced or eliminated minimum parking requirements	In areas that are well-served by transit and other alternatives to driving, allow developers to build residential and commercial buildings with fewer parking spaces or no parking.	Cities	Modify planning code	Any area with quality transit service	9%-16%	Eliminating or reducing off-street parking requirements allows a market based supply of parking, and eliminates the sometimes required over-supply of parking, which encourages property owners/managers to bundle parking in lease/sale agreements and provides an effective subsidy for vehicle travel. This policy reform does not directly influence vehicle travel demand associated with existing development, although elimination of minimum off-street parking requirements does remove a barrier to changes of use, and/or the lease or sale of underutilized private off-street parking constructed in accordance with previous requirements, supporting the development of market-based parking pricing that in turn reduces vehicle travel.	Range of vehicle trip reduction impact of eliminating minium parking requirements on Los Angeles' Westside, as incorporated in the vehicle trip reduction impact analysis conducted for the Los Angeles Westside Mobility Plan (http://www.westsidemobility-plan.com/transportation-demand-model/)
District-based parking management	Manage parking supply in a defined area as a unified whole in order to better manage parking demand between different facilities to eliminate cruising for parking and improve the customer experience.	Cities	Modify city agency procedures;	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Enables compact development	District-based parking management offers the same benefit as shared parking facilities at a wider scale. As with shared parking facilities, the coordinated provision and management of a shared, publicly accessible supply of on-street and off-street parking at a district-scale can reduce vehicle trips by facilitating dense/compact, clustered, and mixed-use development and by reducing expenditure of land and financial resources on off-street parking, thereby reducing an effective subsidy for auto access and mobility.	
Incentivize shared parking.	Facilitate the sharing of parking among multiple land uses that have complementary schedules (e.g., an office with greater demand during the day and restaurant with greater demand at night).	Enabled by cities, brokered by private businesses or developments	Modify planning code	Urban or suburban downtowns, commercial and mixed use areas.	Enables compact development	Shared parking facilities can reduce vehicle trips by reducing the need for construction of dedicated off-street parking facilities for each land use/activity commensurate with the peak parking demand for that use. By so doing, shared parking facilities can enable dense, clustered development that facilitates a greater share of trips by walking, cycling and public transit. Shared parking can also reduce the total amount of land and financial resources dedicated to parking facilities, in turn reducing the effective subsidy for access by automobile that such expenditures represent. However, if shared parking increases available parking supply and thereby reduces parking prices it may in some cases increase vehicle trips and VMT.	Shared Parking does not directly reduce vehicle travel if it substitutes for increased parking supply. To the degree that it increases the available supply of parking and reduces parking prices it can encourage automobile travel. To the degree that Shared Parking allows more Clustered Development it can encourage use of alternative modes.
Improved parking wayfinding signage	Install wayfinding signage to make parking easier to find. This can help to shift parking demand away from overfull spaces to underutilized areas and can help reduce local traffic impacts caused by searching for parking.	Cities	Capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Not available.	Enhanced wayfinding, signage and provision of real-time information about parking supply and availability can reduce Vehicle Miles Traveled (VMT), and traffic congestion by reducing parking search time, but impacts on total vehicle trips are unclear.	
Urban Form and Land Use							
Compact, mixed use development and "park once" districts	Encourage development of districts that allow people to park just once if they drive to reach the district, and walk to destinations within the area once they are there.	Cities are responsible for zoning, land use planning, and development permissions	Amending general plans and zoning codes to plan for and facilitate compact, mixed-use development in appropriate areas. Support implementation of compact, mixed-use development by establishment of public development commissions and other mechanisms to support public investment.	Urban; suburban downtown; transit station	20%-40%	Recent literature indicates that compact development can reduce VMT per capita by 20%-40% compared to conventional "sprawl type" development characterized by low density and segregation of land uses and activities (vehicle trips are assumed to be reduced by a corresponding 20%-40%). Cumulative effects depend on the pace of new development in the County relative to the base of existing development (at a more rapid pace and extensive geographic scale, compact/mixed-use development/redevelopment can lead to greater reduction in vehicle trips.	Ewing, R. K. Bartholomew, S. Winkelman, J. Walters, and D. Chen (2008). Growing Cooler: The Evidence on Urban Development and Climate Change. Washington, DC: Urban Land Institute (ULI), p. 33.

Appendix F2—Menu of Travel Demand Management Measures, Alameda County TDM Program: Public or Private Organization Measures

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Multi-Modal Infrastructure							
Bicycle sharing services	Bicycles are available to members for short-term rental and can be returned at any bike share station. Bike share may be offered in city neighborhoods, near transit hubs, or at major employment centers.	Cities or private bicycle sharing companies (usually at invitation of a city)		Urban; suburban downtown; transit station	2% to 8%	The impact depends on the larger bike network and bicycling conditions. This research does not state if the shift from automobile trips to bicycle trips is for commute or non-commute trips, nor does the research state at what time of day these trips occur, i.e., peak or non peak trips.	Victoria Transport Policy Institute (2008), Public Bike Systems: Automated Bike Rentals for Short Utilitarian Trips, www.vtpi.org/tdm/tdm126.htm.
Enhanced transit service	Improve transit service to better serve potential riders and shift travel from driving trips.	Transit agencies, funded by cities, counties, TMAs, BIDs, regional agencies		Any	5% to 30%	Impacts depend on the level and quality of improvements. The elasticity of transit use with respect to transit service frequency is about 0.5, which means that a 1.0% increase in service (measured by transit vehicle mileage or operating hours) increases average ridership by 0.5%. Not all persons will be shifting from auto to transit so the relationship is not one to one.	Richard Pratt (2000) Traveler Response to Transportation System Changes, Interim Handbook, TCRP Web Document 12. http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_webdoc_12.pdf.
High Occupancy Vehicle/Toll (HOV/HOT) lanes	Implement a system of express lanes for high-occupancy vehicles, transit, and/or people who pay a toll. This provides a time savings to people who commute by modes other than driving alone.	Highway districts, often led by counties or regional agencies		Freeways, any context	2% to 30%	Comsis (1993) and Turnbull, Levinson and Pratt (2006) find that HOV facilities can reduce vehicle trips on a particular roadway by 4-30%. Ewing (1993) estimates that HOV facilities can reduce peak-period vehicle trips on individual facilities by 2-10%, and up to 30% on very congested highways if HOV lanes are separated from general-purpose lanes by a barrier. (Turnbull, Levinson and Pratt, 2006) suggests that HOV highway lanes are most effective at reducing automobile use on congested highways to large employment centers in large urban areas with 25 or more buses per hour during peak periods, where transit provides time savings of at least 5 to 10 minutes per trip.	"Comsis Corporation (1993), Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience, USDOT and Institute of Transportation Engineers (www.ite.org); available atwww.bts.gov/ntl/DOCS/474.html. Katherine F. Turnbull, Herbert S. Levinson and Richard H. Pratt (2006), HOV Facilities – Traveler Response to Transportation System Changes, TCRB Report 95, Transportation Research Board (www.trb.org); available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c2.pdf."
Financial Incentives							
Transit "fare free" zones	Transit agency provides free rides in designated zone.	Transit agencies, can be initiated/funded by cities, transportation management associations (TMAs), Business Districts	Can be implemented directly by transit agency, or another organization can form a funding partnership with the transit agency	Urban or suburban downtowns	Not available	Impact of transit fare-free zones is highly context specific. Some cities have seen very large increases in transit ridership within free-fare zones.	http://www.theatlanticcities.com/jobs-and-economy/2012/10/what-really-happens-when-city-makes-its-transit-system-free/3708/

Travel Demand Management Checklist

The Travel Demand Management (TDM) Element included in Alameda County Congestion Management Program requires each jurisdiction to comply with the Required Program. This requirement can be satisfied in three ways:

- Adopting "Design Strategies for encouraging alternatives to using auto through local development review" prepared by ABAG and the Bay Area Quality Management District;
- Adoption of new design guidelines that meet the individual needs of the local jurisdictions and the intent of the goals of the TDM Element; or
- Providing evidence that existing local policies and programs meet the intent of the goals of the TDM Element.

For those jurisdictions that have chosen to satisfy this requirement by Option 2 or 3 above, the following checklist has been prepared. In order to insure consistency and equity throughout the County, this checklist identifies the components of a design strategy that should be included in a local program to meet the minimum CMP conformity requirements. The required components are highlighted in bold type and are shown at the beginning of each section. A jurisdiction must answer Yes to each of the required components to be considered consistent with the CMP. Each jurisdiction will be asked to annually certify that it is complying with the TDM Element. Local jurisdictions will not be asked to submit the back-up information to the CMA justifying its response; however it should be available at the request of the public or neighboring jurisdictions.

Questions regarding optional program components are also included. You are encouraged but not required to answer these questions.

(Note: Bold type face indicates those components that must be included the "Required Program" in order to be found in compliance with the Congestion Management Program.)

Bicycle Facilities

Goal

To develop and implement design strategies that foster the development of a countywide bicycle program that incorporates a wide range of bicycle facilities to reduce vehicle trips and promote bicycle use for commuting, shopping and school activities. (Note: examples of facilities are bike paths, lanes or racks.)

Local Responsibilities

1a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

1a.1 provides a system of bicycle facilities that connect residential and/or non-residential development to other major activity centers?
Yes No

1a.2 bicycle facilities that provide access to transit?
Yes No

1a.3 that provide for construction of bicycle facilities needed to fill gaps, (i.e., gap closure), not provided through the development review process?
Yes No

1a.4 that consider bicycle safety such as safe crossing of busy arterials or along bike trails?
Yes No

1a.5 that provide for bicycle storage and bicycle parking for (A) multi-family residential and/or (B) non-residential developments?
Yes No

1b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Pedestrian Facilities

Goal

To develop and implement design strategies that reduce vehicle trips and foster walking for commuting, shopping and school activities.

Local Responsibilities

2a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that incorporate the following:

2a.1 provide reasonably direct, convenient, accessible and safe pedestrian connections to major activity centers, transit stops or hubs parks/open space and other pedestrian facilities?
Yes No

2a.2 provide for construction of pedestrian paths needed to fill gaps, (i.e., gap closure), not provided through the development process?
Yes No

2a.3 include safety elements such as convenient crossing at arterials?
Yes No

2a.4 provide for amenities such as lighting, street trees, trash receptacles that promote walking?
Yes No

2a.5 that encourage uses on the first floor that are pedestrian oriented, entrances that are conveniently accessible from the sidewalk or transit stops or other strategies that promote pedestrian activities in commercial areas?
Yes No

2b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Transit

Goal

To develop and implement design strategies in cooperation with the appropriate transit agencies that reduce vehicle trips and foster the use of transit for commuting, shopping and school activities.

Local Responsibilities

3a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

3a.1 provide for the location of transit stops that minimize access time, facilitate intermodal transfers, and promote reasonably direct, accessible, convenient and safe connections to residential uses and major activity centers?
Yes No

3a.2 provide for transit stops that have shelters or benches, trash receptacles, street trees or other street furniture that promote transit use?
Yes No

3a.3 include a process for including transit operators in development review?
Yes No

3a.4 provide for directional signage for transit stations and/or stops?
Yes No

3a.5 include specifications for pavement width, bus pads or pavement structure, length of bus stops, and turning radii that accommodates bus transit?
Yes No

3.b How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Carpools and Vanpools

Goal

To develop and implement design strategies that reduce the overall number of vehicle trips and foster carpool and vanpool use.

Local Responsibilities

4a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

4a.1 For publicly owned parking garages or lots, are there preferential parking spaces and/or charges for carpools or vanpools?

Yes No

4a.2 that provide for convenient or preferential parking for carpools and vanpools in non¬residential developments?

Yes No

4.b How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Park and Ride

Goal

To develop design strategies that reduce the overall number of vehicle trips and provide park and ride lots at strategic locations.

Local Responsibilities

5a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

5a.1 promote park and ride lots that are located near freeways or major transit hubs?

Yes No

5a.2 a process that provides input to Caltrans to insure HOV by-pass at metered freeway ramps?

Yes No

5b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

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Federal and State Transportation Control Measures

The following lists include adopted federal and state transportation control measures (TCMs) for the San Francisco Bay Area. Detail on federal TCMs can be found in the Transportation Improvement Program (MTC) and the state TCMs in the 2010 Clean Air Plan (BAAQMD).

Table I1—Federal TCMs in the 2001 Federal Bay Area Ozone: Attainment Plan (State Implementation Plan)

TCM	Description
Original TCMs from 1982 Bay Area Air Quality Plan	
TCM 1	Reaffirm Commitment to 28 percent Transit Ridership Increase Between 1978 and 1983
TCM 2	Support Post-1983 Improvements in the Operators' Five-Year Plans and, After Consultation with the Operators, Adopt Ridership Increase Target for the Period 1983 through 1987
TCM 3	Seek to Expand and Improve Public Transit Beyond Committed Levels
TCM 4	Continue to support development of HOV Lanes and Ramp Metering
TCM 5	Support RIDES Efforts
TCM 6*	Continue Efforts to Obtain Funding to Support Long Range Transit Improvements
TCM 7	Preferential Parking
TCM 8	Shared Use Park and Ride Lots
TCM 9	Expand Commute Alternatives Program
TCM 10	Information Program for Local Governments
TCM 11**	Gasoline Conservation Awareness Program (GasCAP)
TCM 12**	Santa Clara County Commuter Transportation Program
Contingency Plan TCMs Adopted by MTC in February 1990 (MTC Resolution 2131)	
TCM 13	Increase Bridge Tolls to $1.00 on All Bridges
TCM 14	Bay Bridge Surcharge of $1.00
TCM 15	Increase State Gas Tax by 9 Cents
TCM 16*	Implement MTC Resolution 1876, Revised — New Rail Starts – BART Extension to Colma only
TCM 17	Continue October 1989 Post-Earthquake Transit Services
TCM 18	Sacramento-Bay Area Amtrak Service
TCM 19	Upgrade Caltrain Service
TCM 20	Regional HOV System Plan

Table I1, Continued—Federal TCMs in the 2001 Federal Bay Area Ozone: Attainment Plan (State Implementation Plan)

TCM	Description
Contingency Plan TCMs Adopted by MTC in February 1990 (MTC Resolution 2131), Continued	
TCM 21	Regional Transit Coordination
TCM 22	Expand Regional Transit Connection Ticket Distribution
TCM 23	Employer Audits
TCM 24	Expand Signal Timing Program to New Cities
TCM 25	Maintain Existing Signal Timing Programs
TCM 26	Incident Management on Bay Area Freeways
TCM 27	Update MTC Guidance on Development of Local TSM Programs
TCM 28	Local Transportation Systems Management (TSM) Initiatives
New TCMs in 2001 Ozone Attainment Plan	
TCM A	Regional Express Buss Program
TCM B	Bicycle/Pedestrian Program
TCM C	Transportation for Livable Communities
TCM D	Expansion of Freeway Service Patrol
TCM E	Transit Access to Airports

* Deleted by EPA action from ozone plan.
** Deleted by EPA action from ozone plan, but retained in Carbon Monoxide Maintenance Plan.

Source: Metropolitan Transportation Commission, 2014.

Table I2—State TCMs in the 2010 Clean Air Plan

TCM	Description
TCM A1	Local and Area-wide Bus Service Improvements
TCM A2	Local and Regional Rail Service Improvements
TCM B1	Freeway and Arterial Operations Strategies...
TCM B2	Transit Efficiency and Use Strategies
TCM B3	Bay Area Express Lane Network....
TCM B4	Goods Movement Improvements and Emission Reduction Strategies
TCM C1	Voluntary Employer-Based Trip Reduction Programs
TCM C2	Safe Routes to Schools and Safe Routes to Transit Programs
TCM C3	Ridesharing Services and Incentives
TCM C4	Conduct Public Outreach & Education
TCM C5	Smart Driving
TCM D1	Bicycle Access and Facilities Improvements
TCM D2	Pedestrian Access and Facilities Improvements
TCM D3	Local Land Use Strategies
TCM E1	Value Pricing Strategies
TCM E2	Promote Parking Policies to Reduce Motor Vehicle Travel
TCM E3	Implement Transportation Pricing Reform

Source: BAAQMD, 2010 Clean Air Plan

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Subarea Travel Demand Model Guidelines

General Policy Statement

The Alameda CTC maintains a Countywide Travel Demand Model (Countywide Model) which is in conformance with MTC's Regional Travel Demand Model and land use database and can therefore be used to satisfy Congestion Management Program (CMP) requirements in Alameda County.
The Master Transportation Demand Model Agreements made between the Alameda County Congestion Management Agency and local jurisdictions detail the process through which local jurisdictions can have access to the Countywide Model and use its results for CMP conformance purposes.

An alternative to use of the Countywide Model which local jurisdictions or groups of local jurisdictions may wish to pursue is the development of subarea travel demand models (subarea models) for the purpose of satisfying CMP requirements. Subarea models may be more effective than the Countywide Model for the evaluation of certain local conditions or CMP applications.

Local jurisdictions may use a subarea model for CMP purposes so long as the subarea model demonstrates consistency with the Countywide Model. Results from subarea models which are not consistent with the Countywide Model will not be accepted by the Alameda CTC for CMP purposes.

Consistency Guidelines

A two-step process has been established to determine consistency of a subarea model with the Countywide Model. The two-step process includes an initial evaluation of subarea model compatibility by the Alameda CTC (step one) and, if required, additional data and information to be submitted to the Alameda CTC to verify consistency (step two).

Step One:

A. Local jurisdictions apply to the Alameda CTC for a consistency finding. The application shall consist of the following:

   i. A written communication to the Alameda CTC requesting a model consistency finding.

   ii. A completed model consistency checklist.

B. In the case of new/proposed subarea models, Alameda CTC staff must be part of the Local Technical Advisory/Oversight Committee/Taskforce for model development.

Step Two:

C. If additional information is required to determine consistency, Alameda CTC staff will review modeling procedures and land use database issues with local modeling staff.

Acceptable CMP Related Uses of a Consistent Subarea Model

A subarea model that has been found to be consistent with the Countywide Model may be used for the following CMP related uses:

1. Forecasting of operating conditions on roadway segments.

2. Development impact analysis performed for the CMP Land Use Analysis Program.

3. Testing of mitigation measures or deficiency plan recommendations to address degradation of Level of Service (LOS) on CMP roadway segments operating below LOS E.

Annual Recertification

Annual recertification of subarea models is required by the Alameda CTC. Recertification requires a written request. The request must clearly explain why the subarea model should be recertified on the basis of one of the following two conditions:

1. All changes to the model specifications of the land use database (1) were reported to the Alameda CTC previously or (2) are changes done in coordination with the land use database update process of the Countywide Model.

   OR

2. Recertification request must include a completed consistency checklist.

Development and Operation of Subarea Models

It is assumed that subarea models will be developed by local jurisdictions who will have responsibility for their operation, maintenance, and the costs associated with them. As a condition for delegation of Alameda CTC modeling responsibilities, it is assumed that local jurisdictions will commit to providing adequate ongoing technical support for all model applications in support of a CMP requirement (e.g. land use analysis or deficiency analysis). It is assumed that consultant assistance would normally be required for model development and maintenance.

Dispute Resolution

Disputes regarding consistency or appropriate use of a subarea model shall be brought to the Alameda County Technical Advisory Committee.

Alameda CTC Checklist for Modeling Consistency for Local Jurisdictions

This checklist guides local jurisdictions wishing to develop a subarea model through their model development and consistency review process by providing an inventory of specific products to be developed and submitted to the Alameda CTC, and by describing standard practices and assumptions.

A. General approach:

Discuss the general approach to travel demand modeling by the local jurisdiction and the subarea model's relationship to the Alameda Countywide Travel Demand Model.

PRODUCT:

1) Description of the subarea model's general approach.

B. Demographic/economic/land use forecasts:

Both base and forecast year demographic/economic/land use ("land use") inputs must be consistent—though not identical—to the census tract-level data provided to the Alameda CTC by ABAG. Specifically, if local jurisdictions wish to reallocate land use within their own jurisdiction, they must consult with the Alameda CTC. Further, the resulting deviation in the subject jurisdiction (or jurisdictions) should be no greater than plus or minus one percent from the jurisdiction-level totals in the Alameda CTC land use database for the following variables: population, households, jobs, and employed residents.

Outside the subject jurisdiction (or jurisdictions) and within Alameda County, the land use variables in the travel analysis zones used by the jurisdiction's model must match the Alameda CTC model or another adopted subarea model (e.g. the City of Hayward could adopt the land use from within the City of Dublin if the City of Dublin's model for use in the TAZs within the City of Dublin had an approved subarea model).

Outside of Alameda County, the land use variables in the travel analysis zones used by the jurisdiction's model must match the Alameda CTC model exactly.

PRODUCTS:

2) A statement establishing that the differences between key Alameda CTC land use variables and those of the sub area model do not differ by more than one percent at the jurisdiction level for the subject jurisdiction. A statement establishing that no differences exist at the census-tract-level outside the jurisdiction between the Alameda CTC forecast or the forecast contained within an adopted subarea model.

3) A table comparing the Alameda CTC land use estimates with the subarea model land use estimates by jurisdiction for population, households, jobs, and employed residents for both the base year and the horizon year.

4) If land use estimates within the jurisdiction are modified from the Alameda CTC model's projections, agendas, discussion summaries, and action items from each meeting held with the Alameda CTC at which the redistribution was discussed, as well as before/after census-tract-level data summaries and maps.

C. Pricing assumptions:

Use Alameda CTC's automobile operating costs, transit fares, and bridge tolls or provide an explanation for the reason such values are not used.

PRODUCT:

5) Table comparing the assumed automobile operating cost, key transit fares, and bridge tolls to Alameda CTC's values for the horizon year.

D. Network Assumptions:

Use Alameda CTC's regional highway and transit network assumptions for the other Bay Area counties and other jurisdictions within Alameda County. Local jurisdictions should include more detailed network definition relevant to their own jurisdiction in addition to the regional highway and transit networks. For the CMP horizon year, to be compared with the TIP interim year, regionally significant network changes in the base case scenario shall be limited to the current Transportation Improvement Program (TIP) for projects subject to inclusion in the TIP.

PRODUCT:

6) Statement establishing satisfaction of the above.

E. Automobile ownership:

Use Alameda Countywide Travel Demand Model automobile ownership models or forecasts or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

7) Planning Area-level table comparing estimates of households by automobile ownership level (zero, one, two or more automobiles) to Alameda CTC's estimates for the horizon year.

F. Trip generation:

Use Alameda Countywide Travel Demand Model trip generation models or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

8) County-level tables comparing estimates of trip and/or tour frequency by purpose to MTC's estimates for the horizon year.

G. Trip distribution:

Use Alameda Countywide Travel Demand Model trip distribution models or submit alternative models to Alameda CTC for review and comment.

PRODUCTS:

9) County-level tables comparing estimates of average trip distance by tour/trip purpose to Alameda CTC's estimates for the horizon year.

10) Planning area-to-planning area comparison of journey-to-work or home-based work flow estimates to MTC's estimates for the horizon year.

H. Travel mode choice:

Use Alameda Countywide Travel Demand Model mode choice models or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

11) County-level tables comparing travel mode share estimates by tour/trip purpose to Alameda CTC's estimates for the horizon year.

I. Traffic assignment:

Use Alameda Countywide Travel Demand Model models, or submit alternative models to Alameda CTC for review and comment.

PRODUCTS:

12) County-level, time-period-specific comparison of vehicle miles traveled and vehicle hours traveled estimates by facility type to Alameda CTC's estimates for the horizon year.

13) County-level, time-period-specific comparison of estimated average speed on freeways and all other facilities, separately, to Alameda CTC's estimates for the horizon year.

CMP Transportation Impact Analysis Technical Guidelines

Project Trip Generation Methodologies

The ITE trip generation handbook should be used to determine project trip generation.

Projects near transit or in infill development areas may apply one of the following methodologies to adjust project vehicle trip generation to reflect project context. Other alternative trip generation methodologies will be considered on a case-by-case basis.

EPA's Trip Generation Tool for Mixed Use Development (MXD model):

A description of this method can be found online at:

http://www.epa.gov/smartgrowth/mxd_tripgeneration.html

Caltrans/UC Davis Smart Growth Trip Generation Adjustment Method

A description of this method can be found online at:

http://ultrans.its.ucdavis.edu/projects/smart-growth-trip-generation

MTC's Station Area Residents (STARS) Mode Split Based Adjustment Method

This method uses household travel survey data to determine how mode share varies by land use characteristics and then use this information to reduce ITE trip generation rates. The key assumption is that ITE rates produce a reasonably accurate estimate of person-trips, but that in a more dense, transit accessible setting, many of these person-trips may use modes other than driving, so the vehicle-trip rate will be lower.

In the Bay Area, MTC conducted extensive analysis of the 2000 Bay Area Travel Survey (BATS 2000), the most recent household travel survey, as part of its Station Area Residents Study (STARS). This analysis looked at how mode shares differ as a function of proximity to transit and land use density. The findings of this study are well-suited to producing urban trip generation rate estimates.

Table J1 below reproduces a table from the STARS analysis. This table illustrates how the mode shares of residents living in Alameda County differ based on the location of their residence. For instance, the driving mode share of residents living within a half-mile of transit is only 48.2 percent, while for residents living more than a mile from transit, in a lower density area, this share is 87.0 percent.

This information can be used to adjust ITE trip generation rates. For instance, for a development located more than a mile from transit in a high-suburban density area, an adjusted ITE rate could be computed as:

Adjusted Rate = ITE Rate X 0.82

Note that the STARS analysis examined mode share for specific trip purposes (e.g., school trips, shopping trips, social/recreation trips) and depending on the type of development project, an analyst may wish to use this information instead of the mode share for all trips to adjust ITE rates.

Types of Impacts and Impact Assessment Methodologies

Autos

Projects should consider auto impacts on MTS roadway segments including:

- **Vehicle delay:** the analysis should assess impacts to vehicle delay on MTS roadway segments. The Highway Capacity Manual 2010 (HCM 2010) freeway and urban streets methodologies are the preferred methodologies to study vehicle delay impacts. However, project sponsors may use the HCM 2000 if conformance with local requirements is required.
- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with plans including future Alameda Countywide Arterial Corridors Plan, and should consider opportunities to implement the plan in the project vicinity.

Table J1—BATS2000 Mode Shares by Trip Purpose and Proximity to Rail and Ferries—Alameda County Residents (MTC STARS study Table K-9)

Travel Characteristic	Proximity of Household to Rail Stations and Ferry Terminals						Total
	Within 1/2 mile	1/2 mile to 1 mile	Greater than 1 mile				
			Urban*	High-Sub**	Low-Sub ‡	Rural †	
Home-Based Work							
In-Vehicle Person	56.3%	69.4%	78.0%	86.3%	82.7%	94.5%	78.5%
Vehicle Driver	46.6%	57.6%	68.9%	77.0%	77.3%	84.2%	69.5%
Vehicle Passenger	9.7%	11.8%	9.1%	9.3%	5.4%	10.3%	9.1%
Total Transit	26.5%	18.3%	17.1%	10.0%	13.5%	3.8%	15.0%
Rail and Ferry	23.7%	12.7%	11.1%	6.7%	11.4%	3.8%	10.9%
Bus	2.8%	5.6%	6.0%	3.3%	2.2%	0.0%	4.2%
Bicycle	7.3%	5.2%	1.1%	1.1%	1.0%	1.1%	2.2%
Walk	8.1%	5.2%	2.8%	2.4%	2.4%	0.6%	3.3%
Other	1.8%	1.9%	1.0%	0.2%	0.4%	0.0%	0.9%
Non-Work Trips							
In-Vehicle Person	46.7%	65.5%	77.1%	80.8%	85.0%	85.1%	75.6%
Vehicle Driver	33.0%	40.5%	47.8%	51.5%	55.6%	55.2%	48.2%
Vehicle Passenger	13.7%	25.0%	29.3%	29.3%	29.5%	29.8%	27.4%
Total Transit	25.6%	7.1%	5.7%	3.7%	2.4%	0.4%	6.2%
Rail and Ferry	5.3%	3.8%	1.6%	1.5%	1.2%	0.3%	2.1%
Bus	20.3%	3.3%	4.1%	2.2%	1.2%	0.2%	4.1%
Bicycle	2.6%	4.5%	2.4%	1.1%	1.0%	0.8%	2.1%
Walk	21.7%	21.1%	13.6%	13.0%	10.3%	12.8%	14.6%
Other	3.4%	1.8%	1.2%	1.4%	1.3%	0.9%	1.5%
Total Trips							
In-Vehicle Person	48.2%	66.5%	77.3%	82.0%	84.6%	87.0%	76.2%
Vehicle Driver	35.2%	44.9%	52.6%	57.0%	60.1%	61.0%	52.8%
Vehicle Passenger	13.0%	21.6%	24.8%	25.0%	24.4%	25.9%	23.4%
Total Transit	25.7%	10.0%	8.3%	5.1%	4.7%	1.1%	8.1%
Rail and Ferry	8.2%	6.1%	3.7%	2.7%	3.3%	1.0%	4.0%
Bus	17.5%	3.9%	4.5%	2.4%	1.4%	0.1%	4.1%
Bicycle	3.3%	4.7%	2.1%	1.1%	1.0%	0.9%	2.1%
Walk	19.5%	17.0%	11.2%	10.7%	8.7%	10.4%	12.2%
Other	3.2%	1.8%	1.2%	1.2%	1.1%	0.7%	1.4%

* Urban: 10,000 or more persons/mi² (e.g., San Francisco, Berkeley, Oakland)
** High-Suburban: 6,000 to 9,999 persons/mi² (e.g., Palo Alto, Vallejo, Richmond, San Leandro)
‡ Low-Suburban: 500 to 5,999 persons/mi² (e.g., Lafayette, Walnut Creek, Sausalito)
† Rural: Less than 500 persons/mi² (e.g., Oakland Hills, Point Reyes Station, Guerneville)

Source: http://www.mtc.ca.gov/planning/smart_growth/stars/Appendix_K_Alameda_County_Residents_Walkable_Buffer.pdf, Page K-7

Transit

Projects should consider impacts to MTS transit operators and riders, including:

- **Effects of vehicle traffic on mixed flow transit operations:** the analysis should evaluate if vehicle trips generated by the project will cause congestion that degrades transit vehicle operations. Analysis may be qualitative and may be based on auto traffic circulation analysis, but should consider that transit vehicles may have unique considerations compared to autos (e.g., pulling into and out of stops, longer gaps needed for left turns). For instance, the analysis may use information about delay on a key segment or intersection with transit service to determine that impacts to transit operations will exist. It should not be assumed that transit operational impacts will not exist if a roadway operates at better than automobile LOS F. Furthermore, the mitigations required to address transit operations impacts may not be the same as those to address vehicle delay.

- **Transit capacity:** the analysis should evaluate if transit trips generated by the project will cause ridership to exceed existing transit capacity. Both vehicle and station circulation should be considered, as appropriate. Transit operators should be consulted to see if any routes or stations in the project area require capacity analysis. If a project will cause transit capacity impacts such that additional service will be required, funding for transit operations cannot be assumed and appropriate mitigations considered. If such analysis is required, it should consider volume to capacity ratios. The Alameda CTC can assist in providing ridership data by line or route if needed.

- **Transit access/egress:** the analysis should assess whether pedestrian connections between the project site and transit stops are adequate to support any project trip generation assumed to be served by transit. The site plan should provide good access between buildings and from buildings to transit stops and stations. Sidewalks should be provided on both sides of all streets to provide access to bus stops. Sidewalks and curb cuts at intersections should be designed for ADA accessibility. Designs should avoid requiring pedestrians to walk through parking lots to access transit service. The assessment should include consideration of the safety of crossing opportunities, as needed. Qualitative analysis is sufficient to assess this impact type.

- **Future transit service:** developments in areas without current transit service should seek to avoid designs which preclude future transit service. Trip generation estimates should assess the potential for new transit service, and if warranted by demand, the environmental review should address a funding mechanism to support service. Transit operators should be consulted to ensure that project design and surrounding roadway networks can accommodate transit vehicles (e.g., grades, turning radii, lane widths are appropriate). Where a project proposes private shuttle services, a cost analysis of providing this service versus subsidizing existing transit service should be included. Qualitative analysis is sufficient to assess this impact type.

- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with plans including transit operators Short Range Transit Plan and Long Range Transit Plan and the future Alameda Countywide Transit Plan, and should consider opportunities to implement the plan in the project vicinity.

- **Circulation Element:** for projects involving major update to a General Plan Circulation Element, local jurisdictions are encouraged to develop and maintain a transit component of their Circulation Element.

Bicycles

Projects should consider impacts including:

- **Effects of vehicle traffic on bicyclist conditions:** the analysis should evaluate if vehicle trips generated by the project will present barriers to bicyclists

safely crossing roadways or executing turning movements as well as whether project traffic volumes necessitate greater separation between bicyclists and vehicles. This analysis may be qualitative and may be based on auto traffic circulation analysis.

- **Site development and roadway improvements:** the analysis should evaluate if the project or its mitigations will reduce or sever existing bicycle access or circulation in the area as well as whether the project could produce conflicting movements between bicyclists and vehicle turning into and out of project driveways. Qualitative analysis is sufficient to assess this impact type.

- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with the Alameda Countywide Bicycle Plan, and should consider opportunities to implement the plan in the project vicinity, either in conjunction with other roadway improvements required by the project or as a mitigation measure for air quality or traffic circulation impacts. Qualitative analysis is sufficient to assess this impact type.

Pedestrians

Projects should consider impacts including:

- **Effects of vehicle traffic on pedestrian conditions:** the analysis should evaluate if vehicle trips generated by the project will present barriers to pedestrians safely crossing roadways at intersections and mid-block crossings. This analysis may be qualitative and may be based on auto traffic circulation analysis.

- **Site development and roadway improvements:** the analysis should evaluate if the project or its mitigations will reduce or sever existing pedestrian access or circulation in the area as well as whether the project could produce conflicting movements between pedestrian and vehicle turning into and out of project driveways. The need for new crossing opportunities or circulation given project pedestrian access points and likely access/egress routes should be considered. Qualitative analysis is sufficient to assess this impact type.

- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with the most recent Alameda Countywide Pedestrian Plan, and should consider opportunities to implement the plan in the project vicinity, either in conjunction with other roadway improvements required by the project or as a mitigation measure for air quality or traffic circulation impacts. Qualitative analysis is sufficient to assess this impact type.

Other Impacts and Opportunities

Projects should consider impacts including:

- **Noise impacts:** for projects adjacent to state roadway facilities, the analysis should address noise impacts of the project. If the analysis finds an impact, then mitigation measures (i.e., soundwalls) should be incorporated as part of the conditions of approval of the proposed project. It should not be assumed that federal or state funding is available.

- **Transit Oriented Development access:** local jurisdictions are encouraged to adopt a comprehensive Transit Oriented Development (TOD) program, including environmentally clearing all access improvements necessary to support TOD as part of environmental documentation.

Project Delivery and Timely Use of Funds Policy

Project Delivery Assistance

The Alameda CTC will provide consultant services to assist in monitoring the implementation of projects programmed to receive state, federal or TFCA funds programmed by the Alameda CTC. This service will include ongoing collection of project monitoring information and development of a quarterly status report on the delivery status of projects programmed to receive state, federal funds or TFCA funds programmed by the Alameda CTC. The Consultant will also meet with Caltrans local assistance as needed to review the status of the Caltrans review of Alameda County projects.

The Alameda CTC will provide consultant services to project sponsors to assist in the delivery of state, federal or TFCA funded projects programmed through the Alameda CTC. This assistance could include services such as project delivery workshops for sponsors and development and management of a project delivery website. Due to budget limitations in the Alameda CTC's project oversight contract, one on one on call assistance will likely be limited to the review of documents and answering questions relative to a specific funding program. Sponsors that require assistance beyond this level, such as completing documents that are required for project delivery, can contract with the Alameda CTC's oversight consultant directly or request the Alameda CTC expand the current scope of work on a task order basis to provide the necessary support. Any additional task order work completed through the Alameda CTC contract will be reimbursed to the Alameda CTC from the local agency receiving the support. Billing rates for any additional support work will be based on the rates in the current Alameda CTC contract with the oversight consultant.

Agencies receiving funding through the Alameda CTC will, as part of the application process, submit to the Alameda CTC a baseline schedule for project delivery. The Alameda CTC's project monitoring consultant will provide assistance to sponsors in the development of the baseline schedule to insure that all required state and federal approvals are accounted for in the schedule. Agencies agree to provide the Alameda CTC with quarterly updates on project delivery status and to notify and seek the Alameda CTC's concurrence on any significant changes to the project delivery schedule, scope or cost. The baseline schedule will identify major milestones for each project that are critical for timely delivery of the project. These milestones will likely include start and end dates for: environmental clearance, development of PS&E, acquisition of right of way and construction of the project. Deadlines associated with any timely use of funds provisions such as Caltrans or California Transportation Commission authorizations and/or approvals will also be identified.

The Alameda CTC may host a workshop on project delivery after the adoption of a state/federal/TFCA program by the Alameda Board. The workshop would review the project delivery requirements of the particular funding program(s) adopted by the Alameda CTC and provide an opportunity for project sponsors to have questions related to the specific program answered by both Alameda CTC staff and staff from other agencies that may have project approval authority (i.e., Caltrans, the Air District, MTC). Attendance at this workshop may be mandatory for all project sponsors.

Extension and Reprogramming Requests

The Alameda CTC will consider the following prior to endorsing an extension or reprogramming request: Are the circumstances causing the delay truly "extraordinary," or an oversight during project planning?

Although the circumstances may be unforeseen, baseline project schedules should incorporate risk factors related to unknowns. Are these circumstances "beyond the control" of the implementing agency. Sponsors requesting extensions or reprogramming will be required to provide justification why the circumstances causing the delay are "extraordinary and beyond their control."

Has the project sponsor exercised due diligence in the delivery of the project and is such diligence documented? Have previous milestones in the project delivery scheduled been met and has the Alameda CTC been notified of and concurred with any changes to the schedule? The Alameda CTC should be notified when a delay situation, or potential delay situation, arises in order to be prepared to review the request and to take whatever action may be required to assure no loss of funding to Alameda County. Sponsors requesting extensions or reprogramming must demonstrate that previous milestones identified in the baseline schedule as critical to the delivery of the project have been met, or that the Alameda CTC was notified and concurred with any potential delays to the project schedule.

If the Alameda CTC were to grant an extension or reprogramming, how prepared is the sponsor to meet future delivery deadlines? For example, failure to meet the initial STIP project delivery deadline—project allocation approval—will result in the funds being deprogrammed from the project but returned to the county share. However, once the initial allocation has been received, failure to meet any future SB 45 deadlines will result in a loss of funds to both the project and the county. Sponsors requesting extensions or reprogramming requests must provide the Alameda CTC with a revised schedule for project delivery and a strategy for resolution of the problem that is causing the delay in project delivery. This revised schedule will also provide detail relating to the impact this delay and modified schedule may have on other projects sponsored by the respective agency. The Alameda CTC will consider the circumstances causing the project delivery delay and the impact on other projects being implemented by the sponsor and may deny the extension or reprogramming request until the sponsor can demonstrate an acceptable resolution to the problem causing the delay.

Timely Use of Funds Policy

Any project sponsor that fails to meet a timely use of funds deadline that results in a loss of programmed funds to Alameda County will be penalized in a future state or federal funding cycle an amount equal to the funds that were lost to Alameda County.

This policy will apply to all funding programs administered by the Alameda CTC. Projects programmed to receive TFCA funds will be subject to additional delivery requirements included in the Alameda CTC's adopted TFCA Timely Use of Funds Policy.

Glossary of Terms

Air Quality Attainment Plan. The plan for attainment of state air quality standards, as required by the California Clean Air Act of 1988. It is adopted by air quality districts and subject to approval by the State Air Resources Board.

Assembly Bill 32 (AB 32). The California Global Warming Solutions Act passed in 2006, requires the California Air Resources Board (CARB) to develop regulations and other measures to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions to 1990 levels by 2020, representing a 25% reduction statewide.

Assembly Bill 84 (AB 84). The original bill number for the legislation that required Project Study Reports (PSRs) and the development of Future Project Development lists by the counties.

Assembly Bill 210 (Wieckowski) (AB 210). Adopted in August 2013, AB 210 extends the authority of the County of Alameda and authorizes the County of Contra Costa to impose the transactions and use tax of no more than 0.5 percent for countywide transportation programs until December 31, 2020, conditioned upon prior voter approval.

Assembly Bill 779 (Garcia) (AB 779). This proposed legislation relates to the California Environmental Quality Act that requires a lead agency to prepare, or cause to be prepared, an environmental impact report on a project that it proposes to carry out or approve that may or may not have a significant effect on the environment. AB 779 provides that the transportation impact related to greenhouse gas emissions of a project located within a priority area is not a significant impact on the environment. The bill provides that a described automobile delay impact is also not a significant impact.

Assembly Bill 1098 (Bloom) (AB 1098). This proposed legislation deletes traffic level of service standards as an element of a congestion management program and deletes related requirements, including a requirement that a city or county prepare a plan when highway or roadway level of service standards are not maintained. AB 1098 requires performance measures to include vehicle miles traveled, air emissions, and bicycle, transit, and pedestrian mode share. The bill requires an evaluation of how a congestion management program contributes to achieving a greenhouse gas reduction target.

Assembly Bill 1358 (Leno) (AB 1358). The Complete Streets Act of 2008 stipulates that during the next major update of their General Plan's Circulation Element, all jurisdictions in California are required to incorporate complete streets principles. Alameda CTC required jurisdictions to adopt complete streets policies by June 30, 2013 as part of the Master Program Funding Agreements signed in 2012. All jurisdictions have met this requirement.

Assembly Bill 1963 (Katz) (AB 1963). This legislation amended the Congestion Management Program in 1994 to define the performance element of the CMP as in Government Code Section 65089(b)(2) and to meet Federal Transportation Act requirements. Since that time, the California Department of Transportation Highway Capacity Manual 2010 and the California Environmental Quality Act transportation checklist have also emphasized the importance of multimodal transportation system performance measures. (See Chapter 4 for the Alameda County CMP multimodal performance measures.)

Assembly Bill 2032 (Dutra) (AB 2032). Adopted in 2004, this legislation authorized implementation of the Interstate 680 Express Lane. The project was completed and opened to traffic in September 2010. The legislation also approved a second express lane in the county. The CMA approved Interstate 580 (I-580) as a candidate corridor, and this project is currently in the design phase. As a first step, the eastbound I-580 high occupancy vehicle lane opened in November 2010.

Association of Bay Area Governments (ABAG). The regional agency that is responsible for regional planning other than for transportation. ABAG publishes forecasts of projected growth for the region.

Average Daily Traffic (ADT). The average number of vehicles passing a specified point during a 24-hour period.

Bay Area Air Quality Management District (BAAQMD). The regional agency created by the state legislature for the Bay Area air basin (Alameda, Contra Costa, western Solano, southern Sonoma, Marin, Napa, San Francisco, San Mateo, Santa Clara counties) that develops, in conjunction with MTC and ABAG, the state and federal air quality plans for the region. BAAQMD has an active role in approving the TCM (see definition below) plan for the region, as well as in controlling stationary and indirect sources of air pollution.

Bid targets. Based on the county minimum formula, each county is limited in the amount of funds that can be requested from the state in a given STIP cycle. This limit is called the bid target. In a multi-county region such as MTC, bid targets can be pooled to give additional flexibility at the regional level. MTC also uses bid targets for the federal Surface Transportation Program.

California Transportation Commission (CTC). A body appointed by the Governor and confirmed by the legislature that considers Regional Transportation Improvement Programs (RTIPs) and the PSTIP (see definitions below) and then includes transportation projects from these programs into the State Transportation Improvement Program (STIP). This qualifies the projects for state funding. The CTC also has financial oversight over the major programs authorized by Propositions 111 and 108.

Caltrans—The California State Department of Transportation. Responsible, as the owner/operator of the state highway system, for its safe operation and maintenance. Proposes projects for Intercity Rail, Interregional Roads, and soundwalls in the PSTIP (see definition below). Also responsible for the HSOPP (see definition below), Toll Bridge, and Aeronautics programs. The TSM and State/Local Partnership Programs are administered by Caltrans. Caltrans is the implementing agency for most state highway projects, regardless of program, and for the Intercity Rail program.

Capital Improvement Program (CIP). As used in this document: A seven-year program of projects to maintain or improve the traffic level of service and performance measures developed by the CMP, and to mitigate regional transportation impacts identified by the CMP Land Use Analysis Program, which conforms to transportation-related vehicle emissions air quality mitigation measures.

Capital Outlay. "All money allocated by the CTC from the State Highway, Account, and the net revenues from the passenger rail transportation Bond Fund for streets, highways, guideways, and rail, but not including allocations or expenditures for projects for maintenance, traffic system management, intercity rail, and the state-local partnership program, which are expended for construction, including the acquisition of rights-of-way, reconstruction, and construction engineering." (Streets and Highways Code 188.)

Capital Priorities. A process used by MTC to evaluate and prioritize transit projects in the region. All sources of transit funding, including FTA grants, state programs, and other sources are considered. This process involves all of the transit operators in the region, including bus, rail, and ferries.

Congestion Management Agency (CMA). The agency responsible for developing the Congestion Management Program and coordinating and monitoring its implementation.

Congestion Management Program (CMP). A multi-jurisdictional program to reduce traffic congestion. Required of every county in California with an urbanized area as defined by the Census Bureau (at least 50,000 people).

Council of Governments. A voluntary consortium of local government representatives, from contiguous communities, meeting on a regular basis, and formed to cooperate on common planning and solve common development problems of their area. COGs can function as the RTPAs and MPOs in urbanized areas.

County Minimums. Instituted in 1983 by SB 215 (Foran), the county minimum represents the minimum share

of programming each county should receive. Under this statute (Section 188.8 of the Streets and Highways Code), 70 percent of the capital outlay (defined above) funds must be expended in each county according to a formula based 75 percent on county population and 25 percent on state highway miles in the county. The county minimum calculated over a fixed five year period called a quinquennium.

Database. 1) A collection of data from which information is derived and from which decisions can be made; and 2) A non-redundant collection of data items that can be processed by one or more computer applications.

Federal Highway Administration (FHWA). A division of the U.S. Department of Transportation, established to ensure development of an effective national road and highway transportation system. It assists states in constructing highways and roads, and provides financial aid at the local level.

Federal Transit Administration (FTA). A division of the U.S. Department of Transportation, delegated by the Secretary of Transportation to administer the federal transit program under the Urban Mass Transportation Act of 1964, as amended, and various other statutes.

FTA Section 3 Funds. Discretionary transit capital fund provided by the federal government through FTA. New Rail Starts and Extensions are funded through this program, which operates through earmarking at the Congressional level. The Section 3 program is updated approximately every four years. The minimum local match is 20 percent, although larger local shares are encouraged.

FTA Section 8 Funds. Transit operating funds provided by the federal government through UMTA. Made available through Section 8 of the Urban Mass Transportation Act of 1972, Section 8 funds are available for planning components of the operating budget, only, such as development of Short Range Transit Plan.

FTA Section 9 Capital Funds. Capital funds provided by the Federal government through FTA. Section 9 capital funds are available to support capital purchases only. They must be matched with local capital funds on an 80 percent federal. 20 percent local basis.

FTA Section 9 Operating Funds. Operating funds provided by the Federal government through FTA. Available only to support annual operating budgets. Capital purchases must be supported with other funds. The total amount of Section 9 operating funds is determined by Congress each year and is then divided among regions and operators within regions on a formula basis.

FTA Section 16 (b) 2 Funds. Funds provided by the federal government through FTA to private non-profit providers of transportation for the elderly and handicapped. Program is administered annually in the Bay Area by MTC.

FTA Section 18 Funds. Transit funds provided by the federal government through FTA by formula to rural areas. Administered by Caltrans in California, these funds can be used for either capital or operating expenses. Capital projects require a 20 percent local match. Operating projects require a 50 percent local match.

Flexible Congestion Relief (FCR). One of the state's funding programs for local or regional transportation projects that will reduce congestion. State highway projects, local roads, and rail guideway projects are all eligible.

Fund Estimate. The STIP cycle begins with the development of the Fund Estimate, which compares existing commitments against total estimated revenue expected from state and federal sources. Caltrans estimates state and federal funds "reasonably expected" in annual increments for 7 years (the STIP period). The calculation of existing capital program commitments is based on Caltrans' Project Delivery Report (see definition below), while non capital expenditures of operation and administration costs are estimated based on current spending and projected needs. This comparison of revenues to commitments results in an estimate of total uncommitted funds

that are available for programming and which are then prorated to each program category. The Fund Estimate is required by law to be submitted by 7/15 of odd-numbered years and to be adopted by the CTC by 8/15 of odd numbered years. CTC adopts a policy, known as the "Fund Estimate Methodology" that guides Caltrans in formulating the Fund Estimate.

High Occupancy Vehicle Lane (HOV). A lane of freeway reserved for the use of vehicles with more than a preset number of occupants; such vehicles often include buses, taxis and carpools.

Indirect Source Control Measure. The Federal Clean Air Act defines indirect source as "...a facility, building, structure, installation, real property, road or highway which attracts, or may attract, mobile sources of pollution." An indirect source control measure is a rule or ordinance established to reduce the mobile source emissions associated with specific activity centers such as those noted above.

Interregional Road System (IRRS). On February 1, 1990, Caltrans submitted a plan to the state legislature that identified a set of projects that "will provide the most adequate interregional road system to all economic centers in the State." Statute defines eligible routes that were included, and specified that these be located outside the boundaries of urbanized areas of over 50,000 population, "except as necessary to provide connection for continuation of the routes within urban areas." From this plan, Caltrans includes projects, consistent with the Fund estimate, in its PSTIP to the CTC for programming in the STIP.

Level of Service (LOS). A qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Metropolitan Transportation Commission (MTC). Created by the state legislature in 1970 to prepare a Regional Transportation Plan for the nine counties of the Bay Area. Other important responsibilities include: approving transportation projects that receive state or federal funding, allocating several sources of funds for transit operations, evaluating the performance of the transportation system and the provision of transportation service, promoting and setting guidelines for transit systems coordination, and advocating adequate transportation funding. MTC consists of 16 voting members, including one member from ABAG, and one member from the Bay Conservation and Development Commission. MTC also includes 2 non-voting members, from the state and federal transportation agencies.

Metropolitan Transportation System. A regional, multi-modal transportation system defined as part of MTC's RTP (see definition below). Emphasizes a balanced strategy of highway, arterial, and transit capital investments and operational improvements to manage congestion projected over the next 20 years.

Model: Gravity. A mathematical trip distribution model that is based on the premise that the amount of travel between two zones in proportional to the amount of activity in each of the two zones and inversely proportional to the impedance to travel between the two zones. In other words, trips produced in any given area will distribute themselves in accordance with the accessibility of other areas and the opportunities.

Model: Land Use. A model used to predict the future spatial allocation of urban activities (land use), given total regional growth, the future transportation system, and other factors.

Model: Mode Choice. A model used to forecast the proportion of total person trips on each of the available transportation modes.

Model: Regional Growth. A model used to estimate land uses in a region.

Model: Travel Demand. A mathematical equation or graphic technique used to simulate traffic movements, particularly those in urban areas or on a freeway.

MTC Resolution No. 3434. The Regional Transit Expansion Program adopted by MTC in 2001 as Resolution 3434 identifies the regional commitment to transit investments

in the Bay Area. It has been amended many times. The most recent September 2008 amendment identifies a nearly $18 billion investment in new rail and bus projects that will improve mobility and enhance connectivity for residents in Alameda County and the Bay Area. For Alameda County, Resolution 3434 includes the following transit expansion projects:

- AC Transit Bus Rapid Transit in Berkeley/Oakland/ San Leandro
- AC Transit Enhanced Bus/Bus Rapid Transit: Grand-MacArthur corridor
- BART Warm Springs Extension to San Jose
- Dumbarton Rail
- Ferry service expansions in Alameda and Berkeley

MTC Resolution No. 3866. Adopted in February 2010, the Transit Coordination Implementation Plan, which includes a regional Transit Connectivity Plan and Implementation Requirements, coordinates public transportation services between public transit operators, including coordination of fares and schedules for all public transit systems within MTC's jurisdiction, and details a cohesive strategy for easing passengers' movement from one transit system to another.

MTC Resolution No. 4035. Adopted in May 2012, Resolution 4035 sets forth project selection policies and programming for the federal Surface Transportation Program (STP)/Congestion Mitigation and Air Quality (CMAQ) funding available to MTC for its programming discretion as part of the federal Transportation Improvement Program. Resolution 4035 established the One Bay Area Grant Program, which integrates the region's federal transportation program with California's climate law (Senate Bill 375) Sustainable Communities Strategy for the Bay Area by promoting transportation investments in Priority Development Areas.

North/South Split. State law (Section 188 of the Streets and Highway Code) requires that programming be balanced so that 60 percent of the capital outlay (see definition above) is spent in the 11 Southern counties, and 40 percent is spent in the North (45 counties). This balance must occur for the period July 1, 1989 to June 30, 1993, and for each subsequent five year period. This rule has a serious impact on the type of projects programmed in the North or the South. Rehabilitation and safety funds have historically tended to be spent roughly 60 percent in the north, and only 40 percent in the South, due to worse weather conditions and more mountainous roads in the North. In addition, engineering costs are relatively higher in the North than in the South. Furthermore, Caltrans' project support for locally funded projects, of which the North has a disproportionate share, is also included. Thus, funds for capacity increasing projects have historically been weighted towards the South, so that the overall balance remains 60 percent/40 percent.

Obligation. An action by an administrative agency approving the spending of money for a specific purpose to a specific grant recipient.

Pavement Management System (PMS). Required by Section 2108.1 of the Streets and Highways Code, any jurisdiction that wishes to qualify for funding under the STIP must have a PMS that is in conformance with the criteria adopted by the Joint City/County/State Cooperation Committee. At a minimum, the PMS must contain:

- An inventory of the arterial and collector routes in the jurisdiction that is reviewed and updated at least biennially;
- An assessment of pavement condition for all routes in the system, updated biennially;
- Identification of all sections of pavement needing rehabilitation or replacement; and
- Determination of budget needs for rehabilitation or replacement of deficient sections of pavement for the current biennial period, and for the following biennial period.

Certification is done by implementing jurisdiction and submittal to MTC. MTC then makes a finding of agreement with the certification and transmits the certification to the CTC with the RTIP.

Peak (Peak Period, Rush Hours). 1) The period during which the maximum amount of travel occurs. It may be specified as the morning (A.M.) or afternoon or evening (P.M.). 2) The period when demand for transportation service is the heaviest.

Principal Arterial. The functional classification system at the federal level defines principal arterials for rural areas, urbanized areas, and small urban areas. (Note: other definitions of principal arterials exist). In urbanized areas, the principal arterial system can be identified as unusually significant to the area in which it lies in terms of the nature and composition of travel. Principal arterials derive their importance from service to rural oriented traffic, but equally or even more importantly, from service for major movements within the urbanized area. The principal arterial system should carry the major portion of trips entering and leaving the urban area, as well as the majority of through movements desiring to bypass the central city. In addition, significant intra-area travel, such as between major business districts and outlying residential areas, between major inner city communities, or between major suburban centers should be served by this system. Frequently, the principal arterial system will carry important intra-urban as well as intercity bus routes. Finally, this system in small urban and urbanized areas should provide continuity for all rural arterials which intercept the urban boundary. Because of the nature of the travel served by the principal arterial system, almost all fully and partially controlled access facilities will be part of this functional system. However, this system is not restricted to controlled access routes. The spacing of urban principal arterials will be closely related to the trip-end density characteristics of particular portions of the urban areas. The US Department of Transportation provides the guidance than 50-65 percent of the VMT should be accounted for on the principal arterial system.

Project Delivery Report. Government Code Section 14525.5 requires Caltrans to submit to the legislature by November 15 of each year a report on the delivery of all state highway projects in the adopted STIP which cost $1M or more and for which the department is the responsible agency for project development work (including some, but not all locally funded projects). The report must identify milestone dates by month and year for these projects, and must summarize the number of projects which met milestones and identify those that failed to meet one or more milestones. For those that failed, the report must explain the reasons for the delay and present a plan to resolve any problems and a new schedule for delivery. The Plan must also include an estimate of Caltrans' capital outlay project development staffing needs for the next fiscal year in order to delivery the adopted STIP. The Report must also include a determination of the portion of project development work that will be performed by Caltrans and the portion that will be "contracted out." This Plan is then assessed by the Legislative Analyst in its annual analysis of the Governor's proposed budget.

Project Study Report (PSR). Chapter 878 of Statutes 1987 requires that any capacity increasing project on the state highway system, prior to programming the STIP, have a completed PSR. The PSR must include a detailed description of the project scope and estimated costs. The intent of this legislation was to improve the accuracy of the schedule and costs shown in the STIP, and thus improve the overall accuracy of the estimates of STIP delivery and costs.

Proposed State Transportation Improvement Program (PSTIP). This seven-year program is based on the adopted STIP and the most recent Project Delivery Report. It may include additional schedule changes and/or cost changes, plus new projects that Caltrans proposed for the interregional road system, retrofit soundwalls, and toll bridge and aeronautics programs, as well as the intercity rail program. Caltrans may also propose, under specified conditions, alternative FCR projects to those proposed in the RTIPs; this is the only overlap with the RTIPs. The PSTIP is due to the CTC on 12/1 of odd numbered years.

Proposition 116. Passed by voters in June of 1990, this initiative sponsored by the Planning and Conservation

League provides $1.99B in rail bonds, primarily to projects specified in the legislation. Guidelines for the implementation of the program were available in the Fall of 1990.

Public Transit (Mass Transit). Passenger transportation service, usually local in scope, that is available to any person who pays a prescribed fare. Operated on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time. Examples include bus, ferry, light rail and rapid transit.

Public Transportation. Transportation service to the public on a regular basis using vehicles that transport more than one person for compensation, usually but not exclusively over a set route or routes from one fixed point to another. Routes and schedules may be determined through a cooperative arrangement. Subcategories include public transit service, and paratransit service that are available to the general public.

Regional Transportation Improvement Program (RTIP). A list of proposed transportation projects submitted to the CTC by the regional transportation planning agency (for the Bay Area. MTC), as a request for state funding. The individual projects are first proposed by the CMAs, then evaluated and prioritized by the regional agency for submission to the CTC. The RTIP has a seven year planning horizon, and is updated every two years. MTC may only include projects in its RTIP that are first included in a CMP.

Regional Transportation Plan (RTP). A comprehensive 20-year plan for the region, updated every two years by the regional transportation planning agency (for the Bay Area, MTC). The RTP includes goals, objectives and policies, and recommends specific transportation improvements.

Ridesharing. Two or more persons traveling by any mode, including but not limited to, carpooling, vanpooling, taxipooling, jitney and public transit.

Regional Traffic Signalization and Operations Program (RTSOP). Administered by MTC, this program was created to fund traffic signalization projects that implement cost effective traffic control measures. The types of eligible projects include signal re-timing; upgrades of existing controllers to comply with AB 3418 and NTCIP; repair, replacement, installation, and improvement of hard-wire interconnect systems; and upgrade and improvements to traffic signal systems.

Senate Bill 45 (Kopp) (SB 45). In 1997, this legislation had a significant impact on the regional transportation planning and programming process, by amending the State Transportation Improvement Program (STIP) process. The statute delegated major planning decisions to the regional transportation planning agencies (RTPAs), requiring them to take a more active role in selecting and programming transportation projects and encouraged more decision-making through partnerships among stakeholders. It divided STIP into two sub-programs and designated 75 percent of funding to the region for the Regional Transportation Improvement Program (RTIP) and 25 percent of funding to the California Department of Transportation for the Interregional Transportation Improvement Program (ITIP). SB 45 changed the transportation funding structure; modified the transportation programming cycle, program components, and expenditure priorities; and required the development and implementation of transportation system performance measures.

Senate Bill 226 (Simitian) (SB 226). In 2011, the Office of Planning Research issued regulations to implement SB 226, which seeks to streamline environmental review for eligible infill development projects. These Infill Streamlining updates to the California Environment Quality Act Guidelines also contain the performance standards used to determine an infill project's eligibility for a streamlined review.

Senate Bill 375 (Steinberg) (SB 375). Adopted in October 2008, SB 375 requires California's MPOs to prepare a "sustainable communities strategy (SCS)" that demonstrates how the region will meet its greenhouse gas reduction target through integrated land use, housing and transportation planning.

Senate Bill 743 (Steinberg) (SB 743). Adopted in September 2013, SB 743 includes a series of amendments to the California Environmental Quality Act that streamline the environmental review process, encourage infill development, overhaul traditional impact analysis metrics, and exempt certain projects in transit priority areas. For the Congestion Management Program, it removed the sunset date for establishing the infill opportunity zones including related alternative level of service standard requirements.

Senate Bill 916 (Perata) (SB 916). As amended in June 2003, this bill required the supervisors of the counties of San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Solano to call a special election in March 2004 on Regional Measure 2 (RM2) authorizing a comprehensive Regional Traffic Relief Plan (RTRP). The voters in those counties passed the measure, which authorized a $1 toll surcharge to fund specified transportation projects and programs. In addition, the bill required the Metropolitan Transportation Commission to adopt a regional transit connectivity plan. The latest plan highlights connectivity improvements at 21 regional transit hubs around the Bay Area.

Senate Bill 1474 (Kopp) (SB 1474). Passed in 1996, this bill requires the Metropolitan Transportation Commission (MTC) to adopt, in coordination with a regional transit coordinating council, rules and regulations to promote the coordination of fares and schedules for all public transit systems within its jurisdiction. See MTC Resolution No. 3866 regarding the Transit Coordination Implementation Plan.

Senate Bill 1636 (Figueroa) (SB 1636). Signed by the governor in 2002, this bill established "infill opportunity zones" (IOZs) to encourage transit supportive and infill developments. The statute exempted infill opportunity zones from the requirements to maintain level of service E. None of the local jurisdictions within Alameda County established or adopted infill opportunity zones by the statute's sunset period of December 2009. Senate Bill 743 instituted key changes to the CMP statute that support infill development, including lifting the sunset date on designating IOZs and directing the governor's Office of Planning and Research to develop new metrics for assessment of transportation impacts to replace the level of service measure.

Short Range Transit Plans (SRTP). A seven-year comprehensive plan required by federal and regional transportation funding agencies of all transit operators. The plans must define the operator's mission, analyze its past and current performance, and plan specific operational and capital improvements to realize its short-term objectives.

State Highway Operations and Protection Program (SHOPP) [Formerly called the Highway System Operations and Protection Plan (HSOPP)]. A program created by state legislation that includes state highway safety and rehabilitation projects, seismic retrofit projects, land and buildings projects, landscaping, some operational improvements, bridge replacement, and the minor program. SHOPP is a four year program of projects, adopted separately from the STIP cycle. The June 1990 gas tax increase partially funds the program, but it is primarily funded through the "old" 9 cent gas tax and federal funds. For the purposes of the Fund Estimate, a formula based on a pavement index and safety concerns is used to estimate an additional 3 years of the SHOPP program.

State Implementation Plan (SIP). State plan required by the Federal Clean Air Act of 1990 to attain and maintain national ambient air quality standards. It is adopted by local air quality districts and the State Air Resources Board.

State/Local Partnership. Originally created by SB 140, and subsequently funded by the passage of Proposition 111 by the voters in June of 1990, the State/Local Partnership provides state matching funds for locally funded and constructed highway and exclusive public mass transit guideway projects. $2 billion over ten years have been designated for this program. Eligible projects are defined by the legislation and clarified by guidelines published by the Caltrans Division of Local Streets and Roads. Applications are annually submitted to Caltrans (by June 30 for the following fiscal

year), which administers the program. The amount of state match available in a given year is dependent upon the number of eligible applicants and the size of the appropriation to the program by the legislature during the budget process. The state match can not exceed 50 percent.

State Transit Assistance (STA). This program provides funding for transit and transportation planning. Fifty percent of the revenues transferred to the TP&D Account (see definition below) are appropriated to STA. STA apportionments to regional transportation planning agencies (MTC in the Bay Area) are determined by two formulas. 50 percent by populations and 50 percent by the amount of operator revenues (fares, sales tax, etc.) for the prior year. The Bay Area usually receives about 38 percent of the amount available for STA state-wide. STA funds may be used for transit capital or operating expenditures. Passage of Proposition 117 disallows use of STA funds for streets and roads in the non-urban counties.

State Transportation Improvement Program (STIP). A list of transportation projects, proposed in RTIPs and the PSTIP, which are approved for funding by the CTC.

Sustainable Communities Strategy (SCS). Mandated by Senate Bill 375, it is an Integrated Transportation, Land Use and Housing Plan required to be developed by the 18 Metropolitan Planning Organizations in California to reduce greenhouse gas emissions. The SCS will be adopted as an element of the Regional Transportation Plan.

Traffic Systems Management (TSM) Program. A state-funded program that funds those projects which "increase the number of person trips on the highway system in a peak period, without significantly increasing the design capacity of the system, measured by vehicle trips, and without increasing the number of through traffic lanes". This program is funded outside of the STIP process, through direct application to Caltrans. The CTC programs the projects from a prioritized list submitted by Caltrans. Statute requires that priority be given to projects from counties with adopted CMPs.

Transit Capital Improvement Program (TCI). A state program, currently funded primarily from the TP&D account (see definition below) for transit capital projects and the STA program (see definition above). An annual program, all state funds must be matched 50 percent by local funds.

Transit Operators Coordinating Council (TOCC). A statutorily created committee of MTC that consists of the General Managers of the major transit operators in the region. It meets monthly to discuss matters of mutual concern and to advise MTC.

Transportation Control Measures (TCMs). A measure intended to reduce pollutant emissions from motor vehicles. Examples of TCMs include programs to encourage ridesharing or public transit usage, city or county trip reduction ordinances, and the use of cleaner burning fuels in motor vehicles. MTC has adopted specific TCMs, in compliance with the Federal and State Clean Air Acts that can be found in MTC Resolution No. 3758 and the Transportation Control Measure Plan for the State Clean Air Plan prepared by MTC in January 2006.

Transportation Demand Management (TDM). "Demand-based" techniques for reducing traffic congestion, such as ridesharing programs and flexible work schedules enabling employees to commute to and from work outside of the peak hours.

Transportation Improvement Program (TIP). A federally required document produced by the regional transportation planning agency (MTC in the Bay Area) that states the investment priorities for transit and transit-related improvements, mass transit guideways, general aviation and highways. The TIP is the MTC's principal means of implementing long-term planning objectives through specific projects.

Transportation Management Association (TMA). A consortium of business and industry (private sector) interests formed to help solve mutual transportation problems. A TMA is not in any form a publicly sponsored or coordinated agency or group.

Transportation Planning and Development Account (TP&D). A state account, funded by the sales tax on the new 9 cent gas tax and the diesel sales tax, that is the primary funding source for the TCI (see definition above) program.

Transportation System Management (TSM). A set of relatively low-cost techniques to relieve congestion without adding vehicle capacity to the transportation system. TSM techniques are numerous. Some are "demand-based" techniques such as ridesharing programs and flexible work schedules enabling employees to commute to and from work outside of the peak hours. (Sometimes the demand-based strategies are referred to as TDM). Other TSM measures are engineering-oriented, such as timing traffic signals to smooth the flow of traffic, and ramp metering, which regulates the entrance of vehicles onto a freeway, increasing the efficiency of the freeway.

Urban and Commuter Rail. A state funding program financed by the sales and bonds authorized by Proposition 108. Two additional bond measures to fund this program were rejected by voters in 1992 and 1994. All projects must be matched 50 percent by local funds. Projects are proposed through the CMP process to regional agencies, which then may include them in their RTIPs.

Urbanized Area. As defined by the Bureau of the Census, a population concentration of at least 50,000 inhabitants, generally consisting of a central city and the surrounding, closely settled, contiguous territory (suburbs). The boundary is based primarily on a population density of 1,000 people/mile, but also includes some less densely settled areas, as well as such areas as industrial parks and railroad yards, if they are within areas of dense urban development. The boundaries of urbanized areas, the specific criteria used to determine urbanized areas, or both, may change in subsequent censuses.

Vehicle Miles Traveled (VMT). Travel demand forecasting (modeling) is used to generate the average trip lengths for a region. The average trip length measure can then be used in estimating vehicle miles of travel, which in turn is used in estimating gasoline usage or mobile source emissions of air pollutants.

Vehicle Occupancy. The number of people aboard a vehicle at a given time; also known as auto or automobile occupancy when the reference is to automobile travel only.

Vehicle Trip. A one-way movement of a vehicle between two points.

Glossary of Acronyms

ABAG	Association of Bay Area Governments
AC Transit	Alameda-Contra Costa Transit District
ACCMA	Alameda County Congestion Management Agency
ACE	Altamont Commuter Express
ACTA	Alameda County Transportation Authority (1986 Measure B authority)
ACTAC	Alameda County Technical Advisory Committee
ACTIA	Alameda County Transportation Improvement Authority
ADA	Americans with Disabilities Act
ATG	Automobile Trip Generated
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit District
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBTP	Community Based Transportation Plan
CDT	Community Design Transportation
CEQA	California Environmental Quality Act
CIP	Capital Investment Program
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion Management Program
CTC	California Transportation Commission
CWTP	Countywide Transportation Plan
EIR	Environmental Impact Report
FWHA	Federal Highway Administration
GOA	Growth Opportunity Areas
GPA	General Plan Amendment
GRH	Guaranteed Ride Home Program
HCM	Highway Capacity Manual
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
GOA	Growth Opportunity Areas
JPA	Joint Powers Agreement
LAVTA	Livermore-Amador Valley Transportation Authority
LOS	Level of Service
MTC	Metropolitan Transportation Commission
MTS	Metropolitan Transportation System
NEPA	National Environmental Protection Agency
NOP	Notice of Preparation
O/D	Origin/Designation
PCI	Pavement Condition Index
PDA	Priority Development Areas
RTP	Regional Transportation Plan
RTIP	Regional Transportation Improvement Program
SCS	Sustainable Communities Strategy
SCTVA	Santa Clara Transportation Valley Authority
SFCTA	San Francisco County Transportation Authority
SIP	State Implementation Plan
STA	State Transit Assistance

STIP	State Transportation Improvement Program
STP	Surface Transportation Program
SWITRS	Statewide Integrated Traffic Record System
TASAS	Traffic Accident Surveillance and Analysis System
TAZ	Traffic Analysis Zones
TCM	Transportation Control Measures
TCRP	Transportation Congestion Relief Program
TDM	Travel Demand Management
TEP	Transportation Expenditure Plan
TFCA	Transportation Fund for Clean Air
TIP	Transportation Improvement Program
TLC	Transportation for Livable Communities
TMS	Transportation Management System
TOD	Transit Oriented Development
TOS	Transportation Operations System
V/C	Volume/Capacity
VMT	Vehicle miles traveled

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NCHRP
REPORT 684

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Enhancing Internal Trip Capture Estimation for Mixed-Use Developments

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Enhancing Internal Trip Capture Estimation for Mixed-Use Developments

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

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The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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FOREWORD

By Christopher Hedges
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This report provides an improved methodology to estimate how many internal trips will be generated in mixed-use developments—trips for which both the origin and destination are within the development. The methodology estimates morning and afternoon peak–period trips to and from six specific land use categories: office, retail, restaurant, residential, cinema, and hotel. The research team analyzed existing data from prior surveys and collected new data at three mixed-use development sites. The resulting methodology is incorporated into a spreadsheet model, which can be downloaded from the TRB website at http://www.trb.org/Main/Blurbs/165014.aspx. The report includes recommendations for modification of existing Institute of Transportation Engineers (ITE) procedures in the *Trip Generation Handbook*. This report will be valuable to transportation agency planners and developers who need to provide or fund facilities that meet the transportation demand generated by new developments.

As new development places increasing demands on the transportation system, community leaders, land use planners, developers, and transportation agency administrators need techniques to enable them to reliably estimate the number of net vehicle and person trips that will be generated by new or infill mixed-use development.

For site impact analysis purposes, an internal capture rate that is set too low may unfairly penalize developers by making them pay more than their fair share of costs for transportation mitigation measures. Conversely, an internal capture rate that is set too high may unfairly place this burden on the public. Both cases may result in sub-optimal build-out, particularly in urban areas.

Since the internal capture rate used for a given mixed-use development can be politically contentious, empirical observations are needed to provide professional guidance for better estimating these impacts. By improving the methods for estimating internal capture, the process of determining developers' responsibilities for mitigating transportation impacts of mixed-use development will become more equitable, transparent, and open.

The ITE's *Trip Generation Handbook* has established a procedure for estimating multi-use trip generation; however, the existing framework is based on a limited set of data. ITE advises those estimating transportation impacts of mixed-use developments to "collect additional data if possible." Consequently, when considering potential transportation impacts of proposed mixed-use developments, local and state transportation planners lack a comprehensive, credible data set that can be used to confirm or deny the soundness of proposed internal capture estimates.

Under NCHRP Project 08-51, a research team led by the Texas Transportation Institute developed a methodology to provide an improved estimate of internal trips generated in

mixed-use developments. After an analysis of existing data from previous studies, the research team conducted and analyzed traffic counts and interviews at sites in Dallas, Texas; Atlanta, Georgia; and Plano, Texas. The team developed a classification system for mixed-use developments, an improved methodology for estimating internal trip capture, a data-collection framework and methodology, and a spreadsheet estimation tool to facilitate application of the internal trip capture methodology. Procedures were also provided to enable practitioners to collect and add more data to the database, which has been provided to ITE.

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Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SUMMARY

Enhancing Internal Trip Capture Estimation for Mixed-Use Developments

The goal of NCHRP Project 8-51 is to improve the methodologies used to estimate the extent to which trips made within mixed-use developments (MXDs) are internalized or satisfied with both origin and destination within the development. Specifically, the project developed

- A classification system of MXDs that identifies site characteristics, features, and context likely to influence trips subject to internal capture;
- A defensible improved methodology for estimating internal trip capture with reasonable accuracy;
- A data-collection framework and methodology to quantify the magnitude of travel associated with MXDs to determine appropriate reductions below single-use trip generation estimates; and
- A spreadsheet estimation tool to facilitate computations (available at http://www.trb.org/Main/Blurbs/165014.aspx).

The improved estimation method was developed from existing survey data from prior studies plus three pilot data collection surveys from this project. The method is based on the existing Institute of Transportation Engineers (ITE) procedure, but expands it to cover both A.M. and P.M. peak periods, six primary land uses found at MXDs, and proximity of interacting land uses. This method was tested and found to reduce estimation error by about one-half compared with the existing ITE method and three-fourths compared with raw trip generation estimates.

Summary of Findings, Conclusions, and Recommendations

Existing Practice

Internal capture for MXDs is of most interest to those who either prepare or review transportation impact analyses (TIAs) for such developments; however, transportation planners and developer consultants are also interested in internal capture and the resulting external trip generation. Some additional uses include planning for transit-oriented developments (TODs) and preparing environmental impact statements or assessments.

ITE provides a recommended practice for estimating internal capture and associated external trip generation for such developments. The ITE method documented in the *Trip Generation Handbook* (*1*) is the most widely used technical method. The other widely used approach is a policy determined flat percentage reduction in external trips. Such percentages are established by local planning, zoning, or transportation engineering officials for use in TIAs prepared

to support applications for zoning, subdivision, site plan approval, or access permits. The percentages are usually arbitrarily selected for use throughout the jurisdiction. These percentages are most typically in the range of 10%, but were found to range between less than 5% and as much as 25%.

The ITE method covers trips between only the three most frequent components of MXDs—office, retail, and residential. Data are available for the weekday P.M. peak hour; midday; and what is called "daily," but which is drawn from data collected between noon and 6:30 P.M. The ITE method has nothing for the A.M. peak hour. The policy percentages mentioned above are applied to each analysis period used.

There is some use of invalid applications for internal capture estimation—the two found most frequently were use of shared parking reduction percentages and metropolitan area travel forecast model intrazonal trip percentages. Shared parking reductions apply only to parking accumulations in a parking facility serving multiple uses; the percentage reduction applies only to parking accumulation, not trip generation. Intrazonal trips apply to complete traffic analysis zones used in regional travel forecast models. Zones may range from a block to a square mile. Intrazonal trips are for the complete zone and are not applicable to portions of a zone. Estimates are also accurate only to a regional level, not a development-site level. Neither method should be used for estimating internal capture for MXDs.

Six land uses are the most frequently used components of MXDs—office, retail, restaurant, residential, cinema, and hotel. Most major MXDs have all of these. Most other MXDs have at least four. Six MXDs analyzed in this project ranged in size between 7 and 300 acres. All were single developments from one master plan developed to fully integrate all uses.

Available Data

There are very limited data available that are capable of supporting internal capture rate estimation methodology that can use information that is *available at the time of zoning*. Three Florida surveys plus three more conducted for this and a parallel project were the only surveys with enough detail to develop internal capture methodology

- For both A.M. and P.M. peak hours,
- For use with information that is available at the time of zoning requests and can be reliably projected,
- That provides the ability to analyze the effect of proximity of land uses to each other, and
- That is sensitive to differences in land use mix.

Some cordon counts have been completed for various periods and could be used for validation testing. More data are needed.

Internal Capture Estimation Methodology

This project expanded the database from three to six developments and after considering options, extended the ITE method to

- Add the weekday A.M. peak hour;
- Added restaurant, cinema, and hotel land uses;
- Created a land use classification structure that would permit disaggregation of the six land uses to more detailed categories should enough data become available;

- Include the effects of proximity (convenient walking distance) between interacting land uses to represent both compactness and design; and
- Provide a method that could easily be put in spreadsheet form.

The method uses the following inputs:

- User-estimated A.M. and P.M. inbound and outbound vehicle trip generation for six land uses: office, retail, restaurant, residential, cinema, and hotel;
- Mode split for MXD trips to/from each land use—percent by automobile, transit, non-motorized;
- Vehicle occupancy by land use; and
- Average walking distance between land use pairs.

The following outputs are produced:

- A.M. and P.M. peak-hour internal person trips by land use in origin-destination form;
- A.M. and P.M. peak-hour percent internal capture (person trips); and
- A.M. and P.M. peak-hour inbound, outbound, and total external trips (trips to and from the development being analyzed) by mode:
  - Person trips;
  - Vehicle trips;
  - Transit trips; and
  - Non-motorized trips.

This method was tested for its ability to estimate external vehicle trip generation. The existing ITE method estimates produce about one-half as much error as do ITE trip generation rates. The method developed in this project cuts the estimation error in half again or roughly to about one-fourth of the raw trip generation rates.

The recommended method is described in Chapter 3. The researchers recommend its use for developments of up to 300 acres. Further testing could validate its use for larger developments, but that has not yet been attempted. Due to the difference in scales and reduced levels of internal connectivity, the researchers do ***not*** recommend use of this method for suburban activity centers or new town types of development: the researchers do not believe it will be applicable.

The recommended estimation method was validated by testing it against actual data from several MXDs. The recommended method was found to be more accurate for estimating external vehicle trips for MXDs than either the existing ITE method or unadjusted ITE trip generation rates and equations. Compared with peak-period cordon counts, the recommended method overestimates external trips by an average of about 1%. More telling is an absolute average of about 13% and a standard deviation of about 15%. Details and comparisons with the other methods are discussed in Appendix F.

Recommended Modifications to Existing ITE Procedures

As mentioned previously, the recommended estimation method builds on the current ITE internal trip capture procedures contained in the second edition of the *Trip Generation Handbook* (*1*). Incorporation of this project's recommendations could be accomplished by the following:

1. Expanding Tables 7.1 and 7.2 of the *Trip Generation Handbook* to include all six land uses covered in this report;

2. Adding the proximity adjustment to be made after the unconstrained internal capture estimates are performed but before the balancing process; and
3. Modifying the data-collection procedures to include those recommended in this project.

Data-Collection Methodology

A methodology and procedural instructions were developed for the selection of data-collection sites and for the data-collection itself. Those procedures were used to conduct surveys at three MXDs. The researchers recommend that additional data be collected. The researchers suggest that MXDs selected meet at least the following criteria:

1. Be representative of typical MXDs being developed or being planned so the data will be of use for future years; the area in which the MXD is located should also be representative;
2. Have at least four land uses;
3. Have owners or managers who will permit the needed surveys to be conducted;
4. Be easy to conduct a large enough sample for an affordable cost (in 2006 dollars, the three surveys each cost about $50,000 to set up, conduct the surveys, and summarize data);
5. Be generally in range of 300 to 500 acres or less; and
6. Be economically successful (by appearance) and mature (fully occupied for at least a year and in an area that is mostly developed).

Organizations that collect additional internal capture data are encouraged to provide a copy of the data and analyses to ITE for further use and future refinement of what was produced in this project.

Application in Practice

This research project developed an improved estimation methodology and data-collection framework for use in estimating internal trip capture in MXDs during weekday A.M. and P.M. peak periods. The estimation methodology is based on weekday A.M. and P.M. peak-period survey data from three MXDs in Texas and Georgia (part of this project) plus similar weekday P.M. peak-period data from three developments in Florida (prior project). The six developments surveyed ranged from about 7 to 300 acres in size and had between four and six primary land uses each.

This report presents a technical advancement beyond the internal capture method published in the 2nd edition of the *Trip Generation Handbook* (*1*). The researchers believe that the limited validations conducted for the proposed estimation method confirm that the results provide accurate approximations of external trip generation for typical MXDs consisting of office, retail, restaurant, residential, cinema, and hotel land uses, consistent with the accuracy of trip generation estimates for single-use developments as portrayed in such references as the 8th edition of *Trip Generation* (*2*).

User Instructions and Cautions

At the time of publication of this report, the approach developed in this research had yet not been advanced through the ITE process for development of recommended practices and, therefore, should not yet be considered an ITE–approved methodology.

This report presents information in Chapter 3 on how to use the proposed estimation procedure; however, the researchers and the overseeing NCHRP project panel felt it is important

to encourage users to adhere to the following instructions and cautions in using the proposed estimation methodology:

- **Identify specific land use components of the MXD and classify them into the six classifications**—office, retail, restaurant, residential, cinema, and hotel—covered by the estimation methodology. Any component land uses that do not fit into those six classifications or are too unique to be considered normal for a classification should be kept separate. No internal capture is estimated in the proposed methodology for trips between uses within each of these categories (e.g., two or more different retail uses).
- **Estimate single-use trip generation individually for each land use within the MXD.** Then, sum the individual estimates into the six aggregated classifications: office, retail, restaurant, residential, cinema, and hotel. Do not combine development units into the six classifications and then use one single-use trip generation rate or equation to estimate trip generation for the aggregated land use.
- **When applying the internal capture estimation methodology, use the percentages suggested in Chapter 3 unless local data are available from developments similar to the development being analyzed.** Users are cautioned that data gathered in a method different than the data-collection methods described in this report may not be applicable and could produce inaccurate internal capture estimates.
- **Do not apply the internal capture percentages for this report to other land uses.** Internal capture estimates were not developed for land uses beyond the six classifications provided herein. The extent of the internal capture for other land use pairs has not been tested as part of this project.

The results presented in this report are based on surveys of six MXDs, and validation was limited to seven such developments. As a result, some members of the project's advisory panel strongly recommend that additional research, data collection, and validation testing be conducted before the method is adopted for use in TIAs.

Furthermore, caution should be exercised in the application of this methodology. For example, it cannot be concluded that the methodology will be appropriate for MXDs that differ significantly from those surveyed in this project in terms of

- Regional context, including competing opportunities outside the development;
- Access and parking;
- Scale of the development;
- Complementary land uses, including specific pairs of business types;
- Specific residence types,
- Other component characteristics within each land use category;
- Proximity and connectivity between each pair of land uses, especially the layout of the land uses relative to each other;
- Other characteristics such as proximity to transit and pedestrian access within and around the site; and
- Colder locations that might limit or constrain pedestrian traffic.

Suggested Future Research

Clearly, this project has made progress in estimation of internal capture; however, the database is still sparse and much that is thought to be logical about MXD travel characteristics is

still unproven and even largely untested. Two of the research efforts recommended by the research team include the following:

1. Collect more data at MXDs—the researchers think data are needed from at least six more sites that have five to six land uses.
2. Independent of the additional data collection, test the applicability of the existing methodology for MXDs of different sizes, character, and land use components. Use validation tests similar to those used in this project. The only data needed are a complete directional cordon count for the A.M. and P.M. peak-hours plus development data and a good site plan from which to estimate proximities.

Request for Additional Data

Users are encouraged to collect and contribute additional data using the data-collection procedures described in this report. Those data could be used to further enhance the accuracy of the proposed methodology and/or expand the number of land use classifications covered by the methodology. New data should be forwarded to the Institute of Transportation Engineers at 1627 I Street, Suite 610, Washington, D.C., 20006-4007, or by email to ite_staff@ite.org.

Report Contents

NCHRP Report 684 is composed of the following sections:

- **Chapter 1: Introduction** is a summary of findings from a review of the state of the practice.
- **Chapter 2: Research Approach** describes the objectives, approach, and work performed.
- **Chapter 3: Findings and Applications** describes the work performed and the results, findings, and recommended estimation methodology.
- **Chapter 4: Conclusions, Recommendations, and Suggested Research** includes those items plus lessons learned. Detailed procedures for computations are also included.
- **References** lists the works cited in this report.
- **Appendix A: Trends in Mixed-Use Development** is a description of past and expected trends and characteristics of MXD.
- **Appendix B: Land Use Classification System** presents a framework for classifying land uses for analysis of internal capture.
- **Appendix C: Procedures for Internal Capture Surveys** is a detailed description of how to prepare for and conduct surveys to obtain data for use in analyzing internal capture for MXDs. Sample forms are included.
- **Appendix D: Pilot Survey Experiences and Lessons Learned** contains useful information for those who may be planning to conduct internal capture surveys.
- **Appendix E: Florida Survey Questionnaires** presents the samples of questionnaires used for three Florida internal capture surveys that produced some data used in this project.
- **Appendix F: Validation of Estimation Procedure** documents a test of seven MXDs for which recommended estimation methodology was tested for its ability to reproduce cordon external vehicle trip volumes.

Additionally, a spreadsheet estimation tool to facilitate computations is available at http://www.trb.org/Main/Blurbs/165014.aspx

CHAPTER 1

Introduction

Background

Problem Statement

NCHRP Project 8-51, "Enhancing Internal Trip Capture Estimation for Mixed-Use Developments," was undertaken to improve the methodology(s) used to estimate the extent to which trips made within mixed-use developments are internalized or satisfied with both origin and destination within the development. Such estimates are important in determining the quantities of external trips generated by mixed-use developments.

To fully understand the project, it is first necessary to understand some of the terms used in describing the project. Terms are defined as follows:

- **Mixed-Use Development:** A mixed-use development, according to the Urban Land Institute (ULI), is a single physically and functionally integrated development of three or more revenue-producing uses developed in conformance with a coherent plan (*3,* pp. 4–5). The Institute of Transportation Engineers (ITE) suggests two interacting land uses compose a mixed-use development (MXD) (*2*). MXDs have internal pedestrian connectivity and share parking among some or most uses. An example of a true MXD would be a galleria consisting of retail, hotel, office, restaurant, and entertainment uses, possibly in separate buildings, but interconnected and sharing parking facilities. For the purposes of this project, it has been deemed appropriate and necessary to expand this definition to include multi-use developments. A multi-use development is a real estate project of separate uses of differing and complementary, interacting land uses that do not necessarily share parking and may not be internally interconnected except by public street and/or other public transportation facilities. A multi-use development example would be an activity center such as Tysons Corner in northern Virginia, also with a variety of interactive land uses, but relying on the public road system and separate parking facilities for most of the interaction.
- **Activity Centers:** An activity center is a well-defined, focused concentration of development with high density and a high mix of land uses. An activity center usually meets the above expanded definition of an MXD. An activity center is generally very large compared with other MXDs in its urban area and usually occupies at least several blocks. Perimeter Center in Atlanta is a good example of an activity center. This is not to be confused with shopping centers (for which ITE has specific trip generation rates) (*4,* pp. 561–562); however, for the purposes of this project, activity centers are not a focus of this research, but the estimation methodology may be adaptable for use in activity centers.
- **Neighborhoods and Subareas:** ITE notes that any area that has a specific identity and generates large amounts of traffic could be considered an area or subarea with unique transportation issues (*4,* p. 561). For the purposes of this project, neighborhoods can be classified within this concept when they exhibit a mix of interactive uses. Neighborhoods and subareas are not specifically within the focus of this research; however, as with activity centers, the methodology developed by this research may be adaptable for use in neighborhoods and subareas.
- **Transit-Oriented Development:** According to the American Public Transportation Association (APTA), a transit-oriented development (TOD) is a compact, MXD near new or existing public transportation infrastructure that serves housing, transportation, and neighborhood goals. Its proximity to transit services and pedestrian-oriented design encourages residents and workers to drive their cars less and ride mass transit more (*5*). For the purposes of this project, the research team stipulates that the development must be not only near transit, but the transit service must also be convenient to reach, the service must link the development

with other complementary locations, and the development must include land uses that generate activity that can be readily used by transit patrons.

- **Internal Trip:** An internal trip, as defined by ITE, is one that is made without utilizing the major road system (*2,* p. 85). For the purposes of this project, the definition is expanded to include travel within a highly interactive area containing complementary land uses and convenient internal on- or off-street connections that may use short segments of major streets. An example might be a one-block development consisting of residential, office, and retail buildings with convenient sidewalk connections between them and a single parking facility serving all three land uses.
- **External Trip:** An external trip is a trip made between land uses within the MXD and locations outside the boundaries of the development. This excludes internal trips.
- **Internal Trip Capture (Site) Rate:** Internal trip capture for a development site is the percentage of total trips (normally, but not always, vehicle trips when used for typical traffic impact studies) that are made internally to the development without using roads that are external to the site being analyzed. The internal trip capture is most frequently expressed in terms of a percentage or rate, but can be described in other forms such as equations. For example, if retail uses within an MXD generate 10 trips, 3 of which go to other land uses within the development and 7 of which go to external locations, the 3 internal trips are considered internally captured. The internal capture is 3 out of 10 trips, or 30%. MXDs addressed in this project may be a part of a major activity center. The level of internal connectivity and internalization of trips may be different for MXDs and activity centers. Only MXDs of less than 300 acres in size were examined in this project.
- **Internal Trip Capture (Area):** This area can be defined to include all trips made internally to a defined area such that the trips do not use transportation facilities external to the area. For the purposes of estimating impact of such developments and their internal trip capture on the transportation, care must be taken when considering the impact of the internal trips on the (major) public road system passing through the area.
- **Trip Generation:** Trips to or from a specific land use or a group of land uses constitute trip generation. Trips are inbound, outbound, or total.
- **Transportation or Traffic Impact Analyses (TIAs) or Studies (TISs):** TIAs are analyses of the impact of projected travel associated with existing or proposed land development and determination of needed access and transportation system improvements to successfully accommodate the development without undue deterioration of travel conditions.

Scope of Study

Specifically, the project had three objectives: to develop

1. A classification system of MXDs that identifies site characteristics, features, and context likely to influence trips subject to internal capture;
2. A defensible improved methodology for estimating internal trip capture with reasonable accuracy; and
3. A data-collection framework to quantify the magnitude of travel associated with MXDs to determine appropriate reductions below single-use trip generation estimates.

To accomplish these objectives, several tasks were completed:

- Compilation of a state-of-the-practice summary of methods in use to estimate internal trip capture for use in TIS;
- Development of a prototypes methodology to guide the subsequent work;
- Analysis of internal capture relationships;
- Determination of data needs;
- Conduct of a pilot survey to test the data-collection methodology and provide additional data;
- Identification of data gaps and suggest data to be collected; and
- Documentation of the findings, conclusions, and recommendations.

Following a review of available methods, it was determined that there were few methods and little data available that could credibly be used to estimate internal capture for TIAs. As a result, emphasis shifted from analyzing existing data to expanding the database through an additional pilot study. Subsequently, a third pilot study was made possible through funding of a separate project by a different sponsor (Texas DOT). As a result, two additional tasks were added after the three pilot surveys:

1. Analysis and compilation of data in combination with data available from other sources, and
2. Refinement of the estimation methodology and factors and conduct a verification test.

Past Research and Practice

This portion of the chapter summarizes the state of the art as it was at the time the background work was completed.

Land Use Synergy

Interaction of land uses has probably existed since the first settlements had people who performed different types of work. Older towns and cities had all different types of uses within

walking distances since walking was the principal mode of transportation. When suburbanization started to occur in the late 1800s, there began to be separations of different land use types. By the mid 20th century, zoning and single-use areas had become the normal way to develop.

However, a new type of development began to be seen: the major shopping center, followed by regional malls with restaurants, theaters, and other uses. Next came the MXDs, which had combinations of uses. Developers found the mixed- or multi-use developments appealing because such developments offered a way to capture several types of development in one project that was larger than any single project they might create in the same place. Moreover, the interaction and sharing of facilities had the potential to reduce long-term development costs and increase profitability. Trends in MXDs have progressed through many phases—from early urban villages to downtown complexes, early mixed-use towers, atrium developments, and open centers and, most recently, to town centers and urban villages (*3,* pp. 9–22).

What made MXDs work then and now is the interaction and shared-use features. The key to success is synergy between the land uses. Table 1 shows what ULI considers to be major land use combinations that have the most synergy.

Several other factors that affect internal trip capture have been suggested by Steele (*6*)—mixing uses in proximity, clustering, and siting buildings to promote interaction, connectivity between buildings and parcels, and proper time-phasing. To those Cervero added density, diversity, and other factors in design such as accessibility and high-quality pedestrian convenience and provisions (*7*). The Sacramento Transportation and Air Quality Collaborative lists land use balance as one of the most crucial factors in reducing off-site trips (*8*). Filion et al. found that the synergy works best if it is pedestrian-based to reduce the dependence on personal vehicle travel and internalize the trips (*9,* p. 427).

In their evaluation of multimodal areas, Guttenplan et al. discuss the importance of the infrastructure for walking and biking when assessing the performance of the transportation system (*10*). When evaluating internal trip capture for an area, site, or activity center, the presence of safe facilities for pedestrians and bicyclists can be a factor in the ability for a project to attract and internalize higher percentages of trips.

The importance of pedestrian-based design is emphasized in many studies promoting connections between land uses, but adding the transit component completes the overall picture. TODs combine the MXD with good pedestrian connections and direct access to transit. Portland's Land Use, Transportation, and Air Quality (LUTRAQ) approach to land use and transportation planning worked to reduce vehicle-miles of travel (VMT), increase transit usage, increase walking and biking, and reduce trips overall. Internal trip capture was assumed to explain a portion of the VMT reduction based on the design, proximity of uses, and overall accessibility (*11*). In a later study by the Oregon DOT, Reiff and Kim identified several similar characteristics that may influence internal trip capture including density; land use dissimilarity; urban form; proximity to complementary uses (specifically retail-residential); building coverage ratio (i.e., compactness); and local street connectivity (*12*).

Ewing and Cervero identified a number of potential independent variables that might be used to establish travel characteristics of MXD: land use mix, availability of convenience services, accessibility of services, perception of safety, and pleasing aesthetics (*13*). Much of their quantitative findings were derived from regional transportation models and may not be directly adaptable for individual sites and developments.

Kittelson & Associates listed key characteristics to be analyzed for MXDs when determining internal capture rate, which were as follows (*14,* p.7-1):

- Site Characteristics
  - Development size;
  - Land uses and quantity of development for each use;
  - Parking spaces provided for each use;
  - Density of development for each use; and

Table 1. On-site support and synergy in mixed-use projects.

	Degree of Support/Synergy			
Land Use	**Residential**	**Hotel[1]**	**Retail/ Entertainment[2]**	**Culture/Civic/ Recreation**
Office	●●	●●●●●	●●●●	●●●
Residential	●●●	●●●	●●●●	●●●●●
Hotel	●●●●●	●●●	●●●●	●●●●
Retail/Entertainment	●●●●●	●●●●●	●●●●●	●●●●
Cultural/Civic/Recreation	●●●●	●●●●●	●●●●●	●●●

Bullets: ●=very weak, ●●=weak, ●●●=moderate, ●●●●= strong, ●●●●●= very strong.
[1] Synergy is strongest between high-end hotels and condominiums, less so for mid-priced hotels and residences.
[2] Restaurants and food services are the main source of benefit for offices.
Source: (*3*, p. 85.)

  - Proximity of residential and non-residential developments within the development.
- Transit Characteristics
  - Bus or rail routes serving the development;
  - Proximity of transit stops to the development;
  - Transit assistance provided to workers by employers; and
  - On-site connectivity to transit stops.
- Non-Motorized Transportation Characteristics
  - Internal connectivity among land uses (for pedestrians, bicyclists, and motorists);
  - Parking spaces designated for carpools or vanpools;
  - Fee charged for employee parking spaces; and
  - Availability of on-site bicycle amenities.

Gordon and Peers noted that the jobs-to-housing balance was a crucial component to internal capture of trips. People living near where they work were more likely to stay within the development area for daily activities (*15,* p. 144). The Florida DOT (FDOT) cites the following factors to consider when evaluating internal trip capture: remoteness from other developments and areas, development phasing, income compatibility between residents and patrons, competing opportunities, and internal circulation (*16*).

Other factors that have been discussed by the ITE Trip Generation Committee during development of ITE's Trip Generation Handbook as affecting MXD synergy include competing opportunities and proximity, size of both the development and the individual land uses, maturity and viability of the development and its components, and compatibility of patron/employee income levels with the development's uses.

Trip Capture—Sites

The research team reviewed websites and contacted representatives of a cross section of organizations and agencies that prepare or review traffic impact studies (TISs) to determine what surveys or other data may have been completed in recent years. Table 2 summarizes the responses. It had been expected that a significant amount of survey data would be available based on responses to a 2004 ITE member survey; however, it was determined that respondents misinterpreted a question regarding data in hand. Of the 77 persons interviewed, 12 were able to provide data either directly or indirectly related to internal trip capture. Some data had already been acquired by the research team. No additional new survey data was found. Some information related to regional travel modeling was discovered as was some general or limited findings that may be usable as supporting information.

The interviews confirmed that the most frequently used resource for estimating internal trip capture is the ITE *Trip Generation Handbook* (*2,* p. V-39). It contains summaries of studies of internal trip capture for individual sites and developments as available through 1998. With caveats, Chapter 7 of the report provides suggested capture rates and a recommended procedure for use in TIS for proposed developments. The recommended procedure permits estimates for several different land uses and includes a procedure for balancing internalization of trips based on the size of the component land uses. The handbook also contains unconstrained internal capture rates (that assume sufficient quantity of complementary land use to accept internal trips) for office, retail, and residential land uses. These rates are based on surveys that had been made available to ITE by 1998.Capture rates for origins within a multi-use development range between 0% and 53%; for destinations, they range between 0% and 37%. Tables 3 and 4 provide the unconstrained internal capture rates used in the ITE internal trip capture procedure.

The handbook also recommends procedures for data-collection including interview questions. The handbook includes several summaries of key quantitative and qualitative findings from previous studies of trip generation characteristics at mixed-use sites. For each study, available data are presented on the mix and sizes of land uses within the site, the level of internalization of trips within the site, overall trip generation characteristics for the site, and the level of pass-by trips for the site. In most cases, the analyses use traditional

Table 2. Summary of interview responses.

Sources			Have Completed Surveys or Other Information	Suggested One or More Others
Type	Called	Interviewed[1]		
Agency Rep.	35	34	3	9
TIA Preparer	44	35	8	5
Researcher	7	3	0	1
Other	5	5	1	2
Total	**91**	**77**	**12**	**17**

[1] Sources not interviewed were called at least twice and either declined interview or did not return calls.

Table 3. Unconstrained internal trip capture rates for trip origins within an MXD.

From	To	Weekday Percent Trips Captured Internally[1]		
		Midday Peak Hour	P.M. Peak Hour of Adjacent Street Traffic	Daily
Office	Office	2%	1%	2%
	Retail	20%	23%	22%
	Residential	0%	2%	2%
Retail	Office	3%	3%	3%
	Retail	29%	20%	30%
	Residential	7%	12%	11%
Residential	Office	NA	NA	NA
	Retail	34%	53%	38%
	Residential	NA	NA	NA

[1] Based on limited data; NA = not available.
Source: (*2*, p. 93)

Table 4. Unconstrained internal trip capture rates for trip destinations within an MXD.

From	To	Weekday Percent Trips Captured Internally[1]		
		Midday Peak Hour	P.M. Peak Hour of Adjacent Street Traffic	Daily
Office	Office	6%	6%	2%
	Retail	38%	31%	15%
	Residential	0%	0%	NA
Retail	Office	4%	2%	4%
	Retail	31%	20%	28%
	Residential	5%	9%	9%
Residential	Office	0%	2%	3%
	Retail	37%	31%	33%
	Residential	NA	NA	NA

[1] Based on limited data; NA = not available.
Source: (*2*, p. 94)

ITE independent variables. In several cases, new variables are introduced.

Districtwide Trip Generation Study, FDOT, District IV, March 1995. This study sponsored by FDOT was to develop databases of internal capture rates for MXD sites and for pass-by capture rates. Table 5 presents a summary of the characteristics of six surveyed mixed-use sites (*17*). The sites range in area from 26 to 253 acres (with four of the sites being 72 acres or less). The office/commercial square footage ranges between 250,000 and 1.3 million sq. ft. (with three of the sites having less than 300,000 sq ft).

Internal Trips. Table 6 lists the proportion of daily trips generated within the surveyed mixed-use sites, which were internal to the sites. The internal capture rates ranged between 28% and 41% (average 36%).

Three of the mixed-use sites were further evaluated to determine the internal capture rates for different types of tripmakers. As listed in Table 7, the internal capture rates for trips

Table 5. Characteristics of mixed-use sites surveyed by FDOT.

Mixed-Use Site	Site Size (acres)	Office (sq ft)	Commercial (sq ft)	Hotel (rooms)	Residential (units)
Crocker Center	26	209,000	87,000	256	0
Mizner Park	30	88,000	163,000	0	136
Galleria Area	165	137,000	1,150,000	229	722
Country Isles	61	59,000	193,000	0	368
Village Commons	72	293,000	231,000	0	317
Boca Del Mar	253	303,000	198,000	0	1,144

Table 6. Daily internal capture rates at FDOT sites.

Mixed-Use Development Site	Internal Capture Rate
Crocker Center	41%
Mizner Park	40%
Galleria Area	38%
Country Isles	33%
Village Commons	28%
Boca Del Mar	33%
Average	**36%**

made by site workers is typically higher than rates found for visitors to the site (i.e., users of the mixed-use-site services). The rates by trip-maker are consistent across all three sites. On average, 37% of user trips are internal and 47% of worker trips are internal to the mixed-use site.

Finally, three of the mixed-use sites were further evaluated to determine the internal capture rates of individual land uses. Table 8 lists the reported internal capture rates by land use/trip purpose. In general, the higher internal capture rates were reported for trips to/from banks and sit-down restaurants.

Pass-By Trips. Table 9 lists the pass-by trip proportions as determined through intercept surveys for the six study sites. Pass-by trips are made as intermediate stops on the way along a street on the way from an origin to a primary trip destination (*2*, p. 29). Four of the six sites have pass-by rates between 26% and 29%. These rates appear to be high given the size and composition of the developments. Future surveys should attempt to verify these rates.

FDOT Trip Characteristics Study of MXDs, FDOT District IV, December 1993. This study was the predecessor of the March 1995 FDOT trip generation study (*18*). Much of the data that were collected and many of the relationships derived in this first study are included in the 1995 study results described previously. The 1995 study did not report on two relationships presented in the 1993 report: a procedure for estimating internal trips and internal trip capture by time of day.

Internal Trip Estimation Method. Relationships were developed for estimating internal trips as a function of the

Table 7. Internal trip capture rates by type of trip-maker at FDOT sites.

Trip-Maker	Crocker Center	Mizner Park	Galleria Area	Average
Users	37%	38%	36%	37%
Workers	46%	49%	46%	47%
Total	**41%**	**40%**	**38%**	**40%**

Table 8. Internal trip capture rates by land use type at FDOT sites.

Land Use/Trip Purpose	Crocker Center	Mizner Park	Galleria Area
Office (General)	11%	11%	7%
Office (Medical)	–	15%	12%
Retail	36%	30%	42%
Restaurant (Sit–Down)	54%	52%	–
Restaurant (Fast)	26%	–	56%
Hotel	30%	–	29%
Bank	–	48%	62%
Cinema	–	23%	–
Multi–Family Housing	–	11%	50%
Retail Mall	–	–	39%

Table 9. Daily pass-by rates at FDOT sites.

MXD Site	Daily Pass-By Rate
Crocker Center	26%
Mizner Park	29%
Galleria Area	40%
Country Isles	28%
Village Commons	14%
Boca Del Mar	29%
Overall Average	**28%**

combination of two interacting land use types in terms of development units (e.g., residential dwelling units and office/retail square footage). Good relationships were developed for two internal trip type categories: residential-retail and retail-retail. The office-retail relationship was less definitive.

The study presented a working hypothesis that the number of internal trips from one land use type (A) to another land use (B) within a mixed-use site is directly proportional to the size of Land Use A and also proportional to the size of Land Use B. This suggests a functional relationship of the form

$$\textit{Person Trips between A and B} = \textit{Constant} \times \textit{Land Use A} \times \textit{Land Use B}$$

where:

Land Use A = total site land use of Type A in residential units or 1,000 sq ft;
Land Use B = total site land use of Type B in residential units or 1,000 sq ft; and
Constant = a value that is solely a function of the two land use types.

In the equation shown above, the constant can be derived from information collected on person trips between different land use types and on the sizes of these different land uses. Table 10 shows the derived constants.

Application of these coefficients was tested for the three MXDs. Table 11 shows the results (not included in ITE *Trip Generation Handbook* [*1*]) (*16,* p. V-39). Two of the three estimates were within 15% of actual; the third differed from actual by about 25%.

Table 11. Comparison of internal trip capture: estimation model vs. actual.

MXD	Trip Capture	
	Model Estimate	Actual
Country Isles	24.5%	33.0%
Village Commons	31.9%	27.5%
Boca Del Mar	35.0%	32.7%

Source: (*18*, p. V-39)

This study also collected information on internal capture rates by time of day. Table 12 shows the total internal capture rates for the three surveyed mixed-use sites. The estimated daily, midday, and evening peak period internal capture rates are quite similar. The mean values for the entire survey period shown in the table have a high degree of statistical validity; the maximum two-tailed errors calculated using the binomial distribution, with 90% confidence-level methodology, are all less than 5%.

This report also identified the percentage of employees who are also residents and vice versa (*18,* p. V-27). Table 13 shows the findings for each of the three developments (not included in ITE report [*1*]). The 16% to 19% of employees being locally employed are possibly a major factor in the reported internal trip capture rates.

Trip Generation for MXDs, Technical Committee Report, Colorado-Wyoming Section, ITE, January 1986. This study included interviews to determine whether persons entering and leaving mixed-use sites came there for multiple purposes (*19*). Table 14 lists the size and mix of land uses at the eight sites with interviews to ascertain internal trip-making.

Internal Trips. A key piece of information collected was the number of trip purposes that a respondent accomplished on the particular trip to the mixed-use site. Overall, a majority (77%) of the interviewees indicated that their trip involved only a single stop within the mixed-use site, but this still left a significant proportion (23%) who indicated they were making

Table 10. Internal trip coefficients for paired land use types.

Paired Land Uses	Midday Peak Period (12 noon–2 P.M.)	Evening Peak Period (4 P.M.–6 P.M.)	Daily
Residential/Retail	0.00082	0.00103	0.00557
Retail/Retail	0.01219	0.00995	0.07407
Office/Retail	0.00087	0.00024	0.00232

Table 12. Internal person trip ends by time of day.

Time Period	Average Recorded at Three Sites	Range Recorded at Three Sites
Daily	31%	28–33%
Midday Peak Period (12 noon–2 P.M.)	32%	30–35%
Evening Peak Period (4 P.M.–6 P.M.)	30%	28–32%

Table 13. Percent locally employed residents and locally residing employees.

	MXD		
	Country Isles	Village Commons	Boca Del Mar
Residents employed within development	3.9%	NA	0.9%
Employees residing within development	16.1%	16.8%	18.9%

two or more stops within the mixed-use site. Based on these interview results, the study authors estimated that 25% of an otherwise total number of trips generated by individual trips were eliminated with the linking of internal trips within the eight surveyed mixed-use sites.

Table 15 presents the number of trip purposes/stops reported by survey respondents. The responses are arrayed according to the primary destination. Office buildings and a post office generated the greatest number of multi-stop trips. Theaters, restaurants, and banks tended to generate lower-than-average numbers of multi-stop trips within the mixed-use site.

The Brandermill Planned Unit Developments Traffic Generation Study, Technical Report, JHK & Associates, Alexandria, Virginia, June 1984. Brandermill is a large, planned MXD (and, in many respects, is a small town/village) located approximately 10 miles southwest of Richmond, Virginia. At the time of the study (*20*), there were approximately 2,300 occupied dwelling units, with 180 townhouse-style condominiums and 2,120 single-family detached units. Commercial development consisted of an 82,600–sq ft shopping center; a 63,000–sq ft business park; a 14,000–sq ft medical center; and a 4,400–sq ft restaurant. There were also recreational facilities including a golf course, tennis courts, swimming facilities, and several lakeside recreation facilities. Finally, there was a day-care center, a church, an elementary school, and a middle school. The study had the overall goal of determining the onsite (internal) and off-site (external) traffic generation at Brandermill.

Internal Trips. Based on the various data collected, the split between internal and external trips was estimated. As Table 16 shows, 51% of the daily trips, 55% of the P.M. peak-hour trips, and 45% of the A.M. peak-hour trips were internal to (or captured within) the mixed-use site. Additionally, 46% of the persons employed in Brandermill also reside in Brandermill.

Table 14. Characteristics of mixed-use sites with interviews.

Site	Size (sq ft)	Land Uses
1	240,917	Retail, General Office, Government Office, Restaurants, Health Club, Bank
2	731,846	Retail, Office, Restaurants, Hotel
3	500,000	Retail, Office, Restaurants, Motel, Theaters
4	115,000	Retail, Restaurants, Hardware Store, Supermarket
5	1,000,000	Regional Mall, Retail, Restaurants, Banks, Office, Theaters
6	110,000	Retail, Theaters, Restaurants, Banks
7	95,104	Retail, Restaurants, Supermarket, Medical Office, Savings and Loan
8	300,000	Retail, Hardware, Restaurants, Supermarkets, Post Office

Table 15. Percentages of persons within multi-sites by number of purposes (stops) and by primary destination.

Primary Destination	Number of Purposes/Stops Stated by Interviewee		
	1 Purpose	2 Purposes	3+ Purposes
Bank/Savings and Loan	83%	8%	9%
Hardware Store	76%	22%	2%
Supermarket	77%	17%	6%
Theater	93%	7%	0%
Office/Work Site	68%	31%	1%
Small Retail Shop	73%	14%	13%
Restaurant	85%	12%	3%
Health Club	71%	29%	0%
Post Office	63%	24%	13%
Total (Average)	**77%**	**16%**	**7%**

Travel questionnaires were distributed to residences and used to measure the level of internal trip ends for home-based trips. As Table 17 shows, approximately 35% of the daily home-based trips from Brandermill residences are linked with trip ends within Brandermill. Over 39% of the daily trip ends ***to*** Brandermill residences began within Brandermill. For the shopping center trips within Brandermill, approximately two-thirds of the trips originate within Brandermill during the midday and evening peak hours. These internal percentages are higher than the Florida examples.

Other Surveys. As previously mentioned, a study by the Colorado/Wyoming Section Technical Committee of ITE included surveys of eight MXDs ranging in size between about 95,000 and 1 million sq ft with varying combinations of component land uses (*19*). That study recommended that peak-hour trip generation rates be reduced by only 2.5% even though the surveys showed 25% internal trips. The reason is that driveway counts showed a lower reduction below estimates based on ITE rates. While one of the most ambitious of the early studies of internal trip capture, this study illustrates a key point: survey responses depend on how a question is worded, and asking how many trip purposes are being satisfied on one trip to a development may not yield the same responses as asking how many stops or how many different businesses were visited within the development or how many driving trips would have been needed otherwise. It also demonstrates that the effect of a successful (financially) development's additional trips may overshadow internal trip capture (this is also one reason why trip generation data are so highly dispersed). For this project, the research team sought out developments that appeared to be active and had low vacancy rates.

ITE recently conducted a member survey asking about availability of additional studies on internal trip capture (*21*). The survey identified methods currently being used to estimate internal trip capture. Unfortunately, a question that inquired about trip capture data was misunderstood, and responses indicating 48 sources for additional information were incorrect. Other findings are described later in this section.

In *Transportation Research Record 1617,* Steiner studied six shopping districts that were integrated within residential areas and found that in these districts walking was more prevalent, ranging from 24% to 41% of users studied (*22,* p. 29). Steiner

Table 16. Split between internal and external trip ends at Brandermill.

Trips	A.M. Peak Hour	P.M. Peak Hour	Daily
Total Generated	2,570	2,935	33,540
External Trips	1,420	1,325	16,280
Internal Trips	1,150 (45%)	1,610 (55%)	17,260 (51%)

Table 17. Internal trip ends linked with Brandermill residences and retail centers.

Hours	Home-based trips with destinations within Brandermill	Home-based trips with origins within Brandermill
7 A.M. to 9 A.M.	18%	51%
9 A.M. to 4 P.M.	44%	50%
4 P.M. to 6 P.M.	55%	34%
6 P.M. to 7 A.M.	41%	34%
Daily	35%	39%
Hours	**Shopping center trips with destinations within Brandermill**	**Shopping center trips with origins within Brandermill**
11 A.M. to 1 P.M.	66%	65%
4 P.M. to 6 P.M.	66%	52%

used the ITE rates for shopping centers, rather than for mixed use. Steiner compares trip rates from both ITE and *NCHRP Report 187* (*23*) with the local daily trips that occurred in the six shopping districts studied and found situations where the ITE and NCHRP methods overestimate and underestimate trips when compared with the local data (*22,* p. 35). Kittelson & Associates conducted surveys for three mixed-use sites in Florida: the Crocker Center, Mizner Park, and the Galleria area. They found that the rate of internalization of trips ranged between 38% and 41% (*14,* pp. 5–7).

Mehra and Keller reported relationships between the percentage of internal trips and the ratio of office space to residential units and the ratio of commercial space to residential units (*24*). Based on a Richmond Regional Planning District Commission Planned Unit Developments study they had reviewed, they reported finding that A.M. peak-period home-based work trips were internalized at rates between 0% and about 15% and that midday home-based other trip internal percentages ranged up to more than 40%. Both percentages increased as the ratio of office or other commercial space per dwelling unit increased in ranges of more than 80 sq ft/dwelling unit.

JHK & Associates conducted a shared parking study for San Diego that included user surveys. Table 18 shows the results of surveys of office worker trips to internal destinations in two MXDs (*25*). For both developments, 6% of the midday trips made by office workers are to onsite locations.

Table 19 shows the percentage of internal trips to restaurants and retail for five San Diego MXDs. Also shown are percentages of trips made by walking.

Trip Capture—Activity Centers

In a comprehensive study of suburban activity centers, Hooper conducted interviews of employees, patrons, and visitors to office, retail, residential, and hotels within some of the largest U.S. suburban activity centers (SACs) (*26*). That research developed a comprehensive procedure for determining travel patterns, including trips internal to the activity centers. Data were collected at the six SACs listed in Table 20. In the following discussion, larger centers refer to the three centers having at least 15 million sq ft of office/retail space in each; smaller centers refer to the remaining three, which have less than 8 million sq ft.

For activity center residents, Hooper found that 13% to 50% of employed residents work within the activity centers, with the average being 27% to 33% based on activity center size and whether they lived in owned or rented dwellings. An average of 50% of office employees was found to make midday trips outside their buildings; 20% to 33% of those trips were internal to the activity centers. Work-related, eating, and shopping trips were the most common midday trips for office employees. The study also examined stops to and from work during peak periods and found that such stops within the activity centers were made on an average of 13% to 15% of the trips.

Table 18. Internal trips by office workers to onsite destinations.

Internal Trip Purpose	Internal Trips	
Office work location to	**Marriott Mission Valley**	**La Jolla Village Professional Center**
Business	6%	–
Shopping	14%	13%
Eat Meal	29%	–
Health Club	–	–
Other	–	–
Total	**6%**	**6%**

Table 19. Percentage of internal trips to restaurants and retail.

MXD	Origin Percent Internal	Percent Walking	Origin Percent Internal	Percent Walking	Component Land Uses						
	To Restaurants		To Retail		Retail	Restaurant	Gen'l Office	Medical Office	Cinema	Hotel	Residential
La Jolla Village	23%	14%	–	–		•	•	•			
University Square	15%	14%	2%	10%	•	•			•		
Hazard Center	21%	6%	20%	18%	•	•	•		•	•	
La Mesa Village	25%	21%	13%	17%		•	•				•
Point Loma Place	4%	25	–	–	•	•				•	

Hooper found that internal trips involving retail centers within activity centers were higher in larger activity centers. P.M. peak-hour internal trips averaged 24% (7% to 57% range) while midday trips averaged 37% (7% to 68% range). In the A.M. peak periods, hotel trips internal within the large and largest activity centers averaged 19% and 37%, respectively, and 27% and 36% in the P.M. peak period, respectively, with the internal percentage increasing with the amount of activity center office space.

Table 21 presents a summary of some relevant relationships reported by Hooper in *NCHRP Report 323.* Many of the internal trip percentages resemble the 30% order of magnitude reported in some of the studies previously mentioned. From the information provided, it appears that the larger SACs have higher percentages of internal capture. This is logical since larger activity centers (1) offer more opportunities to meet traveler needs and (2) similarly offer more choices to meet a given need.

Zietsman and Joubert conducted extensive studies at three MXDs in South Africa (*27, 28*). They distinguished between internal trips made out of pure convenience and planned internal trips that would have saved a trip on the external road network. Internal capture rates ranging from 5% to 33% were observed depending on factors such as center size, types of secondary land uses, and weekends versus weekdays.

Cervero found that the existence of a retail component in office buildings in major activity centers was associated with an 8% reduction in vehicle trip rates per employee (*29*). Filion et al. found that over 40% of office building employees make restaurant trips outside their buildings, but internal to the activity center, averaging 2.2 such trips per week (*9,* pp. 420, 428–434). About one-third make similar trips for shopping, averaging about 1.6 trips per week. Four times as many retail customers said they shopped within the activity center due to location rather than because of specific retailers located there. About 55% of the internal trips are made on foot (compared with 26% driving and 19% by transit), with preference being given to "easy and pleasant" (pedestrian environment, no traffic conflicts) walking experiences. The researchers noted that more internalization of trips resulted from better balance, proximity, and pedestrian connectivity of interacting uses.

Trip Capture—Neighborhoods, Small Communities, and Subareas

Several studies have been conducted in neighborhoods and subareas to assess the amount of trip internalization as well as the differences in vehicle trip generation. Some have used regional travel modeling to compare characteristics of neighborhoods or areas with different design characteristics. The

Table 20. Characteristics of *NCHRP Report 323* study sites.

Suburban Activity Center	Office Space		Retail Space		Hotel	Residential
	Gross Floor Area	Employees	Gross Leasable Area	Employees	Rooms	Dwelling Units
Bellevue (WA)	4.7 million	12,880	3 million	6,150	1,000	N/A
South Coast Metro (Orange Co., CA)	3.5 million	10,465	4 million	6,865	1,800	2,300
Tysons Corner (Fairfax Co., VA)	17.0 million	35,020	7 million	13,355	3,100	15,000
Parkway Center (Dallas, TX)	13.0 million	39,000	2 million	3,430	1,800	206
Perimeter Center (Atlanta, GA)	13.0 million	32,500	3 million	5,150	910	2,000
Southdale (Minneapolis, MN)	4.0 million	13,700	3 million	6,155	2,200	3,000

Source: (*2*)

Table 21. Internal trip-making characteristics at *NCHRP Report 323* study sites.

	Average	Range
OFFICE EMPLOYEES		
Percent who make an intermediate stop within SAC		
• on the way to work	10%	7% to 15%
• on the way home from work	11%	6% to 16%
Percent who make midday trips internal to the activity center		
• SACs with high level of professional employment[1]	—	29% to 33%
• SACs with low level of professional employment	—	20% to 23%
OFFICE VISITORS—Percent from within activity center		
• A.M. peak period		
o all SACs	—	15% to 59%
o small SACs	30%	—
o large SACs	54%	—
• P.M. peak period		
o all SACs	—	15% to 68%
o small SACs	33%	—
o large SACs	58%	—
REGIONAL MALLS—Percent trips which are internal to SACs		
• Midday		
o all SACs	37%	7% to 68%
o small SACs	23%	—
o large SACs	47%	—
• P.M. peak period		
o all SACs	24%	7% to 57%
o small SACs	14%	—
o large SACs	31%	—
EMPLOYED RESIDENTS—Percent who work within SACs		
• all	—	13% to 50%
• small SACs	27%	—
• large SACs	33%	—
HOTEL TRIPS—Percent internal to SACs		
• A.M. peak period		
o all SACs	—	13% to53%
o small SACs	19%	—
o large SACs	37%	—
• P.M. peak period		
o all SACs	—	15% to 46%
o small SACs	27%	—
o large SACs	36%	—

[1] Sites with at least 60% of the work force in professional, technical, managerial, or administrative positions.
Source: *2, 26*.

research team chose not to include those here since the level of detail is insufficient for use for development sites and the need is for primary data.

In comparative surveys of Austin, Texas, neighborhoods, Handy found that walkable neighborhoods with neighborhood shopping could generate 6.3 walking trips per (adult) resident per month to internal neighborhood retail establishments and that 77% of those apparently substituted for driving trips (*30*). This might correspond to a reduction in the residential vehicle trip rate of 3% to 5%.

Steiner added that higher density puts destinations closer together, making it possible to walk for some trips, thereby reducing vehicle trip generation rates (*31*). She cautioned that other factors such as income, household size, and other factors affect transportation choices and highlighted the importance of separating the effects of those factors.

Ewing et al. used regional travel surveys to identify internal travel within suburban communities in Florida that ranged in size between about 600 to more than 15,000 acres (*32*). Although this is not the development scale sought for this research, it is interesting to note that within complete suburban communities, internal trips averaged about 25% but ranged between 0% and 57%. Ewing et al. attributed the variation to two factors: (1) larger population communities had higher

internal capture rates, and (2) lower *regional* accessibility resulted in higher internal trip capture. This finding is relevant when considering the relative attraction of an internal complimentary use destination given access to similar offsite opportunities of a similar type. According to this study, easy access to regional areas decreases the attraction of fulfilling several trip purposes without increasing trips on non-internal roadways.

Rutherford et al. found that in multi-use neighborhoods, the total number of trips were about the same as for suburban single-use neighborhoods but walk trips accounted for about 8% more of the total trips (*33*). Vehicle availability did not seem to be a factor, but higher household income was associated with fewer walking trips. Over 70% of the walking trips were ½ mile or less, and about 40% were less than ¼ mile. Less than 10% were over a mile. This confirms the importance of proximity and walkability in internalizing trips.

Gordon and Peers note in their research on pedestrian design for a mixed-use community in Sacramento County (Laguna West) that based on the correlation that the National Resources Defense Council has established between urban density and automobile usage, this development may have a reduction in VMT on the order of 20% to 25% (*15,* p. 144). Furthermore, they noted that the job capture rate in this area averaged between 15% to 20% of local residents holding jobs internal to the area, thus reducing trips and increasing the potential for walking (*15,* pp. 144–145).

A 2003 cordon count of Celebration, Florida—a 10-year-old, self-contained MXD of 3,500 developable acres—compared a three-weekday cordon traffic count to estimated trip generation for development existing at that time based on ITE trip generation rates. The comparison indicated that actual daily external trips were 27.7% less than ITE–based estimates. P.M. peak-hour counts were 31.8% less than ITE–based estimates (*34*).

When analyzing the impact of smart growth site design using a travel modeling process for a project in Atlanta, Walters, Ewing, and Schroeer suggested that good site design using TOD and MXD principles conservatively resulted in a 14% to 52% reduction in travel. This evaluation utilized INDEX software in the modeling process, which is discussed later in this chapter (*35*).

A study was conducted to compare trip-making characteristics between a traditional neighborhood development (TND) in Chapel Hill, North Carolina (Southern Village) and a conventional residential neighborhood in Carrboro, North Carolina (*36*). The TND was comprised of 920 occupied dwelling units (611 single-family, 197 apartments, and 112 condominiums); 30,000 sq ft of retail (including a 5,800–sq ft grocery store and a four-screen movie theater); 95,000 sq ft of office; a 90,000–sq ft elementary school (with 606 students); a 6,000–sq ft daycare center; and a 27,000–sq ft church.

A survey of TND residents found that TND households made about the same number of total trips, but made fewer automobile trips and fewer trips external to the site when compared with households in the conventional neighborhood. A survey of the TND businesses found that 5.2% of the employees live within the TND, 39.2% of the business customers/visitors live in the TND, and 18.1% of trips to TND businesses are by walking.

Based on the survey results and vehicle counts taken at the neighborhood access points, the study estimated 20.2% internal capture of all trips made to or from businesses and households within the TND. The comparable surveys and counts at the conventional neighborhood measured 5.5% internal capture. The study postulated that the difference in internal capture (14.7%) is the product of the TND mixing of uses and spatial characteristics.

Other Related Findings

One of the trip characteristics that may be needed to estimate internal trip capture is trip purpose. The International Council of Shopping Centers conducted surveys in 2003 to obtain detailed information on typical office worker lunchtime activities and shopping habits during and after the workday (*37*). Based on about 500 completed interviews in both suburban and downtown locations, retail density is not a crucial factor: employee mode of transportation was more important, with driving employees spending nearly 30% more per week on each category (shopping, food, and convenience items). On average, office workers bought lunch outside their offices three out of five days a week (more often downtown than in suburbs). Some 62% shopped before, during, or after work at least once a week (slightly more in suburban office locations), with an average of 2.6 shopping trips per week. Office workers were reported to make about twice as many shopping trips close to home than close to work. Of their shopping expenditures, almost 60% were on dry goods and about 40% on convenience items. In addition, 32% of respondents socialize after work at least once per week with most stopping one or two times during the week. Those stopping after work for food and drinks were about twice more likely to stop closer to home than closer to work.

TCRP Report 95, Chapter 15: Land Use and Site Design, Traveler Response to Transportation System Changes contains information related to analyzing transit ridership and other travel relationships to land use and site design features (*38*). This report is a compilation of a large number of sources, some of which are related to internal trip capture.

This report concluded that transit mode choice and ridership are highly related to development density if it is coupled with a higher level of transit service. Density alone is not enough (*38,* p. 15-10). Similarly, non-motorized travel (primarily walking and biking) increases with density, but in conjunction with

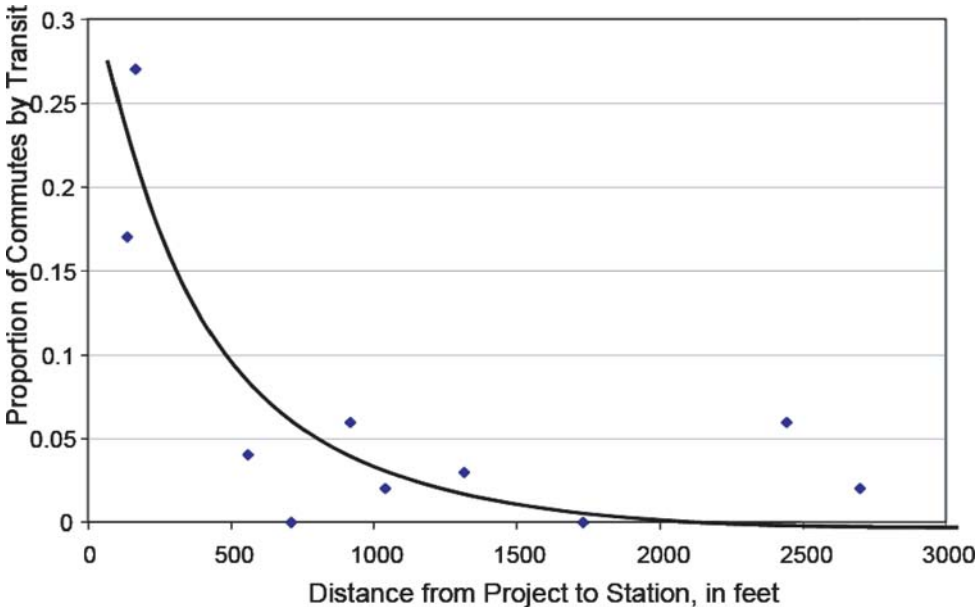
more land use mixing, compactness involving interacting uses, and pedestrian connections. This report concluded that density was not found to be significant by itself in some cases. This report also reports more walking in traditional neighborhoods (mixed use) than in late 20th-century planned unit developments. This report also contains a finding that transit ridership declines with distance of housing to transit, falling 1% to 2% per 100-ft increase in walking distance (*38,* p. 15-31).

A California DOT (Caltrans) funded study confirmed that residential density is insignificant (correlation –0.025) in affecting transit ridership within a 1-mile radius of a transit station (*36*). Street connectivity was found to have the highest correlation (+0.373). Walking distance to the transit station was found to have a significant affect, as Figure 1 shows. The number of walking conflicts is more influential (–0.11 correlation) as is presence of sidewalks on one or both sides of the street (+0.171 and +0.150, respectively). That research concluded that sidewalk width, landscaping, and number of intersections have insignificant influence on transit ridership.

TCRP Report 95, Chapter 15 also reports that vehicle trip generation is 1% to 3% less when improved pedestrian access is provided at regional shopping centers and 6% to 8% less for office employee vehicle trips at the edge city office buildings containing retail (*38,* p. 15-12). This source also reported that Steiner found decreased vehicle use in higher-density residential areas because of closeness, safety in numbers, and attraction of supportive lifestyles that support walking (*38,* p. 15-18). The report contains elasticities of –0.10 for total VMT related to density and –0.05 for vehicle trips related to density, but (1) those elasticities reflect other urban area conditions and (2) the elasticities are derived from regional travel forecasting zonal databases and may not be directly transferable for this internal trip capture research (*38,* p. 15-23). The same report shows that good pedestrian environment and transit versus bad results in about 21% less trips per household and 46% less household VMT (*38,* p. 15-28).

TCRP Report 95, Chapter 15 also examined the relationship between jobs/housing balance and trip making. Most findings showed significantly better balance results in shorter trips, but not fewer trips (*38,* p. 15-41). The quantified results reported in this report varied widely, but one finding was that the "best new communities in the United States" are estimated to achieve 31% to 37% internal commutes (*38,* p. 15-41). Job balance was also reported to result in employees taking jobs closer to home, although the quantification relates to inside or outside city of residence rather than distance per se (*38,* pp. 15-44 through 15-45). The same report indicates that land use balance/mix has an elasticity of –0.10 related to household VMT and that land use balance/mix has an elasticity of +0.23 related to walk/bike trip elasticity (*38,* pp. 15-47 through 15-51). Another source quoted in this report indicates that local land use balance/diversity has an elasticity of –0.03 related to vehicle trips (*38,* p. 15-48).

The same report contains information on residence and shopping land use mix in traditional neighborhoods—those with shopping in or adjacent to and well connected with housing areas. Table 22 shows the relationship between the percentage of survey respondents living within ½ mile of shopping and the number who reported walking to shop (*38,* pp. 15-52



Source: *39,* p. 101.

Figure 1. Percentage of transit commutes by walking distance from station.

Table 22. Comparison of shoppers who walk to shopping with percentage of residents within one-half mile of shopping.

Traditional Shopping Area	Residents Living within 1/2 Mile of Shopping Area	Percent Walking Trips	
		Weekday	Saturday
Rockridge—Market Hall (full array, restaurants)	24%	26%	28%
Rockridge—Alcatraz (grocery, specialty)	40%	38%	41%
Elmwood (convenience, specialty)	33%	28%	36%
El Cerrito Plaza (full array)	12%	10%	10%
Hopkins Specialty (food)	32%	23%	29%
Kensington (convenience, services)	58%	20%	27%
All Areas	**32%**	**24%**	**28%**

through 15-53). This table shows a very close relationship between residential location and the percentage of residents who walk.

Hooper showed in activity center surveys that an integrated development—the Dallas Galleria—had a midday walking trip share of 17% while other suburban activity centers with nearby, but mostly auto-accessible, complementary uses had walk shares of only 2% to 7% (*38,* p. 15-61).

TCRP Report 95, Chapter 15 reports that land use mix in activity centers reduce midday vehicle shares, at least to major retail, and that land use mix influences choice of vehicle or walk access, with greater mix associated with less vehicle use and more walk access (but not transit access) (*38,* p. 15-55). Another researcher found that vehicle trip generation rates at office buildings in suburban activity centers were 6% to 8% lower than normal and transit trips were about 3% higher than normal. The same source reported vehicle occupancy rates for 1 million–sq ft office buildings averaged 0.8 more passengers per work trip than for buildings half that size (*38,* p. 15-62). For activity centers with major office concentrations, for every 10% addition of retail or commercial uses, there was a 3% increase in non-single occupant vehicle commuting (+0.30 elasticity) (*38,* p. 15-64). Similarly, it was reported for Seattle that walking is about twice as prevalent in mixed-use neighborhoods than for suburban-type neighborhoods, although walk percentages varied by location in the region (*38,* p. 15-72).

The same report shows that household income has more effect on mode choice and on total trips per household than does whether the development is a traditional or conventional suburban neighborhood (*38,* p. 15-78). Table 23 shows results of a survey in Orange County, California. Similar walk

Table 23. Trip rates and mode share in different neighborhood types, Orange County, California.

Travel Parameter	Income	Neighborhood Type		
		Traditional neighborhood development	Planned unit development	All types
Mean daily trips per household	Low	6.4	7.2	6.5
	Medium	8.8	10.7	9.9
	High	10.8	12.3	12.5
	All	8.2	10.9	9.6
Mean daily vehicle trips per household	Low	5.1	6.6	5.6
	Medium	8.0	9.7	8.8
	High	10.2	11.3	11.6
	All	7.0	9.8	8.5
Percent by vehicle	Low	80%	91%	86%
	Medium	91%	91%	90%
	High	94%	92%	92%
	All	86%	91%	89%
Percent by transit	Low	6%	3%	3%
	Medium	2%	2%	2%
	High	1%	1%	15
	All	4%	3%	3%
Percent by walk	Low	15%	11%	11%
	Medium	7%	7%	7%
	High	5%	7%	7%
	All	9%	8%	8%

Table 24. Transit share at work sites with alternative land use characteristics.

Conditions	Principal Land Use Characteristic[1]	Percent Trips By Transit	
		With Land Use Characteristic	Without Land Use Characteristic
Offices, residential, retail, personal services, parks within $\frac{1}{4}$ mile of site	Substantial land use mix	6.4%	2.9%
Four or more services, service frequency, sidewalks, transit, transit stops	Accessibility to services	6.3%	3.4%
Restaurant, bank, child care, dry cleaner, drug store, post office	Availability of convenience services	7.1%	3.4%
Sidewalks, street lighting, pedestrian activity, no vacant lots	Perception of safety	5.4%	3.6%
Trees, shrubs in sidewalk zone, wide sidewalks, small building setbacks, no graffiti	Aesthetic setting	8.3%	4.2%

[1] Sites also have TDM programs.

mode results were reported for a pair of neighborhoods in northern California (*38,* p. 15-79).

Transit mode shares at work sites vary based on different land use characteristics. As Table 24 shows, transit ridership is higher—approximately double—with substantial land use and services mixes than without (*38,* p. 15-86). Providing safety and aesthetics also produce greater willingness to use transit.

Table 25 shows some bottom line elasticities contained in *TCRP Report 95, Chapter 15* (*38,* p. 15-117). Local density, diversity, and design all have modest impacts on both vehicle trips and VMT. A Portland, Oregon, METRO report found a source that concluded that residents of mixed-use, gridded neighborhoods in the San Francisco area made 15% fewer automobile trips and 22% more walking trips than did residents of typical suburban neighborhoods (*40*). It is not clear if other factors were kept constant.

Current Practice

When using TIS became more widespread during the 1970s and 1980s and developers took more interest in mixed- and multi-use development during the same period, traffic study preparers and reviewers began to focus on internal trip capture. In a 1993 survey of 15 Texas cities that required TIS, 11 permitted reductions for MXDs (*41*). One had a set reduction percentage and a minimum development size; the others required justification, and what constituted acceptable justification varied. A national survey in 1994 indicated that 17% of responding agencies that required TISs permitted reductions for mixed use (*42*). Permitted reductions reported averaged 10%.

Procedures vary significantly—for example, Destin, Florida, states that any claim for internal capture rate must be justified by the applicant based on empirical data for similar land uses located in similar urban environments. Data are to be from a source generally acceptable to the transportation planning profession. Any internal capture rate exceeding 25% must be justified and approved by the city (*43*). The City of Tempe, Arizona, simply requires that capture rates and sources of information be documented and limits internal capture to no more than 15% (*44*). The City of San Diego uses a simple method. It stipulates internal capture reductions to be used, providing a table of reductions by land use type (i.e., residential, industrial, office, or retail) by time of day (i.e., daily, A.M. peak, and P.M. peak) (*45*). Table 26 is a reproduction of San Diego's table. Retail reductions are permitted only if the retail is neighborhood oriented and more than 100,000 sq ft. All three approaches are used in a variety of cities. San Jose, California, limits internal capture to a maximum of 10%, but provides a bonus if there is a commitment to travel demand management programs and if nearby transit is available in addition to the site being mixed use (*46*). In California, Caltrans indicates that internal trip capture rates may exceed a 5% reduction, but requires approval and review with transportation staff (*47*). Table 27 was compiled by the research team

Table 25. Typical travel elasticities related to land use density, diversity, and design.

Characteristic	Description	Elasticity	
		Vehicle Trips	VMT
Local density	(residents + employees)/ land area	−0.05	−0.05
Local diversity (land use mix)	Jobs/population balance	−0.03	−0.05
Local design	Sidewalk completeness, route directness, street network density	−0.05	−0.03

Table 26. Permitted internal trip capture reductions, City of San Diego.

Land use within MXD	Percent weekday internal trip reductions for MXDs that include predominantly neighborhood-oriented commercial retail		
	A.M. Peak Hour	P.M. Peak Hour	Daily
Residential	8%	10%	10%
Industrial	5%	5%	4%
Commercial Office	5%	4%	3%
Commercial Retail	*	*	*

* Commercial retail reduction equals the sum of the total mixed-use reduction in residential, industrial, and commercial office.
Source: (*45*)

and lists a total of 21 agencies and their requirements for accounting for internal capture for MXDs.

For the U.S. Environmental Protection Agency, Criterion Partners developed geographic information systems (GIS) based software, INDEX. The INDEX software assists in determining the impact of a variety of community design characteristics on vehicle trip generation and VMT (*48*). As inputs to vehicle trips and VMT, the procedure uses population and employment density; population and employment balance (as an indicator of mixed land uses); street network and sidewalk densities; distance to transit; and travel times. The methodology is calibrated and applied at the traffic-analysis-zone level. It uses zone-level regional travel model trip generation as a base and applies elasticities associated with the factors listed above. It does not directly use specific land use trip generation rates or equations of the type typically used in TISs.

ITE's *Trip Generation Handbook* includes a detailed method for estimating internal trip capture (*1*, Ch. 7). It is based on

Table 27. Internal trip capture rates for selected agencies.

State	Agency	Internal Trip Capture Procedure						
		Max or flat %	Justify/ agency approval for higher rate	Agency approval	ITE *Trip Generation Handbook* procedure	Verify with survey	Formula or table	Other
AZ	Phoenix	● (10–15%)						
	Tempe	● (15%)						
	Tucson				●			
CA	Caltrans	● (5%)	●					
	L.A. County			●		●		
	Newport Beach	● (10%)						
	Pasadena		●		●			
	San Diego						●	
	San Jose	● (10%)						TDM bonus
CO	Boulder			●				
FL	Destin	● (25%)	●					
	FDOT				●			Additional considerations
	Gainesville				●			
	Orlando				●			
GA	GRTA				● (modified)			
IN	Indianapolis				●			
NM	NMDOT				●			Prescribed by city
TX	Austin				●			Other approved sources
	Plano				●			Or citywide study
WA	Seattle				●			
D.C.	Washington				●			Documented alternative

Source: Texas Transportation Institute.

complementary land use by number of development units, trip generation rates, and trip capture percentages for any given pair of land use classifications for which data are available and provides a balancing computation to ensure the origin and destination land uses can send and receive the same number of internal trips. It assumes convenient internal connectivity. It depends on empirical data supplied from surveys; data in the handbook are from studies transmitted to ITE.

The Georgia Regional Transportation Authority (GRTA) requirements represent a more specific approach now more commonly used (*49*): it requires use of the ITE–recommended practice as documented in ITE's *Trip Generation Handbook* (*1*). However, GRTA modifies the procedure in accordance with a table that reduces the adjustments according to a combination of distance between complementary uses and whether bicycle/pedestrian facilities are provided (see Table 28). Any other claims for internal trip reductions must be approved by GRTA in advance.

A survey conducted in 2004 by ITE indicated that 64% of the respondents use the method provided in the *Trip Generation Handbook* (*50*). The responses were from a combination of preparers and reviewers, so the percentages should not be interpreted as representing the portion of agencies that require a given method. Multiple responses were permitted, so the total does not add to 100%. A total of 12% reported they use locally established methods; 34% reported they use rule of thumb (usually specific percentage) methods; and 19% reported they use other detailed methods. The locally established and other methods include engineering judgment, specific considerations, state DOTs or other guidance, distance-based method, ULI shared parking rates, results from surveys, and travel forecast model. Land uses for which internal capture estimates are desired were most frequently reported to include retail, residential, office, hotel, health club, theater, and conference center, but several other uses were also mentioned. Those that collected new data usually have done so mainly through interview surveys, although several other methods were reported including traffic and turning movement counts, parking durations/turnover, and field observations.

Additionally, Kittelson & Associates note that it is not advisable to apply internal capture rate reductions in very-high-density MXDs that generate activity that exceeds suburban development because the rates developed by ITE were based on suburban vehicle-oriented travel patterns and may be lower than the same land uses in high-density MXDs (*14,* p. 7-3).

URBEMIS2002, a national model for calculating air-quality impacts of projects, contains adjustments to reflect the effects of several land use and design factors discussed earlier in this chapter. Internal trip capture-related factors specifically included in formulas that compose the adjustment factors are as follows (*51, 52*):

- Net residential density (households per net acre; excludes land consumed by arterial right-of-way);
- Mix of land uses (based on number of study area [0.5 mile radius] households and employment—a jobs/housing balance—with a 2% bonus for inclusion of retail within the study area);
- Transit service index (function of buses stopping within ¼ mile of site, number of rail or bus rapid stops within ½ mile of site, number of dedicated daily shuttle trips);
- Pedestrian/bike score (function of intersection density, and sidewalk and bike lane completeness); and
- Parking supply (function of parking provided/ITE parking generation rate).

Formulas are provided for each of the reductions, but the documentation does not provide complete explanations of how the formulas were derived, and it appears that at least one formula (reflecting residential density) is based on assumptions that are not supported. Nevertheless, URBEMIS2002 provides for air-quality emissions estimation trip reductions of up to the amounts shown in Table 29. The numerical information was developed using a variety of sources including some referenced above. Further review of additional supporting documentation would be needed before the formulas should be considered for use in this project's improved estimation method. The reports' text states that redundancy has been removed by using reduction factors within the equations. Ewing slightly deviated from the standard classification of trips in the modeling process when studying communities in Palm Beach County. Ewing treated trips as part of tours rather than home-based or non-home-based (*53*). Assessing trips as part of a multistop and multipurpose tour or activity-based traffic

Table 28. Adjustments to ITE *Trip Generation Handbook* mixed-use internal trip capture rates.

Bicycle/pedestrian facilities provided	Percent of full reductions allowed by distance between complementary uses			
	¼ mile or less	¼ – ½ mile	½ – ¾ mile	> ¾ mile
Yes	100%	67%	33%	None
No	67%	33%	None	None

Source: (*49*)

Table 29. URBEMIS2002 trip reduction credits related to internal trip capture factors.

Physical Measures	Land Use Type	
	Residential	Non-Residential
Net residential density	Up to 55%	Not applicable
Mix of uses	Up to 9%	Up to 9%
Local-serving retail	2%	2%
Transit service	Up to 15%	Up to 15%
Pedestrian/bicycle friendliness	Up to 9%	Up to 9%
Total	**Up to 90%**	**Up to 90%**

Source: (*51*, p. 3)

modeling is an enhancement to standard modeling that may address internal capture rates more effectively.

Some have tried to adapt the ULI shared parking method for use in estimating trip generations for MXDs. While the ULI shared parking method is applicable to MXDs, it is valid only for estimating parking accumulation and not for trip generation estimation (*54*); however, it is apparent that some preparers are using it to estimate internal trip capture.

Trip Capture Variables

Travel is affected by a myriad of factors ranging from travelers' own demographic characteristics to characteristics of the trip destination. Extensive research has been conducted related to travel behavior. For example, it is widely accepted that income levels and vehicle ownership affect the magnitude of a person's and household's travel. Travel time, travel distance, available travel modes, residential development density, and other factors have all been shown to influence travel characteristics. Table 30 lists a wide range of variables that could influence internal trip capture. Also listed are considerations that are applicable in selecting a smaller set of variables for consideration in developing an improved estimation procedure.

Table 30 also lists (in the first column) the final candidate variables selected by the research team for consideration in developing an improved estimation method. These variables were selected based on causal relationship to internal trip capture, ease of quantification in the field and from preliminary site plans, potential data availability, data collection complexity, and likelihood of acceptance by the user community. Chapter 3 addresses these variables more fully.

Trends in MXD and classification of land uses found in MXDs are covered in Appendixes A and B.

Summary

These findings revealed several estimation techniques and a lot of related data and research findings, but detailed surveys of only seven MXDs (six in two Florida studies and one in Virginia). Hard-copy survey data were acquired for the six Florida sites. All were completed by the mid-1990s, prior to the time that ITE published the first edition of its *Trip Generation Handbook* in 1999 (*55*), which as an ITE–recommended

Table 30. Candidate independent variables.

Use	Variable	Anticipated Sensitivity	Comments
No	Density/compactness	High	Combine as a single independent variable (proximity)
√	Proximity	High	
No	Connectivity	High	
No	Parking	Moderate	Reflect instead in mode of access that may be considered similar in effect. Parking-supply constraints reduce total trip generation but may not significantly change internal trip capture *percentage*. Normally only a factor in central business districts (CBDs), TODs; such sites may require special study anyway. Add parking garage "access time" to impedance used for "competing external opportunity" model component.
√	Land use synergy	High	Use as "yes/no" variable to match users among site land uses
√	Balance of land use quantities	High	Use as control check
No	Principal trip purpose to site	High	Covered largely by land uses and time of day
√	Mode of access	Moderate	Driver trips can be associated with mode of access to site for primary trip. Primary trip purpose strongly influences mode of access. Will be a significant factor where good transit service exists.
√	Time-of-day	Moderate	Provide one trip capture table for each time period of interest (e.g., weekday A.M. peak hour, P.M. peak hour, midday; Saturday peak hour)
	Day of week, season	Moderate	
No	Competing external opportunities	High	Attempt to quantify if data can be found. Data expensive to collect.

practice (approved by its International Board of Direction) contained the first endorsed internal trip capture estimation technique for use in TISs for MXDs.

Most public agencies and preparers of TISs use the ITE method (or a locally developed variation of the ITE method). The two other approaches that are also commonly used are (1) a local agency accepted or established internal trip capture reduction percentage to apply to estimated site vehicle trip generation and (2) negotiations between the study preparer and agency reviewer.

Developers, through payment for TIS, have typically funded most previous site trip generation research; however, since the appearance of the ITE *Trip Generation Handbook* that endorsed an estimation method and provided some data on capture rates for the most frequent mixed uses, a combination of high cost of internal trip capture data collection and an existing accepted method have resulted in no new comprehensive data.

Since the late 1980s, there have been numerous studies of various census and regional travel survey databases, limited site data collection, and studies and surveys of related travel and development characteristics that could contribute useful material for developing an improved estimation technique. Many studies were related to mode of access and finding ways to promote transit usage, including through use of land use and development tools such as TODs. Internal trip capture rates found in the research vary widely depending on conditions and land uses, but for developments with major commercial components, capture rates (percentage of trips made from internal points to internal destinations) typically ranged up to more than 30%. For mixed-use neighborhoods and small communities, internal capture reached 50% and even higher. Interaction between individual pairs of land uses, in the proper balance, also was found in similar ranges; however, it appears from the available data that few developments (all uses combined) completed by about 2000 can typically be expected to have internal capture rates much above 30%, and that percentage requires the right mixes and balances of land use mix.

Besides land use mix, other factors were found to affect internal trip capture. These include connectivity and proximity between interacting land uses and location within an urban area (thought to reflect both competing opportunities and modal options). Conflicting information was found on the effects of development density. Modal impacts found were attributed to proximity to transit (with good service). Trip generation rates and mode split were found to be affected by such traveler characteristics as income and vehicle availability. However, no site-internal travel data have been collected that included those characteristics, and they would be hard or impossible to accurately project for a proposed development at the zoning stage.

Conclusions

Based on this review of past work and the personal experience of the research team, the following were selected as being a reasonable starting place for NCHRP Project 8-51 to develop an improved internal trip capture estimation method:

- To be of value, the project should address both mixed-use and multi-use developments (hereafter referred to in combination as MXDs).
- Activity synergy between the different uses within an MXD is what captures trips internally. Other factors contribute to making this synergy and interaction both possible and more or less attractive compared with other opportunities.
- Land uses that are most frequently identified as having synergy of the type that affects trip making *and* that are commonly included in MXDs include residential; retail (especially convenience); office; hotel; restaurant; and entertainment (theater). However, within each general land use classification, there will be a need for subclassifications if a method is to be easily and accurately applied. Chapter 3 addresses land use categories.
- The research team identified other characteristics most likely to influence internal trip capture and be most readily developed in actual practice. Table 30 lists these characteristics.
- Trip capture has been studied at essentially three development levels: single-site project, larger multi-site development and activity centers, and neighborhoods and subareas. The issues and challenges are similar, but some implications of internal trip capture are different and the extent and complexity of data collection will be different. Findings at each level may not be directly transferable, at least quantitatively.
- Specifically, there are more different scales of mixed development that may act somewhat differently or have to be treated or have data collected in different ways:
  - Single developments;
  - Blocks of separate interactive developments;
  - Small areas of blocks containing interactive uses;
  - Neighborhoods and districts with multiple interactive uses;
  - Mixed- and multi-use subdivisions;
  - Multi-use activity centers; and
  - Small communities.
- The sites for which travel data were used to develop the recommendations in this study are all single master-planned developments. Mockingbird Station is a single block. Atlantic Station and Legacy Town Center are multiple block districts containing fully integrated and adjacent complementary uses. Boca del Mar, Country Isles, and Village Commons all contain pod-type mixtures of single-use development within a single development to provide the mixed-use interaction.

- Trip capture percentages vary greatly among land uses and development types. They also vary by time of day and probably to some extent by the day of week and by season. Various studies have found internal trips make up as little as 0 and as much as more than 60% of total trips generated. Several studies included multiple developments or areas and were able to compute averages.
- The extent to which trips are captured internally may also be influenced by other factors, such as
  - Availability of personal vehicle during the stay at the primary destination (accounted for by mode of access);
  - Match between traveler characteristics and characteristics of potential destinations (e.g., market position versus income levels);
  - Availability of competing onsite and off-site opportunities; and
  - Internal and external accessibility (including such factors as proximity, connectivity, cost, comfort, attractiveness, convenience, parking availability, etc.) to desired activities.
- Local data or more diverse and representative data points regarding internal trips associated with the different MXDs and multi-use-development types is needed to improve the accuracy of predicting trips for MXDs.
- Despite the availability of the method provided in the *Trip Generation Handbook,* several other methods are being used. Some are arbitrary (e.g., set or maximum percentages), and a few are incorrect for application to transportation or TIA or studies (e.g., ULI shared parking percentages). It appears that only the ITE method balances internal trips based on the amount of each interacting land use.
- Two methods are most currently used for estimating internal trip capture: The ITE method contained in the *Trip Generation Handbook,* 2nd edition (*1*), and percentages that local agencies establish as acceptable. In many cases, these methods are specified in local agency TIS requirements or even ordinances. Both approaches are easy to use and require minimal data.
- Since the advent of the first edition of the *Trip Generation Handbook* in 1999 (*55*), there has been wide acceptance of internal trip capture percentages contained in the handbook or lower values accepted by review agencies. The cost of internal trip data collection is high compared with other TIS components, which has resulted in little incentive for developers to fund collection of new data. Obtaining developer commitments to fund additional data collection may be a challenge unless there is expectation of major increases in internal trip capture credit.
- Little detail was found in the literature on data collection methods. The research team's familiarity with data collection for internal trips has revealed a relatively high cost necessitated by interviews, a low return rate on intercept mail-back surveys, and, most crucially, significant variability in questions and the way they were asked—which affects data stability and accuracy. A standard, low-cost method for collecting data is needed.
- Travel forecast models have been used to provide the basis for internal trip estimation and even directly to estimate internal trips. Given the absence of intrazonal trips on the model network and limits to traffic analysis zones, these travel models are not usable for estimating internal trips for TIS or traffic impact fee use.

In conclusion, the estimation and data-collection methods developed by NCHRP Project 8-51 should be easily used, explained, and understood so that they can be used in zoning cases and other TIS applications as well as for other more sophisticated uses. They should also be as economical as possible while supplying enough data to be reasonably reliable.

CHAPTER 2

Research Approach

The approach used to develop an improved estimation procedure and data-collection methodology consisted of the following 12 sequential steps:

1. **Compile and review existing data, practices, research, technical papers and articles,** and other information from published, Internet, and informal sources. One source was a survey conducted by ITE that asked respondents whether they had data from studies of MXD.
2. **Call sources of data or authors of documents** containing information of interest to obtain more details about data, procedures, applications, and lessons learned.
3. **Develop a summary of practice and available data.**
4. **Determine what gaps exist in the data quantifying internal capture** as well as estimation procedures and data-collection methods; this also included assessing the strengths and weaknesses of the data and methods being employed.
5. **Change emphasis to collecting new data.** The intent was to analyze and synthesize a potentially improved estimation procedure from the available data. The researchers found that the reported data available from respondents to the ITE survey were almost all estimates of internal capture used in TISs or related types of studies: there were little actual survey data available. As a result, the researchers, in conjunction with the NCHRP Project 8-51 Panel, decided to shift the emphasis from analyzing existing data to collecting new data to add to the usable existing data.
6. **Develop a proposed land use classification system** that could be used both in the long term with an expanded database and in the short term with an initial smaller database. The land use classification system should be reflective of current and anticipated development trends for MXDs.
7. **Develop an improved estimation methodology for calculating internal capture for MXDs** in a manner that would be usable for at least TIS, using the land use classification system for structure. A key feature was that the input variables need to be known at the stage of development during which rezoning occurs. In some cases, preliminary TIAs may even precede zoning (e.g., platting or subdivision). The procedures needed to be readily usable by analysts in consulting firms or public agencies and need to rely upon information that would be almost certainly available or very easily obtainable in all instances.
8. **Develop a methodology for collecting internal capture data in a manner that could be accomplished at a wide variety of MXDs** using proven data-collection methods and tools for a reasonable cost.
9. **Conduct a pilot study to test and then refine the data collection tools and procedures.** With the shift in priority mentioned in Step 5, a second pilot study was added. Subsequently, a separate sponsor agreed to fund a related study that provided a third pilot study site and the resulting data.
10. **Add the pilot study data to the existing base** of usable data and develop the computational factors needed to populate the estimation method and tools.
11. **Conduct a validation test** to determine how well the estimation procedure reproduced the external trips obtained in the surveys at pilot and other sites.
12. **Recommend methodologies** for both estimation of internal capture and collection of internal capture data.

The desire was to create an improved method that would produce the following outputs:

1. A.M. and P.M. peak-hour internal person trips by land use in origin-destination form;
2. A.M. and P.M. peak-hour percent internal capture (person trips); and
3. A.M. and P.M. peak-hour inbound, outbound, and total external trips (trips to and from the development being analyzed) by mode
   - Person trips,
   - Vehicle trips,
   - Transit trips, and
   - Non-motorized trips.

A key decision made early in the process was to use an estimation method usable with base trip generation estimates from other sources (such as the ITE *Trip Generation Handbook* [*1,* Ch. 7] or local data). This decision was reached for the following reasons:

1. Relieve the method to be developed in this project from largely having to duplicate what has been accomplished over several decades to assemble the ITE and other local trip generation rate databases,
2. Make available a procedure that could be applied to MXD person trip generation that has been developed from any source,
3. Enable users more flexibility in how they conduct the remainder of their analyses, and
4. Focus resources on examining internal capture relationships and developing an improved estimation method.

A second important decision was to develop a method that could grow with the size of the internal trip capture database. The background review found that there were little data available at the necessary level of detail. The researchers recognized the need to be able to work with a small database to develop the methodology, but also saw potential advantage to being able to make the method and tools more sophisticated as the database becomes larger. For example, land use classifications could initially be basic (e.g., residential), but later be split into separate classifications (e.g., single unit detached, townhouse, and multiple family).

The project panel reviewed results and provided suggestions at several junctures, beginning with the initial work scope. There was interest in both studying and surveying different types of MXDs. In the end, current and projected development trends and the limited data narrowed what could be included. The results documented in this report are for what are essentially single developments (i.e., one master developer developing under a single master plan on contiguous sites). Most are on multiple urban blocks. Site sizes range from less than 10 to more than 300 acres. Some could be considered "pod" developments—that is, developments with multiple uses that are adjacent to each other, but not truly mixed together. Others are more fully integrated with closer proximity of interacting uses. However, all of the developments meet the definitions and characteristics identified in this project for MXDs (see Chapter 1 and Appendixes A and B).

CHAPTER 3

Findings and Applications

Chapter 1 provides background about MXDs and current practice in estimating internal trip capture for MXDs. It also describes what was available from existing data found from other sources. Chapter 3 describes the findings from the pilot studies and the compilation of usable data into the estimation procedure. Appendix B provides details about the land use classification system. Appendix C describes the data-collection methodology. Appendix D summarizes the experiences and lessons learned when conducting the surveys.

Pilot Study Surveys

The following are the results for the pilot study surveys conducted.

Mockingbird Station

Development Characteristics

Mockingbird Station is a midtown mixed-use TOD in Dallas, Texas, consisting of five primary land use types: residential, retail, office, restaurant, and cinema. Figure 2 shows an aerial photograph of Mockingbird Station. Figure 3 shows the site plan for Mockingbird Station. The site plan is of the second-floor level, but the notes describe what is on each of the levels of each building. Not shown is a parking garage beneath the surface parking area between the two north-south buildings; this garage serves the loft apartments. The parking shown at the north end of the site also extends below the two buildings on the north end of the site. That parking is available to all users. Lower portions of the garage in the west building are also open to any user; upper spaces are reserved for the office building. However, almost no one other than office building occupants or visitors was observed by the survey crew to have used this garage during survey periods.

Mockingbird Station is bordered on the east by a Dallas Area Rapid Transit (DART) station and transit center on a light-rail line that splits just north of the station. Mockingbird Station has direct access to the station as well as to the transit center that is served by six bus routes. Five routs are year round; the sixth provides shuttle service to nearby Southern Methodist University (SMU) when school is in session. Bus service headways range from 6 to 20 minutes during weekday peak periods, from 20 to 45 minutes during daytime off-peak periods, and 45 to 60 minutes during the late evening hours. Bus service on most of the routes begins before 5 A.M. and continues until about 12:30 A.M. Two routes run slightly shorter schedules. The two light-rail lines have peak-period service ranging between 6 and 10 minutes, with daytime off-peak service ranging between 20 and 30 minutes and evening weekday service at about 30-minute headways.

Mockingbird Station is bounded by Mockingbird Lane, a six-lane arterial on the south and US 75, the North Central Expressway, an eight-lane freeway on the west. To the north, Mockingbird Station is bounded by another development containing an office building and a health club. There is no vehicular access between the two developments, but there is a connecting pedestrianway about midway along the boundary between the two developments.

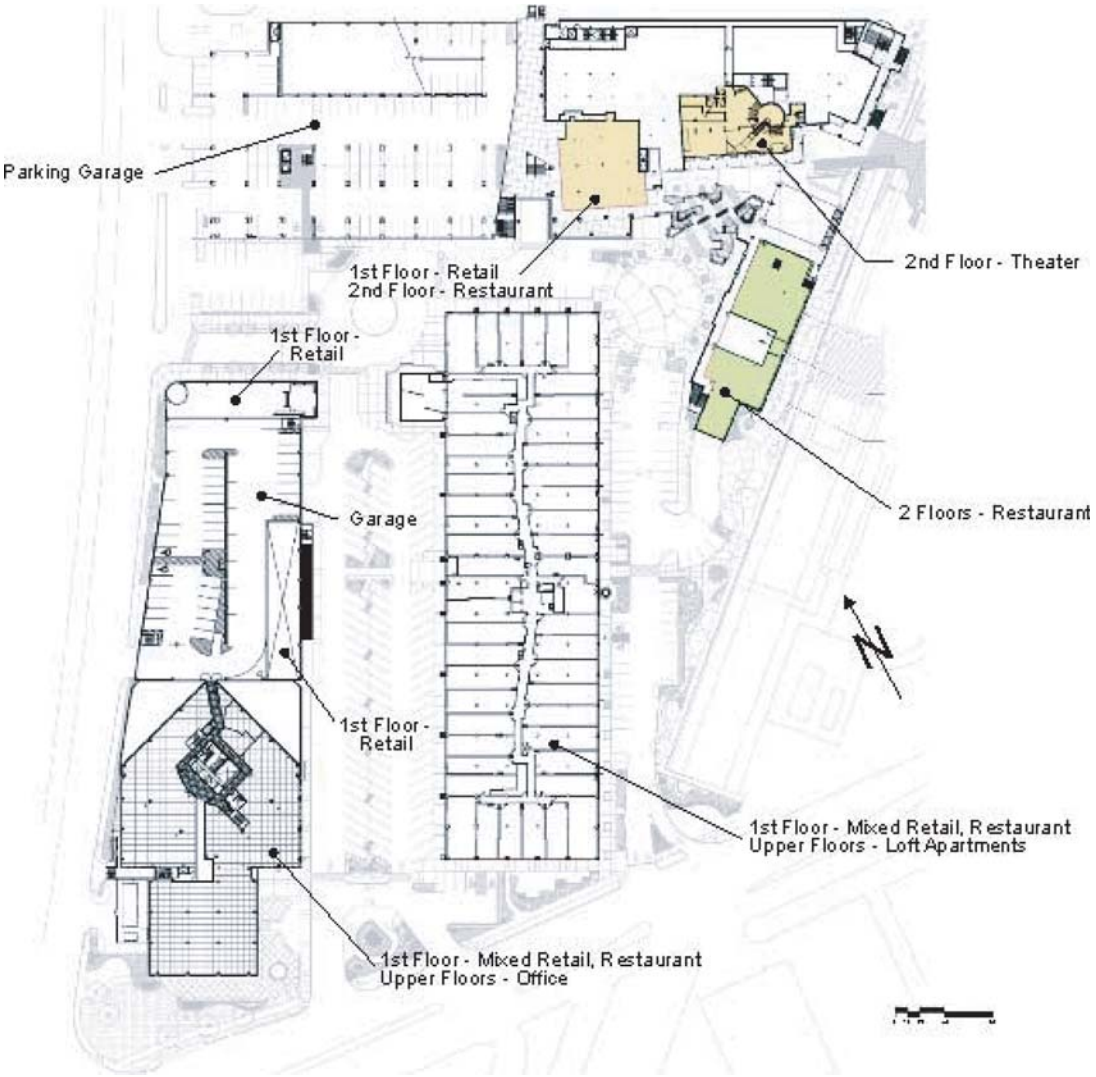
Beginning about a block west of US 75 is the SMU campus, which has a total enrollment of approximately 11,000 students. SMU students occupy several apartments in the area, although no percentage was available and rental rates were reported to be the highest in the area and beyond budgets of most students. Mockingbird Station has vehicular access along only Mockingbird Lane (two driveways) and the northbound frontage road of US 75 (one direct garage access and two additional driveways).

Walk access is available from the east and north via conventional sidewalks adjacent to the street curbs. From the south and west, walk access requires crossing the very busy Mockingbird Lane intersection with the US 75 frontage roads. Walk access to the east is also available through the DART light-rail station and requires traversing stairs (of an elevation of about one building level) between the west side of the station and Mockingbird



Source: Google Earth.

Figure 2. Mockingbird Station.



Source: Selzer Associates.

Figure 3. Mockingbird Station upper-level leasing plan and land uses, 2006.

Station's ground level. There is no elevation change on the east side of the station. As noted previously, walk access is available to the middle of the development to the north via a walkway, which is also about one level above ground and is reachable by a stairway. An elevator is also available to reach these last two pedestrian connections; it is near the stairway to the DART station.

Parking is provided in three garages and surface lots. One garage is reserved for office building use although its visitor spaces can also be used for reaching other Mockingbird Station destinations. A second garage serves the apartments. The third garage is for general use. The second and third garages are actually a single garage that has been partitioned into two facilities by a fence.

During peak onsite activity periods, surface parking is usually fully occupied and drivers circulate hoping to find a space close to the desired destination, but convenient garage parking was observed to be always available. There was no noticeable traffic congestion at any access point during the field surveys. The only congestion occurred occasionally in the parking lots due to excess circulation by drivers seeking a parking space.

Access between the DART station and Mockingbird Station is very convenient. Walking distance between the station and the most distant building entrance is about 700 ft. Only the stairway is judged to present any challenge.

Walking within Mockingbird Station is very easy and convenient. Although few sidewalks are much more than 10-ft wide, there are no obstacles except where three restaurants have set up outdoor tables and left fairly narrow walking widths. However, those constraints did not present deterring bottlenecks. No special provisions have been made for bicycle access. Figure 4 shows an example of sidewalk provisions at the entrance to the apartment building.

Table 31 shows the occupied development in Mockingbird Station. The combined retail and restaurant space and the apartments are more than 90% occupied, and the office space is about 80% occupied. The development appears to be mature and has been in operation long enough to be experiencing initial turnover of tenants that are not correctly positioned in the local market.



Source: Texas Transportation Institute

Figure 4. Entrance to Mockingbird Station lofts.

About one-third of Mockingbird Station's occupied floor space is residential, and another third is retail. More than 20% is office with the remainder split between the restaurants and the cinema. The residential is high-end rental. Mockingbird Station has no major retailers. All have 15,000 sq ft or less. The retail is primarily specialty women's apparel. The restaurants represent a range of middle- to upper-priced sit-down and convenience offerings, including an ice cream shop and a specialty coffee shop.

Table 31. Mockingbird Station development.

Land Use	Occupied Development Units	Largest
Residential	191 DU, 192,940 sq ft	84% one-bedroom
Retail	156,100 sq ft	Two specialty apparel stores of 15,000 sq ft only stores over 10,000 sq ft
Office	114,600 sq ft	All in one building
Restaurant	28,900 sq ft	Largest about 8,800 sq ft
Cinema	31,500 sq ft, 8 screens	
Parking	1,528 spaces	

Travel Survey

The survey of travel characteristics focusing on internal trip capture was conducted on Tuesday afternoon through Thursday morning, May 9–11, 2006. The primary objective was to quantify the percentage of internal trip capture during weekday peak periods in a manner that would support the proposed methodology to estimate internal capture using component land use quantities and reflect mode of original access and the degree of internal connectivity.

The survey was designed to be adaptable to a variety of mixed-use areas. Mockingbird Station was the first site surveyed, and a second site was proposed with somewhat different characteristics. At the time, permission for a second site had not been secured, so specific survey requirements for that site were not known; however, it was known that while there was a standard survey method to be used, some customizing might be needed to fit other sites. The essential requirement was to produce comparable data for each survey site.

For Mockingbird Station, the following travel data were collected for peak periods between 6:30 A.M. and 10 A.M. and between 4 P.M. and 7 P.M.:

- Multimodal cordon count covering all access points;
- Counts of people entering and exiting doors of each building or business being surveyed during a particular period;
- Exit interviews of people as they departed selected doors; and
- Interviews of people leaving the DART rail station and transit center (customer survey to respond to local conditions).

The exit interviews were the primary information source. The counts were used to factor interview results. The DART station interviews were used to provide a more complete indication of who was using transit. All interviews were conducted recognizing that the results would be a sample of all people exiting during a time period. Over the complete duration of the survey, interviews were conducted at all entrances that were open during the survey periods (a few secondary entrances were kept locked by businesses). Survey supervisors selected the entrances to be surveyed during each period, and interviews were conducted at those entrances for complete periods. In some cases, the business activity was low so interviewers were assigned to cover multiple entrances and to intercept and interview any exiting patron they could.

During the A.M. peak period, the only businesses open during the full period were the office building and a Starbucks coffee shop. One other business opened at 9 A.M. while the remainder opened at 10 A.M. (restaurants at 11 A.M.). During the P.M. peak period, all businesses were open for the complete survey period. As a result, all entrances could be fully covered during the A.M. peak, but P.M. interviews covered some entrances one day and the remainder the second day, although interviews were conducted at some locations both days.

Interviewers and counters were trained for several hours prior to the first afternoon's surveys. Each was observed during the first hour in the field (i.e., an hour before the actual data were going to be used) and adjustments were made as needed. Supervision continued throughout the survey period. In a few cases, interviewers were moved to locations that were more active or better suited the interviewer's particular skills (e.g., more mobile to cover several entrances). In another few cases, interviewers were reassigned to perform counts to optimize results. Interview forms were reviewed during each shift and then checked more completely at the end of each shift. Any errors or missing data were checked with the interviewer either by phone and/or prior to starting the next shift. Incomplete and erroneous interviews were not used. The same process was used for the counts although those checks were much more straightforward. Survey personnel who did not perform adequately were released and not used again. The survey crew was initially overstaffed with the expectation that some would be released, so there was no need to add new personnel and repeat the training.

Survey Results

Most of the findings are based on 761 completed exit interviews conducted during two morning and two afternoon peak periods. Of these approximately 30% were obtained during the A.M. peak and 70% during the P.M. peak. The completed and usable interviews covered an average of 33% of people exiting buildings during the A.M. peak period and about 11% during the P.M. peak period. Table 32 shows the numbers of interviews completed and usable for each peak period and land use category. Most interviews yielded one usable trip made during one of the peak periods; some interviews yielded two trips. The A.M. interview percentage was higher than the P.M. percentage because A.M. activity was lower and a similar number of interviewers were available near each interview location. The A.M. population also included more regulars and fewer occasional visitors, which resulted in interviewees who were more comfortable with being interviewed in the morning.

The interview forms included questions not only about the exit trip, but also about the trip made to the location just being departed (see Appendix C for forms closely resembling the forms used in this pilot survey). If the inbound trip to the survey location occurred during the survey period, it could be used as part of the survey database if the information was sufficiently complete. Most inbound trips preceding exiting trips occurred before the survey period or lacked complete information.

Table 33 shows the number of usable trips that were derived from the usable interviews (a usable interview was defined as

Table 32. Peak-period interviews, exit movements, and percent interviewed—Mockingbird Station.

Land Use	A.M. Peak Period			P.M. Peak Period		
	Interviews[1]	Exit Movements	Percent Interviewed	Interviews[1]	Exit Movements	Percent Interviewed
Office	49	130	38%	78	275	28%
Retail[1]	—	—	—	285	2,311	12%
Restaurant	146	395	37%	104	1,560	7%
Residential	43	188	23%	34	218	16%
Cinema[2]	—	—	—	22	220	10%
Hotel[3]	—	—	—	—	—	—
Total	**238**	**713**	**33%**	**523**	**4,584**	**11%**

[1] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[2] Retail and cinema not open during morning peak period.
[3] No onsite hotel at Mockingbird Station.

one that contained at least one fully reported trip). For the A.M. peak, total usable surveyed trips accounted for about 36% of all counted exit movements. For the P.M. peak period, about 13% of the counted trips are represented with usable interview information.

Table 33 information provides the basis for factoring the survey data to represent all peak-period trips made. That expansion is needed to permit an estimate of the number of internal trips. The results reported herein are based on factoring to reflect sampling at each building entrance; factoring was performed by land use for each peak period. The survey results were summarized for the A.M. and P.M. peak periods.

Table 34 shows a different summary of completed interviews, exiting people, and usable trips derived from the interviews. Respondents were asked about not only the trips that they were in the midst of making as they exited from an establishment, but also the trip they had previously made to that same place. The total of the reported trips, if made during one of the two peak periods, are shown as usable trips in Table 34. Some of the reported inbound trips occurred outside the peak periods, but for many of those trips, the respondent was unable or unwilling to provide enough complete information to make the inbound trip usable. Finally, some otherwise complete interviews were not usable because the inbound trip reported was not actually the immediately previous trip—for example, some respondents thought they were being asked for the first trip of the day onsite or to the site and not the immediately previous trip to the establishment they were just leaving. Many of those trips were made outside the peak periods. First trips of the day from the onsite apartments did not have a previous trip that day.

The interviews reported in Table 34 differ slightly from interviews reported in prior tables because the interviews reported in Table 34 are associated with the land use for which an exit trip is reported. Hence, if an interview that was reported in Table 32 has a valid entering trip but not a valid exiting trip

Table 33. Peak-period usable trips, exit movements, and percent usable—Mockingbird Station.

Land Use	A.M. Peak Period			P.M. Peak Period		
	Usable Trips[1]	Exit Movements	Percent Usable	Usable Trips[1]	Exit Movements	Percent Usable
Office	59	130	45%	85	275	31%
Retail[2]	—	—	—	307	2,311	13%
Restaurant	147	395	37%	108	1,560	7%
Residential	51	188	27%	49	218	23%
Cinema[2]	—	—	—	24	220	11%
Hotel[3]	—	—	—	—	—	—
Total	**257**	**713**	**36%**	**573**	**4,584**	**13%**

[1] Must include specific origin location, location of destination, and land use of destination if internal; this total includes reported exiting and entering trips made this period.
[2] Retail and cinema not open during morning peak period.
[3] No onsite hotel at Mockingbird Station.

Table 34. Peak-Period interviews, exit movements, percent interviewed, and usable trips—Mockingbird Station.

Land Use	Morning Peak Period				Afternoon Peak Period			
	Interviews[4]	Exit Movements	Percent Interviewed	Usable Trips[5]	Interviews[4]	Exit Movements	Percent Interviewed	Usable Trips[5]
Office	44	130	34%	50	68	275	25%	70
Retail[1]	8	18	50%	11	292	2,311	13%	368
Restaurant	146	395	37%	165	85	1,560	5%	105
Residential	33	188	18%	33	28	218	13%	30
Cinema[2]	—	—	—	—	22	220	10%	22
Hotel[3]	—	—	—	—	—	—	—	—
Total[1]	**231**	**731**	**32%**	**259[a]**	**495**	**4,584**	**11%**	**595[b]**

[1] Retail trips subsequently removed from further analysis since all stores closed during this period.
[2] No interviews attempted at cinema during the morning peak period since cinema was closed.
[3] No onsite hotel at Mockingbird Station.
[4] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[5] Must include specific origin location, location of destination, and land use of destination if internal; this total includes reported exiting and entering trips made this period.
[a] Includes 2 movements counted at establishments where too few interviews were completed for valid sample.
[b] Excludes 22 movements counted at establishments where too few interviews were completed for valid sample.

(e.g., incomplete information), that interview is reported in Table 32 for the land use where the interview occurred, but reported for the trip origin land use in Table 34.

Table 34 points out one final lesson learned from the survey procedures used in the pilot studies. To obtain accurate inbound trip information while conducting exit surveys, it is necessary to increase the amount of interview practice for each interviewer (i.e., mock interviews with trainers). Interviewers recorded too many incomplete interviews and incorrect previous trips. Some interviewers also failed to ask or record responses for all of the questions about the inbound trip, resulting in more incomplete inbound trip information. However, since only trips that occurred during the two peak periods were of interest and since some of the respondents' inbound trips occurred outside the two peak periods, it was expected that inbound trips would be fewer than outbound trips that are directly surveyed. The only way to obtain similar samples of inbound trips is to interview people as they enter an establishment—something management declined to approve at all three pilot study sites.

Table 34 shows that a few A.M. interviews were completed at retail outlets. These were primarily employees and deliveries. However, the project panel agreed that the number of interviews was too small to provide a representative sample and that the results would not be representative of retail stores that might be open during the A.M. peak period (generally convenience retail or grocery or drug stores), so those data are not reported in other tables.

Table 35 shows for the A.M. peak period the total number of people exiting from each land use. People could exit in one of two ways: (1) from a door of the establishment to the sidewalk in front of the establishment or (2) from the establishment directly to a parking garage via an internal access way and then drive out of the garage and off the site without an opportunity to be interviewed. A sample of the first group was interviewed. None of the second group was interviewed because they immediately became external trips and could be directly categorized in that manner. Table 35 also has a column labeled un-surveyed locations. That column does not apply for Mockingbird Station, but does apply to two other pilot survey sites. Numbers in that column represent the numbers of people counted exiting establishments where no interviews were taken.

Table 35 shows that a number of people exiting the office building and loft apartments did so by going internally to their garage parking space and then driving out of Mockingbird Station. As mentioned above, all of these trips were classified as external trips; drivers and passengers did not need to be interviewed to get the needed information since one garage exits only outside the development's boundary, and the driving distance from the other garage to internal locations is longer than walking. The right column shows the percentage of all exiting trips represented by survey information—either a completed interview or a count of vehicles and occupants exiting the site from garages with internal access. The interviewed and direct garage trips accounted for about half of all exiting trips.

Table 36 shows similar information but for the P.M. peak period. The direct exits from the site establishments through the garages accounted for a much smaller percentage of the total trips. The resulting surveyed percentage of total trips is about 22% in total, but ranges between 7 and 73% by land use.

The survey samples for Mockingbird Station and all other surveyed developments were factored in the same manner. Interviews were expanded to represent the door counts by

Table 35. Morning peak-period surveyed trips, exit movements, and percent surveyed—Mockingbird Station.

Land Use	Surveyed Trips[3]	Exit Movements				Percent Surveyed[6]
		Doors	Unsurveyed Locations[4]	Garage Direct[5]	Total	
Office	59	130	—	34	164	57%
Retail[1]	—	—	—	—	—	—
Restaurant	147	395	—	—	395	37%
Residential	51	188	—	216	404	66%
Cinema[1]	—	—	—	—	—	—
Hotel[2]	—	—	—	—	—	—
Total	**257**	**713**	**—**	**250**	**963**	**53%**

[1] Retail and cinema did not actively generate trips during the morning peak period.
[2] No onsite hotel at Mockingbird Station.
[3] Number of usable trip origins at each land use recorded from traveler interviews.
[4] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made, but no usable trip origins were recorded on interviews.
[5] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[6] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

land use. Where door counts were not available for all establishments within a land use classification, development units were used as a basis for expanding door counts to cover all floor space of a classification. Direct movements to and from inside buildings to external locations were handled through direct counts. The complete discussion is contained in Appendix G.

Table 37 shows data for entering trips that resembles the contents of Tables 35 and 36. A sample of persons entering from the DART rail station and transit center was interviewed; numbers of those persons are shown by the destination land use. The first three columns under each time period accounted for people who entered through either the establishments' outside doors (and are represented by expanded interviews at those doors or at the DART station) or an internal access from a parking garage. The last column shows the remaining people who were counted upon entry but are not represented in the first three columns of the table. All these were considered to be from external origins since they did not have an internal trip origin represented in an interview. These

Table 36. Afternoon peak-period surveyed trips, exit movements, and percent surveyed—Mockingbird Station.

Land Use	Surveyed Trips[3]	Exit Movements				Percent Surveyed[6]
		Doors	Unsurveyed Locations[4]	Garage Direct[5]	Total	
Office	85	275	—	416	691	73%
Retail[1]	307	2,311	—	—	2,311	13%
Restaurant	108	1,560	—	—	1,560	7%
Residential	49	218	—	144	362	53%
Cinema[1]	24	220	—	—	220	11%
Hotel[2]	—	—	—	—	—	—
Total	**573**	**4,584**	**—**	**560**	**5,144**	**22%**

[1] Retail and cinema did not actively generate trips during the morning peak period.
[2] No onsite hotel at Mockingbird Station.
[3] Number of usable trip origins at each land use recorded from traveler interviews.
[4] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made, but no usable trip origins were recorded on interviews.
[5] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[6] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

Table 37. Peak-period person-trips entering land uses—Mockingbird Station.

Land Use	Morning Peak Period					Afternoon Peak Period				
	Survey[3]	Garage Direct[4]	Transit Direct[5]	Balance[6]	Total	Survey[3]	Garage Direct[4]	Transit Direct[5]	Balance[6]	Total
Office	101	382	91	110	684	69	126	12	56	263
Retail[1]	—	—	—	—	—	787	—	129	256	1,172
Restaurant	167	—	29	196	392	380	—	170	1,051	1,601
Residential	12	48	5	138	203	161	236	18	34	449
Cinema[1]	—	—	—	—	—	79	—	106	171	356
Hotel[2]	—	—	—	—	—	—	—	—	—	—
Total	**280**	**430**	**125**	**444**	**1,279**	**1,476**	**362**	**435**	**1,568**	**3,841**

[1] Retail and cinema did not actively generate trips during the morning peak period.
[2] No onsite hotel at Mockingbird Station.
[3] Trip destinations recorded from exit interviews, expanded as described.
[4] Person-trips observed entering onsite parking garages, assumed to be traveling directly from an external location.
[5] Trips entering onsite land uses from external locations recorded on transit interviews.
[6] Balance of person-trips entering onsite land uses; assumed to originate externally.

trips account for approximately one-third of the A.M. peak-period entering trips and about 40% of the P.M. peak-period entering trips.

Table 38 shows the mode split of person trips to Mockingbird Station during the A.M. peak period. Personal vehicles (drivers and passengers) account for about three-quarters of the person trips to and about 70% from Mockingbird Station during the A.M. peak period. The A.M. peak-hour exiting percentages by personal vehicle are about 5% lower than during the A.M. peak period. Table 39 shows similar information for the P.M. peak period.

Transit is a major mode of access for Mockingbird Station. About 15% of inbound and 11% of outbound A.M. peak-period trips use DART rail or bus transit. The peak hour percentages are slightly higher. During the P.M. peak period, transit accounts for about 13% of inbound and 19% of outbound trips. Peak hour percentages are approximately similar. The larger outbound percentage reflects employees who came by transit in the morning in addition to the evening visitors who come and leave by transit. Transit accounts for a significant amount of the trips during both peak periods, attributable at least in part to the proximity of the DART light-rail station and bus transfer center adjacent to Mockingbird Station.

Walk trips also account for more than might be expected in a midtown area, with 5 to 15% walking to or from Mockingbird Station. Although Mockingbird Station is close to SMU, bicycle trips were negligible as were trips by motorcycle. There are limited street crossings of US 75. All are heavily used by traffic and there are no bike lanes. SMU students tend to be more affluent. All these factors may explain the low bicycle share of peak period trips to and from Mockingbird Station.

Table 38. A.M. peak-period and peak-hour cordon person-trip count and mode split—Mockingbird Station.

Travel Mode	Peak Period (7:00 A.M.–10:00 A.M.)				Peak Hour (7:45 A.M.–8:45 A.M.)			
	Trips		Percent[3]		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	670	361	76%	70%	280	129	77%	65%
Motorcycle	0	0	0%	0%	0	0	0%	0%
Delivery Vehicle	39	17	4%	3%	12	3	3%	2%
Transit[2]	128	57	15%	11%	58	28	16%	14%
Walk	42	79	5%	15%	15	38	4%	19%
Bicycle	0	0	0%	0%	0	0	0%	0%
Total All Modes	**879**	**514**	**100%**	**100%**	**365**	**198**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): peak period 1.08/1.11; peak hour 1.09/1.11.
[2] Transit trips include light rail and bus.
[3] Percentage totals may not sum to 100 due to rounding.

Table 39. P.M. peak-period and peak-hour cordon person-trip count—Mockingbird Station.

Travel Mode	Peak Period (4:00 P.M.–7:00 P.M.)				Peak Hour (5:00 P.M.–6:00 P.M.)			
	Trips		Percent		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	1,292	1,208	76%	74%	456	443	77%	73%
Motorcycle	12	5	1%	<1%	2	1	<1%	<1%
Delivery Vehicle	24	21	1%	1%	8	4	1%	1%
Transit[2]	225	301	13%	19%	71	131	12%	21%
Walk	153	83	9%	5%	55	32	9%	5%
Bicycle	4	6	<1%	<1%	0	0	0%	0%
Total All Modes	**1,710**	**1,624**	**100%**	**100%**	**592**	**611**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): peak period 1.25/1.22; peak hour 1.26/1.21.
[2] Transit trips include light rail and bus.

Vehicle occupancies were higher during the P.M. peak (more than 1.2) than for the A.M. peak (about 1.1). This is attributable to people going shopping or to restaurants or the cinema. Table 40 shows (1) the number and percent of internal person trips each peak period and (2) the total person trips generated by each land use type and those that are internal to Mockingbird Station. For example, during the A.M. peak period, 64% of trips leaving the office building are destined for internal destinations. Similarly, 15% of the A.M. inbound trips come from origins within Mockingbird Station.

Note that the only uses active during the A.M. peak were the apartments, the office building, a coffee shop, and a mobile phone store that opened at 9 A.M. All other businesses opened at 10 A.M., although a few employees and delivery people entered before that time. Hence, most of Mockingbird Station was inactive during the A.M. peak period.

Table 40 shows that for the A.M. peak, about 22% of the inbound and 31% of the outbound trips were internal, excluding trips between similar uses (e.g., from retail to retail). Internal trips between similar uses have been excluded (from both internal and total trips) because they are not included in trip generation estimates used for TIS, which are based on trips entering and leaving a site. The office building has about 64% of its trips destined for internal destinations. Nearly all of those were to a coffee shop located less than 300 ft from the office building. The office building did not contain a snack shop, so a strong linkage developed with the coffee shop. This may not always be the case with other types of restaurants. Note that most office building trips during the A.M. peak are inbound; only about 17% of the trips are outbound, so the high percentage of internal trips does not reflect a high number of internal trips in this case.

Table 40. Peak period person-trips and percent internal trip capture by land use—Mockingbird Station.

Land Use	A.M. Peak Period				P.M. Peak Period			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Office	684	15%	142	64%	263	26%	669	15%
Retail[1]	—	—	—	—	1,172	67%	1,284	32%
Restaurant	392	43%	371	28%	1,601	22%	1,519	46%
Residential	203	5%	388	22%	449	36%	361	43%
Cinema[1]	—	—	—	—	356	22%	220	50%
Hotel[2]	—	—	—	—	—	—	—	—
Total All Trips	**1,279**	**22%**	**901**	**31%**	**3,841**	**38%**	**4,053**	**36%**

[1] Retail and cinema not open during morning peak period.
[2] No onsite hotel at Mockingbird Station.

Table 41. Percent distribution of internal trip destinations for trips exiting Mockingbird Station buildings—A.M. peak period.

Origin Land Use	Internal Destination Land Use						Destination Summary			
	Office	Retail[2]	Restaurant	Residential	Cinema[2]	Hotel[3]	Internal	External	Total	Total Trips
Office	—[1]	—	63%[a]	1%	—	—	64%	36%	100%	142
Retail[2]	—	—[1]	—	—	—	—	—	—	—	—
Restaurant	25%	—	—[1]	3	—	—	28	72	100	371
Residential	2	—	20	—[1]	—	—	22	78	100	388
Cinema[2]	—	—	—	—	—[1]	—	—	—	—	—
Hotel[3]	—	—	—	—	—	—[1]	—	—	—	—
All Origins	**11%**	**—**	**19%**	**1%**	**—**	**—**	**31%**	**69%**	**100%**	**901**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Retail and cinema not open during morning peak period.
[3] No onsite hotel at Mockingbird Station.
[a] Chain specialty coffee shop close to office building.

The P.M. peak period internal trip capture percentages are somewhat higher, with about 38% of the inbound and 36% of the outbound trips being internal. Table 41 shows the A.M. peak period internal trip capture for outbound trips by land use. Since Mockingbird Station is fully and conveniently walkable, there are virtually no driving trips (although a few people were observed driving a few hundred feet from one end of a parking area to the other). Since no internal transit is provided, there are no internal trips by transit.

Table 42 shows the same information for the P.M. peak period. For both A.M. and P.M. peak periods, it *appears* that there are a few stronger linkages between land use pairs and several modest linkages. However, note that the internal trip capture percentages are a result of inherent interaction between given land use pairs as well as the quantities and proximities of each. This is discussed elsewhere in this report.

Table 43 shows the distribution of internal origins resulting from inbound trips. For example, of trips inbound to the office building, 1% come from the onsite residential units. This shows that while the coffee shop has a strong interaction with the office building, it also has a stronger interaction with the residential apartments that result in several trips to the coffee shop. However, this table shows that the residents then proceed from the coffee shop to off-site destinations; few return home.

Table 44 shows similar data for the P.M. peak period. As with the interactions shown in Table 42, there are a few strong relationships and a number of minor relationships. The cases and relationships are discussed in a subsequent chapter.

Table 45 shows the percent of trips made into and out of Mockingbird Station buildings that are internal for each mode of travel. Only a small percentage of vehicle driver trips are internal. Not surprisingly, a very high percentage of walk trips are internal.

Table 42. Percent distribution of internal trip destinations for trips exiting Mockingbird Station buildings—P.M. peak period.

Origin Land Use	Internal Destination Land Use						Destination Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel[2]	Internal	External	Total	Total Trips
Office	—[1]	9%	4%	2%	0	—	15%	85%	100%	669
Retail	1%	—[1]	20	7	4%	—	32	68	100	1,284
Restaurant	3	38	—[1]	3	2	—	46	54	100	1,519
Residential	1	31	11	—[1]	0	—	43	57	100	361
Cinema	0	17	25	8	—[1]	—	50	50	100	220
Hotel[2]	—	—	—	—	—	—[1]	—	—	—	—
All Origins	**2%**	**19%**	**9%**	**4%**	**2%**	**—**	**36%**	**64%**	**100%**	**4,053**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] No onsite hotel at Mockingbird Station.

Table 43. Percent distribution of internal trip origins for trips entering Mockingbird Station buildings—A.M. peak period.

Destination Land Use	Internal Origin Land Use						Origin Summary			
	Office	Retail[2]	Restaurant	Residential	Cinema[2]	Hotel[3]	Internal	External	Total	Total Trips
Office	—[1]	—	14%	1%	—	—	15%	85%	100%	684
Retail[2]	—	—[1]	—	—	—	—	—	—	—	—
Restaurant	23%	—	—[1]	20	—	—	43	57	100	392
Residential	0	—	5	—[1]	—	—	5	95	100	203
Cinema[2]	—	—	—	—	—[1]	—	—	—	—	—
Hotel[3]	—	—	—	—	—	—[1]	—	—	—	—
All Destinations	**7%**	**—**	**8%**	**7%**	**—**	**—**	**22%**	**78%**	**100%**	**1,279**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Retail and cinema not open during morning peak period.
[3] No onsite hotel at Mockingbird Station.

Table 44. Percent distribution of internal trip origins for trips entering Mockingbird Station buildings—P.M. peak period.

Destination Land Use	Internal Origin Land Use						Origin Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel[2]	Internal	External	Total	Total Trips
Office	—[1]	5%	19%	2%	0	—	26%	74%	100%	263
Retail	5%	—[1]	50	9	3%	—	67	33	100%	1,172
Restaurant	1	16	—[1]	2	3	—	22	78	100%	1,601
Residential	3	19	10	—[1]	4	—	36	64	100%	449
Cinema	1	14	7	0	—[1]	—	22	78	100%	356
Hotel[2]	—	—	—	—	—	—[1]	—	—	—	—
All Destinations	**2%**	**11%**	**18%**	**4%**	**3%**	**—**	**38%**	**62%**	**100%**	**3,841**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] No onsite hotel at Mockingbird Station.

Table 45. Peak-period person-trips and percent internal trip capture by mode of travel—Mockingbird Station.

Mode of Travel	A.M. Peak Period				P.M. Peak Period[1]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Automobile Driver	857	2	526	3	1,941	4	1,815	5
Automobile Passenger	32	0	35	0	72	0	212	0
Taxi/Car Service	0	0	0	0	0	0	0	0
Transit (Bus)	0	0	12	0	0	0	88	0
Transit (Light Rail)	125	0	22	0	435	0	413	0
Walk/Bicycle	266	100	307	87	1,367	100	1,500	91

[1] Travel mode not reported for 26 entering and 25 exiting trips.

Table 46. Peak-period person-trips and percent internal trip capture by mode of access—Mockingbird Station.

Mode of Access	A.M. Peak Period[1]				P.M. Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Vehicle Driver	1,058	20%	697	31%	2,847	35%	2,694	37%
Vehicle Passenger	32	0%	34	0%	130	45%	354	23%
Taxi/Car Service	0	0%	0	0%	0	0%	0	0%
Transit (Bus)	7	100%	7	100%	60	100%	118	51%
Transit (Light Rail)	131	5%	23	26%	586	26%	654	23%
Walk/Bicycle	10	100%	13	77%	71	100%	157	45%

[1] Access mode not reported for 41 entering trips and 177 exiting trips.
[2] Access mode not reported for 79 entering trips and 244 exiting trips.

Table 46 shows different information. The table shows internal trips by the original mode of access to Mockingbird Station—for example, the first row of the table shows that for the A.M. peak period, of the exiting people who came to Mockingbird Station as vehicle drivers, 31% of them went to internal destinations. The purpose of this table is to determine whether people arriving by different modes have different internal trip-making tendencies. The cells that have larger numbers of trips provide the most useful comparisons. The cells that contain more than 300 trips have consistent internal trip percentages ranging from 20% to 37% internal trips, but even though most numbers of total trips are small, those who arrive by bus or walking/bicycling are much more prone to making more internal trips, perhaps due to fewer options. The apparent tendency of rail transit riders to make fewer internal trips—at least during peak periods—may reflect that many of them use transit to commute to work and are less likely to make internal peak-period trips during peak periods (e.g., some of those trips may be made during midday). The small numbers of people who walk, bike, or ride buses to Mockingbird Station make further analysis speculative. The other two MXDs surveyed for this project had fewer transit riders, so they do not provide significant insight into this question.

Table 47 attempts to explore whether having a personal vehicle available for trips affected internal travel tendencies. One might assume that a person with no vehicle available would have fewer options to make off-site (external) trips, so they would make more internal trips. Accounting for effects of the sample sizes shown, the table does not support that assumption: internal trip capture does not exceed that for people with access to drive personal vehicles.

Findings from surveys of two other MXDs—Atlantic Station and Legacy Town Center—follow. Analyses of relationships between the findings and causal factors are described in subsequent chapters.

Atlantic Station

Development Characteristics

As with Mockingbird Station, Atlantic Station is a midtown redevelopment/infill project, but it is substantially larger and is spread over several blocks rather than being on a single block. Figure 5 shows an illustrative site plan of Atlantic Station when it is fully complete. A dashed outer boundary line shows the outer limits of the portions that had been completed and

Table 47. Peak-period person-trips and percent internal trip capture by vehicle access—Mockingbird Station.

Vehicle Access	A.M. Peak Period[1]				P.M. Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Yes (Vehicle Driver)	1,098	20%	720	30%	265	29%	462	51%
Yes (Non-Vehicle Driver)	118	14%	31	52%	318	33%	571	59%
No Vehicle Access	18	28%	16	31%	3,094	35%	2,795	32%

[1] Automobile access not reported for 45 entering trips and 134 exiting trips.
[2] Automobile access not reported for 164 entering trips and 225 exiting trips.



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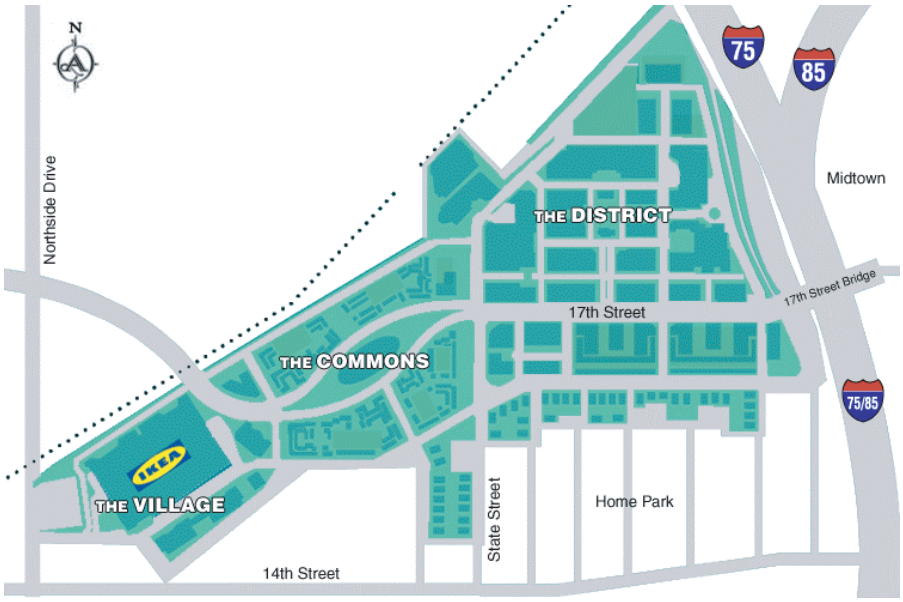
Figure 5. 2006 Atlantic Station site plan at buildout.

occupied at the time surveys for this project were completed. The area inside the inner dashed boundary line has not been developed although some of the parking to serve that development has been completed. Although complete, the survey conducted for this project did not include the IKEA store on the far west end because it was viewed as a non-integrated, free-standing component of Atlantic Station oriented away from the remainder of the development. Figure 6 shows the street names and sectors of Atlantic Station. Atlantic Station consists of three adjacent sectors: the District, the Commons, and the Village.

The District. The District is clearly the heart and most active part of Atlantic Station. It is the densest and has six interactive land uses. The mostly commercial District is on a grid of blocks extending from the south side of 14th Street to 20th Street and from Fowler Street on the east to State Street on the west. Virtually the entire area north of 17th Street has three levels of parking below ground. All parking is contiguous although parking for a few buildings has been partitioned. The garages are designed so the streets on the surface are duplicated underground for ease of navigation and comprehension. There is also short-term metered curb parking on most blocks of the surface level. All spaces are pay parking although businesses have the option of validating parking for specific durations. Visitor parking is free for the first 2 hours, $2 up to 3 hours, $3 up to 4 hours, $5 up to 5 hours, then increasing $3 per hour to the daily maximum of $14 for more than 7 hours. Employees park free on the lowest garage level during their work hours. At the time of the survey, garage parking supply far exceeded demand. Surface curb parking was generally fully occupied during normal business hours.

Land uses in the District consist of residential, retail, office, restaurant, hotel, and cinema. Table 48 shows the number of development units of each type. The largest retailers are Dillard's (department store), Publix (grocery store), and a shoe store. The retailers provide a range of products similar to what can be found in a regional mall. Restaurants range from specialty coffee shops to high-end shops. Residential units open at the time of the survey are in one high-rise building at the corner of 17th and State Streets and along both sides of 16th Street (townhouses). The office space is all in one high-rise building at 17th and Market Streets, while the restaurants and retail are distributed across most of the District.

The entire area north of 17th Street is conveniently walkable due to general compactness; short block lengths (about 150 to 300 ft in most cases); and an attractive walking environ-



Source: www.atlanticstation.com/site_parking.php. Image is used by permission: ©2010 Atlantic Station, LLC. All rights reserved.

Figure 6. Schematic map of Atlantic Station, 2006.

ment. There is a grade between 16th and 17th Streets that may discourage some from walking, but walking is viable for most people.

The Commons. This area includes two multistory apartment complexes along the north (Park District) and south (Art Foundry) sides of 17th Street, which has a wide median in the middle of the area. Resident parking is beneath the residential units, with visitor parking along 17th Street. The walking environment is typical for urban areas. Typical sidewalks are provided along 17th Street. There are no special provisions other than banners that integrate The Commons with The District. Other than banners and a few signs, the two areas could easily pass for being totally disassociated.

The Village. This western sector contains only one building: an IKEA furniture store. The IKEA building faces away from 17th Street and the remainder of Atlantic Station. It has its own parking and, as with the Commons, no strong connection to the District. Although walking between IKEA and the Commons is convenient by conventional sidewalk, little pedestrian activity was observed.

Access

Vehicular access to Atlantic Station and the District is concentrated on 17th Street from both east and west. I-75 and I-85 merge just to the north of 17th Street so Atlantic Station has good regional access by motor vehicle. An interchange

Table 48. Atlantic Station Development (all units within the District except as noted).

Land Use	Occupied Development Units	Largest
Residential	798 DU	• District: 190 apartments at 17th and State; 55 townhomes south of 16th Street • Commons: 553 apartments
Retail	434,500 sq ft	• Department store 227,000 sq ft • Grocery store 30,300 sq ft • Shoe store 27,000 sq ft • Only stores over 12,000 sq ft
Office	550,600 sq ft	• Almost all in one building
Restaurant	64,600 sq ft	• Sports bar/restaurant 19,100 sq ft • Only restaurant over 10,000 sq ft
Hotel	101 rooms	• One hotel
Cinema	87,000 sq ft, 16 screens, 6,000 seats	• One cinema

exists serving 14th and 17th Streets. Access to regional arterial streets is via 17th Street. There is some additional access to and from the south via local streets between Fowler and State. Access to underground parking of The District is from Fowler on the east, 16th Street on the south, State Street on the west, and 20th Street on the north. There are no ramps between the three levels; all access is to a single level. Some of the largest buildings are garage-accessible only from one or two of the three levels; however, there are stairs, elevators, and an escalator providing access between all garage levels and the street level. Stairs are spaced closely so that stairway access is quite convenient. Vehicular access to The Commons and IKEA is primarily via 17th Street although 16th Street also provides access.

Atlantic Station has two types of transit access as Figure 7 shows. Atlantic Station provides a dedicated free shuttle between the District and the Metropolitan Atlanta Regional Transit Authority (MARTA) Art Center rail station that is about ½ mile to the east of the District. The shuttle uses 17th Street but loops through the District. The shuttle operates on 5- to 10-minute headways, between 5 A.M. and 1 A.M., covering MARTA's rail system hours of 5 A.M. to 1 A.M.

MARTA also provides conventional bus service along 17th Street and along 14th Street. The 17th Street service (Route 23) also connects with the Art Center Station on the east. Going west and south from Atlantic Station, this route extends past Georgia Institute of Technology (Georgia Tech) and to downtown. It runs on 30- to 40-minute headways during the day, operating between about 5:30 A.M. and midnight. The 14th Street service runs between the Arts Center Station and the MARTA rail west end station, providing service to the Georgia Tech campus and an additional rail station. This route (Route 98) operates on 14th Street east of State Street and has approximately 40-minute headways all day. Two additional local routes run north–south on Northside Drive just west of the IKEA store. Those routes operate on 60-minute headways between about 6 A.M. and 10 P.M.

Travel Survey

The travel survey was conducted in the same manner as for Mockingbird Station. Surveys were conducted on Tuesday afternoon July 11, 2006, through Thursday morning July 13, 2006. The surveys conducted were



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Figure 7. Atlantic Station transit access, 2006.

- Multimodal cordon count covering all access points of the District and the Bezar townhome area plus the parking garages for the Art Foundry and Park District apartment complexes;
- Counts of people entering and exiting doors of each building or business being surveyed during a particular period;
- Exit interviews of people as they departed selected doors;
- Pedestrian intercept interviews at one sidewalk location between the District and the Commons to catch those not included in the interviews in the Commons apartment complexes (custom survey to respond to local conditions); and
- Interviews of people using the Atlantic Station shuttle (custom survey to respond to local conditions).

MARTA bus patrons were not interviewed specifically because there were very few observed. The Atlantic Station shuttle seemed to be functioning as an almost complete substitute for conventional transit access.

Interviews were conducted in a manner similar to that used for Mockingbird Station, with one exception: the large number of businesses and entrances precluded all being covered. All large businesses were covered as was a sample of smaller ones. Those not surveyed (including a small number that declined permission) were accounted for by including expansion factors using applicable development units (e.g., sq ft). The research team was told by onsite management that occupants of the two residential developments in the Commons were similar and provided permissions for only one complex. Dwelling units were used to apply survey results to cover those units.

Survey Results

Most of the findings are based on 822 usable interviews conducted near doorways to Atlantic Station establishments during two morning and two afternoon peak periods. Of these approximately 27% were obtained during the A.M. peak and 73% during the P.M. peak. Approximately 45% of exiting people were interviewed in the A.M. peak period while about 15% were interviewed in the much more active P.M. peak. The results described in this report are based on expansion factors applied to usable interviews based on sampling rates for each land use and time period as well as the businesses surveyed. The expansion factor process is explained elsewhere in this report.

Table 49 shows the numbers of completed and usable interviews by peak period and land use category. Interviews were completed for about 30% of people exiting at street level (and the grocery store garage) during the A.M. peak and 15% during the P.M. peak. Interviews were not attempted at building entrances within the garage because it was felt that nearly all people using those few entrances would be either leaving Atlantic Station or returning to street level through the same buildings. In the first case, the trips would be external and easily categorized as such. In the second case, the people would be candidates for interviews as they departed from the building at street level. In addition, a few retail buildings were not covered with interviews due to the available survey crew and similarity of tenants to those being surveyed. Survey results were expanded to cover unsurveyed buildings in accordance with development units. Finally, not all residential buildings were surveyed. Local management staff indicated that profiles of the residents were similar to those in buildings being surveyed. Cordon counts were used to factor the residential survey results.

As with the Mockingbird Station interviews, some Atlantic Station interviews yielded more than one trip. All exiting trips were obtained. Some people interviewed also provided complete and usable information about their inbound trips to the interview location. Table 50 shows the total numbers of

Table 49. Peak-period interviews, counted building exit movements, and percent interviewed—Atlantic Station.

Land Use	A.M. Peak Period			P.M. Peak Period		
	Interviews[1]	Building Exit Movements	Percent Interviewed	Interviews[1]	Building Exit Movements	Percent Interviewed
Office	15	93	16%	15	84	18%
Retail	29	153	19%	266	2,138	12%
Restaurant	24	29	83%	184	918	20%
Residential	157	523	30%	66	305	22%
Cinema[2]	—	—	—	31	282	11%
Hotel	21	36	58%	14	95	15%
Total	**246**	**834**	**30%**	**576**	**3,822**	**15%**

[1] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[2] Cinema not open during morning peak period.

Table 50. Peak-period usable trips, counted building exit movements, and percent usable—Atlantic Station.

Land Use	A.M. Peak Period			P.M. Peak Period		
	Usable Trips[1]	Building Exit Movements	Percent Usable	Usable Trips[1]	Counted Exit Movements	Percent Usable
Office	13	93	14%	26	84	31%
Retail	29	153	19%	313	2,138	15%
Restaurant	26	29	90%	189	918	21%
Residential	141	523	27%	56	305	18%
Cinema[2]	—	—	—	38	282	14%
Hotel	37	36	103%[a]	43	95	45%
Total	**246**	**834**	**30%**	**665**	**3,822**	**17%**

[1] Must include specific origin location, location of destination, and land use of destination if internal; this total includes reported exiting and entering trips made this period.
[2] Cinema not open during morning peak period.
[a] More trips reported from both exit and entering trip responses than movements counted.

usable interviews available based on their points of origin. Interviews during the P.M. peak period yielded some second usable trips; none were derived from the A.M. interviews.

The results reported herein are based on factoring to reflect sampling at each building entrance; factoring was performed separately for each peak period. That process is described elsewhere in this report. The survey results were summarized for the A.M. and P.M. peak periods.

Table 51 shows a summary of completed interviews, exiting people, and usable trips derived from the interviews. The total of the reported trips, if made during one of the two peak periods, is shown as usable trips in Table 50. Some of the reported inbound trips occurred outside the peak periods; however, for many of those trips, the respondent was unable or unwilling to provide enough complete information to make the inbound trip usable. Finally, some otherwise complete interviews were not usable because the inbound trip reported was not actually the immediately previous trip. Many of those trips were made outside the peak periods. First trips of the day from the onsite apartments did not have a previous trip that day.

The interviews reported in Table 51 differ slightly from interviews reported in prior tables. This is because the interviews reported in Table 50 are associated with the land use for which an exit trip is reported whereas previous tables reported by where the interview occurred.

Table 51 points out the same lesson learned from the survey procedures as did the Mockingbird Station surveys: to

Table 51. Peak-period interviews, exit movements, percent interviewed, and usable trips—Atlantic Station.

Land Use	Morning Peak Period				Afternoon Peak Period			
	Interviews[2]	Exit Movements	Percent Interviewed	Usable Trips[3]	Interviews[2]	Exit Movements	Percent Interviewed	Usable Trips[3]
Office	13	93	14%	13	15	84	18%	15
Retail	29	153	19%	30	243	2,138	11%	311
Restaurant	26	29	90%	28	167	918	18%	212
Residential	141	229[a]	62%	141	79	115[b]	69%	79
Cinema[1]	—	—	—	—	32	282	11%	32
Hotel	34	36	94%	34	16	95	17%	16
Total	**243**	**540**	**45%**	**246**[c]	**552**	**3,632**	**15%**	**665**

[1] No interviews attempted at cinema during the morning peak period since cinema closed during this period.
[2] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[3] Must include specific origin location, location of destination, and land use of destination if internal; this total includes reported exiting and entering trips made this period.
[a] Excludes 294 movements counted at two residential developments where no interviews were completed.
[b] Excludes 190 movements counted at two residential developments where no interviews were completed.
[c] Includes 3 movements counted at establishments where no or too few interviews were completed for valid sample.

obtain accurate inbound trip information while conducting exit surveys, it is necessary to increase the amount of interview practice for each interviewer (mock interviews with trainers). Interviewers recorded too many incomplete interviews and incorrect previous trips. Most interviewers also failed to ask or record responses for all of the questions about the inbound trip, resulting in more incomplete inbound trip information. Table 51 shows that, unlike Mockingbird Station, A.M. interviews were completed at retail outlets. These were almost all at the onsite grocery store.

Table 52 shows, for the morning peak period, surveyed trips (usable from interviews) by origin land use as well as the number of people exiting doors for each land use. The third column represents exit movements from establishments where no completed interviews occurred. These trips were estimated based on square footage for the specific land use. The fourth column contains the number of drivers plus passengers who exited Atlantic Station from parking garages after reaching the garages via direct internal access from establishments above. Trips in this fourth column were assumed to all be external since they involved trips downstairs into the below ground garages and a drive along the perimeter or beyond to another location. In almost all cases, a walk trip would take less time except between the District and the apartment complexes to the west or townhouses to the south. About 46% of all trips made from survey locations were represented by an interview or direct external trips.

Table 53 displays similar information for the P.M. peak period. For this period, about 31% of the total trips are represented by interviews or direct external trips. Unsurveyed locations, which were judged by the research team to have characteristics similar to other establishments of the same land uses, represent less than 15% of the exiting trips made. The direct garage trips to the external street system accounted for about 20% of the total trips, a little less than for the A.M. peak period.

Table 54 contains somewhat similar information for the entering trips for both peak periods. As with the similar table for Mockingbird Station, this table shows the several sources for information on trips made. Trips represented by exit surveys are shown in the first column of numbers. Trips made direct from internally accessed parking garages to external locations are shown in the second column. Trips made using the free Atlantic Station shuttle and represented by interviews conducted on the shuttle are shown in the third column of numbers. The balance column represents the difference between the total number of counted (or prorated by sq ft) persons entering the establishments (through public doorway or from external points to the garage sections with private internal access) and the trips represented in the prior three columns. All trips in the fourth column of numbers were assumed to be external since they had no reported internal source for trips.

Table 55 shows the mode split of person trips to and from Atlantic Station during the A.M. peak period and peak hour. Personal vehicles account for about 80% of the inbound trips and slightly more than 70% of the outbound trips during both periods, indicating little difference between the periods. Similarly, peak-period and peak-hour mode shares differed little for other modes. Transit, including the free Atlantic Station shuttle, accounted for 8% of the inbound A.M. peak period trips and 9% of the inbound A.M. peak-hour trips. Outbound percentages were smaller. Virtually all transit trips used the free shuttle; MARTA bus service attracted almost no

Table 52. Morning peak-period surveyed trips, exit movements, and percent surveyed—Atlantic Station.

Land Use	Surveyed Trips[2]	Exit Movements				Percent Surveyed[5]
		Doors	Unsurveyed Locations[3]	Garage Direct[4]	Total	
Office	13	93	—	66	159	50%
Retail	29	153	8	136	297	56%
Restaurant	26	29	—	—	29	90%
Residential	141	523	—	68	591	35%
Cinema[1]	—	—	—	—	—	—
Hotel	37	36	—	—	36	100%
Total	**246**	**834**	**8**	**270**	**1,112**	**46%**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Number of usable trip origins at each land use recorded from traveler interviews.
[3] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made but no usable trip origins were recorded on interviews.
[4] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[5] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

Table 53. Afternoon peak-period surveyed trips, exit movements, and percent surveyed—Atlantic Station.

Land Use	Surveyed Trips[2]	Exit Movements				Percent Surveyed[5]
		Doors	Unsurveyed Locations[3]	Garage Direct[4]	Total	
Office	26	84	—	585	669	91%
Retail	313	2,138	532	418	3,088	24%
Restaurant	189	918	115	—	1,033	18%
Residential	56	305	—	50	355	30%
Cinema[1]	38	282	—	—	282	13%
Hotel	43	95	—	—	95	45%
Total	**665**	**3,822**	**647**	**1,053**	**5,522**	**31%**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Number of usable trip origins at each land use recorded from traveler interviews.
[3] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made but no usable trip origins were recorded on interviews.
[4] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[5] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

Table 54. Peak-period person-trips entering land uses—Atlantic Station.

Land Use	Morning Peak Period					Afternoon Peak Period				
	Survey[2]	Garage Direct[3]	Transit Direct[4]	Balance[5]	Total	Survey[2]	Garage Direct[3]	Transit Direct[4]	Balance[5]	Total
Office	86	829	41	41	997	55	69	17	(17)[a]	124
Retail	114	35	24	17	190	1,769	411	66	406	2,652
Restaurant	26	—	31	(23)[a]	34	542	—	48	694	1,284
Residential	0	8	6	186	200	313	90	14	131	548
Cinema[1]	—	—	—	—	—	165	—	39	111	315
Hotel	1	—	7	17	25	88	—	7	0	95
Total	**227**	**872**	**109**	**238**	**1,446**	**2,932**	**570**	**191**	**1,325**	**5,018**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Trip destinations recorded from exit interviews, expanded as described.
[3] Person-trips observed entering onsite parking garages, assumed to be traveling directly from an external location.
[4] Trips entering onsite land uses from external locations recorded on transit interviews.
[5] Balance of person-trips entering onsite land uses; assumed to originate externally.
[a] See Appendix C for more information.

Table 55. A.M. peak-period and peak-hour person-trip cordon count—Atlantic Station.

Travel Mode	Peak Period (7:00 A.M.–10:00 A.M.)				Peak Hour (8:00 A.M.–9:00 A.M.)			
	Trips		Percent		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	2,378	1,165	79%	71%	972	447	81%	72%
Motorcycle	0	0	0%	0%	0	0	0%	0%
Delivery Vehicle	172	216	6%	13%	46	70	4%	11%
Transit[2]	244	56	8%	3%	104	34	9%	5%
Walk	226	195	7%	12%	78	68	6%	11%
Bicycle	6	4	<1%	<1%	2	1	<1%	<1%
Total All Modes	**3,026**	**1,636**	**100%**	**100%**	**1,202**	**620**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): peak period 1.08/1.13; peak hour 1.05/1.12.
[2] Transit trips include circulating shuttle and bus.

Table 56. P.M. peak-period and peak-hour person-trip cordon count—Atlantic Station.

Travel Mode	Peak Period (4:00 P.M.–7:00 P.M.)				Peak Hour (5:00 P.M.–6:00 P.M.)			
	Trips		Percent		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	3,727	3,423	87%	88%	1,382	1,242	89%	86%
Motorcycle	0	0	0%	0%	0	0	0%	0%
Delivery Vehicle	50	43	1%	1%	14	18	1%	1%
Transit[2]	195	243	5%	6%	72	103	5%	7%
Walk	300	184	7%	5%	86	72	6%	5%
Bicycle	15	4	<1%	<1%	4	2	<1%	<1%
Total All Modes	**4,287**	**3,897**	**100%**	**100%**	**1,558**	**1,437**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): peak period 1.40/1.27; peak hour 1.37/1.22.
[2] Transit trips include circulating shuttle and bus.

Atlantic Station trips, possibly due to the fare difference, more frequent shuttle service, and the shuttle loop throughout the District, which the MARTA service does not provide.

Table 56 shows similar summaries for the P.M. peak period and peak hour. Personal vehicles account for more of the travel during the P.M. peaks, accounting for 87–88% of all peak period trips and 86–89% of peak-hour trips. As for the A.M. peaks, there is little difference in mode splits between the peak period and peak hour. Deliveries account for far fewer trips during the P.M.. The transit mode splits are similar in total but more balanced between inbound and outbound trips. Inbound walk trips are similar for both A.M. and P.M. peaks, but outbound walk trips make up a larger percentage of A.M. peak trips than for the P.M.. Note, however, that the A.M. inbound and outbound walk volumes are fairly similar.

From these two tables it is apparent that motor vehicles are the primary mode of travel for Atlantic Station, but transit and walking also play a role. As was found for Mockingbird Station, the P.M. peak-period vehicle occupancies are significantly higher than those for the A.M. peak; this is attributable to people going shopping or to restaurants or the cinema in groups of two or more during the P.M. peak. Almost none of those businesses are open during the A.M. peak.

Table 57 shows the total A.M. and P.M. peak-period entering and exiting trips by land use category plus the percentage of those that were internal. Overall A.M. peak-period internal trip capture was about 12% for inbound and 17% outbound. For the P.M. peak period, the inbound and outbound internal capture percentages total about 44 and 38 percent, respectively. As the table shows, internal capture varies significantly by land use as it did for Mockingbird Station. The A.M. retail percentage reflects activity at the full-service grocery store, which serves both residential and office patrons during that period. The open restaurant was a coffee shop, similar to Mockingbird

Table 57. Peak-period person-trips and percent internal trip capture by land use—Atlantic Station.

Land Use	A.M. Peak Period				P.M. Peak Period			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Office	990	8%	152	33%	124	45%	668	9%
Retail[1]	135	44%	136	42%	1,431	38%	1,867	39%
Restaurant	34	77%	29	48%	1,218	39%	967	60%
Residential	200	0%	591	2%	543	57%	350	13%
Cinema[2]	—	—	—	—	315	52%	281	42%
Hotel	25	4%	36	95%	95	92%	94	86%
Total All Trips	**1,384**	**12%**	**944**	**17%**	**3,726**	**44%**	**4,227**	**38%**

[1] Retail open during A.M. peak period was primarily grocery store.
[2] Cinema not open to customers during morning peak period.

Table 58. Percent distribution of internal trip destinations for exiting trips—Atlantic Station, A.M. peak period.

Origin Land Use	Destination Land Use						Summary			
	Office	Retail[2]	Restaurant	Residential	Cinema[3]	Hotel	Internal	External	Total	Total Trips
Office	—[1]	28	5	0	—	0	33	67	100	152
Retail[2]	29	—[1]	13	0	—	0	42	58	100	136
Restaurant	31	14	—[1]	0	—	3	48	52	100	29
Residential	1	1	0	—[1]	—	0	2	98	100	591
Cinema[3]	—	—	—	—	—[1]	—	—	—	—	—
Hotel	75	14	6	0	—	—[1]	95	5	100	36
All Origins	**8**	**6**	**3**	**0**	**—**	**0**	**17**	**83**	**100**	**944**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Retail open during A.M. peak period was primarily grocery store.
[3] Cinema not open to customer during morning peak period.

Station. The hotel appeared to be heavily oriented to serving the onsite office building, which was the only nearby office building although others exist about ½ mile away. For the P.M. peak period, the internal percentage of entering trips was consistent across most uses, other than the hotel, which again appeared to be very internally oriented. There was more variation in trips exiting Atlantic Station buildings during the P.M. peak period, ranging between 9 and 86%. The office low percentage is reflective of commuters going home, or at least off-site, after work. The low residential percentage is a little surprising, but the longer distance to other uses may be influential.

Table 58 shows the percent distribution of trips from each origin land use to other land uses within Atlantic Station as well as to external destinations. As was explained for Mockingbird Station, trips between similar land uses are not included because they would not be counted as external trips for single-use developments. Some land use pairs have little interchange; others have extensive interaction, as described in the preceding paragraph.

Table 59 shows similar information for the P.M. peak period. A few land use pairs account for most of the internal trips, similar to Mockingbird Station; however, the specific pairs are not the same. This is a result of the residential units being farther removed from the non-residential uses and different balances of land uses. During the P.M. peak, the heaviest percentages of interaction are retail-restaurant (both directions) and from retail to restaurant and residential, cinema to retail, and from hotel to retail and restaurant.

Table 60 shows the A.M. peak period percentage distribution of inbound trips to each destination land use from each origin land use. The highest inbound internal capture percentages are retail from office and restaurant from office and retail. Many of those trips may result from trips for morning coffee or picking up a lunch on the way to work.

Table 61 shows similar information for the P.M. peak period. The largest internal capture percentages are to office, restaurant, cinema, and hotel from retail and to restaurant from retail, cinema, and hotel. These two tables demonstrate that there is a

Table 59. Percent distribution of internal trip destinations for exiting trips—Atlantic Station, P.M. peak period.

Origin Land Use	Destination Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel	Internal	External	Total	Total Trips
Office	—[1]	6	3	0	0	0	9	91	100	668
Retail	2	—[1]	19	13	4	1	39	61	100	1,867
Restaurant	1	41	—[1]	3	8	7	60	40	100	967
Residential	0	9	3	—[1]	0	1	13	87	100	350
Cinema	2	21	11	8	—[1]	0	42	58	100	281
Hotel	0	16	68	2	0	—[1]	86	14	100	94
All Origins	**1**	**13**	**11**	**7**	**4**	**2**	**38**	**62**	**100**	**4,227**

[1] Internal trips within a land use are not included in internal trip capture methodology.

Table 60. Percent distribution of internal trip origins for entering trips—Atlantic Station, A.M. peak period.

Destination Land Use	Origin Land Use						Summary			
	Office	Retail[2]	Restaurant	Residential	Cinema[3]	Hotel	Internal	External	Total	Total Trips
Office	—[1]	4	1	0	—	3	8	92	100	990
Retail[2]	32	—[1]	3	5	—	4	44	56	100	135
Restaurant	21	50	—[1]	0	—	6	77	23	100	34
Residential	0	0	0	—[1]	—	0	0	100	100	200
Cinema[3]	—	—	—	—	—[1]	—	—	—	—	—
Hotel	0	0	4	0	—	—[1]	4	96	100	25
All Destinations	**4**	**4**	**1**	**1**	**—**	**2**	**12**	**88**	**100**	**1,384**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Retail open during A.M. peak period was primarily grocery store.
[3] Cinema not open to customer during morning peak period.

different internal capture rate by direction, similar to that for Mockingbird Station. This should be no surprise as some of the peak period activities are very directional (e.g., commuting to work in A.M., from work in P.M.).

Table 62 shows the internal person trips and percentages for both peak periods by mode of travel for the reported trip. During the A.M. peak, there are a few internal vehicle driver and vehicle passenger trips. All walk and bicycle trips are internal. However, no taxi or transit trips are internal. Unlike Mockingbird Station, Atlantic Station is larger and encourages use of personal vehicles for some trips; the maximum internal trip length is about 0.6 miles.

In the P.M. peak period, the internal capture percentages are significant for trips by all modes. Some combination of after-work shopping, dinner, or cinema may be the cause of higher vehicle use for internal trips. Visitors who are less familiar with specific locations or distances may view the Atlantic Station shuttle as more convenient for internal trips.

Table 63 shows similar information for Atlantic Station, but by original mode of access. The mode shown is that used for the first trip to Atlantic Station, not for the trip being reported; therefore, if a person arrived early in the morning driving a vehicle but is interviewed during a walk trip, the mode of access is vehicle driver. Hence, for those who originally entered Atlantic Station by driving a personal vehicle, during the A.M. peak period 6% of the inbound trips were from internal origins and 26% of the outbound trips from Atlantic Station buildings were to internal destinations. During the A.M. peak period, there were few enough non-vehicle driver trips that the differences in internal trip percentages may be nearly meaningless. However, during the P.M. peak period, those with a personal vehicle as their access mode have a lower percentage of internal trips than most other modes. People who originally arrived by walk/bike and circulator modes tend to have higher internal trip percentages.

Table 64 reports internal capture percentages by whether or not the trip-maker had access to a vehicle for the trip. The

Table 61. Percent distribution of internal trip origins for entering trips—Atlantic Station, P.M. peak period.

Destination Land Use	Origin Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel	Internal	External	Total	Total Trips
Office	—[1]	31	8	0	6	0	45	55	100	124
Retail	3	—[1]	28	2	4	1	38	62	100	1,431
Restaurant	2	29	—[1]	1	2	5	39	61	100	1,218
Residential	1	46	6	—[1]	4	0	57	43	100	543
Cinema	1	26	25	0	—[1]	0	52	48	100	315
Hotel	0	17	71	5	0	—[1]	92	8	100	95
All Destinations	**2**	**20**	**16**	**1**	**3**	**2**	**44**	**56**	**100**	**3,726**

[1] Internal trips within a land use are not included in internal trip capture methodology.

Table 62. Peak period person-trips and percent internal trip capture by mode of travel—Atlantic Station.

Mode of Travel	A.M. Peak Period[1]				P.M. Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Vehicle Driver	1,110	4%	761	6%	2,125	18%	2,336	17%
Vehicle Passenger	72	10%	26	27%	215	27%	358	16%
Taxi/Car Service	0	0%	0	0%	18[a]	100%	43	42%
Transit (Bus)	0	0%	17	0%	15[a]	100%	101	15%
Transit (Circulating Shuttle)	86	0%	9	0%	325	41%	406	62%
Walk/Bicycle	116	100%	129	90%	1,026	100%	1,158	89%

[1] Travel mode not reported for 2 exiting trips.
[2] Travel mode not reported for 2 entering trips and 25 exiting trips.
[a] Limited sample; possible erroneous response.

Table 63. Peak-period person-trips and percent internal trip capture by mode of access—Atlantic Station.

Mode of Access	A.M. Peak Period[1]				P.M. Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Vehicle Driver	1,141	6%	283	26%	2,552	32%	2,645	31%
Vehicle Passenger	70	7%	31	16%	277	43%	409	29%
Taxi/Car Service	1	100%	1	100%	22	100%	22	100%
Transit (Bus)	36	100%	56	64%	40	100%	152	26%
Transit (Circulating Shuttle)	89	3%	4	75%	468	59%	331	84%
Walk/Bicycle	11	100%	18	61%	86	100%	129	68%

[1] Access mode not reported for 36 entering trips and 551 exiting trips.
[2] Access mode not reported for 281 entering trips and 539 exiting trips.

Table 64. Peak period person-trips and percent internal trip capture by vehicle access—Atlantic Station.

Automobile Access	A.M. Peak Period[1]				P.M. Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Yes (Vehicle Driver)	1,206	6%	302	24%	2,710	30%	2,857	29%
Yes (Non-Vehicle Driver)	58	24%	14	100%	71	49%	78	45%
No Vehicle Access	54	13%	20	35%	169	21%	107	34%

[1] Automobile access not reported for 66 entering trips and 608 exiting trips.
[2] Automobile access not reported for 776 entering trips and 1,185 exiting trips.

limited response seems to indicate that vehicle availability does not consistently influence the amount of internal trip making at Atlantic Station. Since most is conveniently walkable, the personal vehicles are not crucial to move around within Atlantic Station.

Legacy Town Center

Development Characteristics

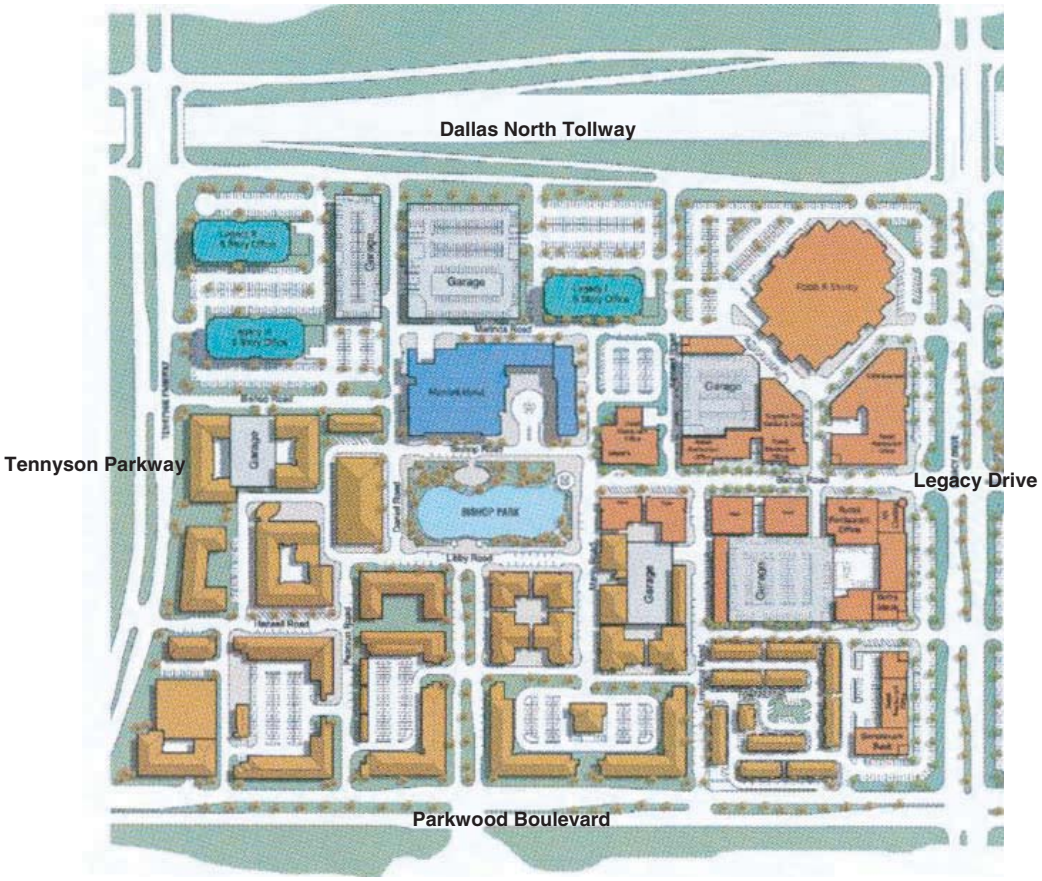
The third MXD surveyed was Legacy Town Center in Plano, Texas, which is a northern suburb in the Dallas–Ft. Worth area. Plano is located about 20 miles north of downtown Dallas. Development is almost solid to the south and east. Much of the area north and west of Plano is in active development.

Phase 1 of Legacy Town Center is completely developed. It is a multiple-block, single-development site bounded on all four sides by major roadways. The site is just over 70 acres. It consists of office, retail, restaurant, cinema, hotel, and residential land uses. Most retail and restaurant buildings are single story. Tenants tend to be specialty retail and restaurants ranging from better fast food to very exclusive. Most office space is in six-to-eight story buildings although a small amount is in second and third stories of two mixed-use buildings (which contain retail, restaurant, office, and/or residential space). Residential development consists of owner-occupied townhomes and rental apartments. There is one major full-service hotel and one five-screen cinema that shows mainly artistic movies. Table 65 contains the development program. Additional phases of Legacy Town Center are being developed to the north of Legacy Drive.

Table 65. Legacy Town Center development components.

Land Use	Occupied Development Units
Residential	1,300 apartments; 60 townhomes
Retail	196,264 sq ft
Office	310,764 sq ft
Restaurant	69,318 sq ft
Cinema	27,125 sq ft; 5 screens; 1,019 seats
Parking	6,070 parking spaces

Figure 8 illustrates the site plan of Legacy Town Center. The site is about 1,600 ft by 2,000 ft. The site is well connected by streets, with block lengths ranging between 300 and 600 ft. Each land use tends to be concentrated in a section of Legacy Town Center—for example, the apartments are in the southeastern



Source: The Shops at Legacy L.P.

Figure 8. Legacy Town Center illustrative site plan.



Source: Texas Transportation Institute

Figure 9. Legacy Town Center retail, restaurant, and cinema buildings along main retail street.

section, retail and restaurants are mixed but in the north portion, and townhomes are in a small portion of the east side. However, the connectivity provides a high degree of linkages between all blocks and land uses. Almost all blocks have landscaped walkways making them attractive to walk along and often are shaded. Figures 9 through 11 illustrate the character of Legacy Town Center.

Legacy Town Center is actually part of a large business park development, which could evolve upon buildout into a major suburban activity center. Much of the area is occupied by free-standing corporate headquarters buildings, but there are many other types of commercial and residential development close by including hotels, regional shopping centers, and residential complexes.

Observed activity demonstrated that Legacy Town Center has become a center of activity in the area, especially after work and in the evenings. Several restaurants were very busy, even during the week. The developer reported that most Legacy Town Center residents work within 5 miles of Legacy Town Center although a few work in Legacy Town Center. Most Legacy Town Center employees also live in the north Dallas region although, again, few are thought by management to live within Legacy Town Center.



Source: Texas Transportation Institute

Figure 10. Pedestrian-friendly environment in main retail and restaurant area.



Source: Texas Transportation Institute

Figure 11. Apartment building on south side of central park with office building in background.

Access to Legacy Town Center is provided by the Dallas North Tollway (which extends to downtown Dallas) and State Highway 121 (which extends across the region from northeast to central Ft. Worth), which is less than 1 mile north of Legacy Town Center. Legacy Drive is a regional east–west arterial. Tennyson Parkway and Parkwood Boulevard are minor arterials about 5 miles long.

Transit service to Legacy Town Center is limited: there is one DART bus route (452) that serves Legacy Town Center in a directional loop along both its north and south boundaries. Service operates between 6 A.M. and 11:30 P.M. Headways are 30 minutes during peak periods and 60 minutes during off-peak periods. There are multiple stops on both Legacy Drive and Tennyson Parkway. No use of this route by travelers to and from Legacy Town Center was observed either during survey periods or occasional additional observations. The Marriott Hotel offers its patrons free shuttle service to and from destinations in the area. Small shuttle vehicles provide this service. Hotel patrons do use this service.

Travel Survey

Travel surveys virtually identical to those conducted at Mockingbird Station and Atlantic Station were conducted at Legacy Town Center. Surveys were conducted Tuesday afternoon through Thursday morning, May 22–24, 2007. Due to rainy weather, surveys were also conducted on the following Thursday afternoon and Tuesday morning. One addition was employed for this survey: inbound office building interviews were conducted during the morning peak period.

Survey Results

Table 66 shows the number of exit movements and interviews during the 6:30–10 A.M. morning and 3:00–7:00 P.M.

Table 66. Peak-period interviews, exit movements, and percent interviewed—Legacy Town Center.

Land Use	Morning Peak Period			Afternoon Peak Period		
	Interviews[1]	Exit Movements	Percent Interviewed	Interviews[1]	Exit Movements	Percent Interviewed
Office	9	77	12%	80	362	22%
Retail	24	91	26%	59	595	12%
Restaurant	99	453	22%	74	913	11%
Residential	146	628	23%	80	592	19%
Cinema[2]	—	—	—	48	108	49%
Hotel	49	181	27%	50	299	17%
Total	**327**	**1,430**	**23%**	**391**	**2,869**	**16%**

[1] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[2] Cinema not open during morning peak period.

afternoon peak periods. Due to the size of Legacy Town Center and number of buildings and businesses, interviews could not be conducted at all buildings and businesses. Samples of each land use were selected based on discussions with the developer and property managers—for example, two of the three office buildings were surveyed and six of the eight major block faces of retail were surveyed. One furniture store declined to be included in the survey.

Overall, 23% of people exiting surveyed buildings were interviewed during the A.M. peak and 16% for the P.M. peak. No land use interview rate was less than 10%. The cinema was closed during the A.M. peak as were almost all non-convenience retail businesses and most restaurants. The only restaurants open were a specialty coffee shop and a bakery/coffee/light breakfast restaurant.

Table 67 shows the number of usable trips derived from the interviews. These are compared with the counted exit movements during the interview periods (including some buildings for which no interviews were conducted). In all, usable trips constituted 18% of the morning people exiting surveyed buildings and 14% in the afternoon. The minimum sample rate for the morning was 12% and afternoon was 8%.

Table 68 shows a summary of completed interviews, exiting people, and usable trips derived from the interviews. Table 67 shows the total of the reported trips as usable trips, if they were made during one of the two peak periods. Unusable trips included inbound trips that occurred outside the peak periods or trips for which the respondent was unable or unwilling to provide enough complete information to make the inbound trip usable. Finally, some otherwise complete interviews were not usable because the inbound trip reported was not actually the immediately previous trip; many of those trips were made outside the peak periods. First trips of the day from the onsite apartments did not have a previous trip that day.

The interviews reported in Table 68 differ slightly from interviews reported in prior tables because the interviews

Table 67. Peak-period usable trips, exit movements, and percent usable—Legacy Town Center.

Land Use	Morning Peak Period			Afternoon Peak Period		
	Usable Trips[1]	Exit Movements	Percent Usable	Usable Trips[1]	Exit Movements	Percent Usable
Office	9	73	12%	74	362	20%
Retail	25	108	23%	62	595	10%
Restaurant	100	551	18%	77	913	8%
Residential	148	710	21%	96	592	16%
Cinema[2]	—	—	—	49	108	45%
Hotel	54	400	14%	50	299	17%
Total	**336**	**1,842**	**18%**	**408**	**2,869**	**14%**

[1] Must include specific origin location, location of destination, and land use of destination if internal; the total includes total reported outbound and inbound trips made this period.
[2] Cinema not open during morning peak period.

Table 68. Peak-period interviews, exit movements, percent interviewed, and usable trips—Legacy Town Center.

Land Use	Morning Peak Period				Afternoon Peak Period			
	Interviews[2]	Exit Movements	Percent Interviewed	Usable Trips[3]	Interviews[2]	Exit Movements	Percent Interviewed	Usable Trips[3]
Office	9	73[a]	12%	9	80	312[b]	26%	74
Retail	24	108	22%	25	59	536[c]	11%	62
Restaurant	99	551	18%	100	74	913	8%	77
Residential	146	710	21%	148	80	592	14%	96
Cinema[1]	—	—	—	—	48	108	44%	49
Hotel	49	400	12%	54	50	299	17%	50
Total	**327**	**1,842**	**18%**	**336**	**391**	**2,760**	**14%**	**408**

[1] No interviews attempted at cinema during the morning peak period since cinema was closed.
[2] Number of interviews conducted with travelers exiting doors of a particular land use that contained at least one usable trip.
[3] Must include specific origin location, location of destination, and land use of destination if internal; the total includes total reported outbound and inbound trips made this period.
[a] Excludes 4 movements counted at establishments where no or too few interviews were completed for valid sample.
[b] Excludes 50 movements counted at establishments where no or too few interviews were completed for valid sample.
[c] Excludes 59 movements counted at establishments where no or too few interviews were completed for valid sample.

reported in Table 66 are associated with the land use for which an exit trip is reported, whereas previous tables reported where the interview occurred. A.M. interviews were completed at the open retail outlets—in this case, a convenience retail store and a dry cleaner—throughout the morning peak period. A United Parcel Service (UPS) store opened at 9 A.M.

Table 69 shows the number of trips exiting Legacy Town Center establishments that had exit trips described in interviews. This table also shows the number of persons counted exiting at locations where interviews were conducted plus the prorated number estimated to have exited at locations where counts and interviews were not conducted. These locations were judged by the researchers to be represented by similar establishments that were surveyed except one case in which the proprietor declined to permit any interviewing. That location was included in the proration by square footage. Legacy Town Center had no direct internal access to parking garages where the interviewers could not intercept exiting people. Hence, unlike Mockingbird Station and Atlantic Station, Legacy Town Center trip characteristics are based entirely on the exit interviews. Legacy Town Center also has far more separate establishments than either of the other two developments surveyed

Table 69. Morning peak-period surveyed trips, exit movements, and percent surveyed—Legacy Town Center.

Land Use	Surveyed Trips[2]	Exit Movements				Percent Surveyed[5]
		Doors	Unsurveyed Locations[3]	Garage Direct[4]	Total	
Office	9	77	21	—	98	9%
Retail	25	108	—	—	108	21%
Restaurant	100	551	—	—	551	18%
Residential	148	710	953	—	1,663	9%
Cinema[1]	—	—	—	—	—	—
Hotel	54	400	—	—	400	14%
Total	**336**	**1,846**	**974**	**—**	**2,820**	**12%**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Number of usable trip origins at each land use recorded from traveler interviews.
[3] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made but no usable trip origins were recorded on interviews.
[4] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[5] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

Table 70. Afternoon peak-period surveyed trips, exit movements, and percent surveyed—Legacy Town Center.

Land Use	Surveyed Trips[2]	Exit Movements				Percent Surveyed[5]
		Doors	Unsurveyed Locations[3]	Garage Direct[4]	Total	
Office	74	362	155	—	517	14%
Retail	62	595	266	—	861	7%
Restaurant	77	913	491	—	1,404	5%
Residential	96	592	794	—	1,386	7%
Cinema[1]	49	108	—	—	108	45%
Hotel	50	299	—	—	299	17%
Total	**408**	**2,869**	**1,706**	**—**	**4,575**	**9%**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Number of usable trip origins at each land use recorded from traveler interviews.
[3] Includes locations where no interviews were attempted (prorated by sq ft) and locations where door counts were made but no usable trip origins were recorded on interviews.
[4] Person-trips observed exiting onsite parking garages, assumed to be traveling directly to an external location.
[5] Includes those trips described in usable interviews or direct exits from a parking garage to the external street system.

in the pilot surveys, so a smaller portion of the establishments could be surveyed with the available resources. Approximately ⅔ of all trips were covered by direct interview sampling; the other ⅓ was included by proration. For the morning peak period, approximately 12% of all exiting trips are represented by surveyed trips.

Table 70 displays similar information for the P.M. peak period. There were about 60% more exiting trips in the P.M. peak period than during the A.M. peak period. The interviewed trips represent a sample of approximately 9% of all exiting trips.

Table 71 shows for each peak period the sources of entering trip information for trips entering Legacy Town Center establishments. For the morning peak period, interviews represent about 18% of the trips and the balance was assumed to all be external. For the evening peak period, about 38% of the entering trips are represented by interviews and the remaining 62% considered all external.

Table 72 shows results from the morning cordon count. As might be expected for a suburban development with limited transit service, almost all trips to and from Legacy Town Center were by motor vehicle. Transit, shuttle, walking, and bicycling combined accounted for about 4 to 6% of the A.M. and P.M. peak person trips. Almost none were by bicycle or public transit although some were by hotel shuttle van. Personal vehicle occupancy rates were about 1.07 inbound and 1.12 outbound for the A.M. peak period.

Table 71. Peak-period person-trips entering land uses—Legacy Town Center.

Land Use	Morning Peak Period					Afternoon Peak Period				
	Survey[2]	Garage Direct[3]	Transit Direct[4]	Balance[5]	Total	Survey[2]	Garage Direct[3]	Transit Direct[4]	Balance[5]	Total
Office	121	—	—	476	597	89	—	—	7	96
Retail	30	—	—	89	119	316	—	—	507	823
Restaurant	156	—	—	437	593	787	—	—	1,217	2,004
Residential	79	—	—	593	672	592	—	—	924	1,516
Cinema[1]	—	—	—	—	—	71	—	—	150	221
Hotel	6	—	—	181	187	115	—	—	200	315
Total	**392**	—	—	**1,776**	**2,168**	**1,970**	—	—	**3,005**	**4,975**

[1] Cinema did not actively generate trips during the morning peak period.
[2] Trip destinations recorded from exit interviews, expanded as described.
[3] Person-trips observed entering onsite parking garages, assumed to be traveling directly from an external location.
[4] Trips entering onsite land uses from external locations recorded on transit interviews.
[5] Balance of person-trips entering onsite land uses; assumed to originate externally.

Table 72. Morning peak-period and peak-hour person-trip cordon count—Legacy Town Center.

Travel Mode	Peak Period (7:00 A.M.–10:00 A.M.)				Peak Hour (7:30 A.M.–8:30 A.M.)			
	Trips		Percent		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	1,767	1,745	93%	91%	770	725	94%	93%
Motorcycle	0	1	0%	<1%	0	0	0%	0%
Delivery Vehicle	77	66	4%	3%	17	12	2%	2%
Transit[2]	15	76	1%	4%	11	29	1%	4%
Walk	49	31	3%	2%	21	13	3%	2%
Bicycle	0	0	0%	0%	0	0	0%	0%
Total All Modes	**1,908**	**1,919**	**100%**	**100%**	**819**	**779**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): 1.07/1.12.
[2] Transit trips include bus and hotel shuttle.

Table 73 shows similar data for the P.M. peak period. As with the A.M. peak period, the P.M. shows that nearly all trips to and from Legacy Town Center are by personal vehicle. Transit, bicycle, and walk modes in total compose a slightly lower percentage of trips in the P.M. than the A.M.. Vehicle occupancies were significantly higher during the P.M. peak period, possibly due to the increased percentages of trips to and from retail, restaurants, and entertainment businesses that are open during the P.M. peak period but not during the A.M. peak period.

Table 74 shows the A.M. and P.M. peak-period internal trip capture percentages as reported in the interviews. The A.M. peak-period internal capture was about 15% for entering trips and 11% for exiting trips. During the P.M. peak period, the internal capture percentages were higher at 33% for entering trips and 37% for exiting trips. These summaries include only trips between different land uses; trips between the same land use are not included to remain consistent with the trip generation methodology used by the ITE.

As might be expected, the highest A.M. internal capture rates are for retail (largely convenience). Office, residential, and hotel generated the lowest percentages of internal trips. Residential trips to internal destinations were primarily to convenience retail or the coffee shop. During the P.M. peak period, interaction between retail, restaurant, cinema, and hotel was demonstrated. Many onsite residents also traveled to these destinations. P.M. internal trip capture percentages were consistent for most land uses with between 30% and 43%. Although there were few trips destined for the office buildings, a high percentage were from internal origins; however, very few of those leaving office space at Legacy Town Center made trips to other onsite destinations. Trips leaving retail also had a high percentage of internal capture, with

Table 73. Afternoon peak-period and peak-hour person-trip cordon count—Legacy Town Center.

Travel Mode	Peak Period (4:00 P.M.–7:00 P.M.)				Peak Hour (5:00 P.M.–6:00 P.M.)			
	Trips		Percent		Trips		Percent	
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
Personal Vehicle[1]	3,192	2,832	94%	95%	1,107	1,066	93%	95%
Motorcycle	5	5	<1%	<1%	3	1	<1%	<1%
Delivery Vehicle	61	57	2%	2%	20	22	2%	2%
Transit[2]	39	13	1%	<1%	22	6	2%	1%
Walk	100	60	3%	2%	35	27	3%	2%
Bicycle	0	0	0%	0%	0	0	0%	0%
Total All Modes	**3,397**	**2,967**	**100%**	**100%**	**1,187**	**1,122**	**100%**	**100%**

[1] Personal vehicle occupancies (entering/exiting): peak period 1.23/1.16.
[2] Transit trips include bus and hotel shuttle.

Table 74. Peak-period person-trips and percent internal trip capture by land use—Legacy Town Center.

Land Use	Morning Peak Period				Afternoon Peak Period			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Office	560	15%	61	8%	90	93%	511	3%
Retail	119	25%	109	37%	728	30%	766	61%
Restaurant	593	26%	550	16%	1,833	33%	1,233	39%
Residential	631	6%	1,622	9%	1,352	32%	1,222	34%
Cinema[1]	—	—	—	—	221	32%	108	43%
Hotel	187	3%	400	9%	315	36%	299	38%
Total All Trips	**2,090**	**15%**	**2,742**	**11%**	**4,539**	**33%**	**4,139**	**37%**

[1] Cinema not open during morning peak period.

leisure shoppers remaining for dinner or a movie or going home to their residence onsite.

Table 75 shows the percentages of internal capture by land use for exiting A.M. peak period trips—that is, trips leaving those land uses. These percentages are based on the interviews. This table shows the degree of interaction between the various land uses. The greatest synergies during the A.M. peak period are from retail (i.e., convenience retail) to office and residential. As with Mockingbird Station and Atlantic Station, there is some interchange from restaurant (i.e., the coffee shop) to office, although at Legacy Town Center the specialty coffee shop is most of the way across the development from the major office buildings.

Table 76 shows similar data for the P.M. peak period. Exiting trips destined to other internal destinations are most frequent from retail to restaurant and residential; from restaurant to residential; and from residential, cinema, and hotel to restaurant. This reflects what is expected for an area that has significant amounts of synergy between complementary land uses.

Table 77 shows the internal trip capture percentages for entering trips by interchange between land uses. These percentages are shown as the percentage of total entering trips from individual land uses in Legacy Town Center. This table is for trips entering the various Legacy Town Center land uses. Internal capture percentages are highest entering retail (i.e., convenience retail) and restaurant from onsite residential.

Table 78 shows P.M. peak-period trip capture percentages for entering trips by interchange between land uses. With a higher total internal capture, the P.M. peak period also exhibits higher percentages of internal trips on individual interchanges with other land uses. The highest percentage of internal trip capture for entering trips was observed for trips entering office buildings from onsite residential and restaurant; however, inbound trips to office are very small in total numbers.

Table 75. Percent distribution of internal trip destinations for exiting trips—Legacy Town Center, morning peak period.

Origin Land Use	Destination Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema[2]	Hotel	Internal	External	Total	Total Trips
Office	—[1]	0	8	0	—	0	8	92	100	61
Retail	17	—[1]	6	14	—	0	37	63	100	109
Restaurant	9	2	—[1]	4	—	1	16	84	100	550
Residential	1	1	7	—[1]	—	0	9	91	100	1,622
Cinema[2]	—	—	—	—	—[1]	—	—	—	—	—
Hotel	0	0	9	0	—	—[1]	9	91	100	400
All Origins	**3**	**1**	**6**	**1**	**—**	**0**	**11**	**89**	**100**	**2,742**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Cinema not open during morning peak period.

Table 76. Percent distribution of internal trip destinations for exiting trips—Legacy Town Center, afternoon peak period.

Origin Land Use	Destination Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel	Internal	External	Total	Total Trips
Office	—[1]	0	1	2	0	0	3	97	100	511
Retail	1	—[1]	29	26	0	5	61	39	100	766
Restaurant	2	10	—[1]	18	6	3	39	61	100	1,233
Residential	4	6	21	—[1]	0	3	34	66	100	1,222
Cinema	0	8	31	2	—[1]	2	43	57	100	108
Hotel	0	5	33	0	0	—[1]	38	62	100	299
All Origins	**2**	**5**	**15**	**10**	**2**	**3**	**37**	**63**	**100**	**4,139**

[1] Internal trips within a land use are not included in internal trip capture methodology.

Table 77. Percent distribution of internal trip origins for entering trips—Legacy Town Center, morning peak period.

Destination Land Use	Origin Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema[2]	Hotel	Internal	External	Total	Total Trips
Office	—[1]	3	9	3	—	0	15	85	100	560
Retail	0	—[1]	8	17	—	0	25	74	100	119
Restaurant	1	1	—[1]	18	—	6	26	74	100	593
Residential	0	2	4	—[1]	—	0	6	94	100	631
Cinema[2]	—	—	—	—	—[1]	—	—	—	—	—
Hotel	0	0	3	0	—	—[1]	3	97	100	187
All Destinations	**0**	**2**	**4**	**7**	**—**	**2**	**15**	**85**	**100**	**2,090**

[1] Internal trips within a land use are not included in internal trip capture methodology.
[2] Cinema not open during morning peak period.

Table 78. Percent distribution of internal trip origins for entering trips—Legacy Town Center, afternoon peak period.

Destination Land Use	Origin Land Use						Summary			
	Office	Retail	Restaurant	Residential	Cinema	Hotel	Internal	External	Total	Total Trips
Office	—[1]	6	30	57	0	0	93	7	100	90
Retail	0	—[1]	17	10	1	2	30	70	100	728
Restaurant	0	12	—[1]	14	2	5	33	67	100	1,833
Residential	1	15	16	—[1]	0	0	32	68	100	1,352
Cinema	0	0	32	0	—[1]	0	32	68	100	221
Hotel	0	13	10	12	1	—[1]	36	64	100	315
All Destinations	**0**	**10**	**10**	**9**	**1**	**3**	**33**	**67**	**100**	**4,539**

[1] Internal trips within a land use are not included in internal trip capture methodology.

Table 79. Peak-period person trips and percent internal trip capture by mode of travel—Legacy Town Center.

Mode of Travel	Morning Peak Period				Afternoon Peak Period[1]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Vehicle Driver	1,968	10%	2,337	8%	3,569	16%	2,875	20%
Vehicle Passenger	6	100%	102	6%	20	100%	177	11%
Taxi/Car Service	0	0%	15	0%	0	0%	16	0%
Transit (Bus)	0	0%	16	0%	0	0%	0	0%
Transit (Hotel Shuttle)	0	0%	140	0%	5	100%	5	100%
Walk/Bicycle	118	100%	136	87%	943	100%	1,069	89%

[1] Travel mode not reported for 2 entering trips and 7 exiting trips.

More significant were trips entering the cinema and retail from restaurants; trips entering restaurants from residential and retail; trips entering residential from retail and restaurants; and trips entering the hotel from retail, restaurants, and residential. Inbound trips to restaurant and residential make up the great majority of the total inbound trips to Legacy Town Center land uses.

Table 79 shows the percentages of internal trip capture by mode of travel for each entering and exiting trip. This table shows data for trips for which mode of travel was reported. Unlike Mockingbird Station where there were almost no internal driving trips, Legacy Town Center has 8% to 10% of personal driving trips that are internal in the A.M. peak period and 16% to 20% in the P.M. peak period. By contrast, all inbound and nearly all outbound walk and bike trips remained internal to Legacy Town Center.

Table 80 shows similar data, but these are for trips made by people based on their original mode of access to Legacy Town Center. These results are limited to those who correctly reported mode of access; a few travelers reported mode of access to the area rather than to Legacy Town Center. During the A.M. peak period, nearly all trips were made by people who arrived at Legacy Town Center as a personal vehicle driver. During the P.M. peak period, there are more trips made by people who used modes of access other than driving. Of those nondrivers (who presumably did not have a vehicle available to drive the next trip unless they were onsite residents), virtually all of the trips entering Legacy Town Center land uses were internal trips. However, for trips exiting the Legacy Town Center land uses, about 25% of the original vehicle passengers were going to other internal land uses and about 50% of the taxi/car service passengers were destined internally; this compares with 31% for people who originally arrived onsite by driving a personal vehicle.

Given the size of the samples and internal trip capture percentages, no conclusion can be drawn from these data as to whether mode of access affects internal capture rates. Table 81 shows similar data, but this is based on availability

Table 80. Peak-period person-trips and percent internal trip capture by mode of access—Legacy Town Center.

Mode of Access	Morning Peak Period[1]				Afternoon Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Vehicle Driver	1,892	6%	670	17%	3,862	22%	2,772	31%
Vehicle Passenger	0	0%	11	0%	40	100%	159	25%
Taxi/Car Service	0	0%	0	0%	23	100%	45	51%
Transit (Bus)	6	100%	6	100%	0	0%	0	0%
Transit (Hotel Shuttle)	0	0%	0	0%	5	100%	5	100%
Walk/Bicycle	9	100%	9	100%	0	0%	0	0%

[1] Access mode not reported for 189 entering trips and 2,052 exiting trips.
[2] Access mode not reported for 609 entering trips and 1,158 exiting trips.

Table 81. Peak-period person-trips and percent internal trip capture by automobile access—Legacy Town Center.

Vehicle Access	Morning Peak Period[1]				Afternoon Peak Period[2]			
	Entering		Exiting		Entering		Exiting	
	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal	Trips	Percent Internal
Yes (Vehicle Driver)	1,892	6%	670	17%	3,862	22%	2,772	31%
Yes (Non-Vehicle Driver)	0	0%	11	0%	13	100%	121	11%
No Vehicle Access	9	100%	9	100%	52	100%	90	58%

[1] Automobile access not reported for 189 entering trips and 2,052 exiting trips.
[2] Automobile access not reported for 612 entering trips and 1,156 exiting trips.

of a personal vehicle for travel. It appears that the internal capture rate for those who did not have a personal vehicle available is higher than for those who could have driven. This is logical since once one travels to a destination, it makes sense to combine trips at the destination area.

Florida Survey Data

FDOT sponsored two studies of MXDs during the early 1990s. The two studies each covered three developments. While the objectives were similar to those for this project, procedural details were quite different for one of the studies. For the Florida study, the resulting internal capture data do not have as much specificity about internal trip-making.

The two studies used different questionnaires and, therefore, collected different data. One questionnaire provided data by individual trip, and the resulting data were usable for the current project. The other aggregated internal trips, so the data were not usable. For the usable study, data were collected for midday and P.M. peak periods. No data were collected for the A.M. peak period. Three MXDs were included. All three are located in Broward and Palm Beach counties (i.e., the east coast of Florida in the Fort Lauderdale–Palm Beach area).

Data for the usable study were not available in original form, so the relevant portion was re-keyed from copies of formatted printouts of the original data so that they could be analyzed. Some survey trip records were not totally clear and a few ran off the available pages, so there could be minor inaccuracies in a few records; however, this was not judged to compromise the overall value of the data for the purposes of this project.

Data for the three Florida developments were collected from mid-morning until 6:15 P.M. Only data matching the data collection periods for the NCHRP Project 8-51 pilot studies were used. Hence, the Florida data used covered the P.M. peak period (3:30 P.M. to 6:15 P.M. compared with 3:30 P.M. to 7:00 P.M. for the NCHRP Project 8-51 pilot studies).

One other characteristic of the data was different from the pilot study data. Interviews for the pilot studies were primarily exit interviews conducted as people departed from specific businesses or other uses and were expanded based on counts of people exiting the same doors. The Florida interviews were conducted at locations within the developments, some of which were in front of entrances and some of which were along busy walkways. The three developments surveyed were

- Country Isles,
- Village Commons, and
- Boca del Mar.

Three sites were surveyed in 1993 as part of a study that produced a report titled *FDOT Trip Characteristics Study of Multi-Use Developments* (*18*). Each site not only had multiple uses, but also had different parts of the development separated from each other in distance, connectivity, or both. Whereas Mockingbird Station, Atlantic Station, and Legacy Town Center are essentially fully integrated and well connected, the Florida sites were more conventionally arranged in pods. Interaction between the pods requires crossing parking lots and some separations that are beyond reasonable walking distances.

Origin-destination interviews were conducted at each of the study sites. The interviews were structured to collect three different types of information about each site: macro trip-making characteristics, micro trip-making characteristics, and trip length. The characteristics for each type of information are as follows:

1. **Macro trip-making** characteristics pertain to the characteristics of a trip to and from the site. These characteristics were used in the FDOT research project to categorize trips as captured, primary, diverted, or secondary.
2. **Micro trip-making** characteristics pertain only to the part of the trip *within* the site. This information was used in the FDOT research project to determine the number of internally captured trips, the number of the trip stops within the site, and the interaction between land uses. Through examination of individual survey records, researchers for

NCHRP Project 8-51 were able to identify next-stop locations and to categorize them as internal or external, and, if internal, the specific land use or site tenant.

3. **The length of the trip** made to and from the site was used in the FDOT research project to calculate the percentages of trips originating or ending at various distances from the site. This was collected in the Florida study for use in impact fee analyses.

Pedestrian count data were collected at most locations where origin-destination surveys were conducted. The purpose of the pedestrian data was to develop survey sample rates. The number of pedestrians entering and exiting each business was recorded. The areas of each site were sectioned off to establish areas of responsibility for each pedestrian counter so that the counts represented a complete, and not overlapping, count of persons entering or leaving the site.

Three different origin-destination survey forms were used. The office and retail/services forms were very similar, each containing 14 questions. The residential survey forms were divided into two different categories: one for incoming surveys and one for outgoing surveys. Appendix E includes copies of the forms.

Country Isles

The Country Isles mixed-use site is located in an area of west Broward County known as Weston. Figure 12 illustrates the general location of the site. Its commercial area is bounded by I-75, SW 14th Street, Weston Road, and Dykes Road. The residential component is directly across Weston Road from the Country Isles Shopping Center. The Country Isles mixed-use site covers approximately 61 acres, of which 46 are commercial and 15 are residential.

The Country Isles site was surveyed on June 30, 1993. Origin-destination surveys were conducted at 18 different locations within the site. Based on site observations, there appeared to be ample parking. There was no charge for parking anywhere within the site. There was no fixed-route transit service to the site.

Site Composition

Country Isles consists of three major development areas:

- Fairlake at Weston, a multi-family residential area;
- Country Isles Shopping Center; and
- Indian Trace Shopping Center.

Figure 13 shows the layout of Country Isles. Total commercial building square footage was 252,681, with about 70% retail (175,697 gross sq ft); 25% office (64,234 gross sq ft); and 5% daycare. The total number of dwelling units was 368. Figure 13 shows the tenant types and locations.

Proximity of Commercial Competition

At the time of data collection, the Country Isles development was the primary shopping center site serving the Weston and Bonaventure areas. The closest competing shopping center was Westgate Square, located approximately 2 miles away. Both sites had a supermarket, drug store, restaurants, banks, and small retail land uses; however, the Country Isles development was larger and more centrally located within the Weston community. It also offered a wider variety of land uses including medical and professional offices, a movie theater, daycare, and a convenience store. Finally, in the opinion of the original FDOT report authors, the general appearance of the Country Isles site (e.g., landscaping, site entrance) was more appealing than that of Westgate Square.

Site Components

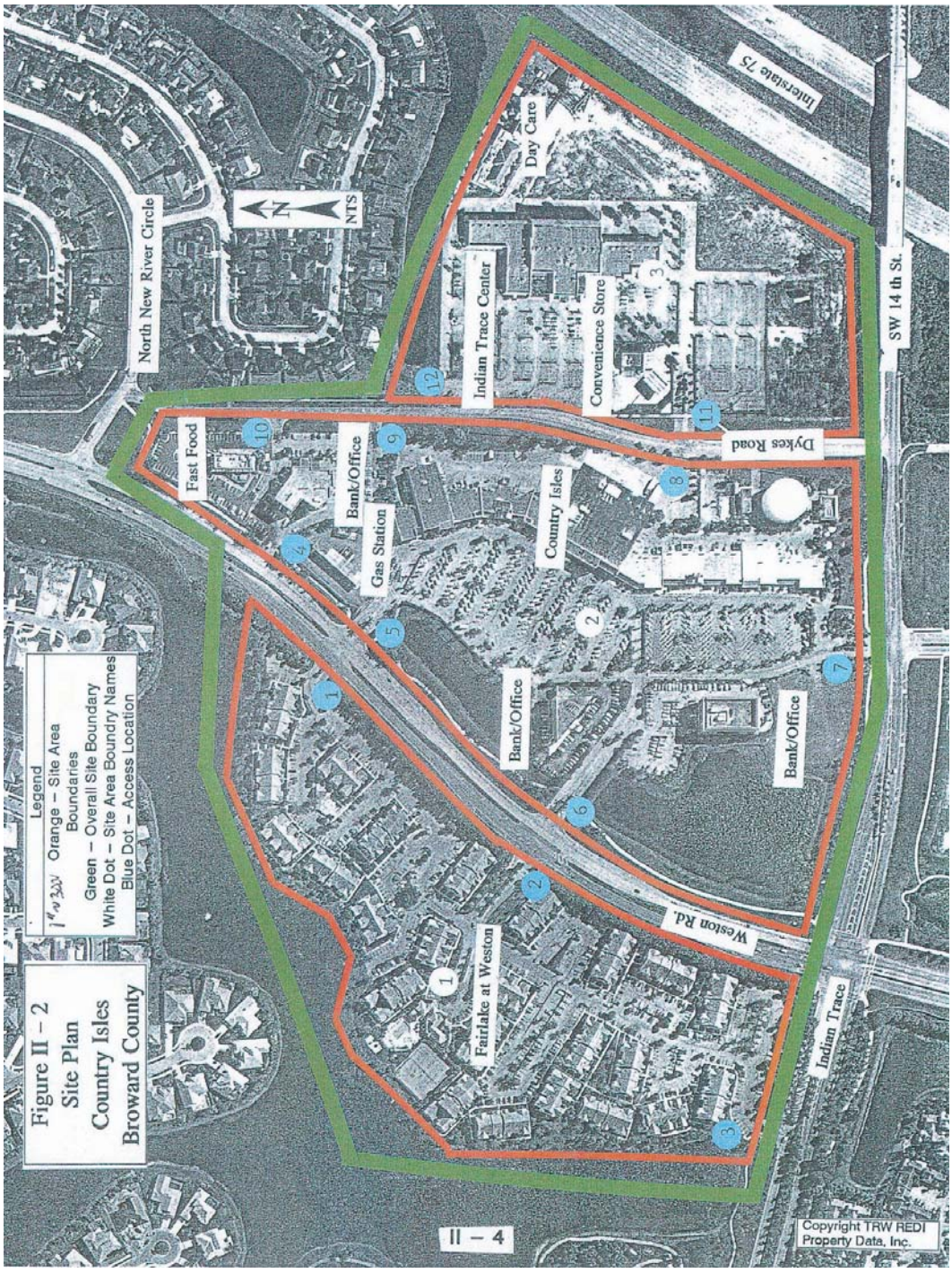
The descriptions that follow are grouped according to how land uses are aggregated for the data collection and data analysis.

Country Isles Shopping Center. The Country Isles Shopping Center was the primary retail center of this mixed-use site. Its 33 businesses included

- A supermarket and drug store;
- Five restaurants, including pizza, bagel, Italian, and Chinese;
- Numerous retail stores, including ice cream, party goods, video rental, shoes, liquor, children's clothing, framing, bicycles, florist, hardware, cards; and
- Several services such as medical offices, insurance agents, banks, shoe repair, a hair salon, a dry cleaner, a weight clinic, real estate agencies, an eye center, and a travel agency.

The Country Isles Shopping Center was 99,651 gross sq ft in size. Its largest tenant was a supermarket composing about 40% of the space. Restaurant use was 11%, bank space was 5%, and miscellaneous office space was 6%. The convenience retail, service units, and the supermarket composed about 78% of the shopping center space. The shopping center was approximately 90% occupied at the time of data collection. The shopping center had approximately 459 parking spaces, all in a surface lot.

Indian Trace Shopping Center. The Indian Trace Shopping Center included various restaurant, retail service, small office, and movie theater land uses. Because Indian Trace faces the back of the Country Isles Shopping Center, the most direct



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-4

Figure 12. Country Isles as depicted in the FDOT report (18).



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-6

Figure 13. Country Isles land use details as depicted in the FDOT report (18).

path between their primary parking areas was approximately 1,400 ft. Indian Trace tenants included

- Four restaurants, ranging from pizza to yogurt to deli;
- Several services including mail shipping, a dance studio, a dry cleaner, a karate school, health foods, an animal clinic, insurance, real estate, and a hair salon;
- Several small offices including a church office and medical offices; and
- A movie theater.

The Indian Trace Shopping Center was 68,400 gross sq ft in size. Its largest tenant was a movie theater composing about 38% of the space. Restaurant use was 8% and miscellaneous office space was 7%.

Convenience Stores. The Country Isles site also had two convenience stores, both with gasoline pumps. The first was located near the Country Isles shopping center and was 924 gross sq ft in size. It had 12 vehicle-fueling positions. The second was located near the Indian Trace shopping center and was 2,946 gross sq ft, with 8 vehicle-fueling positions. Together, the two convenience stores were 3,870 sq ft (less than 2% of the total commercial square footage at Country Isles). Of the three sites surveyed as part of the FDOT internal capture research project and the three sites surveyed as part of NCHRP Project 8-51, Country Isles was the only mixed-use site with onsite convenience stores with gasoline pumps.

Fast-Food Restaurant. There was a stand-alone, fast-food restaurant located in the northern most corner of the

site. Its building was 3,776 gross sq ft (less than 2% of the total commercial square footage at Country Isles). During the P.M. peak period for the NCHRP Project 8-51 analysis window, only two useable interviews were conducted. Therefore, no trips *from* fast-food restaurant were assumed to be internal to the site, but trips to the fast-food restaurant from other Country Isles uses were recorded and reported in the following sections.

Office Buildings. The Country Isles site had three stand-alone office buildings, totaling 64,234 gross sq ft. There was a three-story office building complex located just to the south of the fast-food restaurant. The complex had 26,000 sq ft and included a bank with drive-through facilities, a real estate agency, some medical office space, and some general office space. About one-third of the space was the bank. The building had approximately 118 parking spaces. Persons leaving this office building were not interviewed.

In the west central part of the site, there was a three-story office building complex. The building was 10,000 sq ft and included professional offices and a bank with drive-through facilities. About one-third of the space was occupied by the bank. The building had approximately 46 parking spaces and was located approximately 300 ft from the center of the Country Isles Shopping Center.

In the southern part of the site, there was a three-story office building complex. The building was 28,234 sq ft and included a bank with drive-through facilities, an insurance agency, and professional office space. About 15% of the building space was occupied by the bank. The building had approximately 113 parking spaces and was located approximately 300 ft from the center of the Country Isles Shopping Center.

Fairlake at Weston. Fairlake at Weston is a residential, multi-family apartment development with 368 units. Its occupancy level at the time of this study was estimated at 90%. The approximate center of Fairlake was located 1,200 ft from the supermarket at the Country Isles Shopping Center.

Daycare Center. The Country Isles site had a daycare center located near the northern edge of the Indian Trace Shopping Center, approximately 1,700 ft from the supermarket at the Country Isles Shopping Center and 2,600 ft from the center of the Fairlake residential development. The daycare center was 12,750 gross sq ft. Of the three sites surveyed as part of the FDOT internal capture research project and the three sites surveyed as part of NCHRP Project 8-51, Country Isles was the only one with a daycare center.

Data Collection

Origin-destination interviews were conducted at 18 stations throughout Country Isles. Different expansion factors were developed for each site (i.e., residential, office, and commercial land use categories) based on pedestrian counts, vehicle counts, and vehicle-occupancy counts. Table 82 lists the numbers of useable surveys collected at each land use. Also interviewed were 13 (or 5%) of the 269 inbound motorists at the Fairlake at Weston residential site.

Analysis of Internal Capture

Table 83 summarizes the overall internal capture found at the individual Country Isles land uses. The data shown in the second column represent the percentage of trips from the origin land use that are internally captured within the study site. Data in the right column show the same for trips to the destination land use. To more fully understand these overall internal capture rates for each land use, it was necessary to investigate internal capture rates for pairs of land uses. The following presents these data.

Table 84 presents the distribution of trip destinations for trips exiting each of the surveyed Country Isles land uses. Separate sets of values are listed for the Country Isles Shopping Center, for the Indian Trace Shopping Center, and for the combined trips exiting both shopping centers. The distribution is as follows:

- Of trips leaving the onsite office buildings, 25% had an internal retail destination—20% at the shopping centers and 5% at either of the two gasoline/convenience stores.

Table 82. P.M. peak-period useable surveys and sample rate—Country Isles.

Land Use	Exit Movements	Usable Interviews	Percent Interviewed
Office	573	45	8%
Retail	1,644	123	7%
Gasoline/Convenience	466	65	14%
Residential	173	44	25%
Daycare	396	73	18%
Total	**3,252**	**350**	**11%**

Table 83. P.M. peak-period percent internal capture by land use—Country Isles.

Land Use	Percent Internal Capture as Origin Land Use	Percent Internal Capture as Destination Land Use
Office	25%	2%
Shopping Center	20% for Country Isles 44% for Indian Trace 26% overall	20% for Country Isles 57% for Indian Trace 28% overall
Gasoline/Convenience	4%	36%
Fast-Food Restaurant	Not available	30%
Residential	36%	25%
Daycare	18%	0%
Total	**22%**	**24%**

- Of the trips leaving the Country Isles Shopping Center, 12% were destined to a non-shopping center internal use; 29% of the trips leaving the Indian Trace Shopping Center were destined for the same.
- When combined, the two shopping centers sent 1% of their outbound trips to onsite office buildings; 7% to the onsite gasoline/convenience stores; 2% to the onsite, free-standing fast-food restaurant; and 4% to the onsite residential area.
- Of the trips leaving the onsite gas/convenience stores, 4% were destined to onsite retail; the remainder travel to external destinations.
- Of trips leaving onsite residential, 36% were traveling to onsite destinations—25% to the shopping centers, 9% to the gasoline/convenience stores, and 2% to the fast-food restaurant.
- Of trips leaving the onsite daycare center, 17% were traveling to onsite destinations—15% to the shopping centers and 1% each to the gasoline/convenience stores and to residential.

Table 85 shows the distribution of trip origins for trips entering each of the surveyed Country Isles land uses. Separate sets of values are listed for the Country Isles Shopping Center, for the Indian Trace Shopping Center, and for the combined trips entering both shopping centers. The distribution is as follows:

- Of trips entering the onsite office buildings, 2% had an internal origin, all from the shopping centers (as opposed to 25% of the exiting trips that are internal as shown in Table 84).
- Of the trips entering the Country Isles Shopping Center, 13% arrived from internal use (same as for exiting); also arriving from an internal use were 34% of the trips entering the Indian Trace Shopping Center (greater than the percentage exiting). When combined, the two shopping centers received 7% of their inbound trips from onsite office buildings, 1% from the onsite gasoline/convenience stores, 3% from the onsite residential area, and 4% from the onsite daycare center.

Table 84. P.M. peak-period percent distribution of internal trip destinations for exiting trips—Country Isles.

Origin Land Use	Percent Internal Trips by Destination Land Use[1]							Percent External	Total
	Office	Shopping Center	Gas/ Conv	FF Rest	Residential	Day Care	Total Internal		
Office	—	20	5	0	0	0	25	75%	100
Country Isles Shopping Center	0	—	9	3	0	0	12	88%	100
Indian Trace Shopping Center	2	—	5	3	19	0	29	71%	100
Both Shopping Centers	1	—	8	2	5	0	16	84%	100
Gasoline/Convenience	0	4	—	0	0	0	4	96%	100
Residential	0	25	9	2	—	0	36	64%	100
Daycare	0	15	1	0	1	—	17	83%	100

[1] Calculated to exclude trips within the same land use.

Table 85. P.M. peak-period percent distribution of internal trip origins for entering trips—Country Isles.

Origin Land Use	Percent Internal Trips by Destination Land Use[1]							
	Office	Shopping Centers			Gas/ Conv	FF Rest	Residential	Daycare
		Country Isles	Indian Trace	Subtotal				
Office	—	6	17	8	6	0	0	0
Shopping Center	2	—	—	—	25	27	23	0
Gas/Convenience	0	1	5	1	—	0	0	0
Residential	0	3	3	3	3	3	—	0
Daycare	0	3	9	4	1	0	2	—
Total Internal	2	13	34	17	36	30	25	0
External	98	87	66	83	64	70	75	100
Total	100	100	100	100	100	100	100	100

[1] Calculated to exclude trips within the same land use; totals shown may not equal sums due to rounding.

- Of the trips entering the onsite gasoline/convenience stores, 36% came from onsite uses—6% from the office, 25% from the shopping centers, 3% from residential, and 1% from the daycare center.
- Of the trips that traveled to the onsite, free-standing, fast-food restaurant, 30% came from onsite uses—27% from the shopping centers and 3% from residential.
- Of the trips entering onsite residential, 25% traveled from an onsite origin—23% from the shopping centers and 2% from the daycare.
- Of the trips entering the onsite daycare center, 100% traveled from outside Country Isles.

Village Commons

The Village Commons site is located within the southwestern limits of the City of West Palm Beach in Palm Beach County. The overall mixed-use site straddles Village Boulevard, immediately northwest of Palm Beach Lakes Boulevard. The Village Commons mixed-use site encompasses approximately 72 acres, of which 54 are commercial and 18 are residential. Figure 14 shows the general layout of Village Commons. Figure 15 shows the types and locations of tenant land uses.

Village Commons was surveyed on July 14, 1993. Origin-destination surveys were conducted at 14 different locations within the site. There was no charge for parking anywhere within the site. Additionally, based on field observations, there was an adequate parking supply to service all land uses, with the possible exception of the health spa. There was no formal fixed-route transit service provided to the Village Commons site.

Site Composition

The Village Commons site has four major development areas: the Village Commons Shopping Center, the Brandywine Center, various office buildings located throughout the site, and the Pointe multi-family residential community. Total commercial square footage in Village Commons was 524,350 with 34% retail (179,840 sq ft), 57% office (297,581 sq ft), and 9% health spa. The total number of dwelling units was 317.

Proximity of Commercial Competition

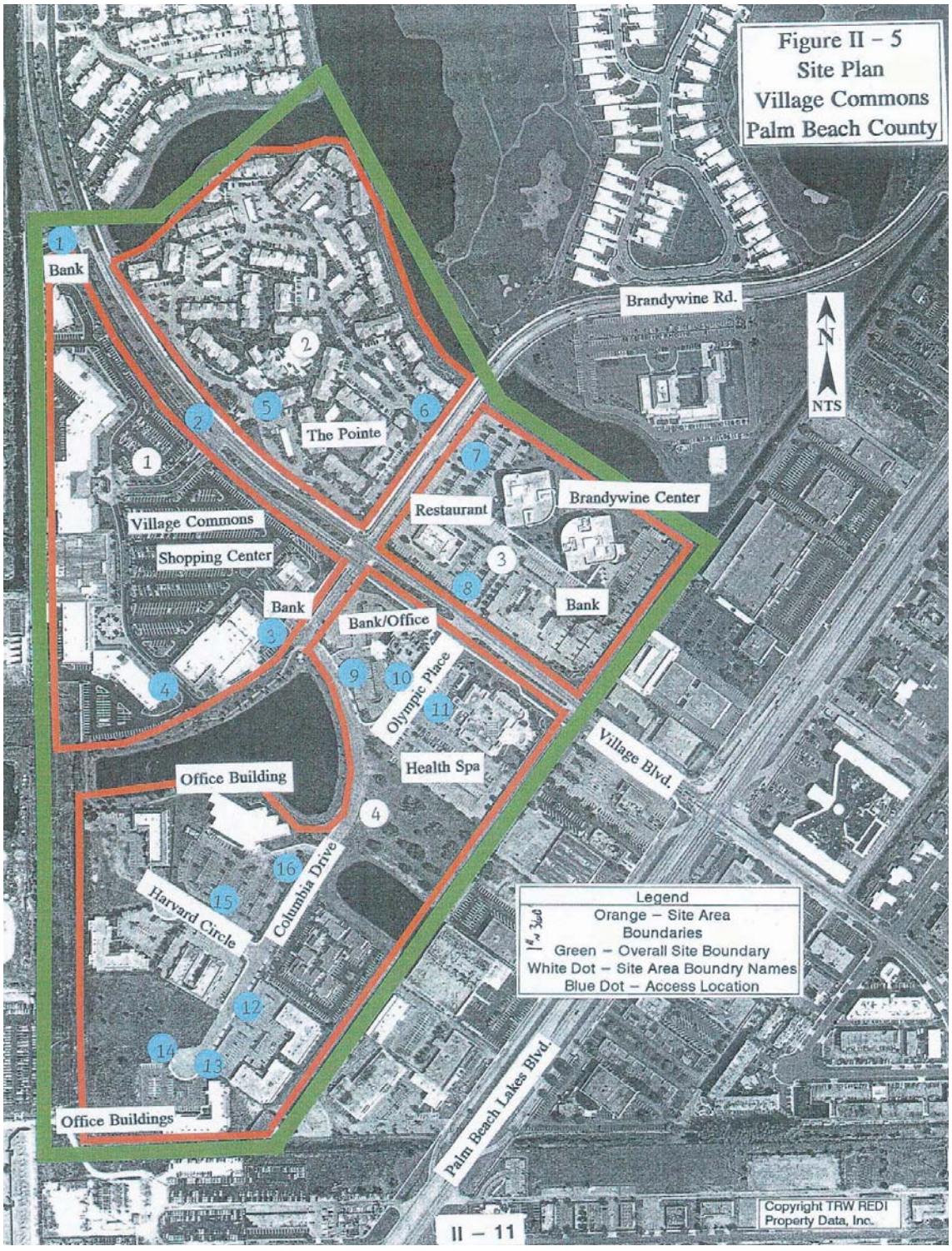
There were numerous office, restaurant, hotel, and retail land uses (including a regional mall) that were proximate to the Village Commons site.

Site Components

The descriptions that follow are grouped according to how land uses are aggregated for the data collection and data analysis.

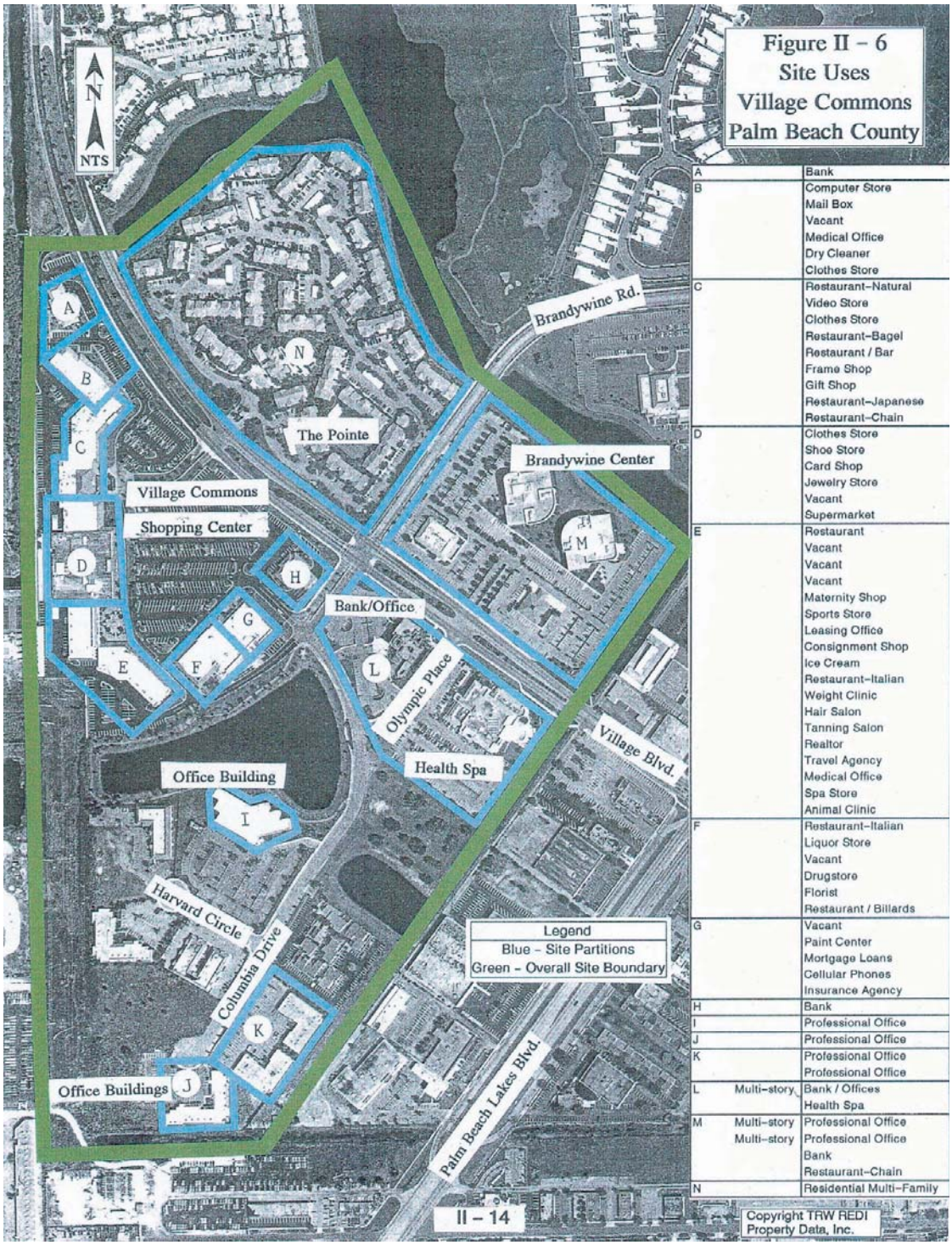
Village Commons Shopping Center. The Village Commons Shopping Center included the following:

- A supermarket and drug store;
- Eight restaurants ranging from natural foods to Japanese to bagels;
- Retail stores including computers, clothing, video, framing, gifts, shoes, cards, jewelry, maternity, sporting goods, consignment, ice cream, paint, cell phones, liquor, and flowers; and



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-11

Figure 14. Village Commons site layout as depicted in the FDOT report (18).



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-14

Figure 15. Village Commons tenant details as depicted in the FDOT report (18).

- Service establishments such as banks, mail shipping, dry cleaning, a leasing office, a weight clinic, a hair salon, a tanning salon, real estate, a travel agency, an animal clinic, insurance, and a mortgage company.

The shopping center was 170,740 gross sq ft in size. Its largest tenant was a supermarket encompassing 23% of the overall center space. There were a significant number of restaurants in the shopping center, composing 19% of the center space. Banks composed 6% and office space composed 4%. Despite being a large component of the overall shopping center, restaurants were not separated in the data analysis because the pedestrian count data did not separate between restaurant and non-restaurant volumes, thereby eliminating the possibility of developing reasonably accurate survey expansion factors for restaurant and non-restaurant trips.

Brandywine Center: Sit-Down Restaurant. The Brandywine Center contained four buildings: a sit-down chain restaurant, a bank, and two office buildings. The restaurant in Brandywine Center was 9,100 gross sq ft. The bank and office buildings are included in the next section.

Office Buildings. Village Commons had a total of nearly 300,000 sq ft in office buildings. The two three-story office buildings in Brandywine Center totaled 122,870 sq ft (of which 4% was in a bank) and were located approximately 1,500 ft from the Village Commons Shopping Center. Although sidewalks and crosswalks were available for pedestrian use, the fact that Village Boulevard was a four-lane divided roadway possibly would discourage pedestrian movement between the Brandywine and Village Commons centers. An office building was located at the northeast corner of Harvard Circle, approximately 1,800 ft from the Village Commons Shopping Center. It totaled 96,270 sq ft. The three office buildings located along Columbia Drive totaled 45,524 sq ft and were approximately 1,800 ft from the Village Commons Shopping Center. A multi-story office/bank building located at the southeast corner of Brandywine Road and Village Boulevard bounded by Columbia Drive and Olympic Place totaled 32,917 sq ft (of which 18% was in a bank). It was located approximately 800 ft from the Village Commons Shopping Center. Persons leaving this office building were not interviewed.

The Pointe. The Pointe development is a residential multifamily development containing 317 units. Its occupancy was estimated to be approximately 93% on the survey date. The FDOT research project was not allowed to conduct origin-destination surveys at the Pointe. Village Commons residential internal trips were estimated using Village Commons vehicle count data and average residential internal trip rates observed at the other two sites. The approximate center of the Pointe is located 900 ft from the supermarket at Village Commons Shopping Center.

Health Spa. There is a health spa located in the area bounded by Village Boulevard and Olympic Place. It encompasses 46,929 sq ft. An origin-destination survey was not conducted at the health spa, and no trips to the health spa were identified during the surveys conducted at other uses at the Village Commons site.

Data Collection

Origin-destination interviews were conducted at 14 stations throughout Village Commons. Different expansion factors were developed for each site (i.e., residential, office, and commercial land use categories) based on pedestrian counts, vehicle counts, and vehicle-occupancy counts. Table 86 lists the numbers of useable surveys collected at each land use.

Analysis of Internal Capture

Table 87 summarizes the overall internal capture found at the individual Country Isles land uses. In order to more fully understand these overall internal capture rates for each land use, it was necessary to investigate internal capture rates for pairs of land uses. Those data follow.

Table 86. P.M. peak-period usable surveys and sample rate—Village Commons.

Land Use	Exit Movements	Usable Interviews	Percent Interviewed
Office	718	78	11%
Retail	1,216	253	21%
Sit-Down Restaurant	167	27	16%
Residential	179	Not Interviewed	Not Interviewed
Total	**2280**	**358**	**16%**

Table 87. P.M. peak-period percent internal capture by land use—Village Commons.

Land Use	Percent Internal Capture as Origin Land Use	Percent Internal Capture as Destination Land Use
Office	7%	0%
Retail	7%	7%
Sit-Down Restaurant	7%	4%
Residential	27%	37%
Total	**9%**	**9%**

Table 88 presents the distribution of trip destinations for trips exiting each of the surveyed Village Commons land uses:

- Of trips leaving the office buildings onsite, 7% have an internal destination—6% to the shopping center and 1% to residential.
- Of the trips leaving the Village Commons Shopping Center, 7% were destined to an internal use, all residential.
- Of the trips leaving the onsite sit-down restaurant, 7% were destined to onsite destinations—half to the shopping center and half to residential.
- Of trips leaving the onsite residential, 27% were traveling to onsite destinations—25% to the shopping center and 2% to the fast-food restaurant. (The Pointe was not surveyed; these internal trip-making estimates are based on values derived at the other two FDOT research sites and on observed balancing of trips into and out of the Village Commons uses.)

Table 89 presents the distribution of trip origins for trips entering each of the surveyed Village Commons land uses:

- None of the trips entering the office buildings onsite had an internal origin.
- Of the trips entering the Village Commons Shopping Center, 7% (same as for exiting) arrived from an internal use—3% each from office and residential and less than 1% from the sit-down restaurant.
- Of the trips traveling to the onsite, sit-down restaurant, 4% came from onsite uses, all from the residential.
- Of the trips entering onsite residential, 37% came from an onsite origin—30% from the shopping center, 4% from office, and 2% from the sit-down restaurant.

Boca Del Mar

The Boca Del Mar site is located in southwest Palm Beach County. The mixed-use site is situated in the southwest quadrant of the intersection of Powerline Road and Palmetto Park Road. The commercial component of the site encompasses 42 acres. Figures 16 and 17 show the layout of Boca del Mar, and Figure 18 shows the tenant land uses and locations for the eastern portion of Boca del Mar. The western portion is all residential.

Boca del Mar was surveyed on July 21, 1993. Origin-destination interviews were conducted at 20 different locations within the site. Based on field observations, there appeared to be an ample parking supply to support the site land uses and there was no charge for parking at the site. There was no formal fixed-route transit system serving the site.

Site Composition

Boca Del Mar has six major development components:

1. Garden Shops at Boca;
2. Palms Plaza;
3. A multi-story office building at the northwest corner of the site;

Table 88. P.M. peak-period percent distribution of internal trip destinations for exiting trips—Village Commons.

Origin Land Use	Destination Land Use						
	Office	Retail	Restaurant	Residential	Total Internal	External	Total
Office	—	6	0	1	7	93	100
Retail	0	—	0	7	7	93	100
Sit-Down Restaurant	0	4	—	4	7	93	100
Residential	0	25	2	—	27	73	100

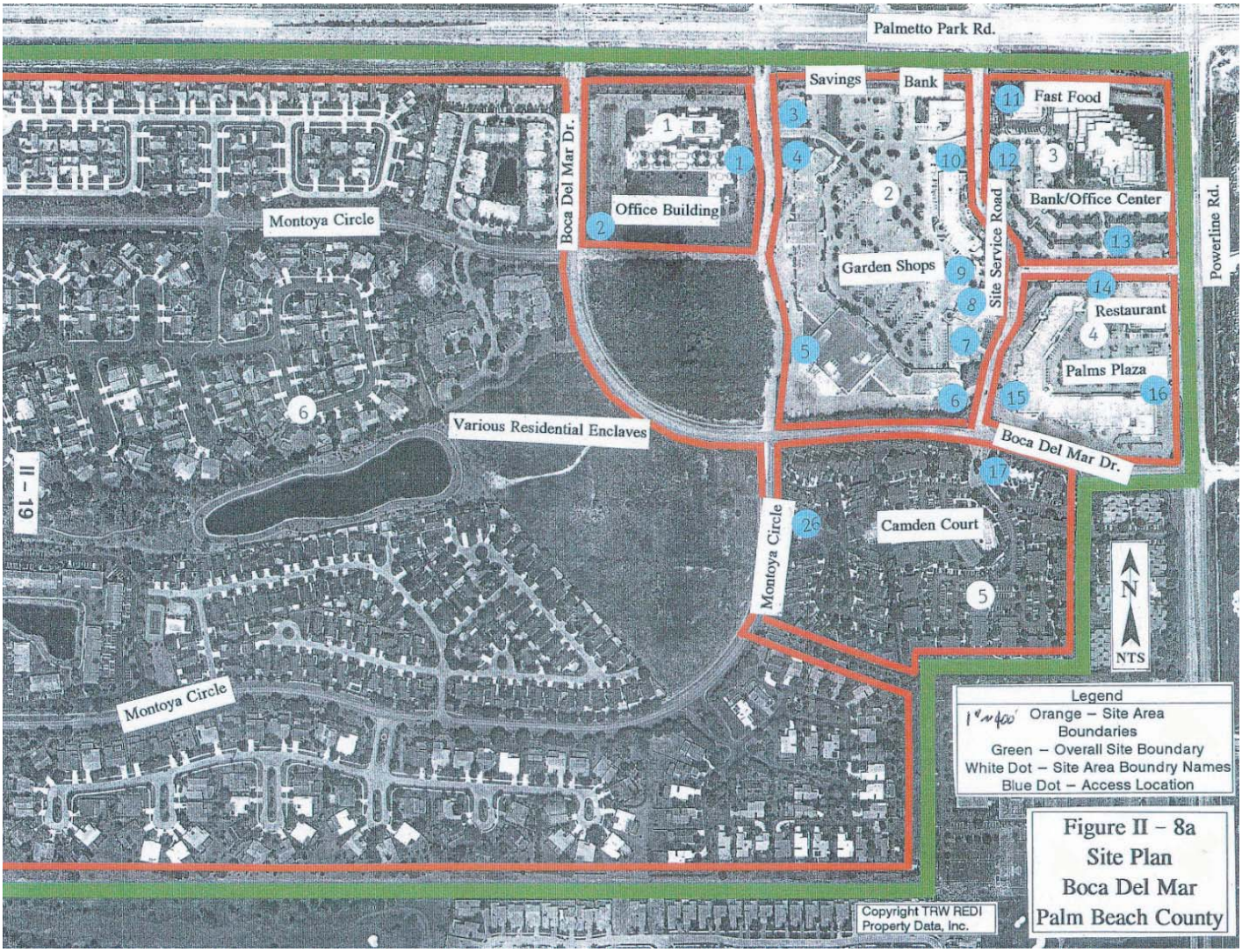
Table 89. P.M. peak-period percent distribution of internal trip origins for entering trips—Village Commons.

Origin Land Use	Destination Land Use			
	Office	Retail	Restaurant	Residential
Office	—	3	0	4
Retail	0	—	0	30
Sit-Down Restaurant	0	<1	—	2
Residential	0	3	4	—
Total Internal	0	7	4	37
External	100	93	96	63
Total	**100**	**100**	**100**	**100**

4. A multi-story bank and office building at the northeast corner of the site;
5. Camden Court, a multi-family residential complex on the south side of the site; and
6. Various residential areas to the west of the site.

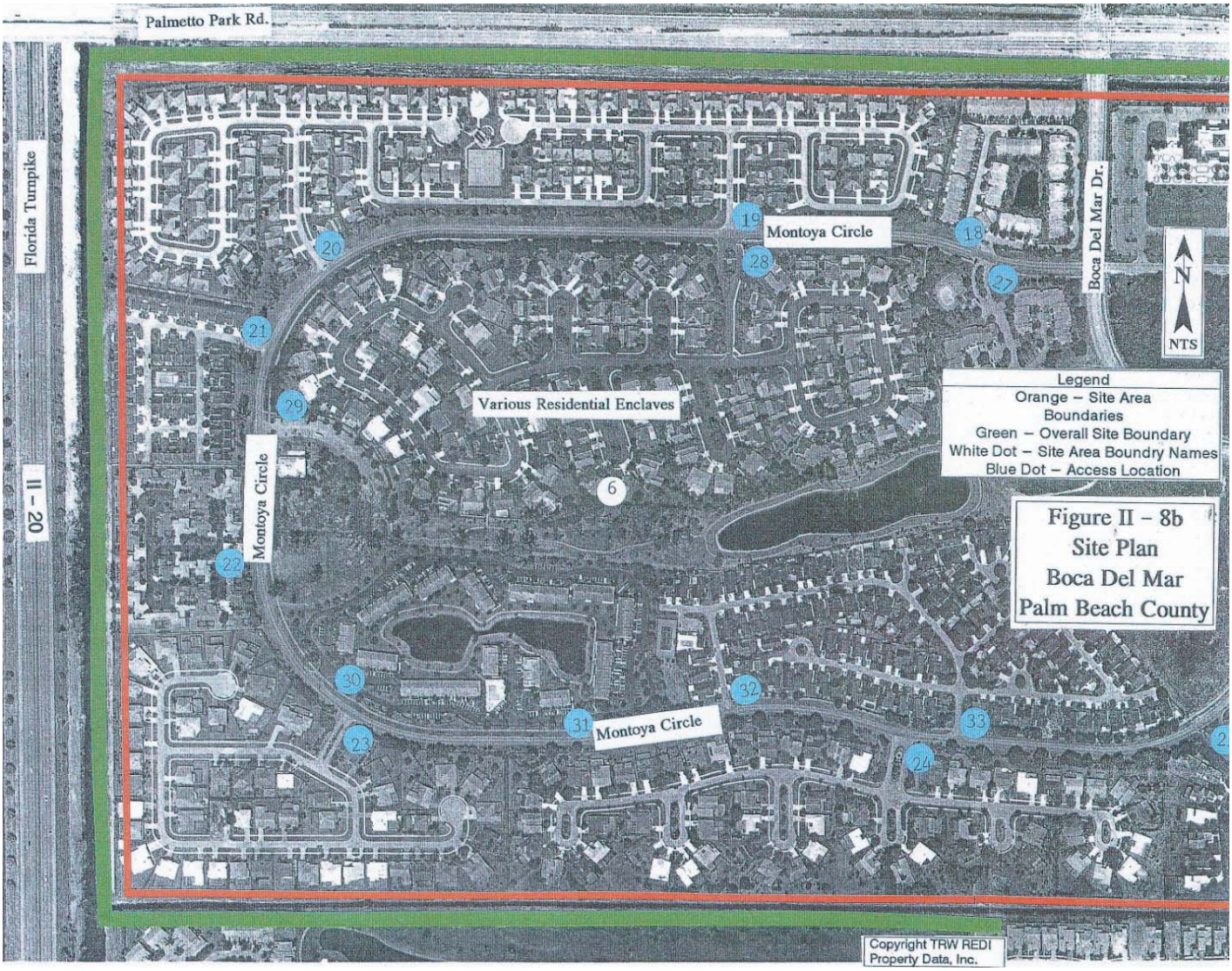
Please note that only the Camden Court residential area was considered internal to the mixed-use site for NCHRP Project 8-51 because insufficient surveys and counts were conducted at the "various residential areas" to enable consistent treatment of the survey responses.

Total commercial square footage in Boca del Mar was 501,254 with 41% retail (207,787 sq ft) and 59% office (293,467 sq ft). There were 1,144 total dwelling units of



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993.

Figure 16. Boca del Mar eastern portion site layout as depicted in the FDOT report (18).



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-20.

Figure 17. Boca del Mar western portion site layout as depicted in the FDOT report (18).

which 513 were single family detached, 517 were townhouses, and 114 were apartments. The total number of dwelling units within Camden Court was 190.

All land uses located within the site were accessible via a service road system that bisects the site. All vehicular trips between site land uses could be made without having to use the arterial road system adjacent to the site.

Proximity of Commercial Competition

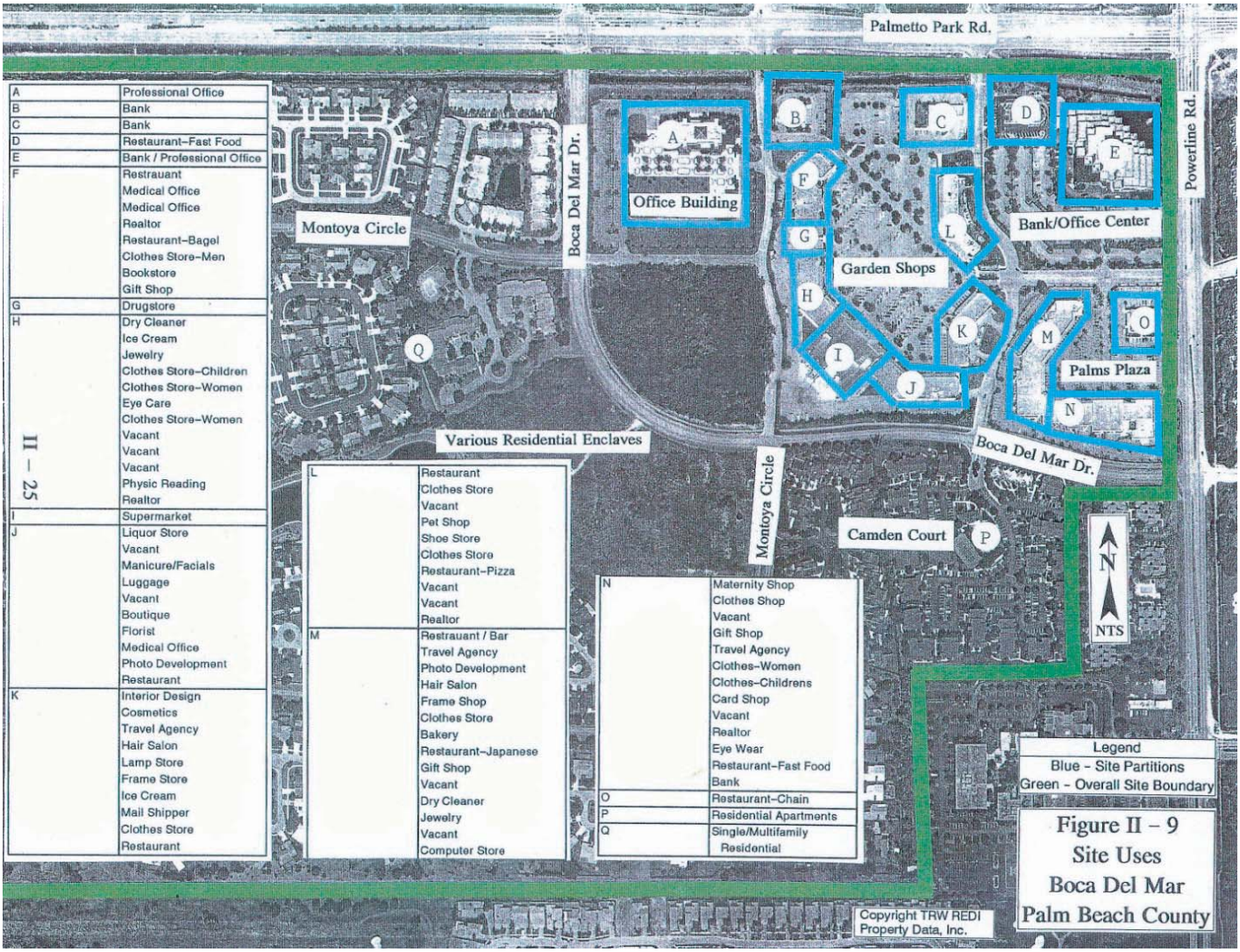
Immediately to the north of the Boca Del Mar site was a competing shopping center with several similar retail businesses, including a supermarket. However, the site was older than Boca del Mar and, in the opinion of the original FDOT research team, its general appearance (e.g., landscaping, site entrance) was not as appealing.

Site Components

The descriptions that follow are grouped according to how land uses are aggregated for the data collection and data analysis.

Garden Shops at Boca. The Garden Shops at Boca was the retail center of the mixed-use site. Its 52 tenants included the following:

- A supermarket and a drugstore;
- Six restaurants;



Source: *FDOT Trip Characteristics Study of Multi-Use Developments*, Tindale-Oliver & Associates, final report, December 1993, p. II-25.

Figure 18. Boca del Mar east end tenant details as depicted in the FDOT report (18).

- Various retail stores including men's, women's, and children's clothing; books; gifts; ice cream; jewelry; liquor; luggage; cosmetics; lamps; framing; pet supplies; a boutique; and a florist; and
- Various services including a medical office, real estate, dry cleaning, eye care, a psychic reader, manicure/facials, photo development, interior design, a travel agency, a hair salon, and a mail shipper.

The shopping center was 140,686 gross sq ft in size. Its largest tenant was a supermarket encompassing about 29% of the overall center space. Restaurants composed 10% of the center space, banks composed 5 percent, and office space composed 7%. The Garden Shops were approximately 95% occupied at the time of the survey.

Palms Plaza Shopping Center. The Palms Plaza Shopping Center was oriented facing away from the Garden Shops at Boca. The most direct path between their primary parking areas was approximately 1,100 ft. Palm Plaza had 27 tenants, including

- Four restaurants, ranging from a major sit-down restaurant chain to Japanese to fast food;
- Various retail stores including clothing, baked goods, gifts, computers, jewelry, maternity wear, cards, and eye wear; and
- Various services including a travel agency, photo development, a hair salon, framing, a dry cleaner, a travel agency, a real estate agency, and a bank.

Table 90. Usable P.M. peak-period surveys and sample rate—Boca del Mar.

Land Use	Exit Movements	Usable Interviews	Percent Interviewed[1]
Office	139	30	22%
Retail	1,672	267	16%
Fast-Food Restaurant	100	33	33%
Residential	108	95	88%
Total	**2,019**	**425**	**21%**

[1] Also interviewed were 18 (or 11%) of the 168 inbound residential motorists.

The shopping center was 63,070 gross sq ft in size. Restaurants composed 25% of the center space, banks composed 4 percent, and office space composed 7%. The remaining 64% was the mix of convenience retail and service businesses. The shopping center was approximately 80% occupied at the time of the survey.

Stand-Alone Fast-Food Restaurant. The Boca Del Mar Site had one stand-alone, fast-food restaurant. Its size was 4,031 sq ft.

Office Buildings. The Boca del Mar had two office buildings. The multi-story office complex on the west side of the site had surface parking around the building plus secured underground parking. Its size was 114,881 sq ft and it was located approximately 800 ft from the Garden Shops at Boca. There were a variety of professional businesses including some medical offices located within the office complex. This building was surveyed.

A 178,586 sq ft, multi-story office center was located on the northeast corner of the Boca del Mar site. Located in the office building are a bank (2% of the total square footage) and professional offices including a number of medical offices. Permission to obtain traffic counts at the access points and origin/destination surveys at this part of the site was not granted by the site property manager.

Camden Court. Camden Court was a residential multifamily community located immediately to the south of the retail shopping center. Camden Court included 190 apartment units, with an occupancy of 97% on the survey date. The approximate center of Camden Court was located 900 ft from the supermarket at the Garden Shops at Boca.

Data Collection

Origin-destination interviews were conducted at 20 stations throughout Boca del Mar. The data collection conformed to the methods used for the other Florida sites reported here. Different expansion factors were developed for each site (i.e., residential, office, and commercial land use categories) based on pedestrian counts, vehicle counts, and vehicle-occupancy counts. Table 90 lists the numbers of useable surveys collected at each land use.

Analysis of Internal Capture

Table 91 summarizes the overall internal capture found at the individual Boca del Mar land uses. To more fully understand these overall internal capture rates for each land use, it was necessary to investigate internal capture rates for pairs of land uses. The following includes the data.

Table 91. P.M. peak-period percent internal capture by land use—Boca del Mar.

Land Use	Percent Internal Capture as Origin Land Use	Percent Internal Capture as Destination Land Use
Office	0%	0%
Retail	4% for Garden Shops at Boca 7% for Palms Plaza 5% overall	7% for Garden Shops at Boca 1% for Palms Plaza 5% overall
Fast-Food Restaurant	24%	3%
Residential	44%	35%
Total	**8%**	**7%**

Table 92. P.M. peak-period percent distribution of internal trip destinations for origin land uses—Boca del Mar.

Origin Land Use	Percent Internal Trips by Destination Land Use[1]						
	Office	Shopping Center	FF Rest	Residential	Total Internal	External	Total
Office	—	0	0	0	0	100	100
Garden Shops at Boca	0	—	<1	4	4	96	100
Palms Plaza Shopping Center	0	—	0	0	0	100	100
Retail – Total	0	—	<1	3	4	96	100
Fast-Food Restaurant	0	18	—	6	24	76	100
Residential	0	42	2	—	44	56	100

[1] Calculated to exclude trips within the same land use.

Table 92 presents the distribution of trip destinations for trips exiting each of the surveyed Boca del Mar land uses. Separate sets of values are listed for the Garden Shops at Boca, for the Palms Plaza Shopping Center, and for the combined trips exiting both shopping centers:

- None of the surveyed trips leaving the office buildings onsite had an internal destination.
- Of the trips leaving the Garden Shops, 4% were destined to an internal use; none of the trips leaving Palms Plaza were.
- When combined, the two shopping centers sent less than 1% of the surveyed trips to the free-standing, fast-food restaurant and 4% to the onsite residential area.
- Of the trips leaving the onsite, free-standing fast-food restaurant, 24% were destined to onsite destinations, 18% to the shopping centers, and 6% to residential.
- Of trips leaving onsite residential, 44% were travelling to onsite destinations—42% to the shopping centers and 2% to the fast-food restaurant.

Table 93 presents the distribution of trip origins for trips entering each of the surveyed Boca del Mar land uses. Separate sets of values are listed for the Garden Shops at Boca, for the Palms Plaza Shopping Center, and for the combined trips entering both shopping centers:

- All of the trips entering the office buildings onsite had an external origin.
- Of the trips entering the Garden Shops at Boca, 4% arrived from an internal use; 1% of the trips entering the Palms Plaza Shopping Center also arrived from an internal use.
- When combined, the two shopping centers received 3% of their inbound trips from onsite uses—1% from fast food, and 2% from residential.
- Of the trips traveling to the onsite, free-standing, fast-food restaurant, 3% arrived from onsite uses—1% from the shopping centers and 2% from residential.

Table 93. P.M. peak-period percent distribution of internal trip origins for destination land uses—Boca del Mar.

Origin Land Use	Percent Internal Trips by Destination Land Use[1]					
	Office	Retail – Garden Shops	Retail – Palms Plaza	Retail – Total	FF Rest	Residential
Office	—	0	0	0	0	0
Retail	0	—	—	—	1	32
Fast-Food Restaurant	0	1	0	1	—	4
Residential	0	3	1	2	2	—
Total Internal	0	4	1	3	3	35
External	100	96	99	97	97	65
Total	**100**	**100**	**100**	**100**	**100**	**100**

[1] Calculated to exclude trips within the same land use.

- Of the trips entering onsite residential, a total of about 35% arrived from an onsite origin—almost 32% from the shopping centers and nearly 4% from the fast-food restaurant.

Comparison of Findings for Pilot Study Sites and Florida Sites

Similarities and Differences Among the Developments

The three MXDs surveyed in this project's pilot studies—Mockingbird Station, Atlantic Station, and Legacy Town Center—are similar in terms of the uses they have and the general proximities of their non-residential uses. All three are highly interconnected. All three are very walkable in their central areas (where commercial uses are located). All three have specialty retail and a range of restaurants from specialty coffee shops to high-end restaurants. All three have a cinema. Most commercial and retail businesses in each of the three developments are small; a few would be considered medium-sized. All have a variety of restaurants. Only Atlantic Station has a large retailer—a national chain department store.

However, there are differences. Mockingbird Station is very compact. Driving between internal destinations is an inconvenience compared with walking. The maximum walking distance is about 700 ft. There is a rail transit station next to and directly connected to the development and transit is used as a significant mode of access; that station is also served by six bus routes. The apartment building sits in the middle of and on top of the central commercial building. Mockingbird Station has no hotel.

Atlantic Station's main residential area extends away from the commercial area and is up to 3,400 ft away. There is a major grocery store there. There is also the retail department store, the only one among the three developments. Transit service that is used by Atlantic Station patrons and residents is via a dedicated shuttle to a nearby MARTA rail station about a mile away. One MARTA bus route serves the area conveniently, and almost no use was made of it by persons going to and from Atlantic Station.

While Mockingbird Station and Atlantic Station both have midtown locations and were redevelopment sites in the middle of fully developed areas, Legacy Town Center is an outer suburban development within a rapidly developing area. At the time of the survey, the area surrounding Legacy Town Center is fully or almost fully developed. Others are in various stages of partial development. Overall the area within about 2 miles is roughly two-thirds developed. Transit is virtually unused and has little presence although a hotel shuttle does provide service for its patrons to nearby destinations. While Legacy Town Center is well connected internally, its land uses tend to be more concentrated into specific areas of the site.

Hence, while the three study sites are truly integrated MXDs, they are not a truly homogenous trio of samples. This is similar to most land use categories included in the ITE trip generation database, although these three developments are more similar than those included in many ITE land use categories. It is also important to note that the three developments represent a range of typical conditions in which MXDs are developed.

The three Florida sites—Village Commons, Country Isles, and Boca del Mar—are less compact than the sites surveyed in this project. The Florida developments are structured sets of development pods separated by parking lots or streets; they are less well connected, less compact, and also have fewer interacting uses than the three developments surveyed in this project.

The six developments together could be considered representative of the range of types of MXDs in the range of ½ to 3 million gross sq ft of development. They are much larger and more diverse than a corner development that might consist of an office building that includes retail and restaurant uses. On the other extreme, the six developments are not as fully self-contained as a downtown or even a major suburban activity center; hence, use of the data from these developments should not be considered applicable to either very small MXDs or downtowns without having data that confirm similarities.

Findings from this project were compared with those contained in *NCHRP Report 323: Travel Characteristics at Large-Scale Suburban Activity Centers (26),* based on limited data in that report on internal capture. As noted previously, suburban activity centers—probably due to their size and greater mix-use uses and choices—have a broader range of internal capture percentages. While the surveys conducted obtained slightly different data, internal capture for *segments of suburban activity center populations* ranged between 6% and 68% with averages among activity centers surveyed ranging from 14% to 58% for specific population types (e.g., office employees).

Internal Trip-Making

Tables 94 through 97 summarize the internal capture percentages found for the three developments surveyed as part of this project plus the three Florida sites (P.M. data available only). The tables show internal capture percentages for the origin ends of trips as well as for the destination ends, similar to what was shown in the findings for each development. As is shown in previous tables, there are no values for trips between the same land uses because ITE trip generation rates already reflect trips within the same land use on the same site. Bold italicized percentages are the highest for each land use pair combination.

Table 94. Unconstrained internal capture rates for exiting trips, all sites—A.M. peak period.

Origin Land Use	MXD Site	Destination Land Use					
		Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	Atlantic Station		***28***	5	0	—	0
	Legacy Town Center		0	8	0	—	0
	Mockingbird Station		—	***63***	***1***	—	—
	Boca Del Mar		—	—	—	—	—
	Country Isles		—	—	—	—	—
	Village Commons		—	—	—	—	—
Retail	Atlantic Station	***29***		***13***	0	—	0
	Legacy Town Center	17		6	***14***	—	0
	Mockingbird Station	—		—	—	—	—
	Boca Del Mar	—		—	—	—	—
	Country Isles	—		—	—	—	—
	Village Commons	—		—	—	—	—
Restaurant	Atlantic Station	***31***	***14***		0	—	***3***
	Legacy Town Center	9	2		***4***	—	1
	Mockingbird Station	25	—		3	—	—
	Boca Del Mar	—	—		—	—	—
	Country Isles	—	—		—	—	—
	Village Commons	—	—		—	—	—
Residential	Atlantic Station	1	***1***	0		—	0
	Legacy Town Center	1	***1***	7		—	0
	Mockingbird Station	***2***	—	***20***		—	—
	Boca Del Mar	—	—	—		—	—
	Country Isles	—	—	—		—	—
	Village Commons	—	—	—		—	—
Cinema	Atlantic Station	—	—	—	—		—
	Legacy Town Center	—	—	—	—		—
	Mockingbird Station	—	—	—	—		—
	Boca Del Mar	—	—	—	—		—
	Country Isles	—	—	—	—		—
	Village Commons	—	—	—	—		—
Hotel	Atlantic Station	***75***	***14***	6	0	—	
	Legacy Town Center	0	0	**9**	0	—	
	Mockingbird Station	—	—	—	—	—	
	Boca Del Mar	—	—	—	—	—	
	Country Isles	—	—	—	—	—	
	Village Commons	—	—	—	—	—	

Table 94 shows and compares the distributions of internal trip destinations for exiting trips during the A.M. peak period. Data are available for only the three sites surveyed for this project. It is helpful to compare the internal capture percentages by land use pair.

Table 94 shows a range of internal capture percentages among the three developments for many of the land use pairs—for example, for trips from office to restaurant, the percentages found were 5%, 8%, and 63%, respectively. The percentages are a product of a number of factors, including the amounts of office and restaurant space exchanging interacting trips; the proximity and quality of connections between the interacting land uses (data available for those two factors); similar off-site opportunities; and the relative attractiveness of the destination as that type of land use (data not available for the last two considerations). For example, the 63% office to restaurant at Mockingbird Station results in part due to a 200-ft walking distance to a popular specialty coffee shop. The relationships of internal capture percentage to trip end constraints and proximity are examined later in this chapter.

The highest percentages found for each land use pair in Table 94 result from actual survey findings. The fact that lower percentages occurred elsewhere means only that the conditions—mainly balance between origin and destination land use demands for the trips between them plus the proximity (or other factors for which data are not available)—were not as ideal. These highest percentages represent the most unconstrained interchanges surveyed among the six sites—that is, the prevailing conditions reflect the best match resulting in the most interactions between the two land uses from among the developments surveyed.

Of the cells in Table 94 where morning peak period data for all three developments are available, only two cells show one percentage substantially higher than the other two: office-to-restaurant and residential-to-restaurant, both at Mockingbird Station. Both of these involve a popular coffee shop very close to the apartment building entrance and the office building entrance. It is natural that a high percentage of those types of trips would go to the adjacent onsite coffee shop during the A.M. peak.

Table 95 shows similar comparisons for the P.M. peak-period exiting trips. Data are available for all six developments.

Table 95. Unconstrained internal capture rates for exiting trips, all sites—P.M. peak period.

Origin Land Use	MXD Site	Destination Land Use					
		Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	Atlantic Station		6	3	0	0	0
	Legacy Town Center		0	1	***2***	0	0
	Mockingbird Station		9	***4***	***2***	0	—
	Boca Del Mar		0	0	0	—	—
	Country Isles		***20***	0	0	—	—
	Village Commons		6	0	1	—	—
Retail	Atlantic Station	***2***		19	13	***4***	1
	Legacy Town Center	1		***29***	***26***	0	***5***
	Mockingbird Station	1		20	7	***4***	—
	Boca Del Mar	0		0	3	—	—
	Country Isles	1		2	5	—	—
	Village Commons	0		0	7	—	—
Restaurant	Atlantic Station	1	***41***		3	***8***	***7***
	Legacy Town Center	2	10		***18***	6	3
	Mockingbird Station	***3***	38		3	2	—
	Boca Del Mar	0	18		6	—	—
	Country Isles	—	—		—	—	—
	Village Commons	0	4		4	—	—
Residential	Atlantic Station	0	9	3		0	1
	Legacy Town Center	***4***	6	***21***		0	***3***
	Mockingbird Station	1	31	11		0	—
	Boca Del Mar	0	***42***	2		—	—
	Country Isles	0	25	2		—	—
	Village Commons	0	25	2		—	—
Cinema	Atlantic Station	***2***	***21***	11	***8***		0
	Legacy Town Center	0	8	***31***	2		***2***
	Mockingbird Station	0	17	25	***8***		—
	Boca Del Mar	—	—	—	—		—
	Country Isles	—	—	—	—		—
	Village Commons	—	—	—	—		—
Hotel	Atlantic Station	0	***16***	***68***	***2***	0	
	Legacy Town Center	0	5	33	0	0	
	Mockingbird Station	—	—	—	—	—	
	Boca Del Mar	—	—	—	—	—	
	Country Isles	—	—	—	—	—	
	Village Commons	—	—	—	—	—	

Because there are more percentages, there are fewer cells where one value far exceeds all others when at least three values are given.

Table 96 shows a similar comparison for entering trips during the morning peak period. No cell containing three percentages has a single value far exceeding the others. The higher percentages are for interchanges that typically involve few trips. The high percentages in this table involve trips entering Atlantic Station's coffee shop from the grocery and to the grocery from the office building. Both of these types of trips would be for convenience and would possibly go to the closest location available, although more specialized needs might require trips to/from external locations.

Table 97 shows internal capture percentages for entering trips during the P.M. peak period. Many cells show consistent percentages or a range with values spread throughout. A few cells show three or more percentages and a single value much higher than others. These are to office from retail (Atlantic Station); from residential to office (Legacy Town Center); and from restaurant to retail (Mockingbird

Table 96. Unconstrained internal capture rates for entering trips, all sites—A.M. peak period.

Destination Land Use	MXD Site	Origin Land Use					
		Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	Atlantic Station		***4***	1	0	—	***3***
	Legacy Town Center		3	9	***3***	—	0
	Mockingbird Station		—	***14***	1	—	—
	Boca Del Mar		—	—	—	—	—
	Country Isles		—	—	—	—	—
	Village Commons		—	—	—	—	—
Retail	Atlantic Station	***32***		3	5	—	***4***
	Legacy Town Center	0		***8***	***17***	—	0
	Mockingbird Station	—		—	—	—	—
	Boca Del Mar	—		—	—	—	—
	Country Isles	—		—	—	—	—
	Village Commons	—		—	—	—	—
Restaurant	Atlantic Station	21	***50***		0	—	***6***
	Legacy Town Center	1	1		18	—	***6***
	Mockingbird Station	***23***	—		***20***	—	—
	Boca Del Mar	—	—		—	—	—
	Country Isles	—	—		—	—	—
	Village Commons	—	—		—	—	—
Residential	Atlantic Station	0	0	0		—	0
	Legacy Town Center	0	***2***	4		—	0
	Mockingbird Station	0	—	***5***		—	—
	Boca Del Mar	—	—	—		—	—
	Country Isles	—	—	—		—	—
	Village Commons	—	—	—		—	—
Cinema	Atlantic Station	—	—	—	—		—
	Legacy Town Center	—	—	—	—		—
	Mockingbird Station	—	—	—	—		—
	Boca Del Mar	—	—	—	—		—
	Country Isles	—	—	—	—		—
	Village Commons	—	—	—	—		—
Hotel	Atlantic Station	0	0	***4***	0	—	
	Legacy Town Center	0	0	3	0	—	
	Mockingbird Station	—	—	—	—	—	
	Boca Del Mar	—	—	—	—	—	
	Country Isles	—	—	—	—	—	
	Village Commons	—	—	—	—	—	

Table 97. Unconstrained internal capture rates for entering trips, all sites—P.M. peak period.

Destination Land Use	MXD Site	Origin Land Use					
		Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	Atlantic Station		***31***	8	0	***6***	0
	Legacy Town Center		6	***30***	***57***	0	0
	Mockingbird Station		5	19	2	0	—
	Boca Del Mar		0	0	0	—	—
	Country Isles		2	—	0	—	—
	Village Commons		0	0	0	—	—
Retail	Atlantic Station	3		28	2	***4***	1
	Legacy Town Center	0		17	***10***	1	***2***
	Mockingbird Station	5		***50***	9	3	—
	Boca Del Mar	0		1	2	—	—
	Country Isles	***8***		0	3	—	—
	Village Commons	3		1	3	—	—
Restaurant	Atlantic Station	***2***	***29***		1	2	***5***
	Legacy Town Center	0	12		***14***	2	***5***
	Mockingbird Station	1	16		2	***3***	—
	Boca Del Mar	0	1		2	—	—
	Country Isles	0	27		3	—	—
	Village Commons	0	0		4	—	—
Residential	Atlantic Station	1	***46***	6		***4***	0
	Legacy Town Center	1	15	***16***		0	0
	Mockingbird Station	3	19	10		***4***	—
	Boca Del Mar	0	32	4		—	—
	Country Isles	0	23	—		—	—
	Village Commons	***4***	30	2		—	—
Cinema	Atlantic Station	***1***	***26***	25	0		0
	Legacy Town Center	0	0	***32***	0		0
	Mockingbird Station	***1***	14	7	0		—
	Boca Del Mar	—	—	—	—		—
	Country Isles	—	—	—	—		—
	Village Commons	—	—	—	—		—
Hotel	Atlantic Station	0	***17***	***71***	5	0	
	Legacy Town Center	0	13	10	***12***	***1***	
	Mockingbird Station	—	—	—	—	—	
	Boca Del Mar	—	—	—	—	—	
	Country Isles	—	—	—	—	—	
	Village Commons	—	—	—	—	—	

Station). Atlantic Station has almost twice as much retail as any of the other six developments; it has the only department store and that store is immediately next to the office building. That may explain the relatively higher portion of P.M. trips entering office from retail. Very few trips enter office buildings during the P.M. peak period. For those that do, it is not surprising that most trips from residential would begin close by in Legacy Town Center. More distant trips from home would be expected to wait until the next day. Because of the compactness of Mockingbird Station, many people were seen leaving restaurants during happy hour and strolling along the fronts of stores and entering a few to look at what was being sold. Atlantic Station and Legacy Town Center are somewhat less compact although they offer a similar opportunity. The Legacy Town Center area had more off-site shopping opportunities nearby than did Mockingbird Station or Atlantic Station. Hence, the differences shown in Table 97 appear logical. The three Florida developments are far less compact and would be expected to have less of this activity.

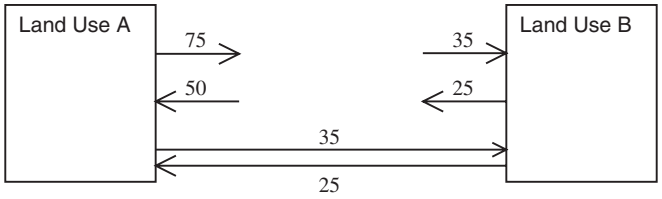


Figure 19. Example of unconstrained demand and balancing of internal trip interchange.

Internal capture percentages in the previous tables are similar for some land use pairs but not for others. One reason for this is the balance between land uses. If two land uses are balanced for the purpose of trip generation interaction, Land Use A would want to send as many people to Land Use B as Land Use B would want to receive from Land Use A.

However, consider a case where Land Use A wants to send 75 trips to Land Use B, but Land Use B only wants to receive 35 trips from Land Use A (see Figure 19). Land Use B will receive all the Land Use A trips it wants: it can be considered to be unconstrained. There are more than enough Land Use A trips to satisfy Land Use B demand; however, Land Use A demand to send trips to Land Use B is constrained because Land Use B will accept only half of the trips Land Use A wants to send. Examining the opposite direction, Land Use B wants to send 25 trips to Land Use A, and Land Use A wants to receive 50 trips from Land Use B. Because all of the Land Use B trips can be accepted by Land Use A, Land Use B is unconstrained in that direction, but Land Use A is constrained.

When internal trips are constrained, they cannot occur, and the travel demand must be satisfied externally. Figure 20 shows what happens in these two examples. Land Use A wants to send 75 trips to Land Use B. Only 35 of those trips can go to Land Use B internal to the development, so the other 40 trips have to seek Land Use B externally. This is based on the assumption that people make trips for a purpose (e.g., eat lunch), and if that purpose cannot be satisfied internally where it is most convenient, the trip maker will have to find someplace to eat externally.

Therefore, returning to Table 94, the (major) differences between the internal trip capture percentages that appear in this table are attributable in many cases to the balance, lack of constraints, or other factors that exist for some zone pairs—

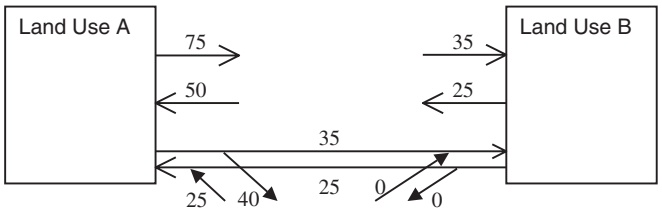


Figure 20. Continuation of Figure 19 example showing external trips resulting from internal constraints.

for example, for Mockingbird Station, 63% of the trips from office goes to internal restaurants, while at Atlantic Station and Legacy Town Center, the corresponding trips amounted to 5% and 8%, respectively. At Mockingbird Station there was a specialty coffee restaurant less than 200 ft from the office building. No other restaurants were open in the development in the morning. The office building had no internal coffee or snack shop. There was a steady stream of people going between the office building and that restaurant during the morning peak period. The other two developments each had similar restaurants; however, they had roughly 3 to 5 times the office space, they were several blocks away, and Atlantic Station's office building had a coffee stand in its lobby during the morning peak. It is no surprise that the Mockingbird Station capture rate is much higher than that for the other two developments.

Table 98 contains a comparison of land use development unit ratios and internal capture rates for land use pairs in Tables 94 through 97 for which one internal capture percentage is much higher than the other two. Table 98 displays relative constraints on trips in the form of the ratio of development units, which is somewhat of a surrogate for total trips made. For exiting trips, the higher the ratio of origin development units to development units, the constraint is greater (i.e., the fewer the development units at the destination end). For entering trips, the lower the ratio, the constraint is greater (i.e., the fewer the development units) at the origin end of the trip. Hence, a high internal capture percentage for exiting trips could be expected where there is a low development unit ratio and proximity. For example, for P.M. peak-period trips from retail to residential at Legacy Town Center, 196,000 sq ft of retail were feeding trips to 1,360 units of residential (144 sq ft of retail per dwelling unit) at an average distance of 1,240 ft, resulting in 26% internal trip capture. On the other hand, for the same interchange, Country Isles had 109,000 sq ft of retail feeding 368 residential units (296 sq ft of retail per residential unit) at an average distance of 1,525 ft, resulting in 4% internal capture. The origin end trips were more constrained at the destination end at Country Isles (about half as many units receiving trips). In addition, the separation was greater, further constraining trips from retail to residential.

Such is the case for most of the examples shown in Table 98. Except for P.M. peak-period entering trips, constraints imposed by development unit ratios and greater proximity distances result in the lower internal capture percentages.

Conclusions

As Table 98 shows, lower ratios and higher proximity tend to result in higher capture rates. The highest percentages of internal capture are associated with lesser levels of constraint and higher proximity. Only additional data will confirm

Table 98. Comparison of internal capture by development unit ratios and proximities for selected land use pairs.

Land Use		Site[1]	Development Units[2]		Ratio[3]	Proximity (ft)[4]	Internal Capture (%)	Comments
Origin	Destination		Origin	Destination				
Morning Peak-Period Exiting Trips (from Table 94)								
Office	Restaurant	AS	551	1.6	344	1,000	5%	Proximity similar to LTC; most constrained at destination.
		LTC	311	5.1	61	1,200	8%	Proximity similar to AS; slightly more constrained than MS.
		MS	115	1.5	77	200	63%	Closest proximity; close to least constrained at destination.
Residential	Restaurant	AS	798	1.6	499	2,300	0%	Farthest separation; most constrained at destination.
		LTC	1,360	5.1	267	1,470	7%	Moderate proximity; somewhat constrained at destination.
		MS	191	1.5	127	100	20%	Closest proximity; least constrained at destination.
Afternoon Peak-Period Exiting Trips (from Table 95)								
Office	Retail	AS	551	435	1.29	660	6%	About middle for both proximity and constraint at destination.
		LTC	311	196	1.59	975	0%	Third longest separation; third most constrained at destination.
		MS	115	156	0.74	320	9%	Close to least constrained at destination; closest proximity.
		BDM	316	151	2.09	1,125	0%	Second longest separation; second most constrained at destination.
		CI	75	109	0.69	775	9%	Least constrained at destination; third closest proximity.
		VC	315	121	2.60	1,600	6%	Most constrained at destination; longest separation.
Retail	Residential	AS	435	798	0.55	2,280	13%	Second most constrained at destination; longest separation.
		LTC	196	1,360	0.14	1,240	26%	Least constrained at destination; third longest proximity.
		MS	156	191	0.82	170	7%	Most constrained at destination; closest proximity.
		BDM	151	1,144	0.13	825	3%	Least constrained at destination; second longest separation.
		CI	109	368	0.30	1,525	4%	Moderate constraint and proximity.
		VC	121	317	0.38	900	7%	Most constrained at destination; moderate proximity.
Restaurant	Residential	AS	65	798	.081	2,360	3%	Third least constrained at destination; longest separation.
		LTC	69	1,360	.051	1,325	18%	Third least constrained at destination; third longest separation.
		MS	29	191	.152	200	3%	Most constrained at destination; closest proximity.
		BDM	34	1,144	.030	1,100	6%	Least constrained at destination; fourth longest separation.
		CI	21	368	.057	1,600	—	Second longest separation; second most constrained at destination.
		VC	42	317	.132	600	4%	Second most constrained at destination; second closest. proximity.
Morning Peak-Period Entering Trips (from Table 96)—no instances of one internal capture percentage much higher than at least two others								
Afternoon Peak-Period Entering Trips (from Table 97)—no instances of one internal capture percentage much higher than at least two others								
Retail	Office	AS	435	551	0.79	895	31%	Third least constrained at origin; second closest proximity.
		LTC	196	311	0.63	975	6%	Third most constrained at origin; third longest separation.
		MS	156	115	1.36	150	5%	Close to least constrained at origin; closest proximity.
		BDM	151	316	0.48	1,125	0%	Second most constrained at origin; second longest separation.
		CI	109	75	1.45	775	2%	Least constrained at origin.
		VC	121	315	0.38	1,600	0%	Most constrained at origin; longest separation.
Residential	Office	AS	798	551	1.45	3,100	0%	Second most constrained at origin; farthest separated.
		LTC	1,360	311	4.37	900	57%	Close to least constrained at origin, second closest proximity.
		MS	191	115	1.66	225	2%	Third most constrained at origin; closest proximity.
		BDM	1,144	316	3.62	2,000	0%	Third least constrained at origin; second farthest separated.
		CI	368	75	4.91	1,000	0%	Least constrained at origin; third closest proximity.
		VC	317	315	1.01	1,750	0%	Most constrained at origin; third farthest separated.

Table 98. (Continued).

Land Use		Site[1]	Development Units[2]		Ratio[3]	Proximity (ft)[4]	Internal Capture (%)	Comments
Origin	Destination		Origin	Destination				
Restaurant	Retail	AS	65	435	0.15	430	28%	Most constrained at origin; second closest proximity.
		LTC	69	196	0.35	500	17%	Least constrained at origin.
		MS	29	156	0.19	300	50%	Second most constrained at origin; closest proximity.
		BDM	34	151	0.23	800	1%	Third most constrained at origin; third longest proximity.
		CI	21	109	0.19	1,200	0%	Second most constrained at origin; second longest separation.
		VC	42	121	0.35	1,100	1%	Least constrained at origin; second longest separation.

[1] AS = Atlantic Station; LTC = Legacy Town Center; MS = Mockingbird Station; BDM = Boca del Mar; CI = Country Isles; VC = Village Commons.
[2] All development units are in gross sq ft except residential, which is in dwelling units; development units shown for restaurant during morning peak are for those restaurants that were open.
[3] Origin development units/destination development units. For exiting trips, this constraint at destination end is represented by highest ratio. For entering trips, highest constraint at origin is represented by lowest ratio.
[4] Separation between interaction land uses based on average weighted by trips (rounded to closest 100 ft).

whether other similarly unconstrained and high proximity examples will demonstrate similar internal capture findings.

Where the highest internal capture percentage accompanies both the least constrained and highest proximity, the reported internal capture percentage is probably close to the maximum the researchers would expect to find. These percentages could be considered unconstrained internal capture percentages. However, where the highest internal capture percentage for a land use pair and period is associated with either a moderately high constraint and/or a proximity significantly farther than the minimum, the researchers expect that future surveys could find higher internal capture percentages. For now, the highest internal capture percentages reported in this report for each land use pair and time period should be considered the documented unconstrained internal capture percentages and should be used as unconstrained values.

In general, the three developments surveyed for this project are more compact, are better connected, and have more component land uses than do the three Florida developments. Additionally, the three developments surveyed for this project generally have higher internal capture percentages. This confirms—at least based on the available data—that internal capture can be increased through the use of more interacting land uses, better connectivity, and/or more compactness. Compactness or proximity is addressed later in this section.

Unconstrained internal capture between individual land uses ranges from a low of none found to highs of over 60%. The comparisons also show a wide range of internal capture rates between land use pairs. This results from a number of factors, the most important and projectable of which (at time of zoning) is the balance between land uses within a development. To demonstrate this phenomenon, consider an office building with 20 employees who want to go out for lunch at an onsite restaurant. The restaurant has eight seats. If all employees want to go there, only eight can be seated. The restaurant seating constrains the interaction between the two land uses. Now compare that development to the next similar development down the street where 25 office employees want to go to a restaurant with 16 seats. At that location, as many as 16 employees can go to that restaurant, so even though the restaurant is again the constraint, the interaction is greater. For the third example, consider that 25 office employees can go to an onsite restaurant with 40 seats. In this example, all 25 employees can be seated. In fact, more could be seated. In this example, the office building is the constraint.

Hence, with differing balances of the land uses making up the six surveyed developments, it is understandable that the internal trip capture percentages vary among them. Some of the differences may be explained by the travel distances between trip origins and destinations—that is, proximity. Proximity is addressed in a later section. In addition, there are other factors not quantified in this research that may also affect internal capture such as attractiveness of specific businesses, demographics of trip-makers, and alternative opportunities for similar destinations at nearby developments (i.e., competing opportunities). While these may influence internal trip capture, they may not be known at the time a development is proposed, so it would be difficult to project those characteristics even if a method of projection was available.

Tables 99 through 102 show the highest values from Tables 94 through 97. The values of Tables 99 through 102 show how much internal capture was achieved by the best balances between interacting land uses. In terms of the office/restaurant example described previously, the values of Tables 99 through 102 demonstrated the most unconstrained individual conditions observed at the six developments.

Although it is very possible that MXDs with other balances of development may experience even higher percentages, at

Table 99. Proposed unconstrained values for percent distribution of internal trip destinations for exiting trips—A.M. peak period.

Origin Land Use	Destination Land Use[1]					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	N/A	28%	63%	1%	N/A	0%
Retail	29%	N/A	13%	14%	N/A	0%
Restaurant	31%	14%	N/A	4%	N/A	3%
Residential	2%	1%	20%	N/A	N/A	0%
Cinema	N/A	N/A	N/A	N/A	N/A	N/A
Hotel	75%	14%	9%	0%	N/A	N/A

[1] Corresponds to ITE *Trip Generation Handbook* Table 7.1; N/A signifies no data or interchanges within same land use categories that are accounted for within ITE trip generation rates.

Table 100. Proposed unconstrained values for percent distribution of internal trip destinations for exiting trips—P.M. peak period.

Origin Land Use	Destination Land Use[1]					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	N/A	20%	4%	2%	0%	0%
Retail	2%	N/A	29%	26%	4%	5%
Restaurant	3%	41%	N/A	18%	8%	7%
Residential	4%	42%	21%	N/A	0%	3%
Cinema	2%	21%	31%	8%	N/A	2%
Hotel	0%	16%	68%	2%	0%	N/A

[1] Corresponds to ITE *Trip Generation Handbook* Table 7.1; N/A signifies no data or interchanges within same land use categories that are accounted for within ITE trip generation rates.

Table 101. Proposed unconstrained values for percent distribution of internal trip origins for entering trips—A.M. peak period.

Origin Land Use	Destination Land Use[1]					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	N/A	32%	23%	0%	N/A	0%
Retail	4%	N/A	50%	2%	N/A	0%
Restaurant	14%	8%	N/A	5%	N/A	4%
Residential	3%	17%	20%	N/A	N/A	0%
Cinema	N/A	N/A	N/A	N/A	N/A	N/A
Hotel	3%	4%	6%	0%	N/A	N/A

[1] Corresponds to ITE *Trip Generation Handbook* Table 7.2; N/A signifies no data or interchanges within same land use categories that are accounted for within ITE trip generation rates.

Table 102. Proposed unconstrained values for percent distribution of internal trip origins for entering trips—P.M. peak period.

Origin Land Use	Destination Land Use[1]					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	N/A	8%	2%	4%	1%	0%
Retail	31%	N/A	29%	46%	26%	17%
Restaurant	30%	50%	N/A	16%	32%	71%
Residential	57%	10%	14%	N/A	0%	12%
Cinema	6%	4%	3%	4%	N/A	1%
Hotel	0%	2%	5%	0%	0%	N/A

[1] Corresponds to ITE *Trip Generation Handbook* Table 7.2; N/A signifies no data or interchanges within same land use categories that are accounted for within ITE trip generation rates.

this point the researchers had no evidence to verify the possibility of higher percentages. Hence, for the purpose of this research project, the researchers concluded that a conservative approach is to use the values of Tables 99 through 102 in the proposed estimation process developed in this project. At a future time, if subsequent surveys using similar procedures show even higher percentages, those results could be incorporated into Tables 99 through 102.

Proximity Effects

Data collected in the pilot study and Florida surveys provided the basis for evaluating proximity effects on internal capture. This analysis was performed to test the hypothesis that travel distance between locations of interacting land uses would affect the degree of interchange between those land uses.

The analyses used surveyed interchanges and walking distances between origin and destination. All three pilot study developments had similar pedestrian environments—outdoor sidewalks adjacent to buildings, mostly along internal two-lane streets or parking lots. Most sidewalks are landscaped with trees, although in Mockingbird Station some sidewalks have no trees. In most cases, the sidewalks are at least 10-ft wide in commercial areas. No sidewalk was considered too narrow for people to walk or pass conveniently. Mockingbird Station has an elevator and one main set and two supplemental sets of stairs between the ground and second levels serving the cinema, a few restaurants, and the DART rail station and bus transfer center. Although the elevator and stairways undoubtedly impede some people in Mockingbird Station, so few destinations required using the stairs that they were not considered further.

The three Florida sites are more spread out with most of the land uses in pods. Each pod is conveniently walkable within. Many of the pods are not interconnected by sidewalks, but are accessible by walking or driving across parking aisles or lots. However, each of these development pods is clearly designed to encourage internal interaction among land use activities.

Data collected and compiled as part of this project provide an indication of the effect of land use proximity on internal capture. It was observed that as distance increases, the level of interaction (i.e., the internal capture) declines. To quantify this relationship, internal capture rates derived from intercept surveys were plotted against proximity of pairs of land uses. All land use pairs for the three newly surveyed pilot study sites and the three Florida sites surveyed in the mid-1990s were plotted.

To illustrate this concept, the top chart in Figure 21 shows the internal capture observed at the six mixed-use sites for trips *from* retail/restaurant uses *to* residential uses. The bottom chart shows internal capture observed *to* residential *from* retail/restaurant. In the charts, each plot point represents a single mixed-use site. From left to right (i.e., closest to farthest), the points represent Mockingbird Station, Legacy Town Center, Boca del Mar, Village Commons, Country Isles, and Atlantic Station.

A key premise about internal capture is that for a trip from one land use to another at a mixed-use site, one direction of travel must be unconstrained (in terms of internal capture) and the other must be constrained. In some instances, the internal capture rates in both directions of travel are in perfect balance and are, therefore, both constrained.

In Figure 21, the presumed unconstrained direction is designated as a large dot and the presumed constrained direction as a small dot. If a site is constrained in the top chart, it must be unconstrained in the bottom chart; if a site is constrained in the bottom chart, it must be unconstrained in the top chart. Each site must have an unconstrained value in one direction or the other. In addition, the unconstrained internal capture values should exceed the constrained values on each individual chart.

In the top chart, internal capture values at the unconstrained sites decrease from around 16% at a proximity of 700 ft to around 5% at a proximity of 2,200 ft. In the bottom chart, internal capture of greater than 50% (at a proximity of 200 ft) decreases to about 20% at a proximity of 1,500 ft.

For many land use pairs, the database consists of only three data points representing unconstrained internal capture—two in one direction and one in the other. It is difficult to reach definitive conclusions about the effect of land use proximity on internal capture with so little data. To improve the likelihood of defining a reliable relationship between proximity and internal capture, data for various land use pairings with potentially common characteristics were grouped and examined. For example, trips to or from retail might have the same proximity-capture characteristics as trips to or from restaurants. As a result of that analysis, two proximity relationships were identified, as Figure 22 shows.

Each point in the figure represents a measured unconstrained internal capture rate for a particular pair of land uses at a single mixed-use site. The *x*-axis in the figure is the proximity distance. The *y*-axis is normalized to represent the percent of the highest unconstrained value for the particular land use pair.

The square-shaped dots in the figure represent the proximity and internal capture values for all land use pairs with residential as the destination, for the origin end of the trip. In other words, these are a combination of the rates

- From office to residential,
- From retail to residential,
- From restaurant to residential,
- From hotel to residential, and
- From cinema to residential.

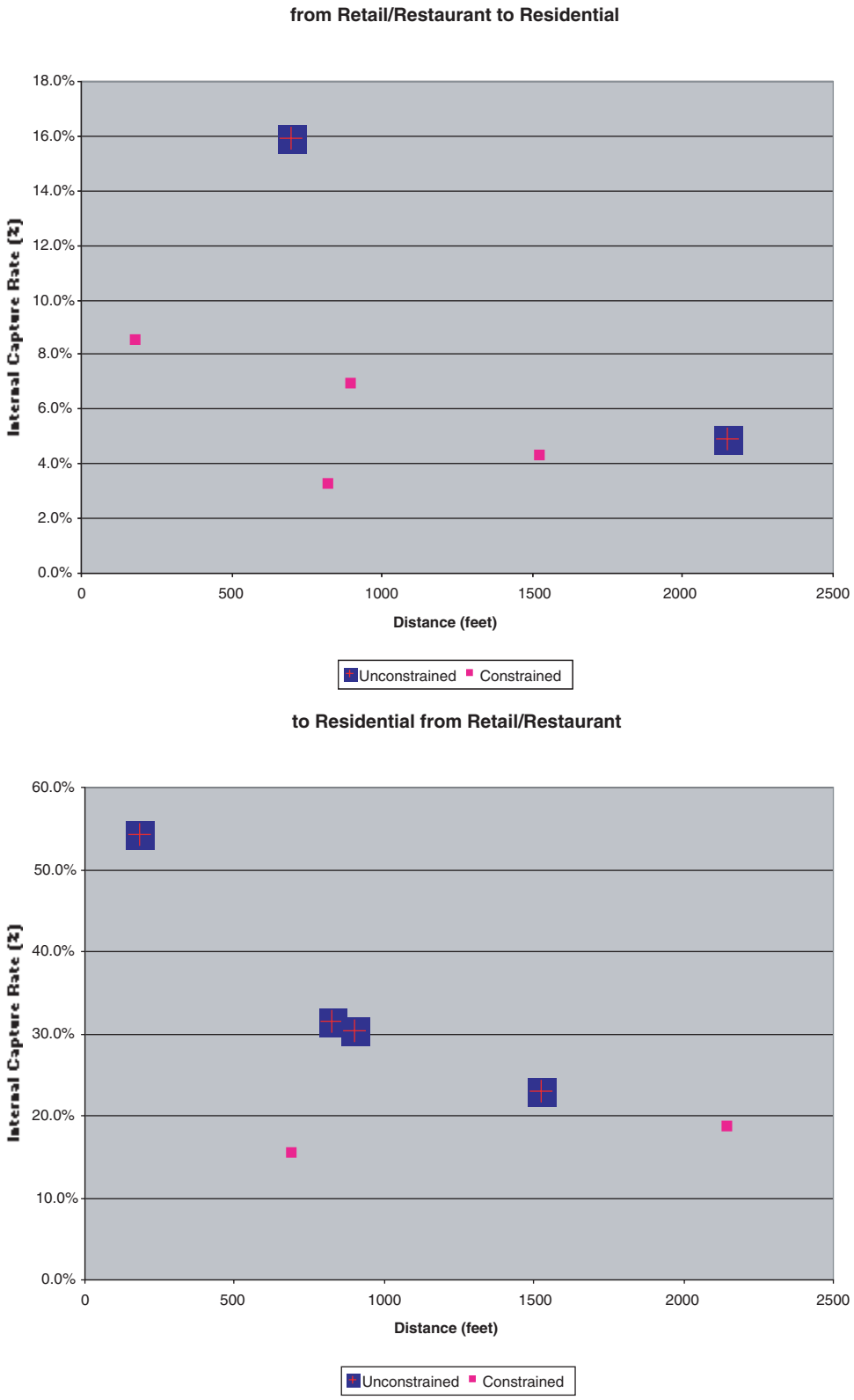


Figure 21. Example of relationship between internal capture percentage in unconstrained and constrained directions (between residential and retail/ restaurant land use pair).

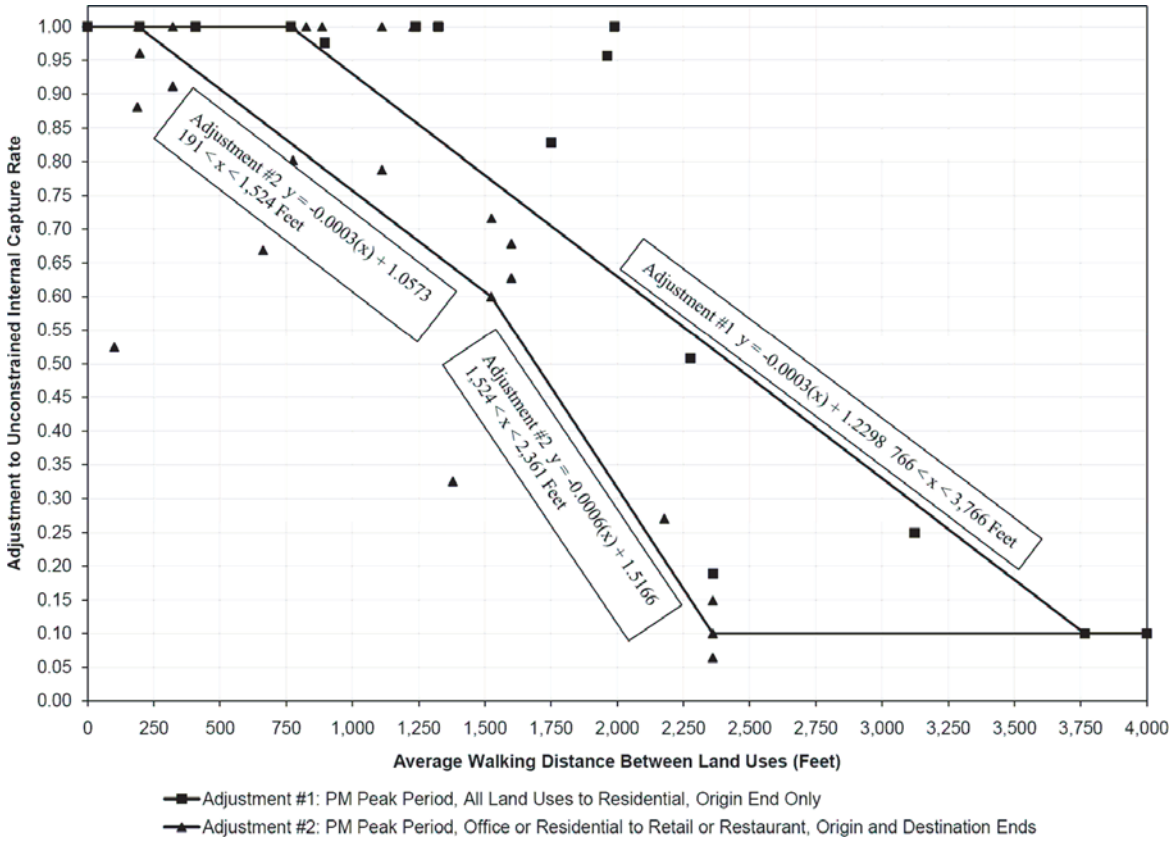


Figure 22. Relationship between proximity and unconstrained internal capture percentage for P.M. peak-period trips for land use pairs and directions with confirmed proximity effects.

The best-fit curve for these data points is shown in the figure as Adjustment #1. The *R*-square for the curve is 0.58. This curve is used in the estimation procedure described later in this chapter to account for land use pair proximity adjustments to unconstrained internal rates.

The triangular-shaped dots in the figure represent the proximity and internal capture values for all land use pairs with either office or residential as the origin and retail or restaurant as the destination, for both the origin and destination ends of the trip. In other words, these are the rates

- From office to retail,
- From office to restaurant,
- From residential to retail,
- From residential to restaurant,
- To retail from office,
- To restaurant from office,
- To retail from residential, and
- To restaurant from residential.

The best-fit curve for these data points is shown in Figure 22 as Adjustment #2. The curve is actually two straight lines that intersect at a proximity distance of 1,524 ft. The *R*-square for the less-than-1,524-ft curve is 0.50. The data at longer distances does not track with that equation and was grouped to create a second intersecting line; that line connected from the extreme end points of the upper line to the midpoint between the two points for the longest proximity distance in this data subset.

The best-fit curve equations in Figure 22 intersect the *x*-axis at proximity distances above which there would presumably be no internal capture. However, at the study sites, internal capture was measured between land uses at the extreme limits of all six mixed-use sites where data were collected. To account for this assumed synergy between land uses no matter how far apart as long as they are both within the mixed-use center, both proximity adjustment lines in the figure are terminated at an arbitrary minimum *y*-axis value of 0.10 (i.e., at 10% of the unconstrained values). This then leaves a minimal internal capture percentage at long distances.

Note that these proximity adjustment relationships represent only a fraction of all potential land use pairs (only 13 proximity adjustment factors out of a total of 60 directional internal capture rates for the 6 land uses). For the remaining 47 land use pairs, a definitive relationship between proximity and internal capture rate could not be established with the available data.

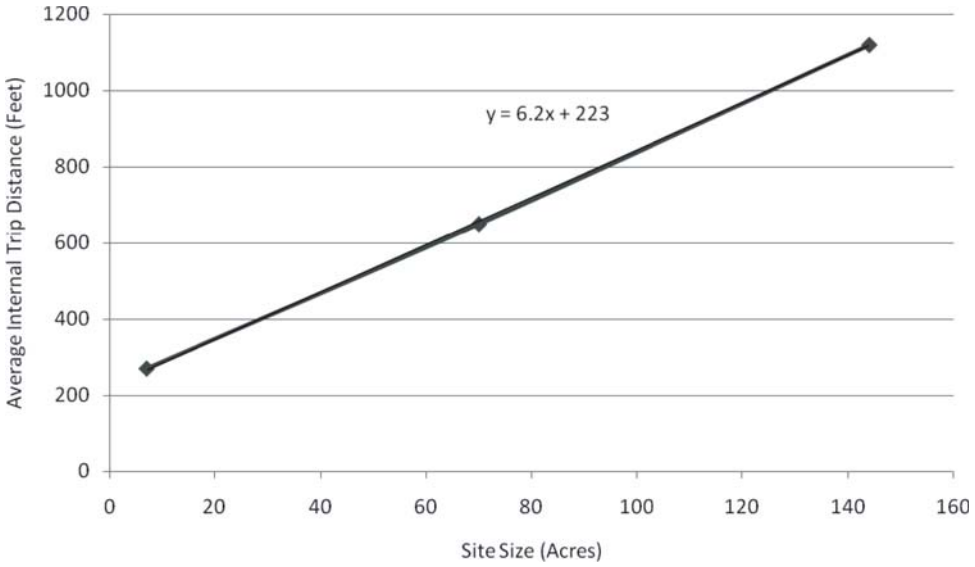


Figure 23. Relationship between average internal travel distances and site size (Mockingbird Station, Atlantic Station, and Legacy Town Center).

Use of Figure 22 requires information from a site plan showing different land uses. During early stages of development planning, it is unlikely that such a layout will always be available; however, a development site will have been defined. Hence, there is a need to be able to estimate travel distances for internal trips based on knowing only site size.

There is no end to the variety of potential site layouts for a given parcel of land, but reasonable assumptions can be made. In the case of internal trip capture estimation, it is prudent to err on the conservative side—that is, to underestimate internal capture rather than to overestimate capture. A few basic assumptions to arrive at a maximum travel distance can be applied. These could include a distance from the property boundary to the building doors and the internal block configuration.

Figure 23 shows the site size and average separation distances between interacting land uses for Mockingbird Station, Atlantic Station, and Legacy Town Center. The straight line relationship may be coincidental since there are differences in the site configurations and layouts of the component land uses. Figure 23 may provide a basis for estimating separation distances if there is no site plan or conceptual land use plan available when an analysis is performed, but this should be validated and refined in further studies.

Procedure for Estimating Internal Capture at a Proposed MXD

The estimation procedure developed in this project is essentially an extension and enhancement of the current ITE method documented in the ITE *Trip Generation Handbook,* 2nd edition (*1*). The recommended method enriches the ITE method in the following manner:

- Adds an A.M. peak-hour period to the existing P.M. peak-hour period;
- Adds three land uses—restaurant, hotel, and cinema—to the existing office, retail, and residential uses;
- Expands the basis for the A.M. and P.M. peak-hour internal capture factors from three developments in one state to six developments in three states and also broadens the types of MXDs included in the database; and
- Adds a proximity adjustment for some land use pairs.

Midday and daily periods, which are included in the ITE *Trip Generation Handbook,* were not addressed since those periods are rarely used in typical TIS and would have increased the data collection cost beyond the available resources. The recommended estimation method consists of the following basic steps:

1. Determine whether the methodology is appropriate for the development to be analyzed.
2. Define the pertinent site and development characteristics.
3. Estimate single-use trip generation for each component land use using ITE or other acceptable source; convert to person trips.
4. Use unconstrained internal capture percentages developed in this project to estimate the number of potential internal trips between each pair of land uses. Include an adjustment for proximity (also developed in this project).
5. Balance internal trips generated at both ends of each interacting pair (i.e., internal trips coming from the origin end

need to be the same as those coming to the destination end); adapt the existing balancing procedure contained in the ITE *Trip Generation Handbook* (*1*).
6. Subtract the estimated internal trips from the total trip generation to estimate external trips for the MXD being analyzed; convert to vehicle trips as needed.

The user of this estimation methodology is cautioned that each MXD has unique characteristics that influence the extent of internal trip capture. Such characteristics include, but are not limited to the following:

- The number and magnitudes of complementary land uses;
- The layout of the land uses relative to each other;
- Specific businesses, residence types, and other component characteristics within each land use category;
- Proximity and connectivity between each pair of land uses;
- Design characteristics of the development and its internal transportation system;
- Specific characteristics of the development's access and parking; and
- Competing opportunities outside the development.

The user is further cautioned that estimates of internal capture for trips between specific pairs of land uses are based on data collected for between one and six surveyed developments. Clearly, additional data on internal capture at existing MXDs would help improve confidence in the accuracy of the internal capture estimates and might result in different internal capture rates.

The researchers believe that the successful but limited validations conducted for this estimation method do confirm that the results provide accurate approximations of external trip generation for typical MXDs consisting of typical office, retail, restaurant, residential, cinema, and hotel land uses. The researchers also believe these approximations are consistent with the accuracy of trip generation estimates for single-use developments as portrayed in such references as *Trip Generation,* 8th edition (*2*). The researchers also believe this methodology provides an advancement and improvement over a similar method described in *Trip Generation Handbook,* 2nd edition (*1*).

The estimation procedure is presented step-by-step in the order it would be performed by the analyst:

- Step 1: Determine whether the methodology is appropriate for your application.
- Step 2: Define the pertinent site characteristics.
- Step 3: Calculate single-use trip generation for the site components.
- Step 4: Estimate the unconstrained internal capture rates for all land use pairs at the site and add adjustments for proximity.
- Step 5: Calculate the balanced internal trips between all land use pairs.
- Step 6: Calculate the overall internal capture rate for the site.

One product of this procedure is an estimate of internal trip capture between pairs of land uses in the development for which internal capture data exist. Users of this estimation procedure are encouraged to carefully and completely read earlier parts of this chapter to understand the background and data supporting this procedure:

- The internal capture estimation methodology and its logic,
- Descriptions of the six developments from which the data behind the estimation methodology were collected,
- Survey findings from the six development sites, and
- The following instructions for use of the estimation methodology.

If the analyst understands the concept of "internal capture balancing" as described earlier in this chapter, these basic instructions should suffice. At the end of this chapter, additional guidance is provided for the analyst who understands the concepts, but who is *unsure of the mechanics* of a specific step. Additional guidance is also provided for the analyst who *thoroughly understands the basic concept and its data limitations,* appreciates the uniqueness of each mixed-use site, and is interested in investigating the potential internal capture impacts of the nuances of a particular site.

Tables 103 through 106 show an automated spreadsheet tool that can be used to compute internal capture and external trip generation for MXDs. The entire workbook consists of six separate worksheets in two sets—one for weekday A.M. street peak-hour estimates and one for weekday P.M. street peak-hour estimates. This description covers the A.M. street peak hour only. The six worksheet and tables in which the A.M. sheets are shown are

- **Table 103** (Worksheet 1): Estimator Input/Output Worksheet—A.M. Street Peak Hour;
- Not shown here (Worksheet 2): Estimator Input/Output Worksheet—P.M. Street Peak Hour;
- **Table 104** (Worksheet 3): Estimator Intermediate Calculations—A.M. Street Peak Hour;
- Not shown here (Worksheet 4): Estimator Intermediate Calculations—P.M. Street Peak Hour;
- **Table 105** (Worksheet 5): Estimator Updated ITE *Trip Generation Handbook* Table 7.1 With Proximity Adjustment (*1,* Ch. 7); and
- **Table 106** (Worksheet 6): Estimator Updated ITE *Trip Generation Handbook* Table 7.2 With Proximity Adjustment (*1,* Ch. 7).

Table 103. Estimator input/output worksheet—A.M. street peak hour (A.M. sheet 1 of 4).

NCHRP 8-51 Internal Trip Capture Estimator			
Project Name:		**Organization:**	
Project Location:		**Performed By:**	
Scenario Description:		**Date:**	
Analysis Year:		**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
Total				0	0	0

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips			
Internal Capture Percentage			
External Vehicle-Trips[3]			
External Transit-Trips[4]			
External Non-Motorized Trips[4]			

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office		
Retail		
Restaurant		
Cinema/Entertainment		
Residential		
Hotel		

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips

Estimator Tool Developed by the Texas Transportation Institute for NCHRP Project 8-51

Table 104. Estimator intermediate calculations—A.M. street peak hour (A.M. sheet 2 of 4).

Project Name:	
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips	Veh. Occ.	Vehicle-Trips	Person-Trips
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[3]						

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[3]						

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

Table 105. Estimator updated ITE *Trip Generation Handbook* (*1*, p. 93) Table 7.1 with proximity adjustment (sheet 3 of 4).

Table 7.1 Unconstrained Internal Trip Capture Rates for Trip Origins within a Multi-Use Development				Proximity Adjustment	
Land Use Pairs		Weekday			
		AM Peak Hour	PM Peak Hour	AM	PM
From OFFICE	To Office	0%	0%	1.000	1.000
	To Retail	28%	20%	1.000	1.000
	To Restaurant	63%	4%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	1%	2%	1.000	1.000
	To Hotel	0%	0%	1.000	1.000
From RETAIL	To Office	29%	2%	1.000	1.000
	To Retail	0%	0%	1.000	1.000
	To Restaurant	13%	29%	1.000	1.000
	To Cinema/Entertainment	0%	4%	1.000	1.000
	To Residential	14%	26%	1.000	1.000
	To Hotel	0%	5%	1.000	1.000
From RESTAURANT	To Office	31%	3%	1.000	1.000
	To Retail	14%	41%	1.000	1.000
	To Restaurant	0%	0%	1.000	1.000
	To Cinema/Entertainment	0%	8%	1.000	1.000
	To Residential	4%	18%	1.000	1.000
	To Hotel	3%	7%	1.000	1.000
From CINEMA/ ENTERTAINMENT	To Office	0%	2%	1.000	1.000
	To Retail	0%	21%	1.000	1.000
	To Restaurant	0%	31%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	8%	1.000	1.000
	To Hotel	0%	2%	1.000	1.000
From RESIDENTIAL	To Office	2%	4%	1.000	1.000
	To Retail	1%	42%	1.000	1.000
	To Restaurant	20%	21%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	0%	1.000	1.000
	To Hotel	0%	3%	1.000	1.000
From HOTEL	To Office	75%	0%	1.000	1.000
	To Retail	14%	16%	1.000	1.000
	To Restaurant	9%	68%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	2%	1.000	1.000
	To Hotel	0%	0%	1.000	1.000

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	20.0%
	To Restaurant	63.0%	4.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	2.0%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	26.0%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	18.0%
	To Hotel	3.0%	7.0%
From CINEMA/ ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	42.0%
	To Restaurant	20.0%	21.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

Table 106. Estimator updated ITE *Trip Generation Handbook* Table 7.2 with proximity adjustment (sheet 4 of 4).

Table 7.2 Unconstrained Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development				Proximity Adjustment	
Land Use Pairs		Weekday			
		AM Peak Hour	PM Peak Hour	AM	PM
To OFFICE	From Office	0%	0%	1.000	1.000
	From Retail	4%	31%	1.000	1.000
	From Restaurant	14%	30%	1.000	1.000
	From Cinema/Entertainment	0%	6%	1.000	1.000
	From Residential	3%	57%	1.000	1.000
	From Hotel	3%	0%	1.000	1.000
To RETAIL	From Office	32%	8%	1.000	1.000
	From Retail	0%	0%	1.000	1.000
	From Restaurant	8%	50%	1.000	1.000
	From Cinema/Entertainment	0%	4%	1.000	1.000
	From Residential	17%	10%	1.000	1.000
	From Hotel	4%	2%	1.000	1.000
To RESTAURANT	From Office	23%	2%	1.000	1.000
	From Retail	50%	29%	1.000	1.000
	From Restaurant	0%	0%	1.000	1.000
	From Cinema/Entertainment	0%	3%	1.000	1.000
	From Residential	20%	14%	1.000	1.000
	From Hotel	6%	5%	1.000	1.000
To CINEMA/ ENTERTAINMENT	From Office	0%	1%	1.000	1.000
	From Retail	0%	26%	1.000	1.000
	From Restaurant	0%	32%	1.000	1.000
	From Cinema/Entertainment	0%	0%	1.000	1.000
	From Residential	0%	0%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000
To RESIDENTIAL	From Office	0%	4%	1.000	1.000
	From Retail	2%	46%	1.000	1.000
	From Restaurant	5%	16%	1.000	1.000
	From Cinema/Entertainment	0%	4%	1.000	1.000
	From Residential	0%	0%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000
To HOTEL	From Office	0%	0%	1.000	1.000
	From Retail	0%	17%	1.000	1.000
	From Restaurant	4%	71%	1.000	1.000
	From Cinema/Entertainment	0%	1%	1.000	1.000
	From Residential	0%	12%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	8.0%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	10.0%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	2.0%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	14.0%
	From Hotel	6.0%	5.0%
To CINEMA/ ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%

The following description of the computational process has been put into the form of these spreadsheets, and there is an accompanying Excel spreadsheet workbook to automate the computations. It is intended that the spreadsheet be used to perform computations. The spreadsheet workbook is explained for the A.M. street peak hour and consists of the four spreadsheets shown in Tables 103 through 106. The P.M. street peak-hour estimate is prepared identically. The estimator—either automated or manual—was designed to have a cover sheet that contains all input and output of interest, with look-up data and intermediate computations on the subsequent spreadsheets. The description that follows uses the spreadsheet as an example.

Step 1: Determine Whether the Methodology Is Appropriate for Your Application

The procedure should only be used for estimating internal capture at an MXD that has characteristics resembling the sites from which the internal capture rates have been derived. This step screens/eliminates sites for which the procedure is appropriate.

- **Development Type:** The MXD should be a single, physically and functionally integrated development on a single block or a group of contiguous blocks with three or more revenue-producing uses, with internal pedestrian and vehicular connectivity, and with shared parking among some or all uses. The site should have sufficient parking supply to meet demand although the most convenient parking may sometimes fill during peak periods.
- **Development Location:** The MXD should be downtown fringe, general urban, or suburban. It should not be located either within or adjacent to a central business district (CBD).
- **Development Size:** The MXD should have at least 100,000 sq ft of building space within an overall acreage of up to roughly 300 acres. The MXD can be a single site, a block, or a district or neighborhood (with multiple interconnected or interactive blocks within a defined boundary); however, this procedure should not be used for a SAC composed of different adjacent, but not directly connected, land uses.
- **Land Use Mix:** The MXD should consist of a combination of at least three of the following uses: retail, restaurant, office, residential, hotel, and cinema. Internal capture for land uses beyond these six should be considered to be zero (unless comparable survey data for other land uses are provided) because there are no supporting data from which to derive an appropriate percentage. In addition, if a substantial portion of the land use at a mixed-use site is outside these six land uses, the reported internal capture rates might not be appropriate.
- **ITE Trip Generation Database:** The MXD should not already be covered in the ITE trip generation database as reported in the latest edition of *Trip Generation* (*2*). Current ITE land use classifications that already account for internal trip-making include shopping center, office park with retail, office building with ground floor retail or onsite cafeteria, and hotel with limited retail and restaurant space.
- **Time Period for Analysis:** The internal capture rates contained in this methodology cover the weekday A.M. and P.M. peak periods for adjacent street traffic. Weekday peak period internal capture rates are not appropriate for estimating weekend internal capture—or weekday midday internal capture—or daily internal capture unless survey data for those periods become available.

Step 2: Define the Pertinent Site Characteristics

In this step, the following data describing pertinent site characteristics are assembled:

- The specific land uses in the mixed-use site in sufficient detail so that vehicle or person trip generation can be estimated for each individual land use (described in Steps 2A and 2B); and
- Building proximity for each pair of land uses (described in Step 2B).

The source of much of this information is a proposed site plan, if one exists. If a site plan is not available, assumptions must be made about general site layout, individual land uses, sharing of parking, and the internal pedestrian circulation system.

Step 2A: Identify Land Uses

Identify specific land use components of the MXD and assign them into the six classifications—office, retail, restaurant, residential, cinema, and hotel—covered by the estimation procedure. Any component land uses that do not fit into those six classifications or are too unique to be considered normal for a classification should be kept separate. If in doubt, keep a land use separate from the six listed classifications.

Define the land use components in as much detail as possible. The greatest detail will allow for greatest precision in trip-generation estimates. The internal capture relationships quantified in this methodology are provided at the aggregated land use level. It is important to separate the retail and restaurant uses in this step because they exhibit different internal cap-

ture characteristics. If the restaurant component is expected to be only a minor portion of the overall retail component of the MXD (e.g., a traditional shopping center), assume the site has no restaurant component.

Enter the development units by land use in sub Table 1-A of Table 103 and the corresponding sub table in the P.M. peak period Worksheet 2 (not shown). ITE land use codes are found in the ITE *Trip Generation* report (*2*). The "quantity" is the number of development units. "Units" are the applicable development units such as dwelling units or gross sq ft of building floor area. Undefined shopping center space should all be classified as just that—shopping center (ITE land use classification Code 820 or similar applicable classification). No guesses should be made as to how it may break out into cinema, restaurant, and so forth, unless that has already been determined in the development plan.

Step 2B: Determine Proximity

Determine the walking distance between each pair of interacting land uses within the MXD. This component of the estimation procedure requires particular consistency in application. If there is only one building of each land use classification (e.g., one apartment building and one office building), enter the distance between the entrances of each building. If there is a group of buildings or businesses of one land use category in an area, the distance used should be the weighted (by trip generation) average of distances between each pair of buildings of the interacting land uses.

For each pair of interacting land uses, determine the actual walking distance along the most direct and reasonable path. Do not use the airline (i.e., shortest direct) distance. For the A.M. street peak hour, there are no proximity adjustments, so the distances are not entered into sub Table 3-A of Table 103; however, proximity distances are to be entered into sub Table 3-P of Worksheet 2 for the P.M. street peak-hour analyses.

Step 3: Calculate Single-Use Trip Generation for the Site Components

In this step, trip generation is estimated for each land use within the MXD. The procedure accounts for (1) trip-generating characteristics of the specific land uses (described in Step 3A) and (2) vehicle occupancy (described in Step 3B).

Mode split is not applied here because it is assumed that the ITE trip generation data, which was almost all collected in suburban areas, is almost totally by motor vehicle. There is typically no or very limited transit and walking for trips to and from development sites.

The recommended approach is to work in person trips rather than in vehicle trips, but the analyst can begin from vehicle trips and use mode split and vehicle occupancy to generate person trips. If the analyst wishes to work in assumed ITE conditions (no adjustments for mode split or vehicle occupancy), then it is workable to perform all calculations in this step (skipping Steps 3B and 3C) and all subsequent steps in vehicle trips. In this case, input mode split as 100% vehicle occupancy is 1.00; these will cause the inherent ITE values to be reflected through the process.

Step 3A: Estimate Trip Generation

Enter vehicle trips in the two right columns of Table 103, sub Table 1-A for the A.M. peak hour and in corresponding sub Table 1-P on Worksheet 2 for the P.M. peak hour. For each land use within the MXD, estimate single-use trip generation individually. Then, sum the individual estimates into the six aggregated classifications: office, retail, restaurant, residential, cinema, and hotel. Do not combine development units into the six classifications and then use one single-use trip generation rate or equation to estimate trip generation for the aggregated land use. If specific land uses are not known at the time of analysis, use a more general category—for example, at zoning, no specific retail categories may be known, so "shopping center" may be the best approximation.

The nationally accepted method of estimating site trip generation is to use ITE *Trip Generation* report (*2*) trip generation rates, equations, and data and apply them as described in the ITE *Trip Generation Handbook* (*1*). However, local agencies may have special local rates they prefer to use. Locally determined rates accepted by the reviewing agency can also be used. The choice of trip generation rates/equations should be discussed with the review agency prior to preparing the estimates.

Analysts should keep track of the directional split (inbound/outbound) of the generated trips for each land use. Directional trips are essential to the proper balancing of internal travel demand within the MXD (described in Step 4). If beginning directly with person trips, see the last paragraph of Step 3C.

Step 3B: Enter Vehicle Occupancy

Enter vehicle occupancy for the trips generated by each land use in Table 103, sub Table 2-A for the A.M. peak hour and corresponding sub Table 2-P of Worksheet 2 for the P.M. peak hour. The vehicle occupancy can be different for entering and exiting vehicles. The vehicle occupancy rate should be based on local data if possible. It is acceptable to use an overall average vehicle occupancy rate based on a survey of a similar mixed-use site or to use land use specific vehicle occupancy rates based on surveys of nearby similar land uses. Metropolitan planning organization (MPO) data could also

be used to derive relevant averages for comparable trips in the region. It is important to use vehicle-occupancy rates that reflect travel during the analysis period. Do not use daily vehicle-occupancy rates.

Step 3C: Enter Mode Split for MXD

This is the mode split for the MXD. It does not apply to the base trip generation rates. Percentages of trips by transit and non-motorized mode (e.g., walk, bike) may be different by direction. Enter the percent of directional trips by each mode for each land use in Table 103, sub Table 2-A for the A.M. peak hour and corresponding sub Table 2-P of Worksheet 2 for the P.M. peak hour. The product of Step 3B is an estimate of the number of person-trips in vehicles entering and exiting each of the mixed-use development land uses. It is important to use mode of access distributions that reflect travel to and from the MXD *during the analysis period,* not daily.

Step 3D: Compute Person Trips

Using the vehicle trips entered in Table 103, sub Table 1-A, and vehicle occupancies entered in sub Table 2-A, compute directional trip generation for each land use:

Person trips = vehicle trips × vehicle occupancy.

Enter the person trips in Table 104, sub Table 7-A for A.M. trips. There are corresponding tables in Worksheet 2 for computing P.M. estimates.

Step 4: Estimate the Unconstrained Internal Capture Rates for All Land Use Pairs at the Site

In this step, unconstrained internal capture rates that are appropriate for the subject development site are determined. This determination begins with the base internal capture rates documented in this research (described in Step 4A); the rates are then modified to account for specific proximity characteristics of the subject site (described in Step 4B).

Step 4A: Estimate Base Internal Capture Rates

Internal trip capture rates are provided for land use pairs involving the following generic land use classifications: office, retail, restaurant, residential, hotel, and cinema. Trip generation estimates were made in Step 3 for specific types of land uses. For estimating internal capture, land use classifications should be combined into the above general categories before continuing into the estimation process—for example, for a development containing apartments and townhouses, for estimating internal capture, these would be combined as residential.

When applying the internal capture estimation methodology, use the percentages from the third and fourth columns of sub Table 7.1 and sub Table 7.2 within Tables 105 and 106. Each sub table contains both A.M. and P.M. peak-hour data. If a local survey has been conducted using data collection and compilation procedures described in this report, the resulting internal capture percentages may be used. Users are cautioned that data gathered in a method different than the data collection methods described in this report may not be applicable and could produce inaccurate internal capture estimates.

For land uses other than the six classifications provided herein, users should assume no internal capture (unless comparable survey data for other land uses are provided). The percentages in Tables 105 and 106 are **not applicable** to other land uses. They are also only for the weekday A.M. and P.M. peak periods and should not be used for other periods.

In some cases, review agencies may set policies to limit the percent internal capture they will permit to be applied based on their own justifications. Such limitations would represent agency policy to use what they consider more conservative trip generation estimates (e.g., to avoid the possibility of underestimating trip generation) and are not to be confused with the findings of this project.

Step 4B: Apply Proximity Adjustment Factors (P.M. Peak Period Only)

The unconstrained internal capture values presented in Tables 105 and 106 represent rates to be expected between land use pairs that are not constrained by proximity. As some land use pairs become farther apart, the unconstrained internal capture rates will decline. This step accounts for the specific proximity characteristics of the MXD.

Proximity adjustment factors are presented below for only the land use pairs for which the available data clearly demonstrates a direct relationship between proximity and internal capture rate. These are comprised of only P.M. peak-period trips; no proximity adjustments are available for the A.M. peak period:

- From all land uses to residential and applicable only to the trip origin end;
- From office to retail or restaurant, applicable at both origin and destination trip ends; and
- From residential to retail or restaurant, applicable at both origin and destination trip ends.

These factors are only applicable during the P.M. peak hour. If a land use pair is not included in the above list, use

Table 107. Proximity adjustment factors for P.M. peak hour internal capture rates.

From Land Use	To Land Use	Proximity Distance	Equation to Calculate Proximity Adjustment Factor[1]
Office	Residential	770–3,760 ft	Factor = 1.23 – 0.0003 x (Distance)
Retail	Residential	770–3,760 ft	Factor = 1.23 – 0.0003 x (Distance)
Restaurant	Residential	770–3,760 ft	Factor = 1.23 – 0.0003 x (Distance)
Cinema	Residential	770–3,760 ft	Factor = 1.23 – 0.0003 x (Distance)
Hotel	Residential	770–3,760 ft	Factor = 1.23 – 0.0003 x (Distance)
From Land Use	**To Land Use**	**Proximity Distance**	**Equation to Calculate Proximity Adjustment Factor[2]**
Office	Retail	190–1,524 ft	Factor = 1.06 – 0.0003 x (Distance)
		1,525–2,360 ft	Factor = 1.52 – 0.0006 x (Distance)
Residential	Retail	190–1,524 ft	Factor = 1.06 – 0.0003 x (Distance)
		1,525–2,360 ft	Factor = 1.52 – 0.0006 x (Distance)
Office	Restaurant	190–1,524 ft	Factor = 1.06 – 0.0003 x (Distance)
		1,525–2,360 ft	Factor = 1.52 – 0.0006 x (Distance)
Residential	Restaurant	190–1,524 ft	Factor = 1.06 – 0.0003 x (Distance)
		1,525–2,360 ft	Factor = 1.52 – 0.0006 x (Distance)

[1] Use 1.00 proximity factor for distances shorter than 770 ft and 0.10 for distances longer than 3,760 ft.
[2] Use 1.00 proximity factor for distances shorter than 190 ft and 0.10 for distances longer than 2,360 ft.

the Table 105 and Table 106 unconstrained internal capture values without adjustment.

Locate the appropriate land use pair and direction in Table 107. Compare the MXD proximity to the proximity thresholds in the table:

- If the proximity is less than or equal to the value in the third column of Table 107, use the unconstrained internal capture values in Table 105 or Table 106, whichever is appropriate. Remember that sub Table 7.1 values in Table 105 will be applied to the outbound trips; sub Table 7.2 values in Table 106 will be applied to inbound trips.
- If the proximity is within the range shown in the third column of Table 107, use the equation provided in the fourth column to calculate the proximity adjustment factor. Enter the proximity adjustment in the right column of sub Table 7.1 of Table 105 and in sub Table 7.2 of Table 106.
- If the value calculated in the fourth column is a proximity adjustment factor of less than 0.10, use the minimum value of 0.10 in subsequent steps.
- For each row of sub Table 7.1, multiply the P.M. peak-hour adjustment factors in Column 4 by the P.M. proximity adjustment factor in the right column of that table. Place the resulting product in the right column of sub Table 7.1a of Table 105. Repeat the same for sub Table 7.2 in Table 106.
- Enter the adjusted internal capture percentage in the right columns of sub Table 7.1a in Table 105 and in sub Table 7.2a in Table 106.

Step 4C: Calculate Proximity-Adjusted Unconstrained Internal Trips at Origin (Outbound) and at Destination (Inbound)

In Table 104, sub Tables 7-A(D) and 7-A(O) show the proximity adjusted internal vehicle and person trips at the origin and destination, respectively. Be sure that any mode splits from Table 103 sub Table 2-A have been incorporated.

In Table 104, each cell in the 8-A(O) and 8-A(D) sub tables is computed as follows:

1. Multiply the direction trips in Table 104, sub Table 7-A(O) (e.g., office exiting trips) by the Table 105 sub Table 7.1 internal capture percentages (e.g., A.M. peak hour 1% to residential).
2. Place the product in Table 104, sub Table 8-A(O). Do the same for the entering trips.
3. Complete the 8-A sub tables of Table 104 in the same manner.

P.M. street peak-hour internal trips can be computed the same way using the corresponding P.M. tables.

Step 5: Calculate the Balanced Internal Trips between All Land Use Pairs

Estimate balanced demand volume by direction by comparing the values in the corresponding cells of sub Tables 8-A(O) and 8-A(D) for each land use pair and select the lower value.

This step is to balance the estimates of directional internally captured trips between the interacting land uses. This must be performed for two reasons:

1. Estimates for each land use are based on the quantity of that land use and its capacity to send or receive internal trips. There is no assurance without balancing that there is enough capacity on the receiving end to accept as many trips as are being sent.
2. The total trips sent internally (i.e., captured trips) from one use to another must equal the number being received at the other end of the trip. Both numbers must be the same.

Figure 20 shows this process. To perform this computation, person trips begin from Table 104, sub Tables 8-A(O) and 8-A(D). Compare corresponding cells and select the lowest figure (i.e., the fewest unconstrained internal trips). For example, compare the "from retail to office" cell. If sub Table 8-A(O) shows 4.4 trips and sub Table 8-A(D) shows 70.4 trips, select the lower value (i.e., 4.4) and enter it into the "retail to office" cell of Table 103, sub Table 4-A in round numbers (4, in this example). Complete sub Table 4-A of Table 103 in this manner. These are the estimated internal trips.

As shown above, P.M. street peak-hour estimates can be computed using the corresponding tables.

Step 6: Calculate the Overall Internal Capture Rate for the Site

In Table 104, sub Tables 9-A (D) and 9-A(O) are used to summarize internally captured trips and compute the external trips. This is started in person trips. Column 2 of sub Table 9-A(D) is computed by summing the office column of sub Table 4-A of Table 103. Column 4 comes directly from Table 104, sub Table 7-A(D), Column 4. The external trips in Column 3 are the difference between the total and internal person trips in each row.

The right three columns in sub Table 9-A(D) are computed by multiplying the external vehicle trips in Column 3 of that table by the applicable mode split percentage in the two right columns of sub Table 2-A of Table 103. The transit external trips are computed by multiplying the transit mode split percentage (Column 3, sub Table 2-A) by the number of external person trips (sub Table 9-A(D), Column 3). Nonmotorized person trips are calculated similarly. For vehicle trips, use the equation of

$$\text{vehicle trips} = \frac{\left(\begin{array}{l}\text{external trips} - \text{transit trips} \\ - \text{non-motorized trips}\end{array}\right)}{\text{vehicle occupancy}}$$

where the vehicle occupancy comes from Table 103, sub Table 2-A, Column 2.

For the bottom row in sub Tables 9-A(D) and 9-A(O), there are no internal trips (no data to support such estimates). Values are taken directly from Table 103, sub Table 1-A, the right two columns. Totals from sub Tables 9-A(D) and 9-A(O) are then entered in Table 103, sub Table 5-A. The entering and exiting values in Row 1 of that table are the totals from Column 4, sub Tables 9-A(O) and 9-A(D). The total in Column 2 is the sum of the entering and exiting volumes. The second row of sub Table 5-A is the sum of Column 2 of sub Tables 9-A(O) and 9-A(D) divided by the sub Table 5-A, Row 1 entries then multiplied by 100%. The remaining entries in sub Table 5-A are taken from sub Tables 9-A(D) and 9-A(O) in a similar manner. Sub Table 6-A is computed using the row figures in sub Tables 9-A(D) and 9-A(O).

Use the corresponding tables to compute P.M. street peak-hour estimates.

Reminder

The previous computational description follows a spreadsheet workbook designed to have a cover sheet that contains all input and output of interest, with look-up data and intermediate computations on the subsequent worksheets. It is intended that the spreadsheet workbook be used to perform computations. If performed manually, analysts may wish to reorder component tables to provide a more logical order.

Additional Guidance

Site Location

The researchers recognize there is internal capture for developments other than single, physically and functionally integrated MXDs (such as CBDs and SACs). The concept of unconstrained internal capture rates constrained by the mix and proximity of land uses also applies to those development patterns. However, the data reported herein include only developments that satisfy the "mixed-use" definition used in this report.

Mixed-Use Development Already in ITE Trip Generation Database

In a typical shopping center that is included in the ITE *Trip Generation* report (*2*), the site restaurants are convenience restaurants that feed off the retail visitors (rather than serve as destination restaurants). In some MXDs, some of the restaurants may be oriented to the convenience of internal users and not draw heavily from outside the development. These may be snack shops, fast food, or other small restaurants rather than full-scale restaurants that are destination eating places. Analysts may wish to consider them part of a shopping center use if the retail uses generate a large portion of the convenience

restaurant business. If this is to be done, it is suggested that not more than the first 5% of overall retail/restaurant square footage be considered as convenience restaurant. This should exclude all destination and free-standing restaurants. In such a case, if greater than 5%, assume the amount above 5% to be restaurant—generate trips accordingly and keep this portion separate for determining the internal capture rates. Add the convenience restaurant square footage to the retail space.

The ITE *Trip Generation* report (*2*) and the *Trip Generation Handbook* (*1*) already include several types of MXDs. Current ITE land use classifications that already account for internal trip-making include the following:

- **Shopping center:** shopping-center trip-generation rates are based on retail developments that already normally include restaurant, cinema, and limited other entertainment uses; however, "if a shopping center is planned to have out-parcel development of a significantly different land use classification or a very large percentage of overall gross leasable area, the site could be considered a mixed-use development for the purpose of estimating site trip generation" (*1*).
- **Office park with retail:** "A subdivision or planned unit development containing general office buildings and support services such as banks, restaurants and service stations arranged in a park- or campus-like atmosphere should be considered as an office park (ITE Land Use Code 750 form ITE *Trip Generation* report)," not as an MXD (*1*).
- **Office building with ground floor retail or onsite cafeteria:** "An office building with support retail or restaurant facilities contained inside the building should be treated as a general office building (Land Use Code 710) because the trip generation rates and equations already reflect the presence of such support uses" (*1*).
- **Hotel with limited retail and restaurant space.** "A hotel with an onsite restaurant and small retail falls within Land Use Code 310 and should not be treated as a MXD" (*1*).

Land Use Split between Retail and Restaurant

The internal capture rates presented earlier in Tables 103 through 106 treat retail and restaurant as separate land uses. To use these rates, it is necessary to differentiate between retail and restaurant uses at the mixed-use site. It is possible that the analyst will only know total retail (i.e., retail plus restaurant) square footage. In that situation, two different approaches are suggested for estimating internal capture:

1. Assume the same retail/restaurant split found at the six sites for which data were available; and
2. Assume and test different retail/restaurant splits (within a reasonable range) to determine whether the retail/restaurant split changes site trip generation and internal capture significantly.

The six-step estimation procedure is merely a mathematical technique for estimating internal capture; the researchers are not trying to suggest how to adhere to specific local TIA requirements.

Proximity of Land Uses

If the analyst knows (or can confidently assume) the land uses and their sizes but does not know their proximities, the analyst must prepare at least a schematic site plan. Do *not* simply assume that each pair of land uses consists of buildings adjacent to each other (e.g., within 200 ft). At the minimum, test different proximities and observe their effects on overall internal capture at the mixed-use site.

If development information is not yet detailed enough to permit a direct estimate of proximity distances, use the site size and Figure 23 to estimate the average probable separation, then use that distance for the proximities between each land use pair. This will produce rough estimates of internal capture, at least related to proximity. As the site plan evolves, use more specific information for proximity.

The recommended approach is to separate each land use into blocks, with a block being the building faces along both sides of a street (see Figure 24). Locate the centroid of the entrances of a specific land use for each block and measure distances between each block of that land use and the other interacting land use. If there are multiple blocks, then make measurements between all pairs of blocks and use the weighted average distance, using trip generation involved in each interchange as the weighting factor.

Figure 24 shows an example of a multi-block scenario. If the dots represent the centroid of the entrances for Land Use A in each block, and if d_1 and d_2 are the respective distances to Land Use B in Block 3, then the weighted average distance between Land Uses A and B is

$$\frac{d_1 \times (\text{sq ft in Block 1 of Land Use A}) + d_2 \times (\text{sq ft in Block 2 of Land Use A})}{(\text{sq ft in Blocks 1 and 2 of Land Use A}).}$$

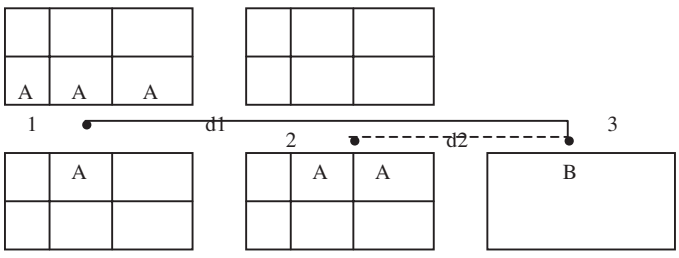


Figure 24. Sample blocks including Land Uses A and B.

Proximity Adjustment Factor

The proximity adjustment factors presented previously are based on the observed effects of changing walk distances on internal capture rates between land use pairs. These walking distances were measured along available routes that did not require the use of stairways or other obstacles or delaying factors. The paths were also along clear, adequately wide walkways in very good repair.

Mode Share of Internal Trips

The great majority of internal trips to a site will be either walked or driven onsite (many sites also accommodate bicycle travel)—that is, few internal trips within a site will use major public streets either on the periphery of the development or internal to the development. An exception will be trips driven within a multi-block area of complementary and interacting land uses.

For those MXD sites or areas where all internal trips will be walked, bicycled, or driven onsite (on private internal streets or through parking areas), the mode of access to the site should be used to factor vehicle external trip generation for the analysis period. The ITE trip generation rates and equations generally incorporate suburban mode splits. Limited observations within the ITE dataset point toward about 2% of the trips arriving by walking, bicycling, or transit. This would be a reasonable assumption to apply to ITE data. The other 98% arrives as either vehicle drivers or passengers.

After arriving on the site, internal trips that could or might be driven will be limited by (1) the convenience (or lack thereof) of driving versus walking, and (2) the availability of a motor vehicle for the trip. Some MXDs may also have internal shuttles. Hence, it is a reasonable assumption that the beginning point for internal trips by personal vehicle will be no higher than the mode of access to the site and possibly far lower if the development is walkable.

The mode split is used at the end of the process to determine the number of external person trips being taken by personal vehicle, transit, and non-motorized modes such as bicycle or walking. The mode split can be derived from surveys of similar land uses near the study site or from other estimates relevant to the study location and land uses (e.g., regional or localized travel data available from MPOs or other credible sources).

Pass-By Trips

"The application of pass-by trip reductions should be applicable to (mixed-use) sites. However, none of the internal trips can be of a pass-by nature because they do not travel on the adjacent (external) street system" (*1*, p. 100). Pass-by trip percentages are applicable only to external trips—those trips that enter or exit the adjacent street system. They should be applied after the external trips are estimated, not to the base vehicle-trip generation.

Unconstrained Internal Capture Rates

The unconstrained internal capture rates presented in Tables 99 through 102 reflect data collected at as many as six MXDs. For several of the land uses, the potential sums of internal capture rates appear to be illogical—for example, the sum of 124% for internal capture for trips to office in the P.M. peak hour (see Table 102) is impossible. However, these "illogical" sums will not occur for three reasons:

- **First, they would require unlikely balances of interacting land uses.** For example, to maximize the inbound office internal capture rate during the P.M. peak hour, the retail space would need to be 20 times the office space and the restaurant space would be half of the office space; a mix with so little office is essentially a shopping center. While the internal capture for trips to the office from retail would be high, the opposite would not be the case. The overall internal capture rate would be modest.
- **Second, the proximity adjustment factors will reduce the effective unconstrained internal capture rates** because of the possibility that all office and residential uses will not be located within 200 ft of all retail and restaurant at the mixed-use site.
- **Third, it appears to be mathematically impossible for all unconstrained maximum internal capture percentages to occur at the same time within a development because each maximum requires a different ratio of development units for the pair of land uses involved.** For example, using Tables 99 through 101, for the A.M. peak to achieve 65% internal capture for trips from office to restaurant, restaurant would need to have $^{63}/_{23}$ times the square footage of the office for a balance to be achieved (the ratio of sq ft of each land use to achieve a complete balance between sending and receiving land uses necessary to obtain the unconstrained internal capture percentage). To achieve the 28% internal capture of trips from office to retail, the square footage of office would have to be $^{28}/_{32}$ times the square footage of retail. The office to residential is 0% due to the value in Table 101. So, for 100,000 sq ft of retail, office would have to have 87,500 sq ft of office and about 239,700 sq ft of restaurant to reach 91% internal capture. At average size of about 5,000 sq ft per restaurant, that would amount to 48 restaurants, a very unlikely balance—and that is only the balance results

for trips from office. To achieve the maximum for internal trips to office, office square footage needs to be ½ times the retail square footage, which would not maximize trips in the opposite direction. To maximize trips from restaurant to office, the office would have to have 41⅓ times the square footage—again, different from what would be required for the opposite direction to maximize. Following the same process, one can quickly see that it is mathematically impossible to achieve all unconstrained internal capture percentages concurrently for a given MXD. In the unlikely occurrence that the sum of internal trips should total over 100% of the total trip generation for a land use, it is recommended that the total internal trips be reduced to 100%, and the interchanges from the affected land use to other interacting land uses be proportionally reduced. This would not yield a total internal capture of 100 percent; rather, it would be one interchange and one direction that would be estimated to be 100%.

Validation of Estimation Procedure

This estimation procedure was tested against development and cordon count data for several developments and found to replicate actual results for MXDs fairly well. The validation procedure and results are described in Appendix F.

CHAPTER 4

Conclusions, Recommendations, and Suggested Research

This chapter pulls together the conclusions, recommendations, and lessons learned during this project. Statements made herein are intended to help practitioners use the results of this project either to estimate internal capture for MXDs or to add to the database and perhaps further refine the methodology and tools provided.

Existing Practice

Internal capture for MXDs is of most interest to those who either prepare or review TIAs for such developments, but transportation planners and developer consultants are also interested in internal capture and the resulting external trip generation. Some additional uses include planning for TODs and preparing environmental impact statements or assessments.

ITE provides a recommended practice for estimating internal capture and associated external trip generation for what it calls "multi-use developments." As described, those developments have characteristics similar to the common definition used for MXDs. The research team accepted the two terms as used as being essentially equal. The ITE method documented in their *Trip Generation Handbook* (*1*) is the most widely used technical method.

The other widely used approach is a policy-determined flat percentage reduction in external trips. Such percentages are established by local planning, zoning, or transportation engineering officials for use in TIAs prepared to support applications for zoning, subdivision, site plan approval, or access permits. The percentages are usually arbitrarily selected for use throughout the jurisdiction. These percentages are most typically in the range of 10%, but were found to range from less than 5% to as much as 25%. Most percentages are conservative compared with internal capture data found in past research and this project. Other approaches found included tables of applicable rates and a formula to modify ITE estimates.

The ITE method covers only trips among the three most frequent components of MXDs—office, retail, and residential. Data are available for the weekday P.M. peak hour, for midday, and for what is called "daily," but which is drawn from data collected between noon and 6:30 P.M. The ITE method has nothing for the A.M. peak hour. The policy percentages mentioned above are applied to each analysis period used.

There is some limited use of invalid applications for internal capture estimation. The two found most frequently were use of shared parking reduction percentages and metropolitan area travel forecast model intrazonal trip percentages. Shared parking reductions apply only to parking accumulations in a parking facility serving multiple uses; the percentage reduction applies only to parking accumulation, not trip generation. Intrazonal trips apply to complete traffic analysis zones used in regional travel forecast models. Zones may range from a block to a square mile. Intrazonal trips are for the complete zone and are not applicable to portions of a zone. Estimates are also accurate only to a regional level, not a development site level. Neither method should be used for estimating internal capture for MXDs.

Six land uses are the most frequent components of MXDs—office, retail, restaurant, residential, cinema, and hotel. Most major MXDs have all of these. Most other MXDs have at least four. MXDs come in all sizes and layouts: some are vertically integrated and developed in one block, some are spread over several or many blocks with land uses well mixed or concentrated in interconnected single-use areas. Six MXDs analyzed in this project ranged in size from 7 and 300 acres. All were single developments from one master plan developed either to integrate fully all land uses or otherwise to promote interaction between onsite land uses. There are other larger MXD types of developments such as SACs and even new towns or very large self-contained urban sections. These last two types were not covered in this project because it was felt that they act differently than does the MXD of 300 acres or less and because they are far less frequently found in most states of the country.

With the increase in emphasis on livability, compact cities, and smart growth in general, MXDs have become more popular. Many are found in midtown-type urban areas (i.e., the central portion of a city or urban area that is outside the CBD but has higher densities than suburban or general urban and may include an outlying business district). Others are found in suburban locations and a few in urban peripheries. The research team did not include downtowns because they would be very difficult to survey and do not develop as one project or development and, therefore, would not need a TIA for the downtown.

During the period this project was active, the research team received dozens of calls asking for internal capture data for land uses and time periods not included in the ITE method. Requests were most frequently received for

- A.M. peak-hour internal capture rates;
- Land uses not included in the ITE method—most notably hotels, cinemas, and restaurants; and
- Very large MXDs in outlying areas.

Available Data

There are very limited data available that are capable of supporting internal capture rate estimation methodology that can use information that is *available at the time of zoning.* Three Florida surveys plus three pilot studies conducted for this project were the only surveys with enough detail to develop internal capture methodology

- For both A.M. and P.M. peak hours;
- For use with information that is available at the time of zoning requests and can be reliably projected;
- That provides the ability to analyze the effect of proximity of land uses to each other; and
- That is sensitive to differences in land use mix.

Some cordon counts have been completed for various periods and could be used for validation testing, but, by themselves with land use information, they do not provide what is needed to develop a sensitive procedure. More data are needed.

Internal Capture Estimation Methodology

Expanded ITE Methodology

This project expanded the database from three to six developments and, after considering options, expanded the ITE method to

- Add the weekday A.M. peak hour;
- Add restaurant, cinema, and hotel land uses;
- Create a land use classification structure that would permit disaggregation of the six land uses to more detailed categories should enough data become available;
- Include the effects of proximity (i.e., convenient walking distance) among interacting land uses to represent both compactness and design; and
- Provide a method that could easily be put in spreadsheet form.

This method was tested for its ability to estimate external vehicle trip generation. The existing ITE method estimates produce about one-half of the estimation error that raw ITE trip generation rates produce. The method developed in this project cuts the estimation error in half again, or roughly to about one-fourth of the raw trip generation rates.

The recommended method is described in Chapter 3. The researchers recommend its use for developments of up to 300 acres. Additional data and/or further testing could validate its use for larger developments, but that has not yet been attempted. The researchers do **not** recommend use of this method for downtowns, SACs, or new town types of development; the researchers do not believe it will be applicable.

The method produced has a component that estimates the effects of proximity. Unfortunately, the database is small enough for the P.M. period that factors could only be developed for some land use pairs. Absence of A.M. peak-hour data from the Florida studies precluded any A.M. proximity factors from being developed. This project's estimation method generally produced slightly closer P.M. estimates with the proximity factor included. It is recommended for use, but it is also recommended that when additional data becomes available, attempts should be made to develop proximity factors for more land use pairs.

Suggested Modifications to Existing ITE Procedures

As mentioned previously, the recommended estimation method builds on the current ITE internal trip capture procedures contained in the second edition of the *Trip Generation Handbook* (*1*). Incorporation of this project's recommendations could be accomplished by performing the following:

- Expanding Tables 7.1 and 7.2 of the *Trip Generation Handbook* (*1*) to include all six land uses covered in this report; and
- Adding the proximity adjustment to be made after the unconstrained internal capture estimates are performed but before the balancing process.

The data collection procedures could be modified to include those recommended in this project, including the next section.

Data-Collection Methodology

A methodology and procedural instructions were developed for the selection of data-collection sites and for the data collection itself. Those procedures were used to conduct surveys at three MXDs. The procedures were refined as a result of the experiences and lessons learned. Appendix C describes the recommended method.

The researchers recommend that additional data be collected. The researchers suggest that MXDs selected meet at least the following criteria:

- Be representative of typical MXDs being developed or being planned so the data will be of use for years to come; the area in which the MXD is located should also be representative;
- Have at least four land uses so that most land use pairs are included;
- Have owners or managers who will permit the needed surveys to be conducted;
- Be easy to conduct a large enough sample for an affordable cost (in 2006 dollars, each survey cost about $50,000 to set up and conduct and to summarize the resulting data);
- Be generally in the range of 300 to 500 acres or less; and
- Be economically successful (by appearance), be mature (i.e., fully occupied for at least a year), and be in an area that is mostly developed.

It is expected that NCHRP will turn over the results of this project and its data to ITE for inclusion in its database. ITE is also the body that issues recommended practices for this type of methodology. Organizations that collect additional internal capture data are encouraged to provide a copy of the data and analyses to ITE for further use and future refinement to what was produced in this project.

Recommended Changes to the Procedures Used in This Project

Based on the experience of collecting and using data following procedures initially recommended for this project, four changes are recommended for consideration to improve the quality and content of data:

1. **Conduct inbound interviews in addition to exit interviews.** Although there is developer/manager resistance to inbound interviews, they would increase the accuracy of the survey data. Questions about the previous trip before the one being interviewed drew some illogical results and included many trips made before the peak period of interest. If the development owner/manager resists giving permission, attempt to conduct inbound interviews in locations where business will not be impeded. Office building and residential building lobbies are good places for conducting inbound interviews.
2. **Delete the questions about the previous trip if inbound interviews can be conducted.** The researchers found inconsistencies and confusion associated with responses to those questions.
3. **Add a time for the previous trip's arrival at the interview building if no inbound interviews can be conducted.** The time is needed to determine whether it was made during the A.M. or P.M. peak period.
4. **Consider adding a question seeking induced trip information.** An add-on question to attempt to determine induced trips was asked as part of the Legacy Town Center interviews. Respondent understanding about the question was inconsistent, so the results were not reported herein. However, it was evident that some of the internal trips made may have been induced or resulted from having proximate interacting land uses. The question asked whether the respondent would have made the trip being discussed if the selected destination did not exist within Legacy Town Center. A substantial number of respondents answered affirmatively—that is, they said they would not have made the trip had it required travel outside Legacy Town Center. Hence, such a trip would not represent a reduction in external trips: it would be an addition—made internally.

Lessons Learned

Several lessons were learned in this project that will be of interest to researchers and practitioners in this field.

- **Detailed data are very scarce and expensive to produce.**
- **There has been little willingness of sponsors to fund data-collection efforts** since the advent of the current ITE estimation method and adoption of flat reduction percentages by numerous agencies.
- **Due to the shortage of data, there is significant apprehension on the part of development review agencies about whether trip generation at MXDs is actually less than the sum of its free-standing components—**that is, if there is actually internal capture.
- **Owners/managers of some developments are reluctant to permit surveys.** They have concerns about the interviews discouraging patrons from doing business at the MXD. In all three pilot studies conducted for this project, permission was gained to conduct only exit interviews—not inbound interviews. This was based on owner/manager belief that patrons would not be bothered after they had already done their business in a particular establishment where the interviews would be conducted.
- **Data clearly show that there is internal capture in the ranges previously documented.**

- **The recommended method did produce estimates of external vehicle trips that represent counted volumes quite closely.** While results varied in accuracy among the developments tested, the recommended method was the closest of the methods tested in four of five cases for which directional volumes were available for both A.M. and P.M. peak hours. For two other sites with partial data, the recommended method was clearly the best for one and it was approximately equal to the existing ITE method for the other. In total, the recommended method displayed about half the estimation error of the existing ITE method (13% versus 23%, respectively), both of which are well below the error using just raw ITE trip generation rates (53%).

Suggested Research

Although this project has made progress in estimation of internal capture, the database is still sparse and much that is thought to be logical about MXD travel characteristics is still unproven and even largely untested. The research team recommends that the following additional research be performed:

- **Collect more data at MXDs.** Data are needed from at least six more sites that have five to six land uses.
- **Test the applicability of the existing methodology for MXDs of different sizes, character, and land use components independent of the additional data collection.** Use validation tests similar to those used in this project. The only data needed are a complete directional cordon count for the A.M. and P.M. peak hours plus development data and a good site plan from which to estimate proximities.
- **Attempt to determine what differences design characteristics of MXDs have on external travel.** Parking availability, degree of direct interconnection, and vertical versus horizontal integration are three such characteristics.
- **Ascertain the effect of off-site competing opportunities on internal capture.** There may be a method of using GIS data and external trip data from the recommended surveys to ascertain these effects.
- **Devise and add a survey question to ascertain induced trip information.** This would permit an assessment of whether MXDs result in induced trips because of the internal opportunities. Note that such a question was asked during one of the three pilot studies, but respondents frequently had a difficult time grasping the concept of an "extra trip that might otherwise not have been made."

Application in Practice

Estimation Methodology and Data-Collection Framework

This research project developed an improved estimation methodology and data-collection framework for use in estimating internal trip capture in MXDs during weekday A.M. and P.M. peak periods. The estimation methodology is based on weekday A.M. and P.M. peak-period survey data from three MXDs in Texas and Georgia (conducted as part of this project) plus similar weekday P.M. peak-period data from three developments in Florida (conducted prior to this project). The six developments surveyed ranged from about 7 to 300 acres in size and had between four and six primary land uses each.

This report presents a technical advancement beyond the internal capture method published in the *Trip Generation Handbook,* second edition, published by the Institute of Transportation Engineers (*1*). The researchers believe that the limited validations conducted for the proposed estimation method confirm that the results provide accurate approximations of external trip generation for typical MXDs consisting of typical office, retail, restaurant, residential, cinema, and hotel land uses, consistent with the accuracy of trip generation estimates for single-use developments as portrayed in such references as *Trip Generation,* eighth edition (*2*).

User Instructions and Cautions

At the time of publication of this report, the approach developed in this research had not yet been advanced through the ITE process for development of recommended practices and, therefore, it should not yet be considered as an ITE–approved methodology.

This report presents information in Chapter 3 on how to use the proposed estimation procedure, but the researchers and the overseeing NCHRP project panel felt it is important to encourage users to adhere to the following instructions and cautions in using the proposed estimation methodology:

- **Identify specific land use components of the MXD and classify them into the six classifications**—office, retail, restaurant, residential, cinema, and hotel—covered by the estimation methodology. Any component land uses that do not fit into those six classifications or are too unique to be considered normal for a classification should be kept separate. No internal capture is estimated in the proposed methodology for trips between uses within each of these categories (e.g., two or more different retail uses).
- **For each land use within the MXD, estimate single-use trip generation individually.** Then, sum the individual estimates into the six aggregated classifications: office, retail, restaurant, residential, cinema, and hotel. Do not combine development units into the six classifications and then use one single-use trip generation rate or equation to estimate trip generation for the aggregated land use.
- **When applying the internal capture estimation methodology, use the percentages suggested in Chapter 3 unless local data are available from developments similar to the development being analyzed.** Users are cautioned that data

gathered in a method different than the data-collection methods described in this report may not be applicable and could produce inaccurate internal capture estimates.
- **Do not apply the internal capture percentages from this report to other land uses.** Internal capture estimates were not developed for land uses beyond the six classifications provided herein. The extent of the internal capture for other land use pairs has not been tested as part of this project.

The results presented in this report are based on surveys of six MXDs and validation was limited to seven such MXDs. As a result, some members of the project's advisory panel strongly recommend that additional research, data collection, and validation testing be conducted before the method is adopted for use in TIAs. Furthermore, caution should be exercised in the application of this methodology—for example, it cannot be concluded that the methodology will be appropriate for MXDs that differ significantly from those surveyed in this project in terms of

- Regional context, including competing opportunities outside the development;
- Access and parking;
- Scale of the development;
- Complementary land uses, including specific pairs of business types;
- Specific residence types,
- Other component characteristics within each land use category;
- Proximity and connectivity between each pair of land uses, especially the layout of the land uses relative to each other;
- Other characteristics such as proximity to transit and pedestrian access within and around the site; and
- Colder locations that might limit or constrain pedestrian traffic.

Request for Additional Data

Users are encouraged to collect and contribute additional data using the data-collection procedures described in this report. Such data could be used to further enhance the accuracy of the proposed methodology and/or expand the number of land use classifications covered by the methodology. New data should be forwarded to the Institute of Transportation Engineers, 1627 I Street, Suite 610, Washington, D.C. 20006-4007 or by email to ite_staff@ite.org.

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APPENDIX A

Trends In Mixed-Use Development

MXD has become a popular way for developers to offer several different types of building products within a single development under the current land use zoning system. However, MXD has not always been implemented in its existing forms.

Brief Background

In earlier times when the transportation system did not yet have mechanized technologies, convenient walking or (horse) riding distances limited how far the necessary goods and services could be from residential and work locations. In urban areas, convenience services and goods had to be within a few blocks of home. Support business services and goods had to be close to other businesses. Employment and housing locations had to be close to each other. This led to the close proximity of complementary uses, often in the same or adjacent blocks. Many businesses were operated by their owners who lived on the upper floors of the building housing their business.

However, this led to some undesirable living conditions. Unhealthy and unattractive industries and housing often coexisted next to each other in an era when noise, air quality, and waste handling were nowhere near to what they are today. In an effort to separate noxious industry from housing and create better and healthier urban environments, cities adopted land use zoning. This became viable as transportation became much better and made it possible for employees to live much farther from work places. This began with horse drawn and electric trolley suburbs and became popular after the automobile became commonly available to most families. By the period immediately following World War II, outlying areas of central cities and separately incorporated suburban municipalities that could provide more protected and pristine environments had become very popular for residence locations.

With the changes in residence preferences and widespread availability of private motor vehicles came changes in other developments. Retail was provided first at or near major intersections, initially in small combinations of separate buildings containing different businesses, then in small shopping centers, and then in larger shopping centers. Employment was still concentrated in downtowns initially, but then gradually began appearing in industrial areas or parks (industry), or free-standing buildings or parks (office). Restaurants were located at high-traffic locations, usually free standing. The same occurred with entertainment buildings (mostly single-screen cinemas). Hotels were located in downtowns, but motels were located along main arteries and highways.

As developers found that there was indeed interaction between some land uses that they could capitalize from and cities realized that several uses could be mixed to the benefit rather than detriment to public health, safety, and welfare, MXD began to reappear. At first, it was difficult to mix some uses because zoning ordinances were oriented to separating different uses and protecting several of these uses. Zoning variances and special-use permits were required as exceptions to zoning ordinances. As successful experiences occurred, zoning ordinances were modified to permit additional uses in some zoning categories and developers proposed mixes under individually negotiated PUDs. As more success evolved, more latitude was permitted, both in zoning ordinances and in zoning application practice. Today most zoning ordinances still give preference to single-use development. However, MXD is commonly approved and many zoning ordinances have one or more mixed-use categories that permit certain mixes of land use.

Modern Mixed-Use Development

Currently MXD is found in two primary forms:

- a traditional building type resembling a district of different land uses (such as neighborhood centers) that reemerged in the latter half of the 20th century after having been undermined by the:
  - widespread adoption and implementation of single-use zoning, and

  - post World War II rush to the suburbs that entailed not only lower densities, but also a development template that separated uses such as shopping malls, subdivisions, and office parks; and
- mixed-use centers, often developed on a single interconnected site, that contain several uses that may or may not be fully interactive. This largely suburban building model became the norm for developers and was ingrained in local zoning and building codes intended to protect suburban homeowners from some of the noxious uses found in cities.

Early Examples

MXD initially re-emerged as downtown revitalization projects beginning in the 1950s with projects such as:

- Penn Center in Philadelphia (1954) – an office, hotel, and retail project developed according to a master plan by the city planning commission, and implemented by several developers;
- Charles Center in Baltimore (1957) – a private, nonprofit corporation formed to manage downtown redevelopment under contract to the city. The project includes office, retail, residential, and hotel facilities, as well as a live theater and extensive pedestrian plazas; and
- Prudential Center in Boston (1959) – a privately financed project in a downtown renewal area containing two office towers, four commercial/retail buildings, apartment buildings and a civic center.

Some of the early projects outside downtowns were close in suburbs. Two examples were:

- Century City in Los Angeles (1961) – one of the first large scale, office oriented suburban mixed-use centers in the U.S., built on a former movie studio lot, and presently housing many entertainment business headquarters; and
- Crystal City in Arlington, Virginia outside Washington, D.C. (1964) – this private project includes apartments, office space, retail, hotels, movie theaters, and recreational facilities, and became a stop on the Washington subway in the 1970s.

The 1960s also saw the first major mixed-use office tower, the John Hancock Building in Chicago, which opened in 1969. Different floors have different uses, beginning at the bottom with retail and commercial, parking, office, and topped off with residential. The mixed-use projects of the 1960s pioneered the concept of dramatic interior spaces—large atriums and gallerias—in modern buildings. A notable example is Peachtree Center in Atlanta, where the atrium and other design concepts incorporated into the Atlanta Hyatt Regency Hotel were emulated in many projects throughout the country and the world. Among the hallmarks of the mixed-use projects of the 1960s was their residential orientation, their relative openness to surrounding areas, and their design according to architectural principles of the international style, which was not good at creating attractive people places.

The 1970s: Megastructures

The number of mixed-use projects expanded rapidly from only 23 in the 1950s and 1960s, to 65 begun in the 1970s, and over 100 in the 1980s, according to an ULI survey. In the 1970s, many of these projects became enclosed and internally focused, a result of the growing popularity of enclosed shopping malls, the growing problems in central cities, and the interest in defensible space. One of the most influential suburban mixed-use projects of the time was the Houston Galleria, which was planned around a central shopping center in one of the most affluent communities in the region at the time. The three commercial elements—office, retail, and hotel, became the most popular mix of land uses in projects developed in the 1970s and 1980s. The development has become the core of what has become the dominant suburban center in the region. Other notable projects in this period were the IDS center in Minneapolis, the Illinois Center in Chicago, the Embarcadero Center in San Francisco, and the former World Trade Center in New York. Although great attention was given to architecture and interior spaces, the projects were increasingly isolated fortresses, cut off from the surrounding city. While a financially successful commercial formula had been found, vastly expanding the number of such projects, the residential component had largely disappeared.

The 1980s: Greater Openness

Development of mixed-use projects in the 1980s became smaller scale, more open, more suburban, and more residential. Projects were developed on much smaller scales, evidence of the concept's continuing evolution and greater acceptance of mixed-use projects in smaller scale and more suburban environments. Residential uses were found in half of the projects surveyed by ULI, a sharp rebound from the 19 percent of the 1970s. The emphasis in planning and design moved from the buildings to the setting, and greater attention to streetscapes and urban design. The design style shifted to more of postmodern and historicist themes, greater openness and sensitivity to the total environment, greater use of historic rehabilitation, and more infusion of entertainment and cultural uses. Notable projects of the period include:

- Miami Lakes Town Center – part of a large scale planned community, driven by the developers' belief that every town needs a hub where people can gather to eat, shop, and socialize;
- The Atlanta Galleria – numerous high-rise office buildings and a hotel/retail complex are arranged around a park;

- Janns Court – a small mixed use building with cinema, retail, office, and residential uses that helped in the revitalization of the Third Street Promenade in Santa Monica; and
- Princeton Forrestal Village – office, retail, and hotel uses around a main street in a suburban office park.

Recent Trends: Town Centers and New Urbanism

The movement among planners and architects toward a new urbanism or traditional neighborhood design philosophy began to have an impact on developers in the 1990s. Two of the most noted projects in the 1990s were Reston Town Center in Reston, Virginia, and Mizner Park in Boca Raton, Florida. They served as suburban models of creating higher density and vibrant urban places in the suburbs. Reston Town Center was built on one of the last remaining undeveloped parcels in the new town of Reston, Virginia. It was an 85-acre (34 hectare) mixed-use center located in a 460-acre town district identified in the original 1962 master plan. At the opening in 1990, there were two office towers, a Hyatt Regency Hotel, a cinema, and retail space in the configuration of a main street town center, surrounded by structured parking. Later additions included more office space, significant amounts of high density housing, and more open space, creating perhaps the largest such town center built to date. The streetscape plan recalls European shopping streets and public squares as well as such American prototypes as Country Club Plaza in Kansas City. The main street is narrow with parking allowed to slow traffic and make pedestrians more comfortable. At the ground level, a variety of retail street fronts were accommodated to create a vibrant pedestrian experience.

Mizner Park used a very different mix, with much greater residential presence, although the same attention to design and public spaces as in Reston Town Center, to create a new town center for Boca Raton. The first phase included four mixed-use buildings surrounding a two block long public park, and containing 156,000 sq ft (15,000 square meters) of specialty retail space with six restaurants and an eight-plex cinema, 106,000 sq ft (985,000 square meters) of office space, 136 apartments over the stores, a performing arts amphitheater, a museum, and structured parking. The projects' careful attention to urban design and sense of place has created an around the clock activity that helps enliven the city's downtown core. The central space contains two public streets enhanced with pavers and a plaza, and offering on street parking in front of the stores.

This period also saw the development or expansion of transit projects in the South and West, offering an opportunity to include transit in mixed-use centers. Some of the early examples included Orenco Station in Hillsborough, Oregon, and Cascade Station near the Portland International Airport, both served by Portland's MAX light rail line; the Arlington Town Square, a redevelopment in Arlington Heights, Illinois, around a commuter rail station; Mockingbird station in Dallas; Lindbergh City Center in Atlanta; and numerous developments adjacent to Washington, D.C.'s Metro rail station, especially in Montgomery and Arlington counties. While transit was an essential part of most new urbanist thinking, most of the early mixed-use developments were significant by its absence. This appears to be finally changing.

Trends and Outlook

MXDs have become an accepted development product, and will possibly expand as designers, developers, and lenders develop greater familiarity and facility with creating these projects. They will continue to evolve, as they have in the past. The near term outlook, however, allows for forecasting how upcoming developments will look.

Forecast

Main Street Theme

The main street element is expected to continue as a central theme, as projects will possibly be arranged around pedestrian friendly streets, blocks, and squares. Projects will continue to be porous, creating pedestrian appeal even as they complicate the collection of traffic and parking data.

Welcoming the Big Box

The financial success of the big box retailers is expected to continue, despite their conventional formats, which are abhorrent to most new urbanist designers. They have started to adapt their concepts to more urban and street front applications, and out parcels are being created in some town centers allowing them to be part of the financial success, but slightly out of the way, and perhaps largely unrelated to the rest of the center.

Flexible Opportunities for Offices

While the office market has been weak in much of the U.S., as well as Europe and Asia, mixed-use centers will be attractive to many office users looking for a quality of life experience. It will be important to maintain flexibility, with limited office buildings incorporated into mixed-use center plans, and, as with big boxes, other opportunities on adjacent parcels.

Mixed-Use Opportunities in Obsolete Malls

Conventional shopping malls, as with big box retailers, are stereotypes of suburban sprawl—isolated, single-use developments that stand apart from their surrounding neighborhoods, oriented inwardly to vast climate-controlled shopping arcades, with a physical presence characterized by monolithic, overscaled, and blank architectural forms, and surrounded by a sea of parking. Fortunately, as shopping mall developers rush

to refresh the mall format and redevelop obsolete mall sites, there is a tremendous opportunity to think big, expand the field of vision, and break the mall's island syndrome. This will take advantage of the extensive amount of developable land in urban locations, and often involve opening up the street grid to adjacent neighborhoods. In addition, many communities will seize the opportunity to use the mall as the core of a redevelopment district, adding significant amounts of adjacent housing.

Life Style Centers: A Moving Target

A hot trend in retailing that adds to the mix has been the development of what are commonly called life style centers. These tend to include highly branded retailers able to move out of conventional malls as well as nationally recognized retailers. The other hallmarks of such centers are generally an open-air setting, greater attention to architectural design, and a clustering of restaurants, all adding to a festive atmosphere for shoppers. Their growing popularity has resulted in the term being highjacked by other centers missing some of these components. For the sake of this study, however, it is important to recognize that life style centers can be part of a MXD or a standalone project.

From Mixed-Use Developments to Mixed-Use Districts

The growing appreciation for mixed-use projects has created a constituency for a broader appreciation for going beyond individual developments to larger planned districts, and a philosophy of planning increasingly known as placemaking. Such mixed-use districts will possibly open up much greater possibilities, since they vastly broaden the supply of properties and developers able to build single-use residential, retail, or office projects, within a district circumscribed with a street and lot structure, development targets, and possibly financing. While a mixed-use project requires an especially sophisticated developer, a mixed-use district, whether planned by a master developer or a city, can create many development parcels suitable for single-use development, but in support of a broader mixed-use district. Studying the travel patterns for such a district will require a data survey plan that acknowledges the possibility for a one-stop experience, and significant internal capture of travel. The following is a concise review of the future trends anticipated for the primary components of mixed-use developments, *subject to local market demand.*

Future Trends

Retail

Retailers and retail developers will continue to explore innovative ways to merchandise products to achieve a marketing advantage in a highly competitive business sector that is battling Internet sales for the retail dollar. Not only will many major regional retail centers be remade or replaced, but the form of separate stores and smaller centers will also continue to change. Convenience and price seem to be dominating this sector, leading to high visibility, larger stores with narrower ranges of merchandise (i.e., big box store approach extending to larger versions of stores that have been traditionally smaller, such as jewelry). This development approach in its mixed-use version would include complementary outparcel development with other retail and restaurants.

Office

Office space will continue to be included in many free standing and business district mixed-use developments as well as suburban commercial concentrations. This space may be located in multi-use buildings or as separate buildings either integrated into or adjacent to the other types of development listed below.

Residential

The new urbanist approach of integrating convenience retail and some restaurants into compact residential developments should continue, especially in downtown and midtown (the central portion of a city or urban area that is outside the CBD but has higher densities than suburban or general urban and may include an outlying business district) infill and redevelopment areas and new commercial centers. There will likely also be more medium- and large-scale developments with relatively conventional PUD layouts that will contain a mix of uses (mainly residential), some intended to be complementary and some more to provide developers with a product mix but not necessarily true synergistic mixed uses.

Hotels

Some hotels will be developed as parts of mixed-use developments in business districts, in downtown, midtown, and suburban locations. Some will be built without food service but will have adjacent independent restaurants that can provide lunch and dinner meals independent of the hotels. Some hotels will be tied to major office developments but less frequently to retail and very rarely to residential developments.

Restaurants

Restaurants will continue to make good outparcel development since they need exterior exposure and convenient parking. Restaurants will also continue to be integrated into some developments but will normally not make up a significant per-

centage of total floor area. Restaurant types will also continue to be very sensitive to the demographics of their immediate surrounding market areas as well as pass-by traffic characteristics. Outparcel restaurants may or may not be synergistic with adjacent retail development; they will serve local market demand and often be synergistic with other types of adjacent development.

Entertainment

Theater, nightclub, bowling alleys, and similar types of entertainment are largely most active on evenings and weekends, although there are specific and unfortunately unpredictable exceptions. Most will continue to seek locations where parking can be shared with daytime uses (e.g., retail, office). Some will continue to be used to draw patrons past retail space to try to increase retail business volumes. Combinations of entertainment with hotels are expected to be infrequent since the synergy has not proven to occur frequently. Combinations with restaurants will still occur. Major, single use entertainment developments such as theme parks will continue to attract outparcel development including hotels, restaurants, and retail, depending on the type of entertainment facility.

Other

True mixed-use developments, especially those in business or town centers, may include just about any types of development that meets local market demand. In addition to the above uses, these could include government offices and services (e.g., post offices), entertainment, and other civic/community facilities. Only market demand, imagination, compatibility of buildings and activities, and development economics will limit uses in these developments.

Development Trends in Mixed-Use Projects

Interviews by the research team with several developers, planners, and local officials revealed that mixed-use projects are being commonly developed in several scales, in several types of venues, and in several types as shown in Table A-1. The scales and venues lists are typical of those mentioned. The types listed in the third column were the most commonly mentioned, but other examples were occasionally discussed.

The current three land uses most commonly included in MXD are retail (in almost all MXDs as either the primary or a secondary use and virtually always including restaurants), residential, and office. Entertainment, in the form of movie theaters, and hotels are occasionally included, and usually make up a small percentage of the square footage.

Synergy Among Uses

A hypothesis of this research was that synergy among all uses is key to both internal trip capture and development profitability. However, virtually all MXD developers, architects, and planners said that market demand drives almost all decisions regarding development components and synergy influences only location—and that within only some larger retail-dominated developments.

It was widely agreed that residential cannot be provided in enough quantity to financially support ground floor retail unless residential is very large and retail is small and convenience oriented. In addition, developers and retail tenants are reluctant to have first floor lobbies occupy significant frontage

Table A-1. Most commonly mentioned MXD types.

Scales	Venues	Types (mainly combinations of retail,[1] office, residential)
1. Small part block development 2. Full block 2–3 story with ground floor retail 3. Modified shopping center with mixed uses side-by-side or split on multiple levels 4. Multiple block town center 5. Full MXD with retail and major office components There was no discussion of large districts or major midtown or suburban activity centers as being trendy in either current or projected MXD.	1. Infill midtown or suburban sites 2. Redevelopment or upgrading of existing developments (usually older shopping centers) 3. Initial components of larger development (said to be less possibly viable) 4. Later component of larger developments as town center (usually 1–4 blocks) 5. Major commercial component of larger development on a single block or "superblock"	1. Retail with small office or residential components 2. Retail with small (usually 2nd floor) office component and possibly also upstairs residential component 3. Side-by-side combinations of retail with residential and/or office 4. Major office or residential with ground floor retail 5. Big box retail with smaller retail and upstairs residential and/or office 6. Major retail, with entertainment to draw more patrons through retail, plus some office and (usually) side-by-side residential

[1]All references to retail in this summary include restaurants as a major component. Virtually all current MXDs of any size have a major percentage of restaurants.

in a retail block. Developers claimed that with two exceptions, residential units within a MXD with office usually do not lead to many residents working within the development. The two exceptions are when (1) the office space is live-work type space (combined live-work units or small boutique office units that are directed to serve the type of residential tenant in the building—not many of these) and (2) when there are very large quantities of dwelling units that house the types of employees that work in a large quantity of office or other on-site businesses.

There was more concern about synergy among retail tenants, and the concern was expressed more by the retail tenants rather than developers. Some major retailers have experienced their shoppers commonly patronizing specific other retailers, so they want to be near those retailers. At the same time, they feel their patrons do not want to be near other retailers so they will either avoid some developments or require a location away from the less desirable retailer. Developers try to accommodate those preferences, sometimes varying rental rates or other lease arrangements accordingly.

Entertainment, primarily large multi-screen movie theaters, is sought out in MXDs with major retail components. They are located strategically to draw patrons past retail stores. This is viewed as adding value for retailers and rent potential for the developers. Major synergy is believed to exist in such developments.

Office is considered to have little synergy with other uses other than directly supportive service retail. As with residential, office is not viewed as being able to be the almost sole support of internal retail space. Restaurants, if properly selected, can benefit from some synergy but all need to be able to draw from the entire local area market. Hotels may also be found in some MXDs. Again, hotels are included if market demand exists in the area and are rarely included based primarily on demand generated internal to the development.

Selecting Uses

As mentioned previously, each land use included by a developer must normally stand on its own based on area market demand. Hence, for estimating internal trip capture, competing opportunities should be considered if developers' practices are felt to be valid.

Interviews with developers yielded no set formula for selecting the component land uses. Developers tend to include the uses (and often tenants or tenant types) that they have most experience with, although several mentioned that the market has been causing them to mix (more) uses than they had included before. The vast majority of MXDs known to the research team have a primary use. The primary use has normally been retail, but sometimes has been either office or residential.

Secondary uses are included in a full range of percentages of square footage from almost equal to the primary use to a very small percentage. Tertiary uses make up small percentages in all but the large developments.

Site Layout and Synergy

Although there are exceptions, the trend in MXDs appears to be following two basic forms:

- town center with ground floor retail facing the street and residential and/or office on upper levels. These may include one or multiple blocks. Larger developments may have other uses such as a theater or hotel; and
- mixed-use off-street development using a pedestrian-oriented spine or block-type layout (somewhat resembling a modified shopping center layout) with buildings facing or backing up to parking fields.

There are also combinations of the above with one or more internal streets flanked by small and sometimes large uses plus larger buildings (e.g., big box retailers) facing their own parking fields. Sometimes some parking is provided below ground or on upper levels.

Different land uses may be integrated or side-by-side. The developers, architects, and planners addressed the question of which arrangement is best; there is no clear answer as to which works best for developers. Many reasons were given as advantages or disadvantages for each approach. The reasons included ownership, structural requirements and costs, parking requirements (tenant or city), tenant or buyer preference, developer experience, timing and phasing of development, market demand, and developer or tenant risk were all given as reasons one way or the other. It appears that both integrated and side-by-side approaches will continue to be widely used.

Parking versus Connectivity or Integration

MXDs with large retailers (big box or department store) often are shaped by the parking preferences of the major retailers. Some are willing to be in a fully shared parking situation. Others will only locate where their full complement of parking is directly adjacent to (and sometimes right in front of) their store. Some may even buy their building pad and the land that is designated as their parking (traditional major shopping center practice by some department store companies). Since those retailers are often the key to the development's success, tenant parking requirements play a big role in site layouts.

In developments having big box retailers, the strong trend is to have them face or back up to their parking. This is most frequently accomplished in one of two ways:

- traditional shopping center style; or
- provide a front door entrance to a town center street but line the front of the building with smaller stores; place park-

ing at the rear with a prominent entrance from that side. Teaser parking (parallel or angle) is placed on the street in front of the store to make parking look convenient and available, but most is behind the store or in an adjacent well marked garage.

Developers are more concerned with having each land use component work on its own than with providing internal connectivity. Few uses have internal building connections as their primary access because they all must serve area demand rather than just internal building demand. On the other hand, developers want the building entrances to be convenient to each other. Relative to internal trip capture, driving trips to most uses will consist of finding a parking place then walking to the primary and other destinations—that is, park once and walk to other destinations. The exception to that is the large MXD containing big box retail that may be laid out so driving to a second retailer may be necessary due to the distances between major tenants.

Walking Distance: Planner/Architect Recommendations versus Developer Experience

Several planners and architects spoke of ¼ mile and even longer acceptable walking distances. However, several developers reported that acceptable walking distances for their developments range from 600 to 1,000 ft. There were no hard data reported or referenced, but some cited tenant preferences or requirements, which are likely influenced either by tenant surveys or their own or lenders' risk considerations.

Consideration of internal trip capture should consider walking distance between the major uses and probably should consider the developer range of acceptable distances since they are possibly influenced by actual common experience rather than high ends of acceptable ranges. Alternatively, the second method would be to conduct user surveys in a variety of MXDs to establish acceptable walking distances.

Shared Parking and Internal Trip Capture

Shared parking is a feature of virtually all current MXDs. The extent of sharing depends on the uses, tenants, and layout. In current practice, the amount of spaces provided is driven by tenant preferences first, then perceived risk (developers or lenders), local requirements, and finally actual estimated demand.

Tenant requirements must be met for the developer to secure a lease or purchase. Some tenants are flexible and some are not. The location and market influence tenant flexibility. For example, tenants are possibly more flexible in Manhattan than in a peripheral greenfield site. How badly a tenant wants to locate in the particular site may also drive flexibility.

Hence, in developing a site, the developer needs to assess (1) what is necessary for the financial pro forma, (2) market demand for particular uses, (3) requirements of specific tenants or land use types, and (4) city requirements. This applies to land uses, tenants, and shared parking.

During discussions of MXD considerations at a 2006 Urban Land Institute conference on placemaking, not one single developer or city official mentioned traffic impacts or access requirements as an influence on major development decisions. They did mention the necessity to provide good access and to meet applicable traffic impact requirements, but reducing trip generation was not mentioned as a primary concern or influencing factor. On the other hand, shared parking was frequently mentioned as an important ingredient for making a development viable because of parking costs (land consumption or garage spaces) and/or space limitations.

Some developers were aware of and use ULI's *Shared Parking* report, but most reported tenant or local requirements override the numbers provided in the report (*1*). Where shared parking is used (to some extent in most MXDs), proper access and location to make sharing work seems to be employed. This is required to sell the sharing to tenants and purchasers. Therefore, in considering internal trip capture, site layout and walking distances must be considered. The mere mixing of uses on a site or in an area will not provide a true characterization of the possible sharing of parking or how internal circulation occurs between component buildings.

Transit-Oriented Development

As expected, there was only limited discussion and experience with TOD. Much was conceptual due to limited actual development experience by most participants. However, what came through very clearly relative to development trends was that all component uses and spaces must stand on their own in the market. Proximity to transit may provide an addition to demand, but it is not considered sufficient to support development on its own. As a result, current developer thinking is that the TOD should respond to local market demand near the site and provide close and convenient access to transit. Building entrances facing transit station entrances as well as close proximity were suggested as key features.

Transit serving tenant uses in TODs are primarily office and residential, and those can be significant only if the adjacent transit serves connecting destinations for those uses. Hence, mode split estimates need to consider not only local transit proximity, but also the extent of service and the destinations served. TCRP Report 128 describes research on TODs for similar types of considerations as were being examined by NCHRP Project 8-51. That project included an assessment of trip generating characteristics of residential TODs. Data collected in that project were limited to only external cordon counts. That project found that TODs did result in lower vehicle trip generation than what is reflected in the ITE *Trip Generation* report, so mode split should be considered (*2*).

Bottom Line

Developers are the ones who create MXDs. Their financial results depend on designing the developments correctly, which means they need to have a solid understanding about how such developments work. While developers seldom have the type of data transportation professionals seek, their experiences and considerations are valuable to help gain an understanding about how MXDs work.

For Developers

From the developer perspective, the following appear to be the prevailing developer combined bottom lines.

- All development projects must make money; financial considerations drive decisions for MXD.
- Developers build what sells in the particular location within the particular market.
- Market demand drives almost all decisions regarding development components and synergy influences only location—and that most frequently within only larger retail-dominated developments. Primary market demand for specific land uses is generated external to the development; any internally generated increment can be helpful but it cannot be the primary source for a successful *significant* project component.
- Retail (including restaurants), residential, and office are the primary, secondary and tertiary uses in MXDs. Movie theaters are used to draw potential retail patrons past store fronts. Hotels are sometimes included in response to area market demand.
- Developers cater to tenant risk limitations.
- Developers pursue projects they are comfortable with and are within their risk limitations.
- Developers follow popular trends that sell successfully.
- Tenant/purchaser requirements and preferences drive project and parking layouts once the design concept is established.
- Developers will adjust their projects to meet agency requirements if the remainder of the project is strong; otherwise they will go somewhere else if their formula for financial success cannot be met.
- Through their own surveys and tenant/purchaser acceptance, developers consider walking distances between destinations are acceptable up to a maximum of 600 to 1,000 ft.
- Internal trip capture is not a significant normal developer concern, but shared parking is; consideration of traffic impacts is a requirement but does not drive the project.

For Transportation Planners

The previous developer considerations and principles shape MXDs. They are also important for transportation planners to be able to understand how MXDs are normally to be designed and how users think they will use such developments. Based on the previous findings, the following are additional considerations related to internal trip capture.

- For internal trip capture, competing opportunities should be considered if developers' practices are felt to be valid.
- Relative to internal trip capture, driving trips to most uses will consist of finding a parking place then walking to the primary and other destinations—that is, park once and walk to other locations. The exception to that are the MXDs containing big box retail that may be designed so that driving to a second retailer may be necessary due to the distance from one entrance to the next.
- Therefore, in considering internal trip capture, site layout and walking distances must be considered. The mere mixing of uses on a site or in an area will not provide a true characterization of the possible sharing of parking or how internal circulation occurs between component buildings.
- Transit serving tenant uses apparently make up insignificant percentages of TODs other than office and residential, and those are significant only if the adjacent transit serves connecting destinations for those uses. Hence, mode split estimates need to consider not only local transit proximity, but also the extent of service and the destinations served.

Conclusions

Trip capture estimation should be able to cover all of the land use combinations expected to develop with some frequency. However, it is clear from the information in this chapter that the primary uses in today's and foreseeable MXDs are retail, restaurant, residential and office. Available resources should be concentrated on those uses, but any procedures developed should be adaptable to all common land uses.

References

1. *Shared Parking,* 2nd edition, Urban Land Institute, Washington, D.C., 2005.
2. Arrington, G.B., and Cervero, Robert. *TCRP Report 128: Effects of TOD on Housing, Parking, and Travel,* Transportation Research Board of the National Academies, Washington, D.C., 2008.

APPENDIX B

Land Use Classification System

Any procedure for estimating internal trip capture within MXDs must have to consider synergy between interacting land uses. That will require those land uses to be categorized and classified.

Desirable Classification System Characteristics

Requirements

It would appear that there are at least three absolute requirements for the land use classification system that will be used in the internal trip capture estimation process.

1. The classification system must be compatible with the ITE trip generation land use classification system since the internal trip capture procedure will be used with ITE trip generation rates.
2. The classification system must distinguish among complementary, interacting land uses.
3. The classifications must be able to be determined and existing or proposed development units quantified:
   – for proposed developments, as early as the zoning step of the development process, and
   – for existing developments, be clearly distinguishable in the field by data collection personnel.

Objectives

There are additional attributes that the classification system should have for successful and effective use in practice. The land use classification system should be:

- comprehensible – comprehensible to both technical analysts as well as agency reviewers and decision makers;
- sensitive – sensitive so internal trip capture estimates for different combinations of interacting land uses represent the true level of interaction between those uses;
- measurable – readily measurable with normally available information at the times when such information is needed;
- stable – stable so short term development fads can be easily accommodated; and
- universally applicable – applicable over all possible types of MXD.

Classifications

From information presented in Appendix A, the land use types that have been and appear for the future to be most frequently included in MXDs are:

- retail,
- restaurant,
- office, and
- residential.

Less frequent and smaller amounts of the following uses are and will be expected to be included in mixed use developments:

- hotel and
- entertainment.

Some additional land uses may be included in town centers and other special developments based on local market demands.

The review of existing documentation, examination of known MXDs, plus discussions with developers, architects, planners, and city planning and transportation officials identified subdivisions of the previous land use types that (1) frequently are included in MXDs and (2) are felt by developers and others to have different users or interaction characteristics. Table B-1 shows subcategories based on these considerations.

Retail

Convenience retail serves a very localized market plus some passersby. Dry goods draw from farther away and may be the

Table B-1. Common MXD land use categories and subcategories.

Land Use					
Retail	**Restaurant**	**Office**	**Residential**	**Hotel**	**Entertainment**
Convenience Full service Discount Other specialty Other	Fast food Sit down – no bar • Family • Quality Sit down – with bar • Family • Quality	Medical General Live-work	Single-family detached Townhouse Condo Rental apartment	No meeting facilities • Low price • Mid price With meeting facilities • Low price • Mid price • High price	Cinema Other[a]

[a]During initial stages, categorize "other entertainment" as retail - other

primary trip destinations for shoppers at that location. However, developers and retailers believe that there are at least three market segments of shoppers (shown in Table B-1 as discount, mid-range, and high end) who shop at different types of stores and therefore should be considered separately. Convenience and dry goods retail cover most of the retail categories. All others can be covered with the other category since there (1) can be significant variability and (2) they normally appear in small percentages in a MXD, if at all.

Restaurant

Fast-food and sit-down restaurants clearly have different trip generation characteristics. They may or may not interact differently in a MXD, depending on whether they have drive-through service.

Office

Developers stated that much of the second or third floor office space in smaller MXDs is occupied by very small businesses. Some is live-work space, but most other businesses are just smaller and oriented to serving local business or other markets. For larger quantities of office space, especially for major office buildings on mixed-use sites, the general and medical office categories should suffice, although little medical office space has been found in the pilot and other studies. General and medical office uses have different trip generation characteristics. Whether internal trip capture differs significantly will need to be determined.

Residential

The four categories shown in Table B-1 are the most basic categories. Trip generation rates differ for some of these. It is not known if interaction with other uses will vary among these or other residential categories. It is possible that there would be more differences in internal trip capture if income or rent levels were to be known, but this is not always known at the zoning stage. At present, there is no distinction in trip generation characteristics for rent or sale price levels in the ITE database. Income or vehicle ownership would not possibly be known at the time of zoning. However, the four suggested subcategories would normally be known at the zoning stage.

Hotel

Hotels with and without meeting facilities should be easily distinguished, even at the zoning stage. It is felt that different room rate levels will draw different travelers who might shop or eat at different retail and restaurant facilities. At present, ITE trip generation data does not distinguish between room rate levels.

Entertainment

There are few common entertainment facilities in modern MXDs other than cinemas. Those that may appear occupy very small percentages of total development square footage. Hence, two subcategories should be sufficient.

Other

Some other uses are expected to be included in a few MXDs or as development trends change over time. When new uses begin to appear frequently, additional categories should be created.

Future Further Disaggregation

However, it could also be advantageous to collect detailed information so the land use classifications used for internal trip capture can be used for further disaggregated levels. One method to accomplish this would be to record the ITE land use classifications, which are needed anyway for the basic trip generation information. The normal ITE process is to provide a detailed description of the development so this should also aid future disaggregation if needed.

Other Classifications Related to Land Use

Context

There are standard transportation planning classifications to describe area types. MPOs use at least urban and rural classifications and may include downtown, midtown, fringe, and/or other classifications. Since the type of surrounding areas may influence internal trip capture by affecting competing opportunities and their attractiveness, it is recommended that area types be included in the classification system.

The following area types or contexts are recommended since they possibly involve different levels of interaction among uses within MXDs:

- rural,
- suburban,
- urban,
- midtown/suburban activity center (define as midtown or suburban business district or activity center [minimum office-retail-restaurant uses with at least 1 sq ft per area population with 100,000 sq ft minimum]),
- urban core (downtown or other regional CBD), and
- special district (industrial, educational, civic center, entertainment).

Development Type

It may be further helpful to classify the development by the type of site, as follows:

- single block (Mockingbird Station is an example),
- multiple block single development (Atlantic Station and Legacy Town Center are such examples), and
- district.

It may also be appropriate to include low-, mid- and high-rise sub-classifications within each category, although application may be difficult since some MXDs are composed of buildings of multiple heights, including low-, mid-, and high-rise buildings.

Internal Connectivity

The fourth component of land use classification that is likely to affect internal trip capture is internal connectivity. The quality and convenience of the internal connectivity will affect the attractiveness of internal destinations within a MXD relative to similar competing destinations outside the development.

Table B-2 lists eight different characteristics of internal connectivity. Data found from other sources and collected in this project were insufficient to relate internal trip capture to these characteristics. However, the characteristics do provide different quality, comfort, and convenience of connections among different uses within MXDs that may affect internal capture and be worth examining in future research.

In practice with real examples of MXD, nearly all examples included in the pilot studies and the other sites from which data were drawn fit into categories 5 through 7 in Table B-2. These were functionally very similar and probably do not warrant separate categories.

When employed in an estimation procedure, it may be appropriate to consolidate the classifications into a smaller number. After a database is established that includes all categories, the stratifications should become clear.

Internal Proximity

While not a land use characteristic per se, proximity between interacting uses will also influence internal trip capture. In land use terms, proximity may be more familiar as compactness (distance between buildings) or density (amount of building space per area of land). However, neither compactness nor density provides a true measure of convenience of internal travel. Proximity may be more accurately quantified by walking distance between interacting uses or maximum walking distance between building entrances internal to the development.

Proximity was examined as a variable in the pilot studies and estimation procedure. Proximity had an effect for a few land use pairs. The effect was uncertain for most pairs. Proximity should also be examined further as the database is expanded.

Conclusions

Characteristics of a MXD are proposed to be classified in an *ultimate* system consisting of five variables:

- land use,
- context,
- development type,
- internal connectivity, and
- internal proximity.

In the near term, however, available data will limit classifications to:

- land use,
- development type, and
- internal proximity.

Table B-3 contains the full system as proposed for initial implementation.

Individual sub-classifications have been proposed for each. The research team considers the classifications as a maximum breakout, having more divisions than a database can support. However, until a database is established with enough samples

Table B-2. Internal connectivity classifications.

Classification	Description		Comments
1. Fully integrated uses	Indoor	All uses combined under one roof with internal connections.	This may include multiple adjacent buildings with internal connections.
	Outdoor	All pedestrian circulation is internal to the development and provides direct connections between different uses. In addition, uses are well mixed and development is more or less continuous and not separated by parking facilities.	This classification has no internal streets or parking that must be crossed at grade to reach other destinations within the development.
2. Fully air conditioned grade separated	Multiple building or multiple block development that is connected by fully enclosed, air conditioned bridges or tunnels.		
3. Internal outdoor walkways	Multiple building development that is fully connected with on-site, internal walkways. Any pedestrian links across parking facilities are provided with specific pedestrian walkways.		Walking between buildings does not depend on walking along or across parking aisles. Some internal circulation may require crossing parking facilities.
4. Open bridges	Open air bridges connect different buildings in the development.		
5. Outside at-grade with priority street crossings	Pedestrians walk on street sidewalks. Mid-block pedestrian crossings and/or pedestrian crossings have priority at intersections.		Priority includes pedestrian activation after short wait (i.e., signals not timed for traffic progression).
6. Outside at-grade standard sidewalk system	Pedestrians use normal street sidewalk system and cross at street intersections with or without traffic signal control.		Standard connectivity for multiple block, street fronting development.
7. Informal	Pedestrian circulation requires walking through parking aisles or along streets without sidewalks.		
8. None	No viable pedestrian connections or they are too long to be convenient; driving is only reasonable way to reach some of the interacting uses.		Examples: (1) development flanks depressed highway and walking distance, even by bridge, is too long to be convenient; (2) development spread out beyond reasonable walking distance, such as a group of four adjacent outlet centers with restaurants extending over 3,000 ft by walking path. No internal trip capture estimated in such conditions.

Table B-3. Proposed ultimate land use classification system.

Context	Land Use[1]	Development Type[2]	Connectivity	Internal Proximity

• Rural
• Suburban
• Urban
• Midtown/suburban activity center[3]
• Urban core[4]
• Special district[5]
	• Retail
	  • Convenience
	  • Full service
	  • Discount
	  • Other specialty
	  • Other
	• Restaurant
	  • Fast food
	  • Sit down – no bar
	  • Family
	  • Quality
	  • Sit down – with bar
	  • Family
	  • Quality
	• Office
	  • Boutique
	  • Medical
	  • General
	• Residential
	  • Single-family detached
	  • Townhouse
	  • Condo
	  • Rental apartment
	• Hotel
	  • No meeting facilities
	  • Low price
	  • Mid price
	  • With meeting facilities
	  • Low price
	  • Mid price
	  • High price
	• Entertainment
	  • Cinema
	  • Other[6]
		• Single block
		• Multiple block single development interconnected
		• District
			• Fully integrated uses
			• Fully air conditioned grade separated
			• Internal outdoor walkways
			• Open bridges
			• Outside at-grade with priority street crossings
			• Outside at-grade standard sidewalk system
			• Informal
			• None[7]
				• Internal walking distance between interacting buildings

[1] It is also recommended that ITE land use classifications be recorded for each development for which data are collected since that classification is needed for trip generation analysis and it will allow for future disaggregation of these land use classifications if needed. For a full list of ITE trip generation land use classifications see *Trip Generation*, 8th edition, Institute of Transportation Engineers, Washington, D.C., 2009.

[2] May also include low-, mid-, high-rise sub-classifications within each category.

[3] Define as midtown or suburban business district or activity center (minimum office-retail-restaurant uses with at least 1 sq ft per area population with 100,000 sq ft minimum).

[4] Downtown or other regional CBD.

[5] Industrial, educational, civic center, entertainment.

[6] During initial stages, categorize "other entertainment" as retail–other.

[7] No internal trip capture estimated in such conditions.

to analyze relationships with internal trip capture, specific aggregation would be speculative.

The ultimate classifications proposed in this chapter should be considered as tentative and subject to consolidation. Consolidation employed for the research reported in this document was:

- Land use:
  - retail,
  - office,
  - restaurant,
  - residential,
  - hotel,
  - cinema;
- Development type:
  - single block
  - multiple block, single development interconnected; and
- Internal proximity:
  - internal walking distance.

APPENDIX C

Procedures for Internal Capture Surveys

This chapter describes a recommended procedural framework for conducting internal capture data collection at MXD sites. The framework collects the independent variable and internal trip making information required by the estimation methodology presented in Chapter 3. The audience of this chapter is the potential collector of internal capture data (whether typical traffic consultants, researchers, or public agency staff).

The recommended framework consists of six steps, starting with the definition of the specific purpose of the data collection effort and concluding with the proper processing of the on-site interview survey data. These steps are described in detail later in this chapter.

For the internal capture estimation method presented earlier in Chapter 3 to be effective, it must be based on consistent and correctly applicable data. Therefore, it is essential that there be consistency in the definitions used and the means by which internal capture data are collected. The data collection framework is structured to be straightforward, easily replicated, and adaptable to any potential mixed-use land use and development type.

The field data collection can be conducted with an experienced survey supervisor and low-cost or temporary personnel who are given specific training prior to initiation of the survey. The data collection procedure described in Steps 4 and 5 may at first appear to be onerous. However, all data listed will be needed for a typical internal capture trip generation analysis. Special or limited studies may require more, less, or different data. Prior to collection of any data the desired outputs should be examined and the necessary field data determined. Even for such special studies, the recommended framework presented in this chapter will provide a good foundation from which to work. However, if the resulting data are to be consistent with other data collected in accordance with NCHRP Project 8-51, the procedures described in this chapter should be followed. Any deviations to add more data should not change the basic data described herein.

The list of data to be collected for a typical analysis has been streamlined so that no extraneous data are collected. There are numerous types of information that could be interesting descriptors but that do not provide direct relevance to estimating internal capture. These extraneous data have been excluded from the data collection plan because requiring them would expand the volume of data to collect (and the cost), could intimidate or discourage a potential data collector, and could thereby hinder the collection of the important and relevant data. However, the entity conducting the survey may have other reasons to collect additional data.

Need for Quality Assurance and Control

An important component of the data collection effort is adherence to a quality assurance/quality control (QA/QC) program. The exact nature of the program should be at the discretion of the agency that is funding or conducting the data collection. However, at a minimum, a QA/QC plan should be developed at the outset and checks should be undertaken during each of the six framework steps.

An important consideration in the QA/QC process should be definition of the level of precision desired. This should be one of the first things determined for each survey. It is critical that the internal capture data be compatible among mixed-use developments. One quality assurance action is to carefully digest the definitions and descriptions of both the developments and the data to be collected and applied.

Methodology Framework

Step 1: Define Purpose of Data Collection

Step 1 provides the structure and scope for the survey. It is used to identify what is to be collected, how the data are to be used, and where to collect it.

Use of Data

The first step is to clearly specify the purpose of the internal capture data collection effort. There are two basic choices: (1) to study specific land use pairs in MXDs or (2) to determine internal capture rates for a development that is similar to a proposed MXD under consideration. In either case, the purpose may be to enhance the existing internal trip capture database or to establish internal capture rates for a similar MXD.

Under both choices, the data to be collected, the survey instrument, and the interview procedures remain the same. The only difference occurs in Step 2, when a data collection site is selected. Also important is how those data will be used. Is it to assess traffic impacts of a proposed development on roads in an area that already experiences congestion during certain periods, or will the data be used in a special generator estimate of trip generation for a regional forecast of daily travel? The specific use will influence selection of the study site as well as the season, day of week, and time-of-day when surveys should be conducted.

Site Selection

At first glance, it may seem that any MXD could be selected for data collection. However, mixed-use sites are rarely identical and often are very different from each other. Their differences may, in some cases, cause only small changes in internal capture. However, some seemingly minor differences (for example, in the proximity of uses or in an area with a different nearby land use mix) can cause substantial changes in internal capture. Therefore, it is important to select a development that is similar to the one to be analyzed or represented in the resulting database.

It is also important to collect the complete set of data to help identify differences that could explain the need to interpret the comparable sites for slightly different characteristics. In other words, although two sites may appear the same, when individual parameters are examined (e.g., actual walking distance between buildings), slight, yet important, differences may be revealed.

Site selection should consider:

- types or styles of development that the data will be used to analyze;
- development land uses and mix;
- size range of development;
- development maturity (is it fully occupied and sufficiently vibrant?)
- external conditions;
- representativeness of the development in relation to sites the data will support analysis of;
- external conditions, including competing opportunities, modes of access, economic strength of the area; and
- willingness of the development(s) owners and/or managers to permit the surveys in a manner needed for the surveys.

Timeframe

An important element to establish when defining the data collection purpose is the timeframe for which internal capture data are desired or required. Internal capture rates at a mixed-use site may vary by the time-of-day, day of the week, season of the year. Therefore, select the following:

- time-of-day such as the morning peak hour for the site, morning peak hour for the adjacent street, evening peak hour for the site, and evening peak hour for the adjacent street, and other peak hour of generator if it may be subject to traffic impact analysis;
- day of the week (weekday, Saturday, or Sunday); and
- season or month of the year (e.g., typical month, holiday shopping season, summer, school-in-session).

In terms of data that would be useful for the enhancement of the overall internal capture database, refer to Step 2 for suggested timeframes for particular land use pairs.

Step 2: Select an Appropriate Site

If the purpose of the data collection effort is to enhance the existing internal capture database, selection of an appropriate mixed-use site should be based on the following criteria.

- The site should be of a density and magnitude for which the potential for intra-site walk trips is significant.
- Individual land uses should be totally accessible *internally* either by pedestrian pathways or by streets completely within the development being surveyed (i.e., no vehicular travel required to make trips between internal points on streets on or beyond the periphery of the development).
- The mix of land uses should be representative of current or anticipated trends in mixed-use development.
- The land uses at the site should interact with each other. If one component of the mixed-use site does not have definitive synergy with any other on-site use (i.e., the number of on-site trips to or from that land use are miniscule or unlikely), the overall mixed-use site should be rejected because it really does not act like a true mixed-use site. Table C-1 shows the land use pairs the researchers concluded are best suited to both produce significant internal trip capture based on data reviewed to date and exist

Table C-1. Priority land use pairs for data collection.

Land Use	Land Use						
	Retail - Convenience	Retail - Other	Restaurant	Office	Residential	Hotel	Entertainment
Retail (Convenience)		√	√	√	√	√	√
Retail (other)			√	√	√	√	√
Restaurant				√	√	√	√
Office						√	
Residential							
Hotel							
Entertainment							

in significant quantity in current and anticipated MXDs. Trip capture data collection should be prioritized for these uses.

- The mix of land uses should be transferable. If a particular mixed-use site has a truly unique land use or tenant or setting, the internal capture data may not be applicable to other sites.
- The site should be fully occupied (or nearly so), mature (at least three years old), and considered successful locally.
- The area in which the development is located should also be mature and mostly built-out with a pattern of development normal for that type of area.
- Buildings are conveniently accessible to each other, both by distance and by accessibility.
- Parking is shared between land uses; the percentage of reserved spaces should be minor.
- The data collection program should be able to isolate the trips to, from, and within the development.
  - There should be locations where representative samples of trip making to and from each individual land use can be surveyed.
  - To that end, it is essential that through traffic not complicate data collection at the site. Ideally, there should be no through traffic.
  - Where tube traffic counters are to be used, the design of external access points should be such that mechanical counting techniques will produce accurate vehicle counts (e.g., short driveway throats make it difficult to place tube counters to work properly), or if not, manual or video counts should be employed.

If the purpose of the data collection effort is to determine internal capture at a site similar to a proposed MXD, the analyst should take a slightly different approach. First, the analyst must define the proposed MXD in terms of the independent variables collected in Step 3. In other words, compile the descriptive data for the proposed MXD as if it was the data collection site.

Armed with that information, selection of a similar site may be possible. Identify a mixed-use site (1) with the same land uses, (2) a similar balance of land uses, (3) with similar site layout characteristics, (4) that is at least three years old, and (5), if possible, that is located near enough so that competing opportunities are similar. In addition, follow the previous criteria.

When data are to be collected for a similar development, it is always valuable to verify acceptance of transferability with the agency that will review and decide whether to accept the results. Advance concurrence with site selection and procedures usually alleviates the possibility of having to collect data elsewhere.

Step 3: Obtain Permission to Collect Data at Study Site

After an appropriate MXD site is selected for the data collection, it will be necessary to obtain the permission from the site owner or property manager. It is not possible or appropriate to collect the necessary data (especially the on-site interviews of site visitors, patrons, and workers) without their permission and cooperation. In most cases, the owner or manager will communicate with internal businesses, landlords, etc. In some cases, the survey supervisor may need to make direct contact to gain full permission.

A primary objective of property management is to keep property ownership and property tenants content by, if possible, maintaining the status quo. One means of achieving this objective is to prevent the occurrence of any problems for the customers, visitors, workers, etc. of their property tenants. To that end, the analyst should contact property management by phone and mail/email, and then meet as necessary to discuss the purpose and procedures of the data collection effort.

During each contact, the analyst should convey an understanding of the need (1) to not impede patrons and (2) to not

divulge proprietary or sensitive information. An incentive for property management to cooperate is to offer to include a site-specific question during the interview process (and to offer the opportunity to receive the survey results or a copy of the study report). If a good working relationship can be developed, property management can often help tailor the intercept sampling procedure for the site and to interpret the survey results.

Step 4: Compile Descriptive Data on Characteristics of Site

After a subject site is selected, all information listed in Table C-2 needs to be collected and compiled. Most of these data will quantify the independent variables that have been demonstrated to affect internal capture at the mixed-use site.

Step 5: Collect Internal Trip Capture Data

The on-site internal trip capture data collection effort must be comprised of at least two components.

1. Counts of people entering and exiting each establishment where interviews are being conducted. These counts are used as controls for expanding interview samples (since complete interviews will not be obtained from every person entering and exiting) to represent all people entering and exiting the establishment.
2. In-person intercept interviews of people as they enter/exit a building (or significant use within a building) to determine the origin/destination, mode and purpose of trips internal to the mixed-use site. Other data collection options such as mail-back questionnaires, employee surveys, and visitor surveys do not obtain all the information required to understand and accurately quantify internal capture at the study site.

It is highly recommended that cordon counts of all persons by mode entering and exiting the survey site be made during the survey. This will provide information on mode of ingress/egress as well as the number of external trips being generated. This also provides the basis for an approximate check of expanded interview data.

Step 5 is subdivided into eight specific steps/decisions that need to be completed to conduct a successful field survey.

Step 5A: Specify Purpose of Internal Capture Data Collection

Step 1 in the overall data collection framework requires the analyst to define the specific purpose of the data collection effort. It should be repeated here and with specific reference to the following questions and issues.

- Within the specific MXD, is internal capture to be measured between selected pairs of buildings or throughout the entire site?
- Specify the timeframe of interest for determining internal capture. Plan to collect internal capture data for one or more of the following periods:
  - street peak hour – collect for at least one-half hour before to one-half hour after the known peak hour (i.e., for at least two hours total) to make sure the peak hour during the survey is actually covered. Check current ITE definition for the complete street peak hour definition to ensure the correct peak hour is selected (the weekday street peak hour is currently the highest 60 minutes of site plus adjacent street traffic within 7 A.M.–9 A.M. and 4 P.M.–6 P.M.) (*3*);
  - peak hour of generator – determine the highest morning or afternoon hour of trip generation from trip generation counts at the survey site. Survey from ½ hour before the beginning of the peak until ½ hour after the end of that peak hour;
  - midday – collect from 1 hour after the A.M. street peak hour to 1 hour before the P.M. street peak hour unless a shorter period has been established with the review agency for the resulting analysis; and
  - daily – Collect survey data during the active part of the 24-hour period (e.g., when businesses are open; between about 6 A.M. and 10 P.M. for typical residential).
- Specify the preferred day of the week (weekday, Saturday, or Sunday), based on the period analyses are to cover. If a weekday, select a typical day of the week for the land uses to be surveyed.
- Specify the preferred season of the year (holiday shopping, summer, school-in-session), based on the period analyses are to cover.

Step 5B: Identify Buildings or Uses at Which to Collect Internal Capture Data

Identify the specific buildings at which to collect internal capture data. This will include all buildings and occupants or a representative sample of each. Specifics will depend on resources available, the site size, the number of land uses to be surveyed, and agreements with the agency that will need to accept the survey results. Generally, for a single time period, it is desirable to have at least 50 usable interviews per land use (30 minimum). Generally sample sizes of less than 30 are avoided to ensure the sample results benefit from the central limit theorem that says the sampling distribution of the means will approach that of a normal distribution even if the population being sampled is not normally distributed (*4*).

Table C-2. Descriptive data for MXD sites.

Data	Specific Information Desired	Comments
Overall Characteristics of Site	Name	Record the common name for the overall mixed-use development site
	Development Type	Specify whether the site is contained within a single-block, multiple blocks or a district
	Site Maturity	Record the year the site opened. If opened in stages, also specify the date of the latest significant building opening.
	Primary Tenant(s)	Determine the primary tenant (i.e., the tenant that serves as the primary driving force behind the overall site being developed as a mixed-use site); some sites may have more than one major (anchor) tenant.
	Other Land Uses within Site	List the other land uses within the site. Use standard nomenclature. ITE trip generation land use classifications are preferred.
	Building/Area Names and Addresses	If the overall site is subdivided into sectors with different names or building addresses, identify them.
Physical Characteristics of Site	Site Plan	Obtain a site diagram, sketch, plan, or aerial photo of the site, preferably to scale. The diagram should show: • overall site layout with building footprints, • building entrances and pedestrian pathways, • access points from street system, and • parking supply.
	Site Area, Size, and Density	Record total site acreage. Record number of development units for each building or area (gross square footage, number of dwelling units); at a minimum, collect dwelling units listed for each ITE trip generation land use category. Identify the developed portions by phase for developments to be expanded (if applicable).
	Locations and Types of Access	Document the overall site access plan for motorists (including delivery and service vehicles), pedestrians (including transit patrons), and bicyclists, including: • location of each access point, • type of traffic control at or serving each access point (i.e., signalized or unsignalized), and • transit stops and station entrances along with existing or planned transit service.
	Internal Circulation Facilities	Locate the internal roadways and driveways used by motorists. Locate the pathways for pedestrians (and describe whether pathways are enclosed, covered, or open-air). Locate the pathways or lanes designated for bicyclists, if any.
	Location and Quantity of Parking	Document the location of single-use or shared parking facilities. • Record the quantity of spaces in each facility. • Document the type of parking facility (e.g., surface, garage). • Assess how much of the development truly shares parking. • Record the daily/hourly cost for parking.
Characteristics of Individual Buildings within Mixed-Use Site (*This information is needed for each individual building or area.*)	Building Size	Quantify the building size in development units such as office building square footage (GSF), amount of leased retail space (GLA), number of restaurant or theater seats, or number of residential units. Also obtain the number of stories.
	Primary Land Use	Identify the primary land use within the building as being either retail, restaurant, office, residential, hotel, entertainment, or other. If more than 5 percent of the building square footage is occupied by a secondary use, treat it as a separate land use so internal capture can be quantified. For both the primary and secondary land uses in a building site, classify them in accordance with ITE Trip Generation Land Use codes (*1*). List the ground floor uses separately since counts may be needed for each.

	Space Allocated to Individual Land Uses	Quantify the space allocated to primary and secondary land uses (any exceeding 5 percent of the building). Since it may be desired to estimate trip generation for specific land uses, it is suggested that the land uses be disaggregated by the following land use categories (which are more detailed than the seven general land use categories listed above):
		• For retail, subdivide into:
		  • Convenience (e.g., grocery, drug store, bank, dry cleaner)
		  • Full service
		  • Discount Other/specialty Other

(continued on next page)

Table C-2. (Continued).

Data	Specific Information Desired	Comments

Characteristics of Individual Buildings within Mixed-Use Site (*This information is needed for each individual building or area.*)	Space Allocated to Individual Land Uses	• For restaurant, subdivide into:
		  • Fast-food
		  • Sit-down with no bar
		  • Family
		  • Quality
		  • Sit-down with bar
		  • Family
		  • Quality
		• For office, subdivide into:
		  • Boutique
		  • General
		  • Medical (nearly all space is doctor offices and medical related uses that serve patients)
		• For residential, subdivide into:
		  • Single-family detached
		  • Townhouse
		  • Condominium
		  • Rental apartments
		• For hotel, subdivide into:
		  • High price
		  • Mid-price with meeting facilities
		  • Mid-price with no meeting facilities
		  • Low-price
		• For entertainment, subdivide into:
		  • Cinema
		  • Other
		• For other, specify the use

	Building Occupancy	Quantify the building occupancy (e.g., occupied office, retail, and apartments, not just leased). In a multi-tenant building, contact the property manager, leasing agent, or owner to obtain occupied space data.
	Building "Primary Access Point" or "Center of Gravity" if multiple access points are available	Determine the main access point. If multiple access points exist, designate the "center of gravity" (or "access point") for the building. One characteristic of a mixed-use site that has a significant effect on internal capture is the proximity of its complimentary uses. To measure this proximity, the trip end points must be defined at a certain level of precision. For some buildings (for example, a multi-story office building), the center of gravity seems obvious (in this example, the building lobby). However, for multi-tenant retail buildings, the definition of center of gravity is much less clear. For the purposes of internal capture data collection and data analysis, the following convention for determining a building center of gravity is used: • for an enclosed retail mall with more than one anchor store, use inside entrances for anchor stores. It is important to use the location of the mall-side, not outside, entrance; • for an open-air community or neighborhood shopping center or for an enclosed mall with a single anchor store, use the location of the main entrance for primary tenant. The primary tenant could be a grocery store, any other big box or a discount store; • for an office building, use the office lobby; • for a hotel, use its lobby or registration desk; • for a restaurant, use its main customer entrance; • for a residential site, use its approximate center of gravity of the ground floor dwelling unit entrances; and • for an entertainment facility, use its main lobby. Another possibility is to disaggregate all data to individual building entrances. In that case, no center of gravity needs to be determined. In any case judgment will often need to be used. Three examples of centers of gravity include: • midway between two entrances on the same building face if both have similar levels of inbound and outbound volumes; • center of block face with numerous entrances; and • center of block for a land use covering an entire block with entrances on each side, each with similar volumes.

Table C-2. (Continued).

Data	Specific Information Desired	Comments
	Building Proximity	Measure proximity of the building to each other building in the mixed-use site. Measure as walking distance along pedestrian facilities between building "centers of gravity" (as defined previously). The desired level of precision for each of the above measurements is 10 percent of the approximate total distance or 100 ft, whichever is less.
	Connectivity between Buildings (Not currently part of recommended procedure, but a consideration in evaluating internal connectivity)	Rate the connectivity between the building and each other building in the mixed-use site, using the following scale: • fully-integrated uses – the pedestrian connection between uses is direct and internal to the development, and does not require crossing a parking facility at-grade; • outside sidewalks with at-grade, priority street crossings – pedestrians use street sidewalks. Any street crossings (whether midblock or at intersections) assign priority to pedestrians; and • informal – the pedestrian connection requires walking through parking aisles or along streets without sidewalks.
	Parking Supply	Rate the parking supply within 600 ft of the building entrance for building tenants and visitors, in particular its convenience. Rate as either ample or limited (based on availability of parking at the ITE *Parking Generation* report rates) (2). Report total parking spaces and rates if any. Indicate number of spaces reserved for each land use and any time restrictions.
Setting/Context of Site within Surrounding Region[1]	Location within Urban Area	Classify location of the overall site as either rural, suburban, urban, midtown/activity center, urban core, or special district
	External Competition for Individual Components of Site (Not currently part of recommended procedure, but may influence internal capture)	Consider the degree to which off-site land uses will compete with those on-site and assess if that will affect how representative the candidate site will be to the survey. A development with extreme off-site competition may have fewer internal trips than one with almost no competition. Selected data collection sites should be representative of typical conditions or of a similar proposed development to be analyzed.
[1] Quantification of the site setting and context measures is facilitated if a GIS linkage is provided for the mixed-use site.		

Step 5C: Identify Intercept Locations at Study Sites

Identify all means/routes of entering or exiting the building (or significant use within the building) whether to make an internal or external trip. Identify the entrances/exits that can be used to make a trip internal to the mixed-use site, whether by foot, bike, or vehicle. At each of these latter entrances/exits, select an interview location.

It is not necessary to interview at external site access points where only external trips from specific single-use buildings can be made, but these must be counted (person trips by mode) instead. This is because all trips directly between on-site buildings and the external transportation system are (1) external, (2) can be added to trip interview data from that building, and (3) can be counted as person trips by mode. Usually this condition only occurs when a garage has access directly to an external street. Pedestrian access does not assure that the person is actually going external unless it is a direct connection to a transit station or an off-site garage. Table C-3 provides guidance on where to conduct surveys.

Table C-3. Survey and count requirements for several sample locations.

Survey Site Location	Survey and Count Requirements
Office building connected to a retail building by walkways at several levels in a fully-integrated mixed-use site; office building has elevator/stairs to parking garage	Survey at either end of each walkway connecting the office and retail uses. Count (1) each walkway connecting office and retail and (2) people entering/leaving the office building via the garage or any other entrance.
Stand-alone office building situated near or adjacent to a retail shopping center; parking provided on surface and below-grade (accessed via elevator or stairs in office building); pathway to retail leads to/from building lobby	Survey everyone who passes through lobby or who uses garage (because a person could drive to the adjacent retail site and thus would be considered an internal trip). Count at lobby and garage entrances.
Regional mall with nearby office and residential uses	Survey at the mall entrances Count each mall entrance separately (including any outside entrances for anchor stores).

Step 5D: Identify Count Locations at Study Sites

The data collection program must include a count of all people (not simply vehicles) entering or exiting the building at which interviews are being conducted. Therefore, appropriate count locations must be identified. These will usually be doors to the property being surveyed (count people entering and existing), garage access points (count vehicles and occupants); there may be other access points.

The count should keep track of entering and exiting people separately. The counts will be used for two purposes:

1. person trip generation count for establishment being surveyed and
2. for computing an expansion factor to be applied to the interview data.

Separate data are necessary for survey factoring and for determining an overall internal capture rates for the surveyed site. Table C-3 provides guidance on the extent of a count program for sample mixed-use sites.

The survey should include interviews at as many establishments as possible while obtaining the desired number of interviews per land use during each survey period. Interviewers should be deployed to representative establishments within each land use. Under the best scenario, interviews will be conducted at each establishment. If that is not possible, conduct interviews at a representative cross-section within each land use. When using the sampling approach, deploy interviewers to the busiest locations in each land use. If interviewers are assigned to low volume access points, they will not complete many interviews. This may be partially offset by having interviewers intercept people at multiple adjacent establishments.

A competent interviewer (actively approaches people to get interviews, responses are complete and accurately recorded) located at a moderately active entrance should be able to complete interviews with at least 10 people per hour. However, activity levels will vary and typically result in a range of 5 to 20 completed interviews per hour. An average interviewer should be able to obtain completed interviews from one out of every three to four persons approached. Recognize that some interview candidates will decline to participate or have been interviewed previously and not want to participate again.

Step 5E: Determine Staffing Requirements

For mixed-use sites, it is desired to conduct 50 or more interviews per land use per survey time period. This may not be possible for land uses that are small or are relatively inactive during the survey time period (e.g., weekday morning retail). One way an interview sample can be expanded is by conducting interviews during the same time periods over multiple days.

The survey supervisor should determine how many surveyors are needed, based on the survey location requirements described in Step 5D and on the minimum sample requirements described previously. If there is a steady stream of pedestrians at a survey location, a rate of 20 complete interviews per hour is a reasonable expectation for each surveyor. For less active locations, estimate 5 to 10 complete interviews per hour for well-trained interviewers who are experienced at approaching strangers. When estimating manpower requirements, it is important to assess the pedestrian traffic flow to be intercepted.

Step 5F: Develop Survey Instrument and Other Data Collection Forms

Interviews of persons are typically conducted as they leave a single land use or building within the site. Each interview can obtain information on both the trips ***to*** and ***from*** the surveyed building and to and from the overall mixed-use site. Figure C-1 provides a sample list of interview questions. The questions are written for exit interviews at building or garage access points (i.e., interviews of people as they leave a location). If the interview is to be conducted as people enter the location, the form shown in Figure C-2 should be used. In general, interviews should be conducted in both directions. However, if that is impossible, complete interviews conducted in one direction can yield usable data since information is asked in each interview for one outbound and one inbound trip.

If the survey will be conducted at the cordon driveway or other type of location, the supervisor may need to revise the questions to capture the last (for exit interviews) or first (for inbound interviews) on-site stop. Other modifications may be needed for special locations or applications. The survey supervisor should make sure that the questionnaires to be used fit the conditions as well as collect the desired data. In general, use of questionnaires such as those shown in Figures C-1 and C-2 will be adaptable to nearly any standard survey and can be automated if desired. Each item is needed for a complete analysis or for checking responses. However, some survey sites may need supplemental questions to firmly and clearly establish the characteristics of the trips being reported.

The field survey form should include a space for the interviewer to record the date, the name of the development, the interviewer's location within the site, the time each interview begins, as well as the interviewer's name. It is important that every single item be filled out completely and accurately for each interview. Omissions can make an interview unusable. Inaccurate entries, guesses, or incomplete entries will also invalidate an interview, wasting both time and money.

Interviews will be completed for a sample of all persons exiting establishments or the site. Factoring will be used to expand the survey data to represent the universe of trips

As persons DEPART intercept as they leave a specific entrance

Interviewer name:_____ Building: _____ Date: _____ Start Time: _____ A.M. P.M.

1

→→ Hello. May I please have a moment of your time to ask you a couple of questions for a Mockingbird Station survey?

Building Entrance	Time	**Where are you headed now?**			**How are you going to get there?**	**Where did you come from *immediately before* you came to [name place being exited]**			**How did you travel from there?**	**What time did you arrive here on that trip?**	**How did you *initially* travel to (name the study site) today?**	
		1. Within (name study site) 2. Outside (name study site)	1. Office 2. Retail 3. Restaurant 4. Residential 5. Medical office 6. Cinema 7. Hotel/motel 8. Other (specify)	Specify business/building	1. Auto driver 2. Auto passenger 3. Walk 4. Rail 5. Bus 6. Bicycle	1. Within (name study site) 2. Outside (name study site)	1. Office 2. Retail 3. Restaurant 4. Residential 5. Medical office 6. Cinema 7. Hotel/motel 8. Other (specify)	Specify business/building	1. Auto driver 2. Auto passenger 3. Walk 4. Rail 5. Bus 6. Bicycle		0. I live here 1. Auto driver 2. Auto passenger 3. Bus 4. Rail 5. Walk 6. Bicycle	If not as driver, did you have an auto available for your trip here? 1. Yes 2. No
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
										am pm		
2	3	4	5	6	7	8	9	10	11	12	13	14

Figure C-1. Sample exit interview questionnaire.

Intercept persons as they look like they will ENTER a specific entrance

Building entrance: _____ Interviewer name:_____ Date: _____
1 2

Time	**Are you headed into (name of establishment where you are interviewing)**	**Where are you coming from?**			**How did you travel to get here?**	**Before you were at (prior place) where were you before then? (Immediately prior to last place)**			**About what time did you arrive there?**	**How did you travel to get there?**	**How did you *initially* travel to (name survey site) today?**	
	3. Yes 4. No (If "no," terminate interview)	1. Within (name survey site) 2. Outside (name survey site)	9. Office 10. Retail 11. Restaurant 12. Residential 13. Medical office 14. Cinema 15. hotel/motel 16. Other (specify)	Specify business/building	7. Auto driver 8. Auto passenger 9. Walk 10. Rail 11. Bus 12. Bicycle	3. Within (name survey site) 4. Outside (name survey site)	9. Office 10. Retail 11. Restaurant 12. Residential 13. Medical office 14. Cinema 15. Hotel/motel 16. Other (specify)	Specify business/building		1. Auto driver 2. Auto passenger 3. Walk 4. Rail 5. Bus 6. Bicycle	7. I live here 8. Auto driver 9. Auto passenger 10. Bus 11. Rail 12. Walk 13. Bicycle	If not as driver, did you have an auto available for your trip here? 3. Yes 4. No
									am pm			
									am pm			
									am pm			
									am pm			
									am pm			
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									am pm			
									am pm			
									am pm			
									am pm			
									am pm			
3	4	5	6	7	8	9	10	11	12	13	14	15

Figure C-2. Sample inbound interview questionnaire.

Location: _____ Counter: _____ Date: _____ Hour Starting ____:00 am pm

Minutes after hour	Direction	Business/Place							
		3	3	3	3	3	3	3	3
:00 to :15	In								
	Out								
:15 to :30	In								
	Out								
:30 to :45	In								
	Out								
:45 to :00	In								
	Out								

4 5 6 6 6 6 6 6 6 6

Figure C-3. Sample door count form.

represented in the survey. Counts of all persons exiting the survey locations (or all locations) will be needed to develop the expansion factors. This expansion process will need to be developed as part of the survey design so the proper counts can be made. Figure C-3 shows a manual count form that can be used to count people exiting (or entering) each door of each establishment where interviews are to be conducted or that the interviews are to represent. This form or an automated equivalent can be modified to meet specific survey site needs.

Cordon counts may also be needed for factoring and/or checking total external trips. These counts should be directional and by travel mode. Vehicle occupancies should be counted since the recommended estimation methodology (and therefore survey methodology) is for person trips. Counts should cover all access points. Figure C-4 shows a manual cordon count form that can be used for this type of survey. This form can be automated or modified as needed for specific survey conditions.

Step 5G: Recruit and Train Field Personnel

After recruiting the survey field personnel, the survey supervisor should conduct a training exercise. Some personnel will need to conduct door counts—the counts of people entering and existing establishments to be surveyed. Some personnel will conduct interviews. Generally the most outgoing and assertive staff will make the best interviewers. Retiring personalities should not be deployed as interviewers but may make good counters.

The interviewers should be made familiar with the survey instrument through practice of intercept interviews. The same is true for counters. All survey personnel should be provided with maps showing each location where counts and/or interviews are to be performed. The survey supervisor should include on each map the overall MXD site with names of buildings, tenants, and areas to which interviewees might refer as well as the specific location and movements the counter or interviewer is to handle.

Field surveys are not trivial. They require thorough preparation and training as well as good supervision. Most surveys of this type will require one supervisor for each 10 to 15 interviewers and counters. Specifics of the survey site, including size and distribution of survey personnel, may increase or decrease the number of supervisors needed.

Step 5H: Conduct Field Data Collection

Inbound and Outbound Door Counts. As noted previously, total person counts are needed at each location where intercept surveys are to be conducted. If several adjacent

Location: _____ Counter: _____ Date: _____ Hour Starting ____:00 am pm
1 2

Minutes after hour	Direction	Personal Vehicles				Motorcycles		Delivery/Service Trucks		Walk	Bike
		Occupants				Riders		Occupants			
		1	2	3	4+	1	2	1	2+		
:00 to :15	In										
	Out										
:15 to :30	In										
	Out										
:30 to :45	In										
	Out										
:45 to :00	In										
	Out										
3	4	5	6	7	8	9	10	11	12	13	14

Figure C-4. Sample cordon count form.

establishments are to be surveyed, one counter may be able to count multiple doors concurrently. This will depend on sight lines and placement of the counter. A counter should only be assigned those movements to count that can easily be seen while looking in one direction. Requiring a counter to look in multiple directions will result in missed persons entering or exiting doors being counted.

As mentioned previously, every establishment door where interviews are conducted must have entering and exiting people counted. Counts should be made by 15-minute periods beginning on the hour or half hour when the survey begins. Counts should be made for the complete survey period.

The survey supervisor should have extra personnel to provide short breaks for the counters to use restrooms. It is suggested that breaks be permitted every two hours. With cell phones now in common use, they can be used by survey personnel to request restroom breaks, if needed before scheduled breaks. Survey personnel should be cautioned to stay hydrated, especially on hot days, but not to drink so much that frequent trips to restrooms are needed.

Counters should be trained in what they are to do. Training should be completed prior to the survey. Training often requires at least four hours and often more. It can be beneficial to begin the first day's survey an hour early to make sure the survey personnel are comfortable with their job before the survey period actually starts. On the first survey day, the supervisor should walk each counter to the assigned survey location. The supervisor should make clear what doors and movements are to be counted and where on the form each movement should be recorded (form for each counter should be set up in advance). The supervisor should ask each counter if he or she has any questions to make sure instructions are clear.

After the survey begins, the supervisor should circulate among the counters to check to see that counts are being made and recorded correctly. Common problems are line of sight obstructions (unanticipated or resulting because counter moved), inattention, recording counts in the wrong column, not keeping track of time, talking to another counter, and socializing with passersby.

Interviews. The survey supervisor should carefully recruit and select interviewers. The ideal interviewer is outgoing, assertive, willing to approach and talk to strangers, sounds professional, and understands the purpose and procedure for the interviews. The survey supervisor will need to train all survey personnel, but spend more time with the interviewers. It is recommended that each interviewer perform a few practice interviews under supervision prior to beginning actual surveys.

On the first survey day, the supervisor should walk each interviewer to the assigned interview location. The supervisor

should make clear what doors and movements for which interviews are to be conducted and make clear where the inbound and outbound trips are to be recorded. If appropriate, the supervisor should also discuss the strategy for approaching people to interview. The supervisor should ask each counter if he or she has any questions to make sure instructions are clear. Practice or test interviews are recommended. It may be beneficial to begin interviews an hour early the first shift worked by each interviewer to make sure the interviewer is comfortable and approaching and interviewing people correctly.

After the survey begins, the supervisor should circulate among the interviewers to check to see that candidate respondents are being approached professionally and that interviews are being conducted and recorded correctly. Common problems include:

- shyness in approaching people to interview,
- not asking questions correctly or leading respondents by guessing answers for them,
- incomplete recording of responses,
- not asking all questions,
- not keeping track of time,
- talking to another survey staff member, and
- socializing with passersby.

The selection of a representative and sufficient sample of workers, shoppers, visitors, and residents at the survey site is critical to the success of the survey. Therefore, the survey supervisor should closely monitor the real-time progress of the intercept surveys to make adjustments as necessary to achieve the representative and sufficient sample, keeping in mind the stated objectives for data collection effort. This may require redeployment of interviewers to different locations that have more activity or making other changes that will increase the number of usable interviews for each land use.

Cordon Counts. One counter should be assigned responsibility for each cordon count location. Since the counter must be able to count not only vehicles, but also vehicle occupants as well as pedestrians and bicyclists, the counter will need to be close to where the cordon crossing is located. Ideally the counter can be immediately adjacent to the driveway, street, garage entrance, or other cordon location. In some cases, two adjacent cordon locations will be so close together that a single counter can count both with accuracy. In either case, each form should be set up specifically for the location(s) to be counted.

A counter should only be assigned those movements to count that can easily be seen while looking in one direction. Requiring a counter to look in multiple directions will result in missed persons and vehicles crossing the cordon line. Counts should be made by 15-minute periods beginning on the hour or half hour when the survey starts. Counts should be made for the complete survey period.

The survey supervisor should have extra personnel to provide short breaks for the counters to use restrooms. It is suggested that breaks be permitted every two hours. Cell phones can be used by survey personnel to request restroom breaks, if needed before scheduled breaks. Survey personnel should be cautioned to stay hydrated, especially on hot days, but not to drink so much that frequent trips to restrooms are needed.

Counters should be trained in what they are to do. Training should be completed prior to the survey. On the first survey day, the supervisor should walk each counter to the assigned survey location. The supervisor should make clear what movements are to be counted and where on the form each movement should be recorded (form for each counter should be set up in advance). The supervisor should ask each counter if he or she has any questions to make sure instructions are clear.

After the survey begins, the supervisor should circulate among the counters to check to see that counts are being made and recorded correctly. Common problems are line of sight obstructions (unanticipated or resulting because counter moved), inattention, recording counts in the wrong column, not keeping track of time, and socializing with passersby.

Use of Electronic Recording Devices. A number of electronic survey recording devices, including laptop computers, are now available. They can be successfully used for these counts and interviews, if they are set up in formats that are easily used. Formats that do not allow counters or interviewers both ease of use and logical positioning of response only invite confusion and errors. For example, use of an electronic intersection turning movement count board for a door count where several doors are to be counted by one person will probably not present a logical input format and lead to errors.

Step 5I: Supervise in Field

Survey supervisors should have a survey check procedure developed as part of the QA/QC procedure suggested at the beginning of this chapter. This procedure should be in place prior to training. The check procedure should include assignments of supervisors to check each counter and interviewer and how to perform the check. Supervisors should observe interviewers at work and suggest refinements in their approach and conduct of interviews. Spot checks of interview records should be made early in the first interview period to make sure the responses are both logical and complete. Supervisors should understand that errors in procedure usually continue until corrected. If not corrected, interviews for an entire day could be lost as unusable. The same is true for counts.

It is important for the supervisors to keep circulating among those being supervised. Even though the counts or interviews

are being performed correctly, other supervisory needs may arise. Common needs include complaints from business or landlords wanting survey personnel to relocate or stop their survey, unexpected movements that are being missed by the survey, too much activity for one person to cover, "no" activity to count or interview, business opened or closed unexpectedly, and survey staffer unable to perform as needed.

Step 5J: Check Data after Each Period

The survey supervisors should perform a check of the counts and interviews immediately after each survey period. The check should be included in the QA/QC plan, but should generally include at least the following:

- Counts:
  - count covers full period;
  - inbound and outbound balances are logical;
  - variations by 15-minute period are logical;
  - modal splits are within the expected ranges;
  - vehicle occupancies are in expected ranges;
  - for cordon counts, it is desirable to total the counts to see if they appear reasonable, particularly the balances between inbound and outbound;
  - for door counts, for each land use, compare inbound and outbound totals to make sure the balance appears logical; and
  - if discrepancies are found, determine if corrections can be made, and if not, schedule a recount(s) as needed.
- Interviews:
  - times of interviews are recorded;
  - are responses within range of permitted choices (i.e., are codes consistent with choices available)?
  - are write-in responses complete and understandable?
  - destination for outbound trip is logical and mode fits origin-destination pair;
  - origin of inbound trip is logical for reported time of trip (i.e., was it really the immediately prior trip?); is time reported for that trip logical for immediately prior trip?
  - check response to whether a vehicle was available for trip; is it logical for reported mode of trip?
  - is mode of access to site logical given mode reported for these trips? and
  - where discrepancies or errors appear to exist, review forms with interviewer (call as soon as possible while memory still clearest) to determine if corrections can be made or if interviews must be discarded. If necessary, repeat interviews where prior interviews had to be discarded.

After the survey has been completed in the field, the supervisor should complete the checking of all counts and interviews. Those that are unusable should be deleted. Erroneous counts should have been repeated. Small percentages of unusable interviews should be deleted. Large numbers should have been repeated.

Step 6: Process Internal Capture Data

For each survey site (establishment), the analyst should determine the number of usable interviews. Under normal circumstances, 50 or more usable interviews should be available for each land use (100 desirable, 30 minimum). In some cases, this will not be possible because the land use will not be active (e.g., retail closed during A.M. peak hour) or because the quantity of development in a land use category will be small. That number can be compared to the total door counts for the same period. The sampling percentages can be calculated by dividing the number of usable interviews by the number of people counted in the same direction (inbound or outbound). The same can be performed for each land use by aggregating all establishments within specific land uses.

Since the interviews represent a sample, the next step is to compute an expansion factor to expand the sample to represent the total for that universe. This can be accomplished in at least two ways:

- by land use (normal approach):
  - separate each interview record into individual trip records; there will be one or two usable trips in each interview record depending on how many occurred during the survey period;
  - aggregate by land use numbers of inbound and outbound trips (aggregate to the interview end of the trip) reported during the survey period from those interviews; this includes both trips reported in the interview if they were during the designated survey period (T_L for each direction);
  - aggregate door counts to the land use level (C_L for each direction);
  - determine number of development units (e.g., gross square feet) covered by interviews and the number of development units for which no interviews were conducted (in cases where only a portion of establishments within a given land use were interviewed); calculate a sample percentage for each land use (S);
  - the expansion factor (F_L) for reported trips for each land use and each direction will be: $F_L = (C_L/T_L)/S$; and
  - apply directional land use expansion factor F_L to each trip record; and
- by establishment:
  - separate each interview record into individual trip records; there will be one or two usable trips in each

Table C-4. Sample summary format—outbound trips.

From	To					
	Internal				External	Total
	Land Use 1	Land Use 2	Land Use 3	Etc.		
Land use 1	Number or %	Number or %	Number or %	Number or %	Number or %	100%
Land use 2						100%
Land use 3	4 (4%)	8 (8%)	20 (20%)	0 (0%)	68 (68%)	100 (100%)
Etc.						100%
External						100%

interview record depending on how many took place during the survey period;
- aggregate by establishment the numbers of inbound and outbound trips (aggregate to the interview end of the trip) reported during the survey period from those interviews; this includes both trips reported in the interview if they were during the designated survey period (T_E for each direction);
- aggregate by establishment the door counts (CE for each direction);
- for each establishment surveyed, compute the expansion factor to apply to trips to and from that establishment; it will be the establishment's directional door count divided by the establishments usable trips in the same direction (CE/TE);
- determine number of development units (e.g., gross square feet) covered by interviews and the number of development units for which no interviews were conducted (in case where only a portion of establishments within a given land use were interviewed); calculate a sample percentage for each land use (SE);
- Apply directional establishment expansion factor FL to each trip record for each establishment (Ei), then sum to aggregate trips to the land use level, or
- FEi = (CEi/TEi)/SE; and
- those expansion factors are then applied to trip records for each surveyed establishment; the sum equals the total for that land use.

After the expansion factors are applied at either the land use or establishment levels, a summary of internal capture can be created. This should be performed for each end of a trip and in the inbound and outbound directions; that is:

- Land Use A – outbound trips to internal destinations at each other land use, plus outbound trips to external destinations; and
- Land Use A – inbound trips from internal origins at each other land use, plus inbound trips from external origins.

Tables C-4 and C-5 show a format for this summary. Using the trip records and expansion factors from the survey, sum the expanded trips in origin-destination format. This should be a straight forward process to begin from the origin end of trips and sum to produce a table similar to Table C-4. This provides a distribution for all trips departing a given land use (the example shown is referred to as Land Use 3). Some trips will end in the same land use, although at another establishment. Some trips will travel to other internal land uses. Some will leave the surveyed development and travel to an external destination. All trips must travel to either an internal or external destination. For Land Use 3, those outbound trips will total 100 percent. Hence, each of the entries in the Land Use 3 row can be converted to percentages. For example, if there are 100 outbound trips from Land Use 3 and 8 trips travel to Land Use 2, then 8 percent travel to Land Use 2. Since this is internal, 8 percent were internally captured by Land Use 2 (see Table C-5).

ITE has a large trip generation database built from counts of external traffic (vehicle trips) from single-use developments (or at least single classifications). ITE trip generation data excludes internal trips. For the Table C-4 data to match the ITE definition, internal trips must be deleted. Table C-5 shows

Table C-5. Sample summary format—outbound trips (ITE definition).

From	To					
	Internal				External	Total
	Land Use 1	Land Use 2	Land Use 3	Etc.		
Land use 1						
Land use 2						100%
Land use 3	4 (5%)	8 (10%)		0 (0%)	68 (85%)	80 (100%)
Etc.						100%
External						100%

Table C-6. Sample summary format—inbound trips.

From	To				
	Internal				External
	Land Use 1	Land Use 2	Land Use 3	Etc.	
Land use 1			Number or %		
Land use 2			Number or %		
Land use 3			Number or %		
Etc.			Number or %		
External			Number or %		
Total			**100%**		

how that is accomplished. Movements between establishments within the same land use are not considered; they are deleted from the trip table. Table C-5 shows the hypothetical results with the trips internal to Land Use 3 deleted. The internal trips to other land uses remain. The total trips external to Land Use 3 remain the same as do the external trips, which are the trips of most interest in transportation impact studies.

Trips also travel into the surveyed development and its land uses. A similar summary of inbound trips can be created as Table C-6 shows. These numbers and percentages may be different than the numbers in Table C-4. Logic supports such a finding. For example, in a MXD with retail, restaurants, and office, the restaurants will send few P.M. street peak hour (e.g., 5–6 P.M.) trips to office uses because few, if any, office workers will travel to their office at that time. However, restaurants may receive a significant percentage of their 5–6 P.M. trips from internal office uses (people going for an early dinner, drinks, or hors d'oeuvres). Hence, it would be logical to expect different directional percentages between office and restaurant during the P.M. street peak hour.

References

1. *Trip Generation, 7th Edition, Vol. 3: User's Guide,* Institute of Transportation Engineers, Washington, D.C., 2003, p. iv–viii.
2. *Parking Generation,* 3rd edition, Institute of Transportation Engineers, Washington, D.C., 2004.
3. *Trip Generation, Volume 1 of 3: User's Guide,* Institute of Transportation Engineers, Washington, D.C., 2008, p. 7.
4. *Fundamental Research Statistics for the Behavioral Sciences,* John T. Roscoe; Holt, Rinehart and Winston, Inc., 1969.

APPENDIX D

Pilot Survey Experiences and Lessons Learned

This appendix describes experiences and lessons learned in conjunction with the pilot studies. Survey results are described in Chapter 3.

The project panel requested that the two initial pilot study sites have different character—one a TOD and the other large enough to require driving to complete at least some internal trips. Two developments were sought that would meet those general criteria. A third development was later added courtesy of a different sponsor.

Site Survey Permissions

Permissions

The first step after selection of the preferred steps was to obtain permission from the owners or managers of the selected developments. The initial phone conversation requested permission to:

- conduct brief interviews of people entering or leaving buildings and businesses during weekday A.M. and P.M. peak periods (two days each);
- count people entering and exiting each entrance where surveys were being conducted; and
- conduct a (person trip) cordon count around the development(s) site being surveyed.

The owner or manager was also requested to provide information quantifying development characteristics, a site plan, and other information needed to complete the survey and analyze the results per the procedures described in the interim report. The initial phone conversation was followed up with a letter or email message requesting permission and describing the surveys to be conducted.

One of the initial sites selected for surveys was Mockingbird Station (a TOD) in Dallas, Texas. Mockingbird Station had been the subject of several different types of studies since opening. The on-site management company provided permission to conduct surveys. The management company wanted to review each survey instrument to make sure questions or information was not intrusive. A commitment was made not to impede movement to and from businesses or residences and to accept interview refusals without question. Only exit interviews were permitted. Each survey crew member had to be identified with a badge issued by the management company. The management company was very cooperative and helpful before and during the survey.

The second site was Atlantic Station in Atlanta, Georgia. Even though Atlantic Station had opened less than a year earlier, ownership there had changed from a single developer who had welcomed studies of the development to several different owners with varying levels of interest. Owners were primarily concerned about having patrons and residents interviewed and did not want to risk customers not wanting to do business at a place where interviews were being conducted. Permissions were secured with some limitations about where interviews could be conducted. Only exit interviews were permitted. Some access/parking-related information was to be provided by the parking operator rather than be collected directly.

The third development added later was Legacy Town Center in Plano, Texas. The sponsor for that survey specified a scenario unrelated to this NCHRP project, but which permitted a development meeting this project's requirements. Although the master developer was still active on an adjacent block of land, this development, too, had multiple developers and owners. In the end, only one owner declined to permit interviews. However, again there was concern about the effect of inbound interviews on business. As a result, the inbound trip information was obtained by asking outbound respondents about the trip they had made to reach the building from which they were exiting. Unfortunately, that information was often incomplete or for trips outside the time periods of interest. The results were surveys with much more outbound than inbound trip data.

Lessons Learned

The permissions process took much longer than had been experienced by the researchers in past surveys. The researchers had recommended the first two sites because the owners had previously welcomed the attention and information that resulted from different types of case studies. However, changes in ownership from original developers to owner-operators or investors using operating companies made obtaining permissions significantly more challenging at all three developments. In the case of Atlantic Station, the development has been structured so it may be possible for each commercial block and each residential project to be sold to separate owners. Since surveys to determine internal capture need to cover samples of all different land use types in the survey area, diverse ownership will make it much more difficult to obtain the necessary permissions.

One of the considerations for future surveys of this type should be the ownership structure of the buildings or businesses to be surveyed. From this experience, it would appear that original developers (who will be more interested in reduced traffic impacts due to internal capture) are possibly more willing to have surveys conducted and single local owners may also be easier to interest.

An additional aid would be a completed survey report so the owners-managers are able to see an example of what will be conducted. There was considerable reluctance to be involved in something new with uncertain results, although most of the owner-manager representatives were able to grasp the concept of internal capture after extended discussions.

Even if favorable ownership structures are encountered, the complexity of the owner-tenant relationships may result in a longer approval period than for single-use or single manager-operator developments. A period of one month should be allowed for a site, but if difficulties arise, it could take two or even three months to secure complete permissions and authorizations to proceed.

Finally, the limitation to only exit interviews means that data for inbound trips must come from the exit interviews. A compromise could be to conduct exit interviews at retail, restaurant, and cinema establishments and attempt to obtain interviews in both directions elsewhere. Where only exit interviews are permitted, it should be recognized that the inbound data may be limited and that interviewers need to persist to obtain complete information for the inbound trips.

Field Data Collection

Surveys

The surveys were built around exit interviews. The objective was to obtain for both A.M. and P.M. peak periods a sample of travel patterns involving internal and external trips for each land use type. Interview information included both origin and destination land use types, time and mode of trip, original mode of access to the development. The owners-managers demanded brief interviews.

While the intent was to interview at every land use type represented within each study area, it was recognized from the beginning that interviews would not be able to be conducted at all entrances (permissions withheld at some; number of entrances to cover) all the time. It was also understood that the interviews would represent a sample of the total trips made at interview locations because people could not be detained for their interview until the interviewer completed a previous interview. Hence, counts of people entering and exiting entrances where surveys were being conducted were necessary. Interviews were conducted at every entrance at Mockingbird Station (over 50). At Atlantic Station there were too many entrances to interview at all of them and permissions could not be obtained for all businesses so sampling had to be performed by land use (factored proportionally by square footage within each land use).

In addition to interviews and door counts, person trips by mode were counted at each cordon location plus some added locations where needed to separate different types of destinations. For example, at both developments some parking areas for certain buildings were cordoned off or otherwise partitioned from general parking and it was necessary to count entrances to those areas separately.

Surveys were conducted between 6:30 A.M. and 10:00 A.M. and between 4:00 P.M. and 7:00 P.M. The same interview approach was used at all three developments. The research team secured about 40 temporary personnel for each survey to conduct interviews or perform counts. Not all persons worked all shifts; since much of each development was retail space and since most retailers did not open until 10 A.M., fewer personnel were needed for the A.M. peak. Three members of the research team supervised the surveys.

Cordon counts were conducted at all cordon locations for at least one A.M. and one P.M. survey period. As applicable, inbound and outbound counts were made by the following modes:

- personal vehicle:
  - 1 person,
  - 2 people,
  - 3 people,
  - 4+ people;
- motorcycle;
- delivery truck;
- walk; and
- bike.

Mockingbird Station had no on-site transit routes (both light rail and bus transit serve a transit station adjacent to the site). A shuttle connects Atlantic Station to a nearby MARTA rail station; the shuttles were surveyed separately. One bus route passed along two sides of Legacy Town Center.

Door counts were made both inbound and outbound during interview periods. Whenever interviews were being conducted on a building face, all doors were counted on that building face for that period.

Interviews were conducted at both developments 6:30 A.M.–10 A.M. and 4 P.M.–7 P.M. beginning on a Tuesday afternoon and ending on a Thursday morning. With minor exceptions, all interviews were conducted at building access points as people exited the building. Interviewers were assigned either single entrances where activity was heavy or groups of entrances where they were close together and activity was low to moderate. Interviewers were instructed to interview everyone they could, but not to try to have anyone wait to be interviewed while another interview was being completed. Interviewers were to be assertive in trying to initiate interviews but were told to accept refusals without question. Interviewers assigned to multiple entrances were to watch people enter business and try to intercept them as they departed. It was estimated that effective interviewers were turned down about one-third of the time.

On the average, interviewers were able to complete interviews with 10 to 15 percent of all exiting individuals. Productivity varied by the amount of activity at the assigned location, the assertiveness of the interviewers, and the interviewer skill. All personnel were trained prior to the first shift. A few trainees were not used as a result of unsuccessful training. Some others were either reassigned to counting jobs or discharged during the first shift if supervisor checks showed that the interview approach or results were insufficient. About 25 percent of the original personnel did not work after their initial shift.

The plan for all three developments was to interview as many people as possible using about 20–25 interviewers in the P.M. peak (when all businesses were open) and a lesser number during the A.M. peak commensurate with the number of businesses open. This required interviewing at different locations each day, although some of the lower activity entrances were covered both days.

At Mockingbird Station, inbound interviews were also conducted at the entrance from the DART rail station that is served by two rail lines and six bus routes. The purpose was to ascertain modes of access. At Atlantic Station, interviews were conducted on the shuttles operating between Atlantic Station and the MARTA Art Center rail station for the same reason. Interviews were also conducted inbound at a few locations to intercept walkers and bikers entering Atlantic Station's business district from the adjacent residential portions of the development. Use of buses for trips to and from Legacy Town Center was almost non-existent. No special interviews were conducted for that mode.

Cost and complexity were the two primary reasons given in telephone conversations with consultants and public agencies about why more internal capture studies had not been conducted. The research team elected to cap the survey team size at about 40 people during the P.M. peak for cost considerations. The cost for temporary labor to conduct the surveys may differ by location, and it did for the Dallas, Atlanta, and Plano surveys, but the direct cost for the Atlanta team was approximately $19,000 using a temporary employment agency and personnel classified as interviewers.

In all three cases the temporary employment agency had difficulty securing the requested 40 persons. In one city, a second agency was used to provide people. In another city, the agency provided a large percentage of people who could work some but not all shifts. All count data were compiled by 15-minute period. All interviews were maintained as separate trip records.

Lessons Learned

The cordon counts were easily completed for all three developments with no problems. They were easy enough so people who could not successfully perform the interviews (or did not want to do interviews) could accurately complete the counts. Men were assigned locations that were out of view of passing pedestrians (e.g., some parking garage entrances). Supervisors made it a priority to locate counters so they would be visible but not distractions to passersby. Supervisors also walked by every isolated location at least hourly. All personnel also had cell phones and the supervisors' phone numbers in case an emergency arose or relief was needed. No safety or security difficulties or concerns were reported by any of the survey team at any development. Use of cell phones and men in isolated locations was successful.

Some interviewers, despite successful training, were not successful because they were not effective at approaching people quickly enough to get their attention. Assertiveness was the deficiency in most cases. Despite practice interviews in a training atmosphere, the only way to confirm a good interview approach is in the field with practice interviews under watch by a supervisor. This should be conducted in advance of initiating surveys.

Despite a clothing specification given to the temporary employment agencies, at two locations a few of the personnel were not attractively dressed and probably discouraged people from talking with the interviewers. In such a case, those interviewers should be assigned to counting or sent home to change clothes.

With as many as 40 temporary employees on a survey team, a range of capabilities will exist. For a survey of this complexity, at least three supervisors are needed to be able to both check and circulate to all sites. The most frequent supervision was needed to:

- answer initial judgment questions related to interview responses (e.g., how to record trips to walk the dog);
- locate interviewers so they could intercept exiting patrons from multiple doors;
- identify and separate interviewers talking with each other instead of focusing on exiting patrons (a problem in low activity locations);
- schedule breaks and place "floaters" in those locations;
- deliver water to survey personnel near mid-shift time; and
- respond to cell phone calls for help (usually questions or approval to relocate to more active or convenient spot).

Development Data

Development Characteristics

Data describing the characteristics of the developments were acquired from the on-site management company for Mockingbird Station, from the parking operator on behalf of the management companies for Atlantic Station, and from the various owners and management companies at Legacy Town Center. Because trip generation surveys need to be linked to occupied development areas rather than total area, the research team requested both total and occupied square footage or other development units, current at the time the surveys were conducted.

On-site management companies sometimes do not have information on occupied areas. That information is usually maintained by the leasing offices, or agents, which are often separate offices or even handled by separate companies. In the case of Mockingbird Station, leasing was handled by the management company for office space, by another office of the management company for residential, and an outside company for retail and restaurant. The management company ultimately assembled information.

The diversity of ownership of Atlantic Station would have posed a similar situation for Atlantic Station. However, the parking operator needed the same information for its own surveys being conducted during a similar timeframe. Hence, the research team was able to obtain the development data after the parking operator assembled the information. Both development and occupancy data for Legacy Town Center had to be obtained from the applicable owner, management company, or leasing agent.

Lessons Learned

MXDs may have separate ownerships in what seems like a single development. Occupied space inventories are usually maintained by the leasing (or sales) units, which may or may not be parts of the ownership or on-site management organization(s). Ownership that is more diverse may lead to more diverse sources for the development and occupancy data. However, after permissions have been obtained to conduct the survey, obtaining the development data becomes somewhat easy. However, it may take several follow-up calls to obtain a complete set of information.

APPENDIX E

Florida Survey Questionnaires

Source: *FDOT District IV Trip Characteristics Study of Multi-Use Developments,* Tindale-Oliver & Associates, Appendices to Final Report, December 1993, Appendix B, pp. 6–9.

FDOT Trip Characteristic Study
Multiuse Developments
Office Survey Form

Date: _____ INTERVIEWER: _____
Site Location: _____
_____

Weather: AM _____
Weather: NOON _____
Weather: PM _____

Comments: _____
_____
_____

(1) Time	(2) Do you work in this building? 1. Work 2. Visitor 3. Courier 4. Delivery 5. Banking 6. Medical 7. Shop/Retail 8. Eat 9. Other	(3) What mode of transportation did you use to get here? 1. Car - Driver 2. Car - Passenger 3. Car - Drop Off 4. Walk 5. Bicycle 6. Taxi 7. Bus 8. Motorcycle 9. Other	(4) Where did you last stop prior to coming here? 1. Home 2. Friend's Home 3. Another Office 4. Restaurant 5. Daycare/School 6. Medical 7. Gas Station 8. Bank 9. Movie Theatre 10. Shop/Retail 11. Other	(5) What is the address or nearest intersection where you came from? Enter address/ intersection information on form.	(6) Were any stops made within this development on the way to this building? 1. Yes 2. No	(7) Names of all stops within this development	(8) Would you have driven by this building if you did not stop here today? 1. Yes 2. No	(9) Where will your next stop be when you leave this building? 1. Home 2. Friend's Home 3. Another Office 4. Restaurant 5. Daycare/School 6. Medical 7. Gas Station 8. Bank 9. Movie Theatre 10. Shop/Retail 11. Other	(10) What mode of transportation will you use to get there? 1. Car - Driver 2. Car - Passenger 3. Car - Drop Off 4. Walk 5. Bicycle 6. Taxi 7. Bus 8. Motorcycle 9. Other	(11) What is the address or nearest intersection where you are going to? Enter address/ intersection information on form.	(12) Are you going to make any additional stops within Country Isles/Indian Trace Development? 1. Yes 2. No	(13) Names of all stops within this development	(14) What is your home Zip Code?

QC REVIEW: _____ DATE: _____ DATA ENTRY BY: _____ DATE: _____ COMMENTS: _____

Tindale-Oliver & Associates:

OSD_OFF.WK1

Figure E-1. FDOT office survey form.

FDOT Trip Characteristic Study
Multiuse Developments
Residential Survey Form (Incoming)

Date: _____ INTERVIEWER: _____
Site Location: _____
_____

Weather: AM_____
Weather: NOON_____
Weather: PM_____

(1) Time	(2) Are you coming to your home in Fairlea or Weston? 1. Home 2. Visitor 3. Courier 4. Delivery 5. Empty/Work 6. Other	(3) Was the mode of transportation being used to make the trip. 1. Car - Driver 2. Car - Passenger 3. Car - Drop Off 4. Walk 5. Bicycle 6. Taxi 7. Bus 8. Motorcycle 9. Other	(4) What was the purpose of your visit at the place where your last came from? 1. Work 2. Shop/Retail 3. Home 4. Restaurant 5. Daycare/School 6. Medical 7. Gas Station 8. Bank 9. Movie Theatre 10. Other	(5) What was the name of the place where your trip started? Enter the name of the place interviewee is coming from.	(6) What was the address or nearest intersection where you just came from? Enter address/ intersection information on the form.	(7) Did you make any stops in Country Isle / Indian Trace before coming to Fairlea or Weston? 1. Yes 2. No	(8) Enter the names of all stops within the Country Isle / Indian Trace Development	(9) What is your home Zip Code?

QC REVIEW: _____ DATE: _____ DATA ENTRY BY: _____ DATE: _____ COMMENTS: _____

Tindale-Oliver & Associates

OSD_RESI.WK1

Figure E-2. FDOT residential survey form (incoming).

FDOT Trip Characteristic Study
Multiuse Developments
Residential Survey Form (Outgoing)

Date: _____ INTERVIEWER: _____ Weather: AM_____

Site Location: _____ Weather: NOON_____

_____ Weather: PM_____

(1) Time	(2) Are you coming from your home in Fairlake at Weston? 1. Home 2. Visitor 3. Courier 4. Delivery 5. Empy/Work 6. Other	(3) Note the mode of transportation being used to make the trip. 1. Car - Driver 2. Car - Passenger 3. Car - Drop Off 4. Walk 5. Bicycle 6. Taxi 7. Bus 8. Motorcycle 9. Other	(4) What is the purpose of your trip today? 1. Work 2. Shop/Retail 3. Home 4. Restaurant 5. Daycare/School 6. Medical 7. Gas Station 8. Bank 9. Movie Theatre 10. Other	(5) What is the name of the place where you are going? Enter the name of the place you are going on the form.	(6) What is the address or nearest intersection where you are going? Enter address/ intersection information on the form.	(7) Will you make any stops in Country Isles / Indian Trace before arriving at that destination? 1. Yes 2. No	(8) Enter the names of all stops within the Country Isle / Indian Trace Development	(9) What is your home Zip Code?

QC REVIEW: _____ DATE: _____ DATA ENTRY BY: _____ DATE: _____ COMMENTS: _____

Tindale-Oliver & Associates: OSD_RESO.WK1

Figure E-3. FDOT residential survey form (outgoing).

APPENDIX F

Validation of Estimation Procedure

Estimation Procedure

The estimation procedure was applied to seven different developments for which at least land use information, peak hour cordon counts, and proximity information were available. Four of these developments provided data for this study; the other three did not. The validation test was to see how well the estimation procedure could begin with ITE trip generation data and reproduce the external vehicular cordon volumes. Five of the developments had directional cordon traffic volumes available for both peaks. These developments included:

- Mockingbird Station,
- Legacy Town Center,
- Atlantic Station,
- Crocker Center (independent site, Boca Raton, Florida), and
- Mizner Center (independent site, Boca Raton, Florida).

Two developments had on non-directional P.M. peak period counts available. They were:

- Boca del Mar and
- Southern Village (independent site, Chapel Hill, North Carolina).

The validation test compared four different estimation methods to determine which method produced the results closest to the cordon counts:

- the estimator described in this report,
- the estimator, but without the proximity adjustment,
- the existing ITE estimation method, and
- unadjusted ITE trip generation.

Development data and approximations of surveyed mode split and vehicle occupancies were input to the estimation procedure. Table F-1 shows the ITE land use codes used to estimate single-use vehicle trip generation for component land uses of the seven developments. Where businesses were closed during a peak period and there were no observed trips to or from the business (e.g., cinema during A.M. peak), no trips were included in the validation estimate.

Southern Village had additional land uses (a school and park-and-ride lot) that were not included in the internal capture estimate; those were handled as additional land uses. Information provided in the source document was used as the basis for the trip generation estimate. Table F-2 shows the results numerically. Figures F-1 through F-4 graphically compare the results for the five developments for which complete data were available. Error comparisons were also made and are shown in Table F-3.

Table F-2 rows contain data as follows:

1. Counted at cordon: vehicles(persons) counted using site driveways;
2. Estimator output: directional volume of vehicles (persons) estimated with recommended estimation method:
   – First four columns: volumes as described,
   – Last four columns: percent internal trips;
3. From survey – directional volume of vehicles (persons) derived from survey:
   – First four columns: volumes as described,
   – Last four columns: percent internal trips;
4. Estimator/counted: ratio of estimated trips divided by counted trips in respective columns; and
5. Unadjusted/counted: estimate using raw ITE trip generation divided by counted trips

Table entries for Southern Village contain additional rows to account for land uses that do not qualify for internal capture under the recommended procedure.

Table F-2 shows comparison of external vehicle and person trips estimated by each method. Also shown are estimated internal capture percentages. The most important results are

Table F-1. ITE land use codes used in validation.

Land Uses		ITE Land Use Code
NCHRP Project 8-51 Classification	Subgroup	
Office	-	710
Retail	-	820
Restaurant	Quality sit down	931
	High turnover	932
	Fast food, no drive-through	933
	Fast food with drive-through	934
Cinema	-	444
Hotel	-	310
Residential	Single family detached	210
	Apartments	220
	Townhomes	230
Additional Land Use		
Port and terminal	Park-and-ride lot	090

the external trip estimates. Figures F-1 through F-4 show the comparisons of vehicle trips for both A.M. and P.M. peak periods and both inbound and outbound directions. In Figure F-1, it is evident that for the A.M. peak hour inbound vehicle trips, the NCHRP estimation methods—both with and without the proximity adjustment—produce the best results for three of the five developments; the current ITE method is closest for one site and slightly better than the NCHRP method for another site. Atlantic Station is more closely estimated by both unadjusted trip generation and the current ITE method. The current ITE method is better than raw trip generation, but the method developed in this project is even closer to the counts.

Figure F-2 shows similar results for A.M. peak hour outbound vehicle trips with the recommended estimator (both with and without the proximity adjustment) producing the best results for four of the five developments. This time Mizner Center is better estimated by raw trip generation and the current ITE method. As with the previous comparison, the ITE method is an improvement on raw trip generation.

The P.M. inbound comparison shown in Figure F-3 shows that the NCHRP method with proximity adjustment produces the closest estimates for two sites, with the methods with and without proximity about equal for the two sites, and the raw ITE trip generation closest for one site. Again, Mizner Center was better estimated by another method (this time raw trip generation), but the other four are best estimated by the recommended method.

Figure F-4 shows the comparison for P.M. peak hour inbound trips. As for the other time periods and directions, one or the other of the NCHRP methods produces the closest estimates in four of the five cases. The methods with and without proximity adjustments are each best for one MXD while both yield approximately the same results for two MXDs. In this case, Boca Center is better estimated using the existing ITE method.

In total, the recommended method—with or without the proximity adjustment—produces more reliable estimates for four of the five developments.

The results for the other two developments—Boca del Mar and Southern Village—show two different patterns. For Boca del Mar, both the existing ITE and recommended methods produce significantly low estimates, but are closer than the recommended method without proximity adjustments or the ITE method. The raw estimate is above the actual external count, but it and the ITE method are the closest of the estimates (about 4 percent closer than the recommended method with proximity adjustment). For Southern Village, the results are very different. The recommended method (both with and without proximity adjustments) produce estimates very close to the counts.

Table F-3 may quantify the degree of accuracy or error more clearly, recognizing that the statistics presented represent the sum of combined results. The average error shown is the simple sum of the percent deviations from the counts as derived in Table F-2. On average, as a group the estimates all exceed the counts (for example, the recommended method with proximity adjustment is an average of 4 percent). This is very misleading and not relevant for single developments because overestimates and underestimates tend to cancel each other out. What may be of value in those percentages is that they could result in the sum total trip generation of several developments in an area. However, that is not what is being validated here.

More applicable is the absolute average error, which is the sum of the magnitudes of the errors averaged over the five

Table F-2. Summary of estimator validation comparisons.

Development/data	Vehicle Trip (Person Trips)				Percent Internal Trips (Peak Period)			
	A.M. Peak Hour		P.M. Peak Hour		A.M.		P.M.	
	In	Out	In	Out	In	Out	In	Out
Mockingbird Station								
Counted at cordon	272(385)	128(213)	367(595)	353(586)				
Estimator output	259(329)	107(165)	422(565)	412(588)	19%	32%	33%	33%
From survey					35%	46%	36%	42%
Estimator/counted	0.95(0.85)	0.84(0.77)	1.15(0.95)	1.17(1.00)				
Without proximity adjustment								
Estimator output	Same	Same	422(563)	411(586)	Same	Same	33%	33%
Estimator/counted	Same	Same	1.15(0.95)	1.16(1.00)				
With ITE *Trip Gen Handbook* data								
Estimator output	322(409)	156(242)	537(715)	523(745)	No data	No data	15%	15%
Estimator/counted	1.18(1.06)	1.22(1.14)	1.46(1.20)	1.48(1.27)				
Unadjusted ITE *Trip Generation* report								
Estimator output	399	233	798	832	0%	0%	0%	0%
Unadjusted/counted	1.47	1.82	2.17	2.36				
Atlantic Station								
With proximity adjustment								
Counted at cordon	962(1012)	455(502)	1023(1396)	1038(1260)				
Estimator output	796(843)	252(308)	962(1126)	1151(1342)	17%	37%	36%	34%
From survey					40%	30%	41%	42%
Estimator/counted	0.83(0.83)	0.55(0.61)	0.94(0.81)	1.10(1.07)				
Without proximity adjustment								
Estimator output	Same	Same	938(1097)	1124(1310)	Same	Same	38%	36%
Estimator/counted	Same	Same	0.91(0.79)	1.08(1.04)				
With ITE *Trip Gen Handbook* data								
Estimator output	952(1130)	398(484)	1232(1445)	1604(1750)	No data	No data	16%	13%
Estimator/counted	0.99(1.11)	0.87(0.96)	1.29(1.04)	1.55(1.39)				
Unadjusted ITE *Trip Generation* report								
Estimator output	1122	473	1690	1992	0%	0%	0%	0%
Unadjusted/counted	1.17	1.03	1.65	1.92				
Legacy Town Center								
Counted at cordon	734(819)	641(779)	933(1187)	955(1122)				
Estimator output	736(906)	690(850)	1003(1236)	912(1123)	15%	16%	34%	36%
From survey					32%	25%	48%	44%
Estimator/counted	1.00(1.11)	1.08(1.09)	0.95(1.04)	0.95(1.00)				
Without proximity adjustment								
Estimator output	Same	Same	923(1136)	831(1023)	Same	Same	39%	42%
Estimator/counted	Same	Same	0.98(0.96)	0.87(0.91)				
With ITE *Trip Gen Handbook* data								
Estimator output	864(1065)	821(1009)	1231(1516)	1413(1740)	No data	No data	27%	24%
Estimator/counted	1.18(1.30)	1.28(1.30)	1.32(1.28)	1.48(1.55)				
Unadjusted ITE *Trip Generation* report	909	862	1598	1502	0%	0%	0%	0%
Unadjusted/counted	1.24	1.34	1.71	1.57				
Boca (ex-Crocker) Center								
Counted at cordon	488	219	281	532				
Estimator output	525	189	342	461	13%	26%	32%	31%
From survey					No data	No data	No data	No data
Estimator/counted	1.08	0.86	1.22	0.87				
Without proximity adjustment								
Estimator output	Same	Same	342	461	Same	Same	32%	31%
Estimator/counted	Same	Same	1.22	0.87				
With ITE *Trip Gen Handbook* data								
Estimator output	617	271	385	502	No data	No data	26%	33%
Estimator/counted	1.26	1.24	1.37	0.94				
Unadjusted ITE *Trip Generation* report	655	295	566	678	0%	0%	0%	0%
Unadjusted/counted	1.34	1.35	2.01	1.27				

(continued on next page)

Table F-2. (Continued).

Development/data	Vehicle Trip (Person Trips)				Percent Internal Trips (Peak Period)			
	A.M. Peak Hour		P.M. Peak Hour		A.M.		P.M.	
	In	Out	In	Out	In	Out	In	Out
Mizner Center								
Counted at cordon	220	145	547	328				
Estimator output	239	99	417	388	13%	25%	29%	35%
From survey					No data	No data	No data	No data
Estimator/counted	1.09	0.68	0.76	1.18				
Without proximity adjustment								
Estimator output	Same	Same	412	383	Same	Same	30%	35%
Estimator/counted	Same	Same	0.75	1.17				
With ITE *Trip Gen Handbook* data								
Estimator output	267	134	425	402	No data	No data	27%	32%
Estimator/counted	1.21	0.99	0.78	1.23				
Unadjusted ITE *Trip Generation* report	272	137	613	585	0%	0%	0%	0%
Unadjusted/counted	1.24	0.94	1.12	1.78				
Boca del Mar								
With proximity adjustment								
Counted at cordon	-	-	2187	← 2-way				
Estimator output	-	-	915	895	-	-	26%	28%
From survey					No data	No data	7%	8%
Estimator/counted	-	-	0.83	← 2-way				
Without proximity adjustment								
Estimator output	-	-	689	676	-	-	44%	47%
Estimator/counted	-	-	0.62	← 2-way				
With ITE Trip Gen Handbook data								
Estimator output	-	-	839	831	-	-	33%	35%
Estimator/counted	-	-	0.76	← 2-way				
Unadjusted ITE Trip Generation report	-	-	1241	1209	-	-	0%	0%
Unadjusted/counted	-	-	1.12	← 2-way				
Southern Village								
Counted at cordon	-	-	1336	← 2-way				
Estimator output	-	-	546	438				
Additional trips for non MXD uses	-	-	97	290				
Total estimated	-	-	645	731	-	-	11%	13%
From survey					No data	No data	No data	No data
Estimator/counted	-	-	1.03	← 2-way				
Without proximity adjustment								
Estimator output	-	-	537	429	No data	No data	N/A[a]	N/A[a]
Additional trips for non MXD uses	-	-	97	290				
Total estimated	-	-	637	722				
Estimator/counted			1.01	← 2-way				
With ITE Trip Gen Handbook data								
Estimator output			574	466	-	-	6%	8%
Additional trips for non MXD uses	-	-	97	290				
Total estimated	-	-	671	756				
Estimator/counted			0.99	← 2-way				
Unadjusted ITE Trip Generation report			633	512	-	-	0%	0%
Additional trips for non MXD uses	-	-	97	290				
Total estimated	-	-	730	802				
Unadjusted/counted			1.15	←2-way				

[a] Person trips not known for non-MXD uses

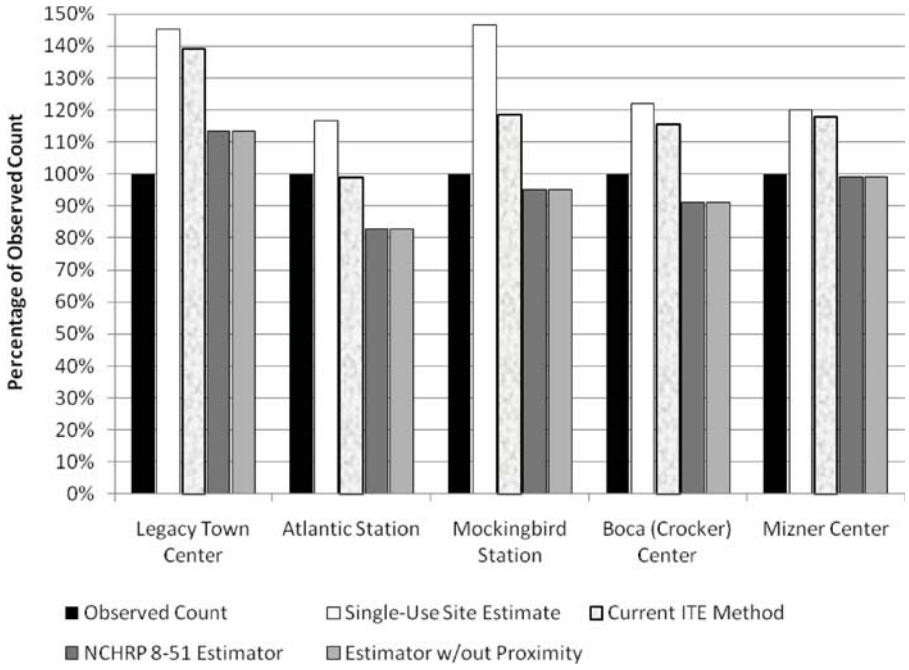


Figure F-1. Comparison of estimates to cordon counts: A.M. peak-hour inbound direction.

developments. This shows more clearly what deviations—above or below actual—were found. Clearly, by examining the figures and Table F-3, it is easy to determine that the raw trip generation greatly overestimates external vehicle trip generation for the validation sites. The existing ITE method is a major improvement from raw trip generation. The recommended method brings the estimates significantly closer to actual. Note that the difference between the actual and absolute value of the errors shows that there are both overestimates and underestimates occurring.

The standard deviation shown in Table F-3 better represents the estimated probable magnitude of error that might

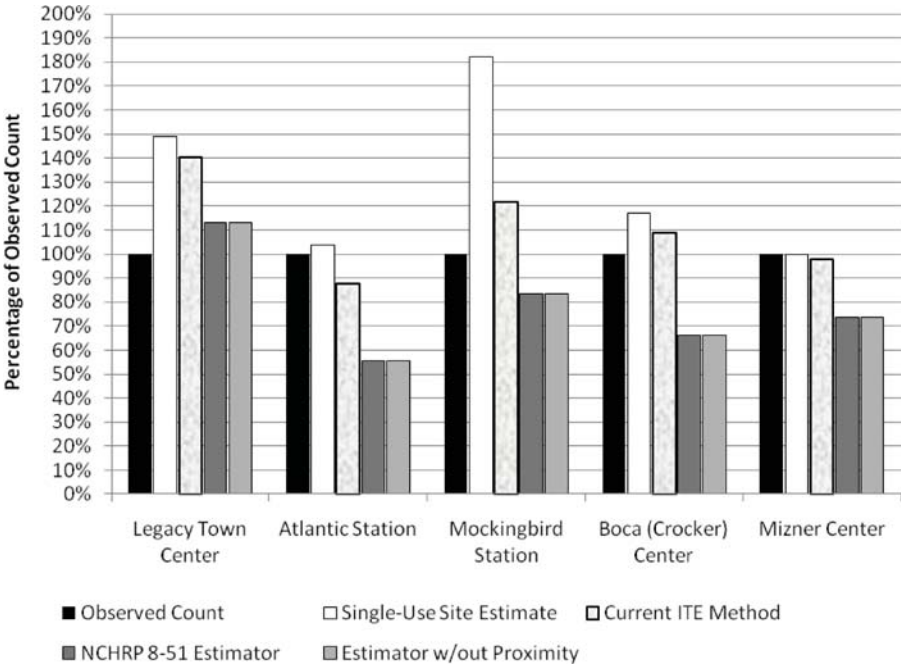


Figure F-2. Comparison of estimates to cordon counts: A.M. peak-hour outbound direction.

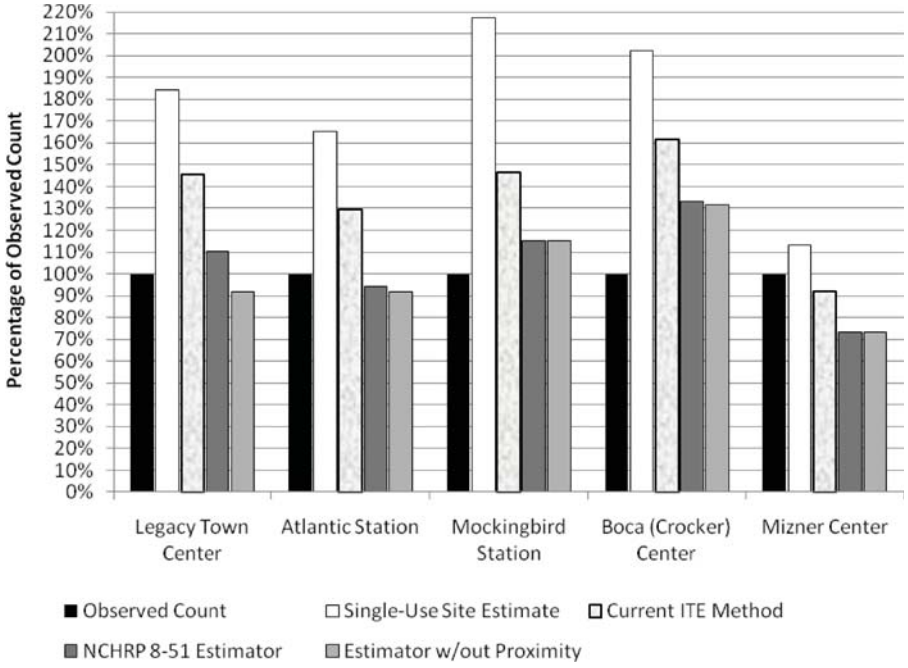


Figure F-3. Comparison of estimates to cordon counts: P.M. peak-hour inbound direction.

occur using these estimation methods. Again, the relative magnitudes of error among the methods place them consistently in the same order.

It is clear that the recommended method provides more accurate estimates. Since the existing ITE method was developed from data from three of the six developments used in this NCHRP project, the recommended method can only be viewed as being a further improvement.

The standard deviations for the recommended method, both with and without proximity adjustment, are about 20 percent of the actual external inbound and outbound volumes. This is less than the variations in the raw ITE nondirectional trip generation rates for the component land uses. For example, for the land uses listed in Table F-1, the standard deviations for their A.M. and P.M. peak hour trip generation rates are all in excess of 50 percent of the mean.

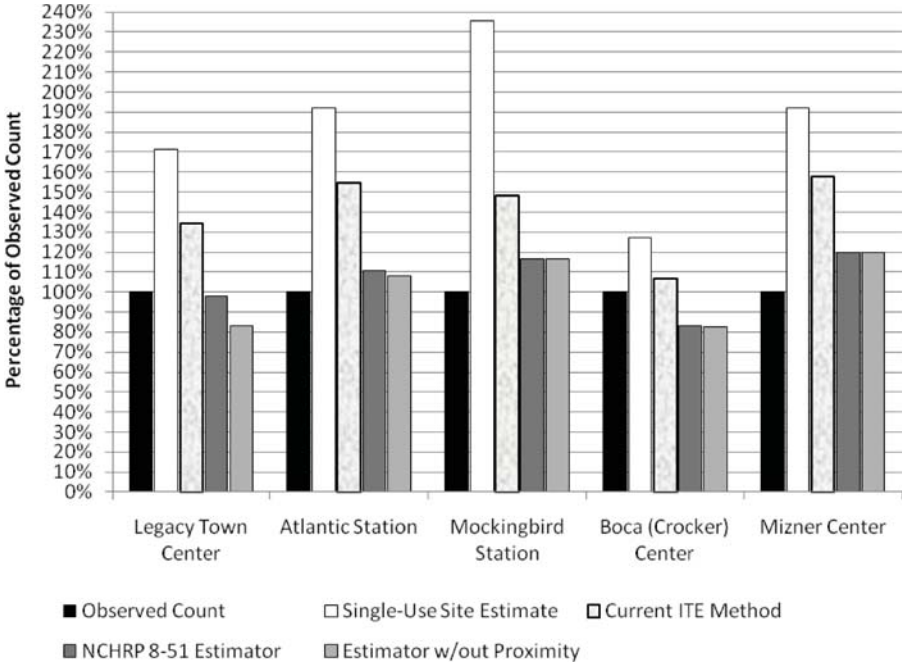


Figure F-4. Comparison of estimates to cordon count: P.M. peak-hour outbound direction.

Table F-3. Comparison of error statistics.

Error Type	Raw ITE Trip Generation	Existing ITE Method	Recommended NCHRP Method		Explanation
			With Proximity Adjustment	No Proximity Adjustment	
Average error	+55%	+26%	-4%	−7%	Average error for sum of all sites
Absolute average error	55	28	17	17	Average magnitude of error per site
Standard deviation	68	34	20	19	Expect two-thirds of site estimates within this error range

Not clear, however, is whether or not the proximity adjustment adds any current value. The validation results show no significant statistical benefit. It has sufficient data only for the P.M. peak period (and less of that than would be desired). There is no A.M. proximity adjustment recommended at this time. On the other hand, the only examples for which the results were better without the proximity adjustment was when both variations of the new method were overestimating. In all cases the proximity adjustment either has no significant effect or renders the estimate more conservative (higher).

Conclusions

The validation supports two principal findings:

1. The recommended method does produce noticeably more accurate results than either raw ITE trip generation estimates from the ITE Trip Generation report or the existing method described in the *Trip Generation Handbook*. This is true with or without the proximity adjustment.
2. The proximity adjustment, available at this time for the P.M. peak period, tends to make slightly more conservative estimates but overall does not, at this time, improve accuracy over a group of estimates. It can produce significant effects for larger developments.

It would be logical for ITE to consider the recommended method for inclusion in the next edition of its *Trip Generation Handbook*. The researchers recommend this since it could increase trip generation estimation accuracy. The advisory committee that ITE uses to review potential new material may wish to test further both the existing method and the recommended method with more MXDs for which it can obtain the needed data. This could help to determine if the proximity adjustment shows enough added value in its current form to be included in the next edition.

In addition, the research team confirmed the desirability and need for more surveys to expand the database. Six samples are far better than three. Addition of several more could possibly provide the basis for confirming the value of the proximity adjustment.

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation



GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

December 2002

PREFACE

The California Department of Transportation (Caltrans) has developed this "Guide for the Preparation of Traffic Impact Studies" in response to a survey of cities and counties in California. The purpose of that survey was to improve the Caltrans local development review process (also known as the Intergovernmental Review/California Environmental Quality Act or IGR/CEQA process). The survey indicated that approximately 30 percent of the respondents were not aware of what Caltrans required in a traffic impact study (TIS).

In the early 1990s, the Caltrans District 6 office located in Fresno identified a need to provide better quality and consistency in the analysis of traffic impacts generated by local development and land use change proposals that effect State highway facilities. At that time, District 6 brought together both public and private sector expertise to develop a traffic impact study guide. The District 6 guide has proven to be successful at promoting consistency and uniformity in the identification and analysis of traffic impacts generated by local development and land use changes.

The guide developed in Fresno was adapted for statewide use by a team of Headquarters and district staff. The guide will provide consistent guidance for Caltrans staff who review local development and land use change proposals as well as inform local agencies of the information needed for Caltrans to analyze the traffic impacts to State highway facilities. The guide will also benefit local agencies and the development community by providing more expeditious review of local development proposals.

Even though sound planning and engineering practices were used to adapt the Fresno TIS guide, it is anticipated that changes will occur over time as new technologies and more efficient practices become available. To facilitate these changes, Caltrans encourages all those who use this guide to contact their nearest district office (i.e., IGR/CEQA Coordinator) to coordinate any changes with the development team.

ACKNOWLEDGEMENTS

The District 6 traffic impact study guide provided the impetus and a starting point for developing the statewide guide. Special thanks is given to Marc Birnbaum for recognizing the need for a TIS guide and for his valued experience and vast knowledge of land use planning to significantly enhance the effort to adapt the District 6 guide for statewide use. Randy Treece from District 6 provided many hours of coordination, research and development of the original guide and should be commended for his diligent efforts. Sharri Bender Ehlert of District 6 provided much of the technical expertise in the adaptation of the District 6 guide and her efforts are greatly appreciated.

A special thanks is also given to all those Cities, Counties, Regional Agencies, Congestion Management Agencies, Consultants, and Caltrans Employees who reviewed the guide and provided input during the development of this Guide for the Preparation of Traffic Impact Studies.

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Appendix "B" Methodology for Calculating Equitable Mitigation Measures
Appendix "C" Measures of Effectiveness by Facility Type

I. INTRODUCTION

Caltrans desires to provide a safe and efficient State transportation system for the citizens of California pursuant to various Sections of the California Streets and Highway Code. This is done in partnership with local and regional agencies through procedures established by the California Environmental Quality Act (CEQA) and other land use planning processes. The intent of this guide is to provide a starting point and a consistent basis in which Caltrans evaluates traffic impacts to State highway facilities. The applicability of this guide for local streets and roads (non-State highways) is at the discretion of the effected jurisdiction.

Caltrans reviews federal, State, and local agency development projects[1], and land use change proposals for their potential impact to State highway facilities. The primary objectives of this guide is to provide:

- guidance in determining if and when a traffic impact study (TIS) is needed,
- consistency and uniformity in the identification of traffic impacts generated by local land use proposals,
- consistency and equity in the identification of measures to mitigate the traffic impacts generated by land use proposals,
- lead agency[2] officials with the information necessary to make informed decisions regarding the existing and proposed transportation infrastructure (see Appendix A, Minimum Contents of a TIS)
- TIS requirements early in the planning phase of a project (i.e., initial study, notice of preparation, or earlier) to eliminate potential delays later,
- a quality TIS by agreeing to the assumptions, data requirements, study scenarios, and analysis methodologies prior to beginning the TIS, and
- early coordination during the planning phases of a project to reduce the time and cost of preparing a TIS.

II. WHEN A TRAFFIC IMPACT STUDY IS NEEDED

The level of service[3] (LOS) for operating State highway facilities is based upon measures of effectiveness (MOEs). These MOEs (see Appendix "C-2") describe the measures best suited for analyzing State highway facilities (i.e., freeway segments, signalized intersections, on- or off-ramps, etc.). Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" (see Appendix "C-3") on State highway facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing MOE should be maintained.

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[1] "Project" refers to activities directly undertaken by government, financed by government, or requiring a permit or other approval from government as defined in Section 21065 of the Public Resources Code and Section 15378 of the California Code of Regulations.

[2] "Lead Agency" refers to the public agency that has the principal responsibility for carrying out or approving a project. Defined in Section 21165 of the Public Resources Code, the "California Environmental Quality Act, and Section 15367 of the California Code of Regulations.

[3] "Level of service" as defined in the latest edition of the Highway Capacity Manual, Transportation Research Board, National Research Council.

A. Trip Generation Thresholds

The following criterion is a starting point in determining when a TIS is needed. When a project:

1. Generates over 100 peak hour trips assigned to a State highway facility
2. Generates 50 to 100 peak hour trips assigned to a State highway facility – and, affected State highway facilities are experiencing noticeable delay; approaching unstable traffic flow conditions (LOS "C" or "D").
3. Generates 1 to 49 peak hour trips assigned to a State highway facility – the following are examples that may require a full TIS or some lesser analysis[4]:
    a. Affected State highway facilities experiencing significant delay; unstable or forced traffic flow conditions (LOS "E" or "F").
    b. The potential risk for a traffic incident is significantly increased (i.e., congestion related collisions, non-standard sight distance considerations, increase in traffic conflict points, etc.).
    c. Change in local circulation networks that impact a State highway facility (i.e., direct access to State highway facility, a non-standard highway geometric design, etc.).

Note: A traffic study may be as simple as providing a traffic count to as complex as a microscopic simulation. The appropriate level of study is determined by the particulars of a project, the prevailing highway conditions, and the forecasted traffic.

B. Exceptions

Exceptions require consultation between the lead agency, Caltrans, and those preparing the TIS. When a project's traffic impact to a State highway facility can clearly be anticipated without a study and all the parties involved (lead agency, developer, and the Caltrans district office) are able to negotiate appropriate mitigation, a TIS may not be necessary.

C. Updating An Existing Traffic Impact Study

A TIS requires updating when the amount or character of traffic is significantly different from an earlier study. Generally a TIS requires updating every two years. A TIS may require updating sooner in rapidly developing areas and not as often in slower developing areas. In these cases, consultation with Caltrans is strongly recommended.

III. SCOPE OF TRAFFIC IMPACT STUDY

Consultation between the lead agency, Caltrans, and those preparing the TIS is recommended before commencing work on the study to establish the appropriate scope. At a minimum, the TIS should include the following:

A. Boundaries of the Traffic Impact Study

All State highway facilities impacted in accordance with the criteria in Section II should be studied. Traffic impacts to local streets and roads can impact intersections with State highway facilities. In these cases, the TIS should include an analysis of adjacent local facilities, upstream and downstream, of the intersection (i.e., driveways, intersections, and interchanges) with the State highway.

[4] A "lesser analysis" may include obtaining traffic counts, preparing signal warrants, or a focused TIS, etc.

B. Traffic Analysis Scenarios

Caltrans is interested in the effects of general plan updates and amendments as well as the effects of specific project entitlements (i.e., site plans, conditional use permits, sub-divisions, rezoning, etc.) that have the potential to impact a State highway facility. The complexity or magnitude of the impacts of a project will normally dictate the scenarios necessary to analyze the project. Consultation between the lead agency, Caltrans, and those preparing the TIS is recommended to determine the appropriate scenarios for the analysis. The following scenarios should be addressed in the TIS when appropriate:

1. When only a general plan amendment or update is being sought, the following scenarios are required:
   a) Existing Conditions - Current year traffic volumes and peak hour LOS analysis of effected State highway facilities.
   b) Proposed Project Only with Select Zone[5] Analysis - Trip generation and assignment for build-out of general plan.
   c) General Plan Build-out Only - Trip assignment and peak hour LOS analysis. Include current land uses and other pending general plan amendments.
   d) General Plan Build-out Plus Proposed Project - Trip assignment and peak hour LOS analysis. Include proposed project and other pending general plan amendments.

2. When a general plan amendment is not proposed and a proposed project is seeking specific entitlements (i.e., site plans, conditional use permits, sub-division, rezoning, etc.), the following scenarios must be analyzed in the TIS:
   a) Existing Conditions - Current year traffic volumes and peak hour LOS analysis of effected State highway facilities.
   b) Proposed Project Only - Trip generation, distribution, and assignment in the year the project is anticipated to complete construction.
   c) Cumulative Conditions (Existing Conditions Plus Other Approved and Pending Projects Without Proposed Project) - Trip assignment and peak hour LOS analysis in the year the project is anticipated to complete construction.
   d) Cumulative Conditions Plus Proposed Project (Existing Conditions Plus Other Approved and Pending Projects Plus Proposed Project) - Trip assignment and peak hour LOS analysis in the year the project is anticipated to complete construction.
   e) Cumulative Conditions Plus Proposed Phases (Interim Years) - Trip assignment and peak hour LOS analysis in the years the project phases are anticipated to complete construction.
3. In cases where the circulation element of the general plan is not consistent with the land use element or the general plan is outdated and not representative of current or future forecasted conditions, all scenarios from Sections III. B. 1. and 2. should be utilized with the exception of duplicating of item 2.a.

[5] "Select zone" analysis represents a project only traffic model run, where the project's trips are distributed and assigned along a loaded highway network. This procedure isolates the specific impact on the State highway network.

IV. TRAFFIC DATA

Prior to any fieldwork, consultation between the lead agency, Caltrans, and those preparing the TIS is recommended to reach consensus on the data and assumptions necessary for the study. The following elements are a starting point in that consideration.

A. Trip Generation

The latest edition of the Institute of Transportation Engineers' (ITE) TRIP GENERATION report should be used for trip generation forecasts. Local trip generation rates are also acceptable if appropriate validation is provided to support them.

1. Trip Generation Rates – When the land use has a limited number of studies to support the trip generation rates or when the Coefficient of Determination (R^2) is below 0.75, consultation between the lead agency, Caltrans and those preparing the TIS is recommended.
2. Pass-by Trips[6] – Pass-by trips are only considered for retail oriented development. Reductions greater than 15% requires consultation and acceptance by Caltrans. The justification for exceeding a 15% reduction should be discussed in the TIS.
3. Captured Trips[7] – Captured trip reductions greater than 5% requires consultation and acceptance by Caltrans. The justification for exceeding a 5% reduction should be discussed in the TIS.
4. Transportation Demand Management (TDM) – Consultation between the lead agency and Caltrans is essential before applying trip reduction for TDM strategies.

NOTE: Reasonable reductions to trip generation rates are considered when adjacent State highway volumes are sufficient (at least 5000 ADT) to support reductions for the land use.

B. Traffic Counts

Prior to field traffic counts, consultation between the lead agency, Caltrans and those preparing the TIS is recommended to determine the level of detail (e.g., location, signal timing, travel speeds, turning movements, etc.) required at each traffic count site. All State highway facilities within the boundaries of the TIS should be considered. Common rules for counting vehicular traffic include but are not limited to:

1. Vehicle counts should be conducted on Tuesdays, Wednesdays, or Thursdays during weeks not containing a holiday and conducted in favorable weather conditions.
2. Vehicle counts should be conducted during the appropriate peak hours (see peak hour discussion below).
3. Seasonal and weekend variations in traffic should also be considered where appropriate (i.e., recreational routes, tourist attractions, harvest season, etc.).

C. Peak Hours

To eliminate unnecessary analysis, consultation between the lead agency, Caltrans and those preparing the TIS is recommended during the early planning stages of a project. In general, the TIS should include a morning (a.m.) and an evening (p.m.) peak hour analyses. Other peak hours (e.g., 11:30 a.m. to 1:30 p.m., weekend, holidays, etc.) may also be required to determine the significance of the traffic impacts generated by a project.

[6] "Pass-by" trips are made as intermediate stops between an origin and a primary trip destination (i.e., home to work, home to shopping, etc.).
[7] "Captured Trips" are trips that do not enter or leave the driveways of a project's boundary within a mixed-use development.

D. Travel Forecasting (Transportation Modeling)

The local or regional traffic model should reflect the most current land use and planned improvements (i.e., where programming or funding is secured). When a general plan build-out model is not available, the closest forecast model year to build-out should be used. If a traffic model is not available, historical growth rates and current trends can be used to project future traffic volumes. The TIS should clearly describe any changes made in the model to accommodate the analysis of a proposed project.

V. TRAFFIC IMPACT ANALYSIS METHODOLOGIES

Typically, the traffic analysis methodologies for the facility types indicated below are used by Caltrans and will be accepted without prior consultation. When a State highway has saturated flows, the use of a micro-simulation model is encouraged for the analysis (please note however, the micro-simulation model must be calibrated and validated for reliable results). Other analysis methods may be accepted, however, consultation between the lead agency, Caltrans and those preparing the TIS is recommended to agree on the data necessary for the analysis.

A. Freeway Segments – Highway Capacity Manual (HCM)*, operational analysis
B. Weaving Areas – Caltrans Highway Design Manual (HDM)
C. Ramps and Ramp Junctions – HCM*, operational analysis or Caltrans HDM, Caltrans Ramp Metering Guidelines (most recent edition)
D. Multi-Lane Highways – HCM*, operational analysis
E. Two-lane Highways – HCM*, operational analysis
F. Signalized Intersections[8] – HCM*, Highway Capacity Software**, operational analysis, TRAFFIX™**, Synchro**, see footnote 8
G. Unsignalized Intersections – HCM*, operational analysis, Caltrans Traffic Manual for signal warrants if a signal is being considered
H. Transit – HCM*, operational analysis
I. Pedestrians – HCM*
J. Bicycles – HCM*
K. Caltrans Criteria/Warrants – Caltrans Traffic Manual (stop signs, traffic signals, freeway lighting, conventional highway lighting, school crossings)
L. Channelization – Caltrans guidelines for Reconstruction of Intersections, August 1985, Ichiro Fukutome

*The most current edition of the Highway Capacity Manual, Transportation Research Board, National Research Council, should be used.

****NOTE**: Caltrans does not officially advocate the use of any special software. However, consistency with the HCM is advocated in most but not all cases. The Caltrans local development review units utilize the software mentioned above. If different software or analytical techniques are used for the TIS then consultation between the lead agency, Caltrans and those preparing the TIS is recommended. Results that are significantly different than those produced with the analytical techniques above should be challenged.

[8] The procedures in the Highway Capacity Manual "do not explicitly address operations of closely spaced signalized intersections. Under such conditions, several unique characteristics must be considered, including spill-back potential from the downstream intersection to the upstream intersection, effects of downstream queues on upstream saturation flow rate, and unusual platoon dispersion or compression between intersections. An example of such closely spaced operations is signalized ramp terminals at urban interchanges. Queue interactions between closely spaced intersections may seriously distort the procedures in" the HCM.

VI. MITIGATION MEASURES

The TIS should provide the nexus [Nollan v. California Coastal Commission, 1987, 483 U.S. 825 (108 S.Ct. 314)] between a project and the traffic impacts to State highway facilities. The TIS should also establish the rough proportionality [Dolan v. City of Tigard, 1994, 512 U.S. 374 (114 S. Ct. 2309)] between the mitigation measures and the traffic impacts. One method for establishing the rough proportionality or a project proponent's equitable responsibility for a project's impacts is provided in Appendix "B." Consultation between the lead agency, Caltrans and those preparing the TIS is recommended to reach consensus on the mitigation measures and who will be responsible.

Mitigation measures must be included in the traffic impact analysis. This determines if a project's impacts can be eliminated or reduced to a level of insignificance. Eliminating or reducing impacts to a level of insignificance is the standard pursuant to CEQA and the National Environmental Policy Act (NEPA). The lead agency is responsible for administering the CEQA review process and has the principal authority for approving a local development proposal or land use change. Caltrans, as a responsible agency, is responsible for reviewing the TIS for errors and omissions that pertain to State highway facilities. However, the authority vested in the lead agency under CEQA does not take precedence over other authorities in law.

If the mitigation measures require work in the State highway right-of-way an encroachment permit from Caltrans will be required. This work will also be subject to Caltrans standards and specifications. Consultation between the lead agency, Caltrans and those preparing the TIS early in the planning process is strongly recommended to expedite the review of local development proposals and to reduce conflicts and misunderstandings in both the local agency CEQA review process as well as the Caltrans encroachment permit process.

APPENDIX “A”

MINIMUM CONTENTS

OF A

TRAFFIC IMPACT STUDY

MINIMUM CONTENTS OF TRAFFIC IMPACT STUDY REPORT

I. EXECUTIVE SUMMARY

II. TABLE OF CONTENTS

A. List of Figures (Maps)
B. List of Tables

III. INTRODUCTION

A. Description of the proposed project
B. Location of project
C. Site plan including all access to State highways (site plan, map)
D. Circulation network including all access to State highways (vicinity map)
E. Land use and zoning
F. Phasing plan including proposed dates of project (phase) completion
G. Project sponsor and contact person(s)
H. References to other traffic impact studies

IV. TRAFFIC ANALYSIS

A. Clearly stated assumptions
B. Existing and projected traffic volumes (including turning movements), facility geometry (including storage lengths), and traffic controls (including signal phasing and multi-signal progression where appropriate) (figure)
C. Project trip generation including references (table)
D. Project generated trip distribution and assignment (figure)
E. LOS and warrant analyses - existing conditions, cumulative conditions, and full build of general plan conditions with and without project

V. CONCLUSIONS AND RECOMMENDATIONS

A. LOS and appropriate MOE quantities of impacted facilities with and without mitigation measures
B. Mitigation phasing plan including dates of proposed mitigation measures
C. Define responsibilities for implementing mitigation measures
D. Cost estimates for mitigation measures and financing plan

VI. APPENDICES

A. Description of traffic data and how data was collected
B. Description of methodologies and assumptions used in analyses
C. Worksheets used in analyses (i.e., signal warrant, LOS, traffic count information, etc.)

APPENDIX “B”

METHODOLOGY FOR

CALCULATING EQUITABLE

MITIGATION MEASURES

METHOD FOR CALCULATING EQUITABLE MITIGATION MEASURES

The methodology below is neither intended as, nor does it establish, a legal standard for determining equitable responsibility and cost of a project's traffic impact, the intent is to provide:

1. A starting point for early discussions to address traffic mitigation equitably.
2. A means for calculating the equitable share for mitigating traffic impacts.
3. A means for establishing rough proportionality [Dolan v. City of Tigard, 1994, 512 U.S. 374 (114 S. Ct. 2309)].

The formulas should be used when:

- A project has impacts that do not immediately warrant mitigation, but their cumulative effects are significant and will require mitigating in the future.
- A project has an immediate impact and the lead agency has assumed responsibility for addressing operational improvements

NOTE: This formula is not intended for circumstances where a project proponent will be receiving a substantial benefit from the identified mitigation measures. In these cases, (e.g., mid-block access and signalization to a shopping center) the project should take full responsibility to toward providing the necessary infrastructure.

EQUITABLE SHARE RESPONSIBILITY: **Equation C-1**

NOTE: $T_E < T_B$, see explanation for T_B below.

$$P = \frac{T}{T_B - T_E}$$

Where:

P = The equitable share for the proposed project's traffic impact.

T = The vehicle trips generated by the project during the peak hour of adjacent State highway facility in vehicles per hour, vph.

T_B = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (e.g., 20 year model or the furthest future model date feasible), vph.

T_E = The traffic volume existing on the impacted State highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

EQUITABLE COST: **Equation C-2**

$$C = P\ (C_T)$$

Where:

C = The equitable cost of traffic mitigation for the proposed project, ($). (Rounded to nearest one thousand dollars)

P = The equitable share for the project being considered.

C_T = The total cost estimate for improvements necessary to mitigate the forecasted traffic demand on the impacted State highway facility in question at general plan build-out, ($).

NOTES

1. Once the equitable share responsibility and equitable cost has been established on a per trip basis, these values can be utilized for all projects on that State highway facility until the forecasted general plan build-out model is revised.
2. Truck traffic should be converted to passenger car equivalents before utilizing these equations (see the Highway Capacity Manual for converting to passenger car equivalents).

3. If the per trip cost is not used for all subsequent projects, then the equation below will be necessary to determine the costs for individual project impact and will require some additional accounting.

Equation C-2.A

$$C = P\,(C_T - C_C)$$

Where:

C = Same as equation C-2.

P = Same as equation C-2.

C_T = Same as equation C-2.

C_C = The combined dollar contributions paid and committed prior to current project's contribution. This is necessary to provide the appropriate cost proportionality. Example: For the first project to impact the State highway facility in question since the total cost (C_T) estimate for improvements necessary to mitigate the forecasted traffic demand, C_C would be equal to zero. For the second project however, C would equal $P_2(C_T - C_1)$ and for the third project to come along C would equal $P_3[C_T - (C_1 + C_2)]$ and so on until build-out or the general plan build-out was recalculated.

APPENDIX “C”

MEASURES OF EFFECTIVENESS

BY

FACILITY TYPE

MEASURES OF EFFECTIVENESS BY FACILITY TYPE

TYPE OF FACILITY	MEASURE OF EFFECTIVENESS (MOE)
Basic Freeway Segments	Density (pc/mi/ln)
Ramps	Density (pc/mi/ln)
Ramp Terminals	Delay (sec/veh)
Multi-Lane Highways	Density (pc/mi/ln)
Two-Lane Highways	Percent-Time-Following Average Travel Speed (mi/hr)
Signalized Intersections	Control Delay per Vehicle (sec/veh)
Unsignalized Intersections	Average Control Delay per Vehicle (sec/veh)
Urban Streets	Average Travel Speed (mi/hr)

Measures of effectiveness for level of service definitions located in the most recent version of the Highway Capacity Manual, Transportation Research Board, National Research Council.

Transition between LOS "C" and LOS "D" Criteria

(Reference Highway Capacity Manual)

BASIC FREEWAY SEGMENTS @ 65 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	65.0	0.30	710
B	18	65.0	0.50	1170
C	26	64.6	0.71	1680
D	35	59.7	0.89	2090
E	45	52.2	1.00	2350

SIGNALIZED INTERSECTIONS and RAMP TERMINALS

LOS	Control Delay per Vehicle (sec/veh)
A	**≤ 10**
B	**> 10 - 20**
C	**> 20 - 35**
D	**> 35 - 55**
E	**> 55 - 80**
F	**> 80**

MULTI-LANE HIGHWAYS @ 55 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	55.0	0.29	600
B	18	55.0	0.47	990
C	26	54.9	0.68	1430
D	35	52.9	0.88	1850
E	41	51.2	1.00	2100

Dotted line represents the transition between LOS "C" and LOS "D"

TWO-LANE HIGHWAYS

LOS	Percent Time-Spent-Following	Average Travel Speed (mi/hr)
A	35	> 55
B	> 35 - 50	> 50 - 55
C	> 50 - 65	> 45 - 50
D	> 65 - 80	> 40 - 45
E	> 80	40

URBAN STREETS

Urban Street Class	I	II	III	IV
Range of FFS	55 to 45 mi/hr	45 to 35 mi/hr	35 to 30 mi/hr	35 to 25 mi/hr
Typical FFS	50 mi/hr	40 mi/hr	35 mi/hr	30 mi/hr
LOS	Average Travel Speed (mi/hr)			
A	> 42	> 35	> 30	> 25
B	> 34 - 42	> 28 - 35	> 24 - 30	> 19 - 25
C	> 27 - 34	> 22 - 28	> 18 - 24	> 13 - 19
D	> 21 - 27	> 17 - 22	> 14 - 18	> 9 - 13
E	> 16 - 21	> 13 - 17	> 10 - 14	> 7 - 9
F	16	13	10	7

Dotted line represents the transition between LOS "C" and LOS "D"

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Governor

MARIA CONTRERAS-SWEET
Secretary
Business, Transportation and Housing Agency

JEFF MORALES
Director
California Department of Transportation

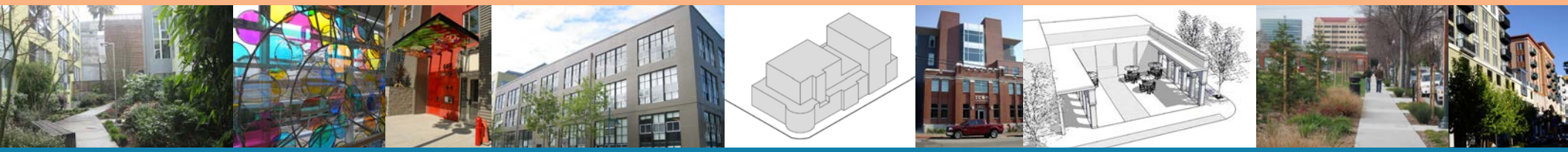
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Additional copies of these guidelines can be copied from the internet at,
http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/



EMERYVILLE DESIGN GUIDELINES

CITY OF EMERYVILLE | Adopted December 7, 2010

Amended August 7, 2012
Amended May 19, 2015

EMERYVILLE DESIGN GUIDELINES

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Urban and Regional Planners

EMERYVILLE DESIGN GUIDELINES

CITY OF EMERYVILLE | Adopted December 7, 2010

Amended August 7, 2012
Amended May 19, 2015

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1 Introduction

PURPOSE

The Emeryville Design Guidelines provide guidance for achieving high quality design. While the Guidelines largely address private development and its relationship to the public realm, guidelines for street landscaping and sidewalk design are also outlined. The Guidelines are intended to assist project applicants during the project design phase and City staff and decision makers in the review and approval process to meet the spirit of urban design goals. They provide specific and broad recommendations to create high quality buildings and site plans that will result in more attractive, livable, and safe streets and districts. They aim to be prescriptive enough to create a framework for design and to carry out the community's urban design vision—articulated in the General Plan Urban Design Element and applicable area plans—but flexible enough to allow for creativity and innovation in design and planning.

HOW DO THE DESIGN GUIDELINES FIT IN TO THE REGULATORY PROCESS?

Basis for Design Review

Conformance with the General Plan and Zoning Ordinance are requirements for project approval. These Design Guidelines provide supplementary and advisory recommendations for developers and architects as they are designing their projects. They also serve as the basis for design review by the City, assisting City staff and decision makers in evaluating projects. Details of the design review process can be found in the Zoning Ordinance.

Relationship to Other Plans and Programs

GENERAL PLAN

These Guidelines build on the guiding principles of the Emeryville General Plan, which express the community's vision for Emeryville's evolution from a center for commerce into a livable and diverse city for residents, workers, and visitors. The General Plan includes an Urban Design Element (chapter 5) which establishes the City's design related goals and policies.

These Guidelines take implementation a step further by providing specific guidance for project design to meet the intent of General Plan goals, policies, and actions. For example, the Design Guidelines outline recommendations for site planning to improve pedestrian accessibility; for open space to maximize sunlight; and for landscaping to improve air quality, stormwater management, and visual beauty.

PLANNING REGULATIONS

The Planning Regulations establish development standards for many elements of building and site planning, including massing, setbacks, open space, landscaping, parking, and site design. Collectively, these requirements shape the relationship of the building to the street and the look and feel of a community. The Guidelines supplement objective standards in the Planning Regulations with qualitative direction—providing a broader illustration and interpretation of the individual standards and examples for how project applicants can meet requirements and the intent of the City's vision.

SPECIFIC AND AREA PLANS

The City maintains plans for districts and neighborhoods and may prepare additional documents in the future that address design of streets, parks, and other public infrastructure. By law, these plans must be consistent with the General Plan.

Both these Design Guidelines and any relevant area plan should be consulted by the project applicant. As the area plans are tailored to the unique needs of different areas, provisions of these plans take precedence if there are conflicts. Currently, area plans include:

- North Hollis Area Urban Design Program
- San Pablo Avenue Urban Design Plan
- South Bayfront Design Guidelines
- Park Avenue District Plan
- Shellmound Design Guidelines

ORGANIZATION

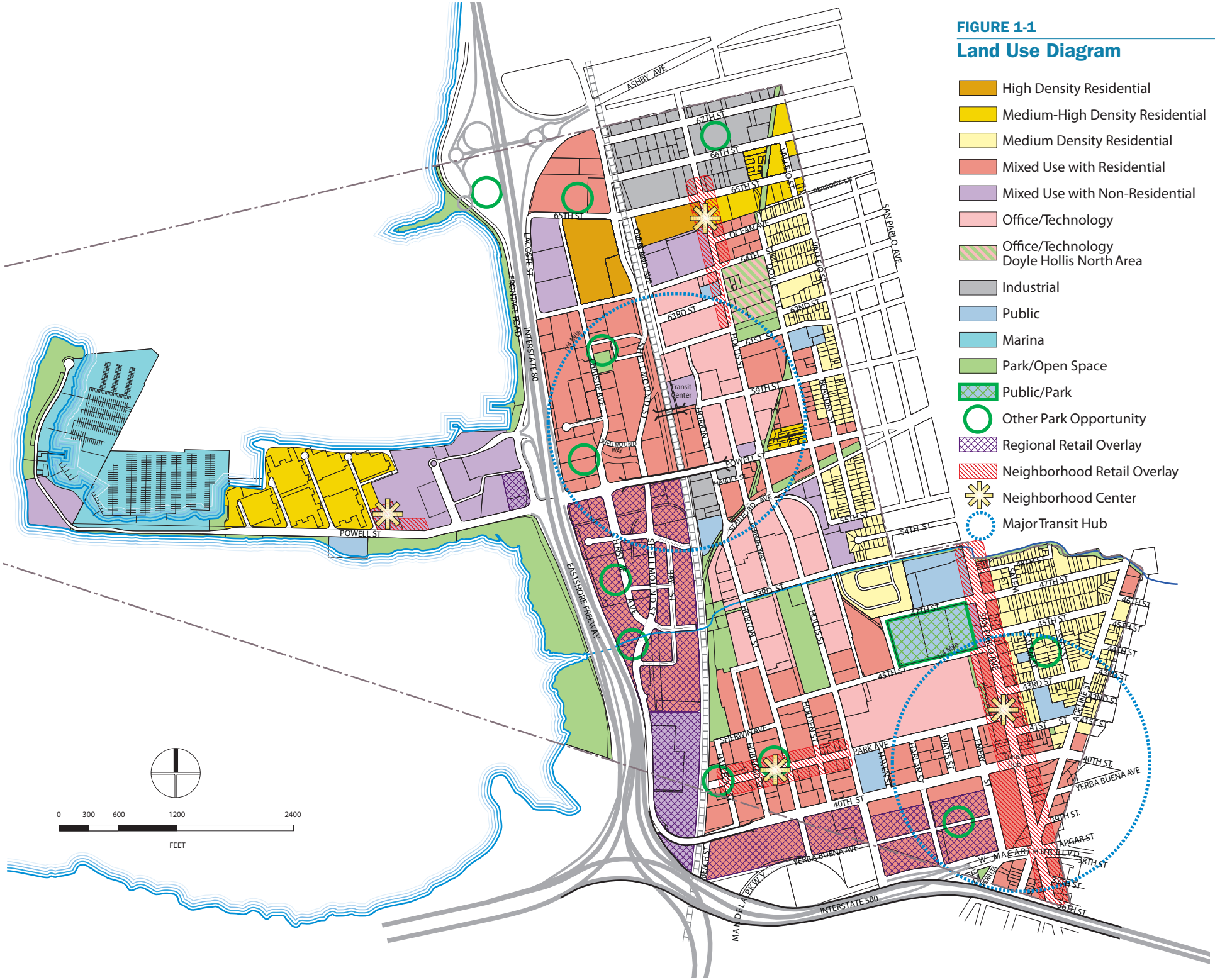
The document is organized into two chapters, following this introduction.

- **Chapter 2: General Guidelines:** This chapter provides general guidelines that are applicable to all projects regardless of site location or use. Topics include:
    - Sidewalks and Landscaping
    - Parking and Access
    - Site Planning
    - Building Massing
    - Building Form and Articulation
    - Architecture and Building Materials
    - Open Space
    - Signs
- **Chapter 3: Area Specific Guidelines and Building Type Guidelines:** This chapter supplements the General Guidelines, providing guidelines applicable to specific General Plan designations and/or building/use type. This chapter highlights guidelines that are unique to each category and do not reiterate general guidelines addressed in Chapter 2.

  Property owners should refer to the figures on the following pages to determine relevant Area Specific Guidelines and Building Type Guidelines (also consult the General Plan for any amendments that have been made). Area Specific and Building Type categories include:

    - Area Specific
        - Regional Retail Overlay
        - Neighborhood Retail Overlay and Neighborhood Centers
        - Eastern Residential Neighborhoods
        - Pedestrian Priority Zones
        - Gateways
        - Greenways and Green Streets
        - Transit Hubs
        - Freeway/Railway Adjacent
    - Building and Use Types
        - Mixed Use Developments
        - Retail
        - Industrial
        - Civic and Public Buildings
        - Office/Technology
        - Residential
        - Family-Friendly Residential
    - Street Types
        - Local Streets
        - Connector Streets
        - Auto Dominant Highways
        - Bicycle Boulevards, Paths and Routes
        - Transit Streets

FIGURE 1-1
Land Use Diagram



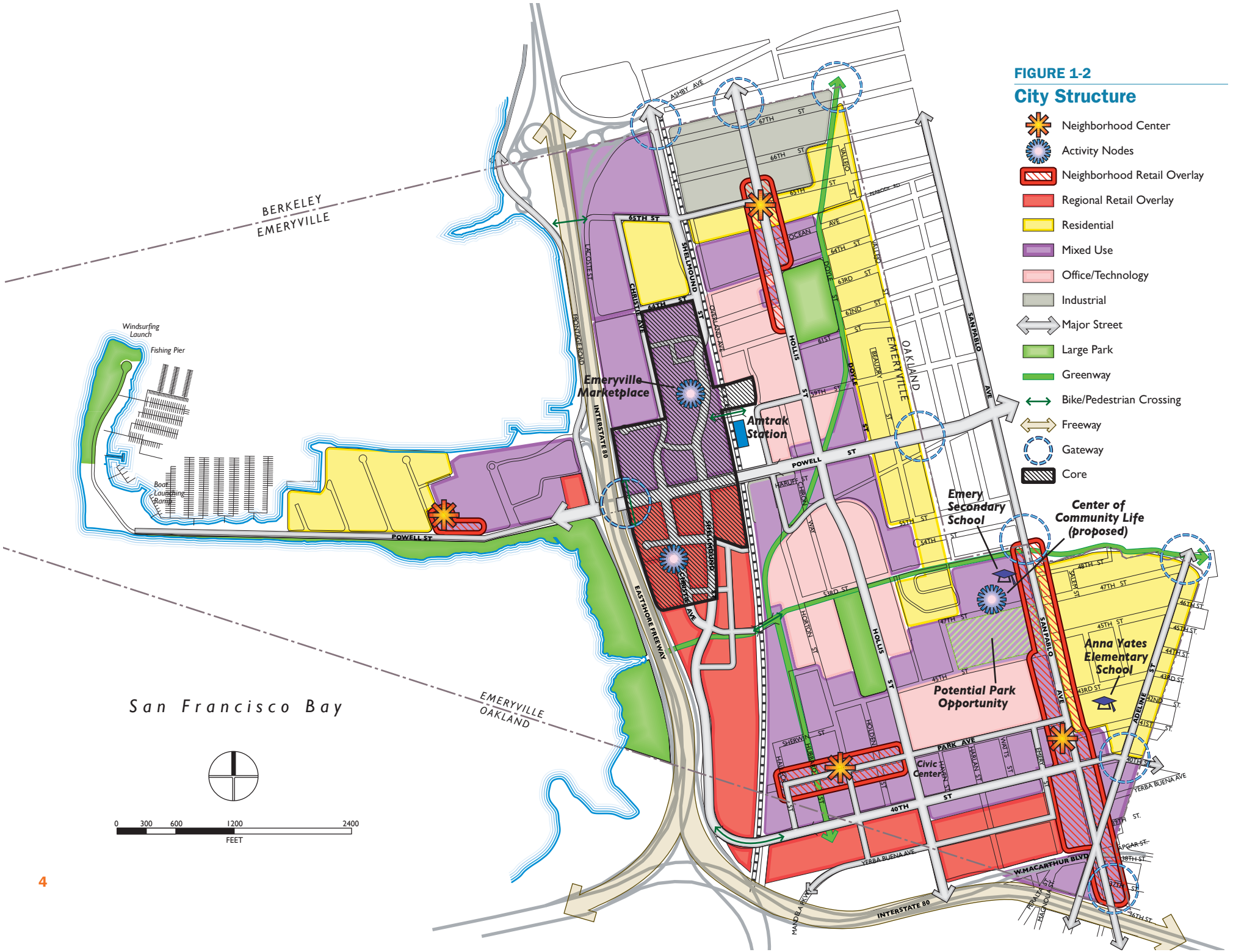


FIGURE 1-2

City Structure

- Neighborhood Center
- Activity Nodes
- Neighborhood Retail Overlay
- Regional Retail Overlay
- Residential
- Mixed Use
- Office/Technology
- Industrial
- Major Street
- Large Park
- Greenway
- Bike/Pedestrian Crossing
- Freeway
- Gateway
- Core

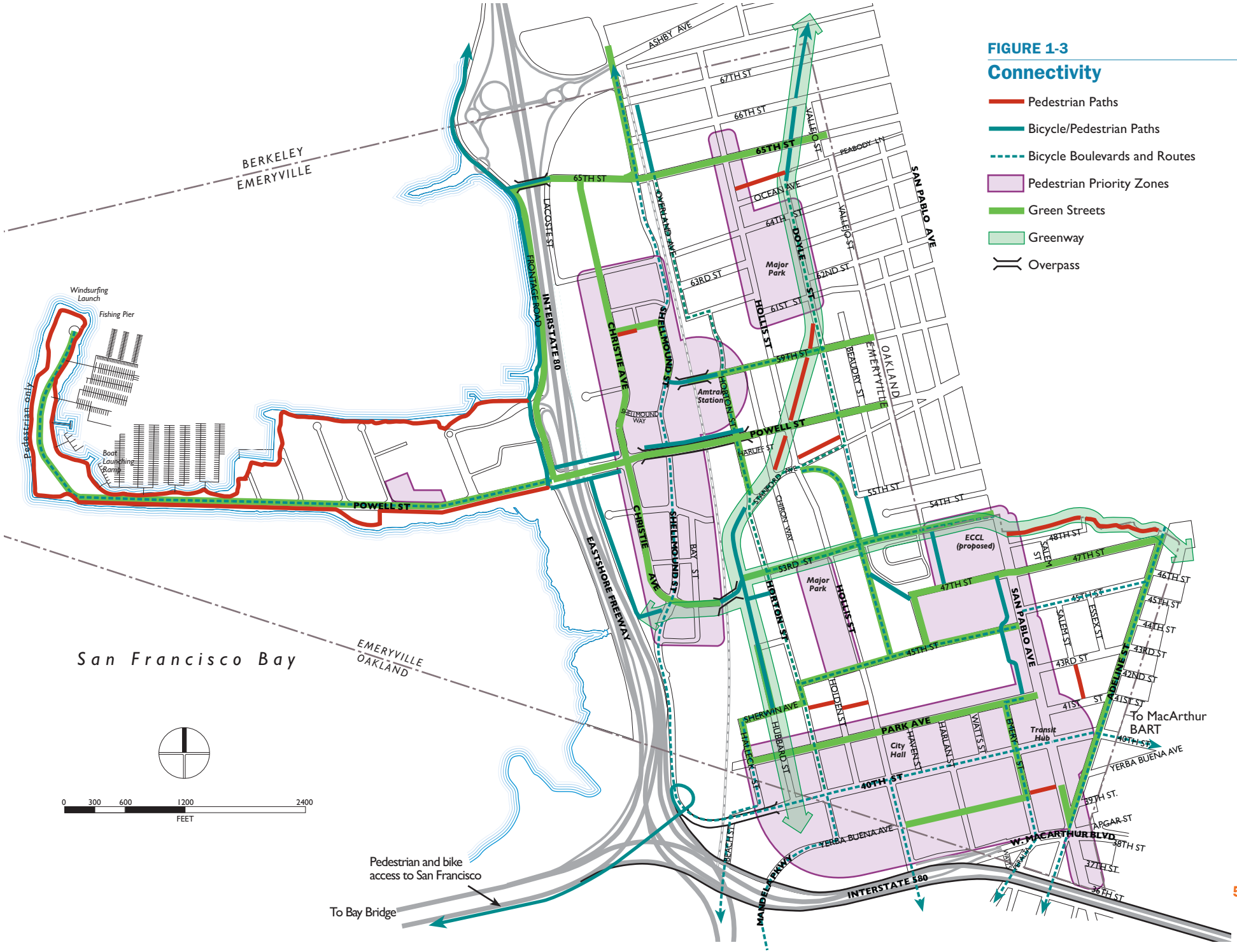


FIGURE 1-3

Connectivity

- Pedestrian Paths
- Bicycle/Pedestrian Paths
- Bicycle Boulevards and Routes
- Pedestrian Priority Zones
- Green Streets
- Greenway
- Overpass

2 General Guidelines

The guidelines in this chapter apply to all sites in Emeryville, regardless of building/land use type or location.

A SIDEWALKS AND LANDSCAPING

How a building or series of buildings relate to the sidewalk and street affects the experience of the pedestrian, bicyclist, or driver passing by. The sidewalk serves multiple active and passive purposes. The following guidelines consider the interface between private development and the public realm in order to create a pedestrian-scaled experience. Sidewalk and curb standards, and the Urban Forestry Ordinance can be found in Title 7: Public Works of the Emeryville Municipal Code.

SIDEWALKS

A-1 Consider the following three components in the design of the sidewalk area:

A. Building Entry/Public Space: This area furthest from the curb represents the interface between the street and the building, providing accessibility and visibility between buildings and the street. Building entrances may be signified with architectural detailing, articulation, canopies, or signage. On active pedestrian streets, this area may include space for outdoor dining, displays (e.g. produce stands), and plazas. (See "Neighborhood Retail Overlay and Neighborhood Centers" and "Pedestrian Priority Zones" in Section I: Area Specific Guidelines)

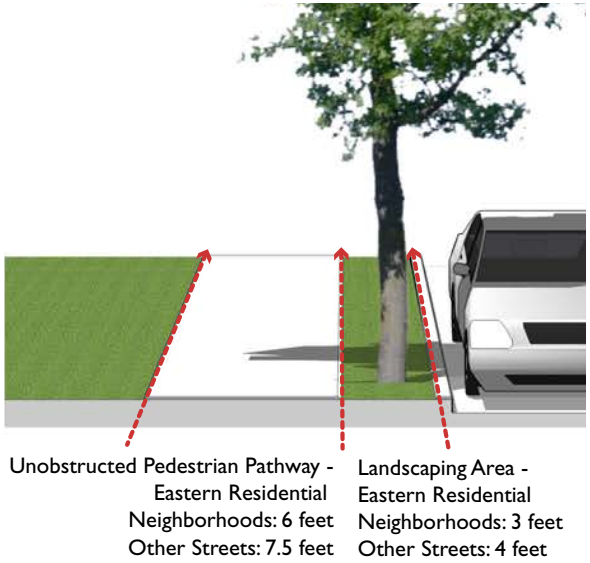
B. Pedestrian Pathway: This middle area is the unobstructed path of travel for pedestrians.

C. Landscaping/Street Furniture: The area closest to the curb provides space for street trees, landscaping, street lights, bus stops, street signs, benches, trash/recycle bins, bicycle parking, and other street furniture. This area also represents the barrier between parking or driving/biking lanes and the pedestrian pathway.

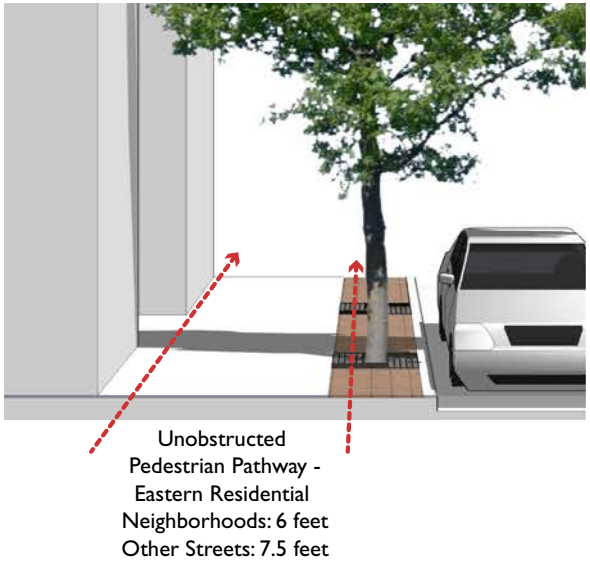
DESIRABLE



This graphic shows the sidewalk as three distinct components. Area A shows the café entry and outdoor seating. Area B shows a clear travel lane for pedestrians. Area C shows street furniture and lush trees. The result is an active and vibrant sidewalk.



Maintain an unobstructed pedestrian pathway and landscaping area.



If vegetative strips are infeasible, tree grates may be constructed as a last resort to accommodate up to six inches of the pedestrian pathway minimum.

A-2 Maintain an unobstructed pedestrian pathway of a minimum of six feet in the Eastern Residential Neighborhoods (Triangle and Doyle Street neighborhoods) and 7.5 feet on all other streets in the city. For sites within a Regional Retail Overlay, Neighborhood Center/Neighborhood Retail Overlay, Greenway, Green Street, Pedestrian Priority Zone, or Eastern Residential Neighborhood area, additional sidewalk corridor guidelines are provided in Section I: Area Specific Guidelines.

A-3 Maintain a landscaping area of a minimum of three feet in the Eastern Residential Neighborhood and four feet on all other streets in the city.

A-4 Although vegetative strips are preferred (see "Street Landscaping" on page 11), if infeasible, tree grates may be constructed, as a last resort, to accommodate up to six inches of the pedestrian pathway minimum. Tree grates should be flush with the sidewalk, ensuring the safety of pedestrians, and designed to protect the health of the tree.

DESIRABLE



The redesigned Park Avenue enjoys wide sidewalks, with 9 to 11 foot pedestrian pathways, benches, brick pavers in the landscaped area, unique lampposts, creating an attractive streetscape that is safe and inviting for pedestrians.

UNDESIRABLE



Utilities should be sited away from the pedestrian pathway.

DESIRABLE



If tree grates are necessary to meet the minimum unobstructed pedestrian path guideline, they should be constructed flush with the sidewalk..

UNDESIRABLE



On this Downtown San Francisco street, street trees are planted toward the center of the sidewalk, limiting the pedestrian pathway to only four feet. The 1.5-foot area between the street tree and the curb is essentially unusable.

> "Lowly, unpurposeful and random as they appear, sidewalk contacts are the small change from which a city's wealth of public life must grow."
>
> **- Jane Jacobs**

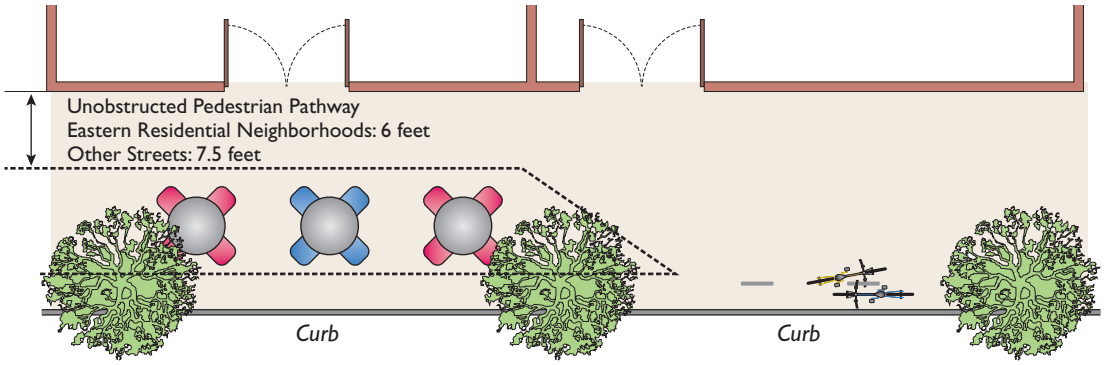
DESIRABLE



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In this Palo Alto example, a mid-block connection creates a finer street grid and a more pedestrian oriented character. The path receives nearly as much architectural and streetscape attention as a public street, providing opportunities for outdoor dining and landscaping.

DESIRABLE



This plan view illustrates how a clear pedestrian path can be maintained even with sidewalk seating and landscaping.

A-5 Variation in pavers may be used to delineate the active use of pedestrian pathways and passive uses, including landscaping, street furniture, and public space areas.

A-6 Where there are multiple street frontages prioritize streetscape improvements along the primary street frontage. Secondary streets should be well designed, but may not require the same level of investment.

A-7 Adequate lighting should be provided on streets to ensure safety and usability at night. Direct lighting down, not up and out, with fully-shielded fixtures.

A-8 Underground utility boxes, transformers, and lines, where possible, or locate these outside the pedestrian pathway in order to provide unobstructed walkways and views.

A-9 Where desirable, wide sidewalks should be provided to allow outdoor dining or other retail uses, while maintaining an adequate continuous walkway for pedestrians.

A-10 Encourage the multi-functionality and flexibility of streets, by supporting various modes of travel and pedestrian and bicycle amenities (e.g. street furniture and bicycle parking).

STREET LANDSCAPING

A-11 Design streetscapes that provide distinction, identity, and unified cohesive appearance.

A-12 Select tree species that enable sunlight to filter along most streets in the winter, while providing appropriate shade during summer. (The City will establish a unified planting palette to define corridors and promote continuity, distinction, and identity.)

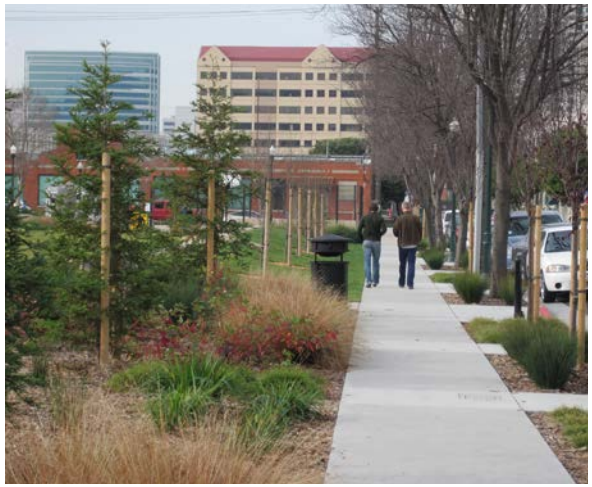
A-13 Design generous planting strips in the landscaping/street furniture area, where feasible. Support the development of large healthy trees and tree canopies by reducing concrete area and other barriers to root growth, using City standards for compost and mulch, and rootable soil volumes.

A-14 Follow the City's Stormwater Guidelines for Green, Dense Redevelopment, which includes measures such as bioretention basins, biofiltration swales, cisterns integrated into the architecture, and/or green roofs, to meet stormwater treatment thresholds.

A-15 Follow Bay-Friendly Landscaping guidelines. These guidelines represent a whole systems approach to the design, construction and maintenance of the landscape in order to support the integrity of the San Francisco Bay watershed. Key components include:

- Reducing waste and using materials that contain recycled content.
- Nurturing healthy soils with mulch and compost while reducing fertilizer use.
- Conserving water, energy and topsoil.
- Using Integrated Pest Management to minimize chemical use and prevent pollution.
- Reducing stormwater runoff.
- Creating wildlife habitat.

DESIRABLE



Bay-Friendly landscaping along Doyle Hollis Park delineates the park edge, provides an attractive and safe sidewalk, and helps to manage stormwater through bioswales.

DESIRABLE



These Portland, Oregon examples demonstrate how stormwater management can be integrated into the streetscape, through the use of vegetated swales, rain gardens, and native plants.

UNDESIRABLE



At the north end of Hollis Street, narrow sidewalks and limited street trees create an uninviting street for pedestrians.

> "Street trees are a simple intervention that is almost universally of value to walkability."
>
> **- Kevin Klinkenberg**

B PARKING AND ACCESS

These guidelines seek to provide adequate and convenient parking and loading areas while minimizing their visibility, to prevent conflicts between vehicles and pedestrians and cyclists, and to reduce paved areas which cause the urban heat island effect. Readers should also refer to the parking requirements in the City's Zoning Ordinance.

> "The more parking space, the less sense of place."
>
> **- Jane Holtz Kay**

B-1 Design parking below grade or encapsulated within buildings to reduce the visual impact. Prioritize active uses on the ground level.

B-2 Limit the number of curb cuts and driveway entrances to reduce conflicts with pedestrians. Locate the entrance on a side street where feasible. If a driveway entrance is located on the primary street frontage, minimize the length of the curb cut and explore sharing driveways and/or loading areas with adjacent property owners.

B-3 Where drop-off facilities are necessary, limit curb cuts, by providing curbside drop-off locations or co-locating with driveways or parking garage entrances.

B-4 Loading should be designed to be off the public right-of-way. Service areas should be accessible for truck drivers, with appropriate access from docks into buildings. Avoid locating access to loading areas on major streets.

B-5 Design structured parking as an integral part of the project it serves, consistent in style and materials with the rest of the project. This will enhance the visual interest of the parking structure and reduce its apparent mass at the ground level. This can be achieved through some or all of the following means:

- Use the same cadence of windows and massing as in adjoining or adjacent buildings.
- Compose openings within the parking structure façade to appear similar to well-proportioned windows rather than continuous open strips.
- Use contrasting, high-quality materials that generate a multi-layered façade (for example glass, perforated metal, or decorative screens).
- Employ landscaping (such as green screen, vines, or landscaped trellis) as a screening, as long as it is compatible with building design.
- Emphasize stair towers and pedestrian entries as identifying architectural elements.

B-6 In residential projects, cluster parking spaces on site to encourage interaction among occupants

B-7 Orient pedestrian entries to be visually open and free of visual obstruction to ensure safety and minimize conflicts between pedestrians, bicycles, and vehicles. Entries may be located on the primary street frontage or on a side street (as long as there is sidewalk access and signage) near the intersection with the primary street.

B-8 Ensure adequate lighting along garage façades to improve visibility and pedestrian safety, but shield the street from interior garage lighting. Consider motion-sensing lights and lights with timers to reduce unnecessary energy consumption, while maintaining safety and security.

B-9 Use permeable paving, or similar materials that reduce runoff, as a surface material for driveways, pathways, and surface parking areas.

B-10 Bicycle parking should be located near entrances and exits and secured and weather protected. (See the Zoning Ordinance for detailed standards for short- and long-term bicycle parking.)

DESIRABLE



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Although not well integrated with the main building, this public parking garage in Palo Alto is set back from the street edge and well-screened by wooden slats and planter boxes.

DESIRABLE



© Dyett & Bhatia

This parking garage in Mountain View is screened from the street, by ground-floor retail and integrated architectural design.

DESIRABLE



This loading area, located in a private alley in Emeryville, is well integrated into the building, and avoids conflicts with pedestrians and bicyclists.

UNDESIRABLE



Loading areas should be located on side streets to avoid conflicts with pedestrians and vehicles, like in this Powell Street Plaza example.

C SITE PLANNING

Careful site planning supports walkability at the street-level and quality of life for building occupants by facilitating sunlight, views, plazas and open spaces, and visual interest. These guidelines encourage sunlight, views, accessibility, beauty, and energy efficiency in the siting of buildings and projects.

C-1 Consider the three-dimensionality of buildings: how they are perceived from the ground-level, public streets, and side streets; and how they can contribute to, or detract from, the views, neighborhood or district character, and overall quality of life.

C-2 Site buildings and locate plazas, building entrances, seating, and visually interesting architectural features to encourage interaction among occupants and passersby.

C-3 Incorporate climate appropriate design strategies to protect building entrances and open spaces from wind and to allow for passive solar access. Roofs should be oriented and designed to allow for active or passive solar gain.

C-4 Consider edge conditions and transition areas during site design to ensure compatibly between existing and new development.

C-5 Screen refuse bins and other waste containers by placing them indoors, locating them away from the street, and/or shielding them with fencing and/or landscaping. Prevent contamination of waste in stormwater runoff by maintaining covered bins and preventing empty bins from tipping during storms or due to wind.

C-6 Conceal all mechanical, electrical, and other building equipment from the public right-of-way and from other existing buildings, where feasible. Use screening materials and other buffers to minimize noise and visual impacts. Mechanical equipment should not be located along the ground floor street frontage.

C-7 As a temporary measure, unused or underdeveloped portions of a site should be planted with groundcover, at a minimum. Consult Bay-Friendly Landscape guidelines.

DESIRABLE





The landscaped setback accommodates pedestrian traffic on Horton Street. Mechanical equipment is shielded from the street level (top), but visible from other buildings (bottom). It is mitigated by the matching paint color and generally fits with the industrial nature of the building and the use within.

DESIRABLE



These refuse bins near 40th Street are well-screened with landscaping, mitigating the impact of the trash bins.

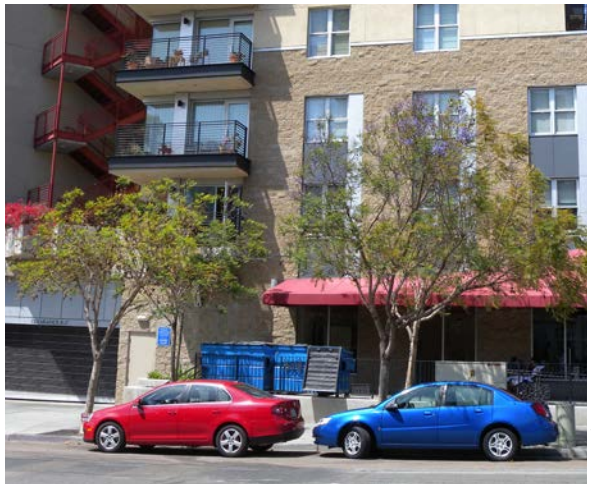
DESIRABLE



© Dyett & Bhatia

Although the entrance to the Bridgecourt Apartments is on 40th Street, the back of the building is still treated as a major façade. This acknowledgement of three dimensionality of the building allows a more attractive building from the front and back.

UNDESIRABLE



© Dyett & Bhatia

Although there are a many good elements to the massing and form of this building in San Diego, the design at ground-level is not successful. The garage entry and the refuse area and utility box disrupt the pedestrian experience.

DESIRABLE



© Dyett & Bhatia

On this street in Santa Cruz, individual buildings line up at equal distances from the curb, creating a consistent street wall that is attractive for pedestrians and facilitates the visibility of businesses.

UNDESIRABLE



Although the street wall is uninterrupted, long blank walls and lack of fenestration or architectural features prevent this Emeryville sidewalk from being comfortable and interesting for pedestrians.

DESIRABLE



A continuous street does not preclude building articulation. In fact, a consistent street wall and varying façade creates an attractive and accessible streetscape.

STREET WALL

C-8 The street wall should enclose the physical space of the street, producing a safe, attractive, and cohesive streetscape where pedestrians can see building entrances, signs, and businesses.

- At strategic locations—such as street corners or building entrances—plazas are permitted and encouraged as interruptions to the street wall. (See "Neighborhood Retail Overlay and Neighborhood Centers" and "Pedestrian Priority Zones" in Section I: Area Specific Guidelines)

C-9 Design the street wall façade to create visual interest and diversity, and to reinforce the pedestrian scale and character of the street.

- Blank walls along the public right-of-way are strongly discouraged. (See Urban Design Element Policy UD-P65.)

D BUILDING MASSING

Massing refers to the bulkiness of buildings. A building or a series of buildings that is slender, tiered, or varied in height and shape permits light and air to pass through; allows views; and creates visually interesting skylines. Bulky buildings, on the other hand, can cast large shadows and obstruct sunlight and views. Building massing guidelines seek to define a skyline that supports pleasant, safe, and sunlit streets and sidewalks.

D-1 In areas where building heights transition, step back upper levels of buildings to transition to adjacent lower building heights.

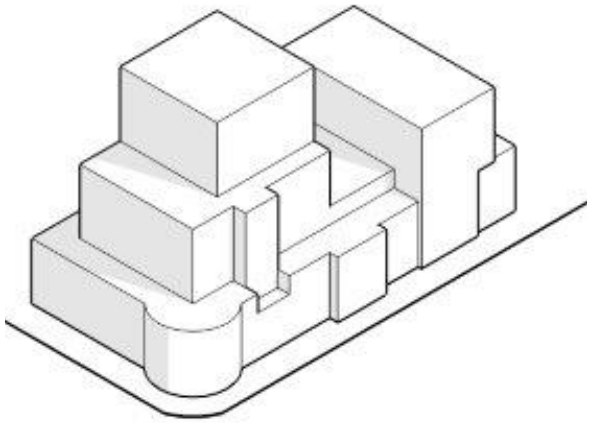
D-2 Encourage variation and articulation through changes in height and massing.

D-3 Create buildings openings that permit mid-block pedestrian connections, thereby breaking up "super blocks" and expanding the pedestrian network.

D-4 Space towers to allow sunlight, air, breezes, and privacy for tenants, while maintaining views and natural light at the street-level.

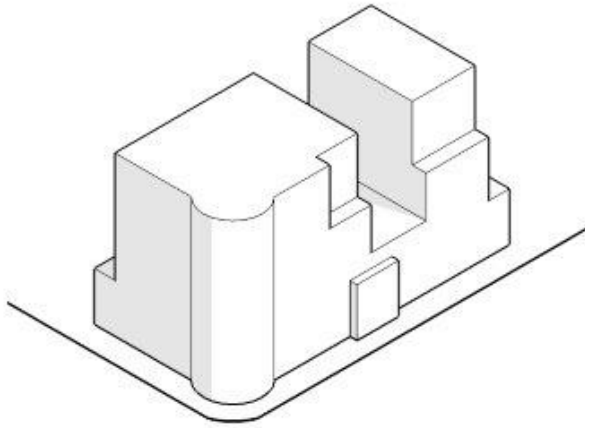
D-5 Towers should be slender in order to minimize the casting of large shadows. If large floor-plates are necessary on lower floors, middle and upper floors should taper, step back or otherwise employ a reduction in massing.

DESIRABLE



Variation in massing and upper floor stepbacks add visual interest to the building and more sunlight onto the street.

UNDESIRABLE



Bulky buildings with long blank walls tend to appear oppressive and inhospitable to pedestrians at the ground level.

DESIRABLE



© Dyett & Bhatia

With 338 units in three towers, this San Francisco building is made more human-scale through its careful massing. The base, middle and top of the building are discernible through the use of color, height, window type, and architectural features. The building steps down to meet the lower height of an adjacent historic building.

UNDESIRABLE



Lacking step backs, tapering, and a more slender appearance, Pacific Park Plaza's blocky design looks bulky and massive.

D-6 Incorporate a distinguishable base, middle, and top for all buildings of five stories or more:

- Distinguish the base of the building through the use of materials, massing, or articulation of the façade. The base of a building should address the street through entries, fenestration, articulation and building orientation.
- Step the middle of a building back from the base. The middle should be more slender and less bulky than the base and also differentiated through architectural elements and materials.
- Design buildings with a solid top or other distinguishing features to signify the end of the building; this does not require an actual stepback, but articulation through use of materials or façade rhythm. Reserve a portion of the top habitable floor and penthouse for mechanical and other equipment. Alternatively, shield equipment from view, from taller adjacent buildings, with a parapet and appropriate screening.
- Reduce the apparent bulk of a building by breaking it into smaller masses that correspond to the internal function of the building (e.g. through changes in materials, colors, or fenestration) and through changes in roof heights and vertical planes.

D-7 Design of new buildings should consider shadow impacts on surrounding areas. 3D modeling is recommended to test the effect of building heights and massing on sidewalks and streets, in terms of shadows.

DESIRABLE



© Dyett & Bhatia

This 595-unit building in San Francisco appears smaller through massing and design. The corner is accentuated, the ceiling heights of the grocery store are raised, and the change of colors and fenestration reduce the apparent building mass. The portion of the building on the right side of the photo employs a step-back, revealing a landscaped terrace. A mid-block pedestrian connection (far right in the photo) allows pedestrian circulation between public streets on this otherwise large block.

UNDESIRABLE



All of the office buildings on Emeryville's peninsula have a blocky appearance, inhibit sunlight and the views from street level and other buildings.

General Plan Guiding Principle #10. An imageable and memorable city. The City will foster high-quality new construction of exceptional design while preserving and enhancing the best of existing buildings and neighborhoods. The City will foster a dramatic skyline of slender and elegant high rise buildings stepping down to low-rise buildings in the older residential neighborhoods. Enhance the experience of entering Emeryville with attractive and appropriate streetscape improvements along major regional and city arterials. Collectively, these elements serve to foster Emeryville's character as a vibrant, connected, livable community, and a rising signature city from afar and within.

E BUILDING FORM AND ARTICULATION

Building form and articulation further shape a building's identity. Façade composition can create unified and harmonious buildings, promote distinctive architecture, and visual diversity. These guidelines seek to respect Emeryville history and existing neighborhood character; maximize visual interest and visibility; balance privacy and safety; and ensure pedestrian orientation.

BUILDING FORM

E-1 Find opportunities for diversity, creativity, and innovation in building form.

E-2 Incorporate neighborhood and district identity in the design of buildings, by considering the style and character of existing structures.

E-3 Preserve and enhance the historic industrial-warehouse character found in many parts of Emeryville through the retention of architecturally significant structures and the addition of architecturally compatible new construction.

E-4 Respect the form of adjacent or nearby historic structures through appropriate design of new developments.

E-5 Incorporate green roofs into building design to manage stormwater runoff and reduce energy consumption through insulation.

- "Intensive" roofs are appropriate when resident or tenant access is desired. Soil layers are typically deeper, eight to 15 inches, depending on the loading capacity of the roof and the architectural and plant features desired. These roofs must be relatively flat.
- "Extensive" roofs are appropriate when human access is limited and the goal is for ecological roof cover. Layers may be thinner, two to six inches. Extensive greenroofs can be constructed on slightly sloped roofs.
- All green roofs must be designed to permit routine maintenance and irrigation, as necessary.

DESIRABLE



This store brings modern design and a functional and eco-friendly green roof to Bay Street while acknowledging the brick and industrial character in Emeryville.

DESIRABLE



Incorporating historic buildings and/or façades into new projects celebrates Emeryville's history and is an efficient use of resources. This helps preserve neighborhood and district character.

DESIRABLE



© Field Paoli

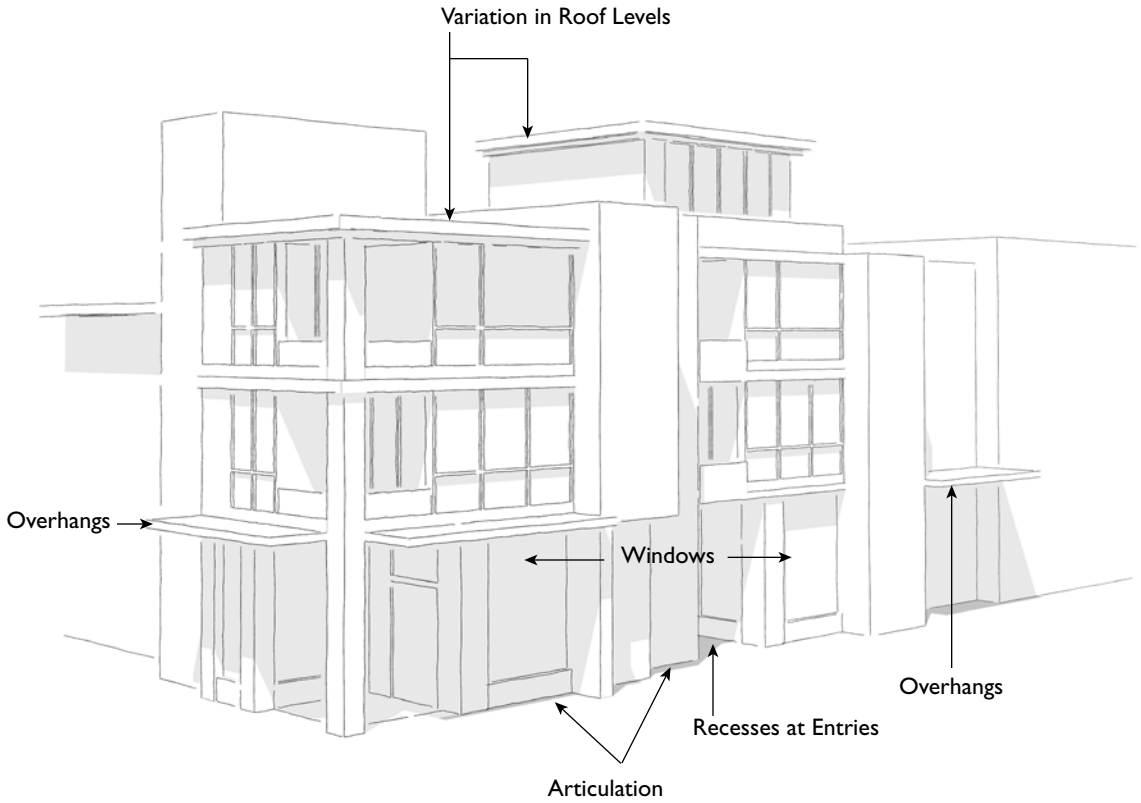
Building form need not be regular and at right angles. This building in Denver has curvilinear elements and unexpected angles and forms.

DESIRABLE



This set of residential units in Emeryville provides a transition between industrial and residential uses. Its style is reminiscent of some of its industrial neighbors, while is massing and sloping roofs are compatible with its residential neighbors.

DESIRABLE



The graphic above illustrates ways to articulate buildings through variety in the wall plane and roof form.

BUILDING ARTICULATION

E-6 Articulate building mass and surfaces with three-dimensional elements that create a visual play of light and shadow:

- Incorporate design features such as balconies, recesses, windows, signage, reveals, brackets, cornices at the roof and at the top of the ground floor, and piers at corners and structural bays.
- Use awnings and over-hangs to provide shelter and shade over the sidewalk along pedestrian-oriented retail streets and to enhance the pedestrian realm. Awnings should be made of durable, high quality materials and should not interfere with the tree canopy.
- Employ variations in floor level, façades (such as shallow recesses at entries, roof styles, architectural details), and finishes that break up the appearance of large buildings.
- Use horizontal articulation, such as recessions/projections, change in materials, and building transparency.

E-7 Provide operable windows that allow natural ventilation and potentially eliminate the need for mechanical ventilation. If mechanical systems are necessary, use energy-efficient and low emission heating, ventilation and air conditioning (HVAC) systems.

E-8 Layer structural and detail elements to provide visual variety and depth.

E-9 Ensure unified and harmonious building façades, integrating all elements, including signs, balconies, and building entrances. Windows should have regular patterns or be coherent in their variety (e.g. in shapes and proportions).

E-10 Utilize corner lots to highlight architecture features with changes in massing and building and soffit height and/or create defined building entrances or small plazas by increasing ground level setbacks

E-11 Orient tenants spaces and windows toward the primary street to engage pedestrian interest and maximize interior light and exterior safety through 'eyes on the street.'

DESIRABLE



The large size of EmeryStation North is rendered more hospitable to pedestrians at the ground level by the use of recesses, varying materials, human-scaled lighting, and landscaping.

UNDESIRABLE



On this Emeryville street, a blank flat wall at the ground level creates an unwelcoming streetscape for pedestrians.

DESIRABLE



Recesses, overhangs, step backs, and varying roof heights articulate the form of the Icon apartments on Park Avenue, creating visual interest from the street and allowing more light into individual units.

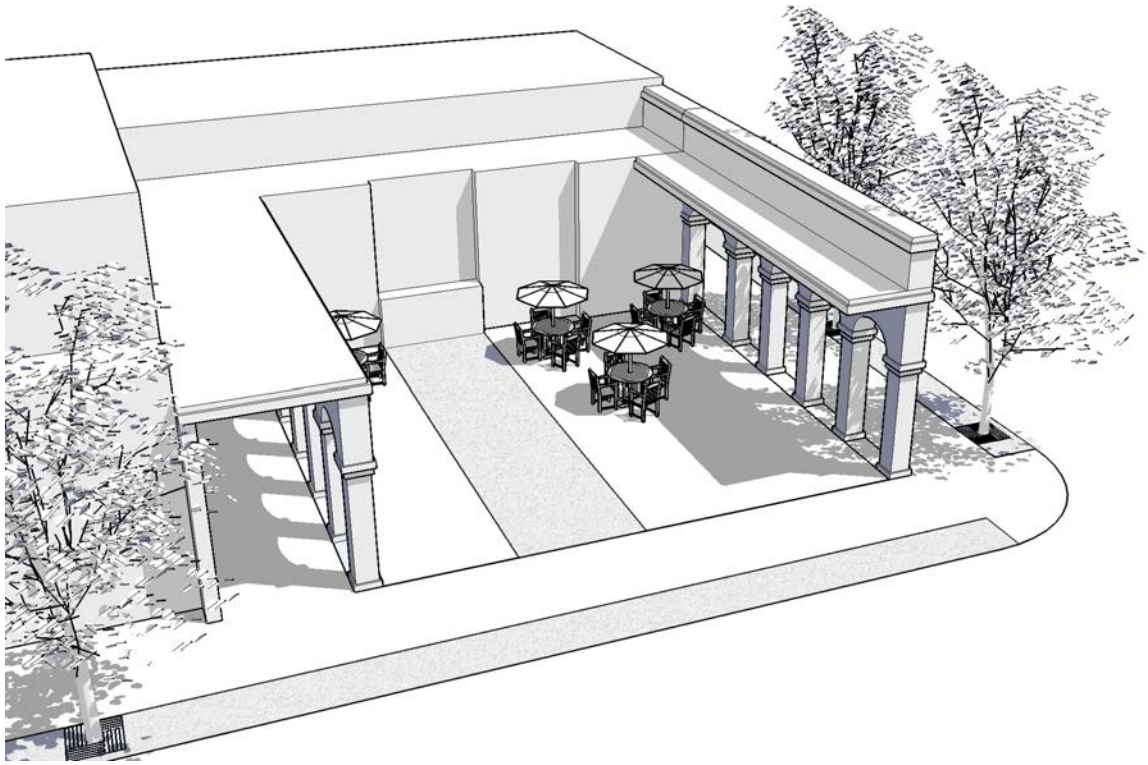
UNDESIRABLE



© Rob Quigley Architects

Although this San Diego building is successful in breaking down a massive building into smaller components, the façade lacks articulation and the ground-floor is not pedestrian-oriented, resulting in a building that does not interface well with the street.

DESIRABLE



Plazas on block corners or at building entries can create opportunities for open space. This arcade defines the building edge, while also providing sunlight access, shade, and inviting open space.

BUILDING ENTRANCES

E-12 All public entrances should be visible and accessible. Building overhangs, canopies, and entryway landscaping should not obstruct views, the street tree canopy, or street signs.

E-13 Create building entries with entry plazas, vertical massing, and architectural elements, such as awnings, or porticos. Design entries so that they are clearly defined and distinguishable as seen from the street.

E-14 Orient the primary building entrance (defined as the entrance which provides the most direct access to a building's lobby and is unlocked during business hours) to face a public street. Secondary building entrances are encouraged to access side streets, parks, or plazas.

DESIRABLE



The main entrance to this building is strategically placed to be accessible from the parking lot and from Hollis Street. The staircase, use of color, and large overhang, create a clear prominent entrance.

UNDESIRABLE



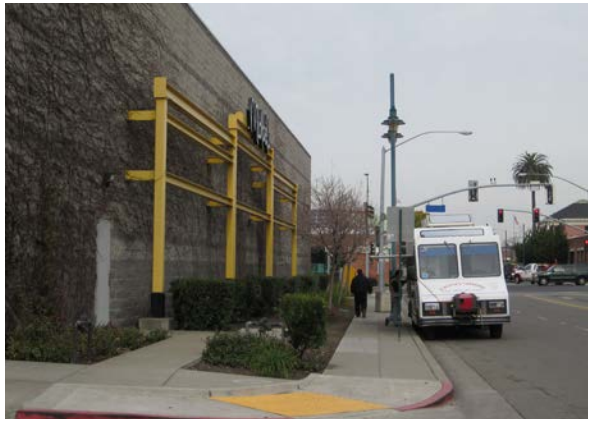
The entrance to this store is highlighted by a canopy and architectural features, but their designs are not well-integrated into the building style. Moreover, this entrance is from the parking lot, not from a primary street (i.e. 40th or Hollis streets), resulting in primarily auto-oriented access.

DESIRABLE



Individual unit entrances face onto a park along the greenway, improving safety and access to the open space.

UNDESIRABLE



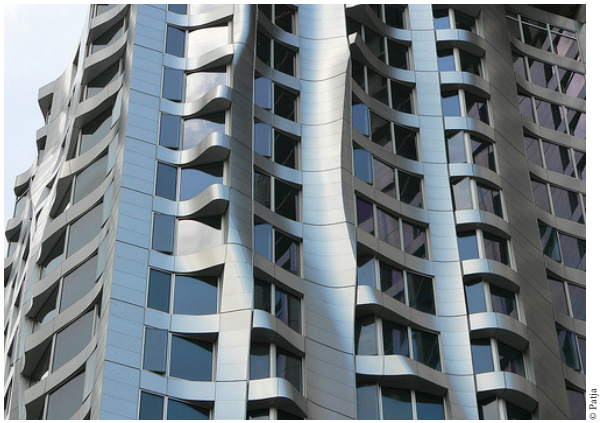
This façade along Hollis Street represents the linkage between the store and the public street. The blank wall and lack of entrance inhibit pedestrian access to the store.

> "...there must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street. The buildings on a street equipped to handle strangers and to insure the safety of both residents and strangers, must be oriented to the street. They cannot turn their back or blank sides on it and leave it blind."
>
> **- Jane Jacobs**

F ARCHITECTURE AND BUILDING MATERIALS

Building details, materials and color are particularly effective tools in establishing continuity and variety in design and quality within a development or among adjacent buildings. The following guidelines seek to ensure high quality design and visual interest through durable and attractive building materials, color, and detailing.

DESIRABLE



© Pajja



DESIRABLE





ARCHITECTURAL STYLE

No particular architectural style is mandated for any area in the city. Rather, these Guidelines encourage and are adaptable to a range of styles. All development should be sensitive to the context and the surroundings, without necessarily conforming to the architectural style of surrounding development.

These guidelines support a range of architectural styles, as long as they are compatible with existing structures

ARCHITECTURAL DETAILS

ARCHITECTURAL FEATURES

F-1 Consider and respect the architectural features and styles of adjacent buildings and the neighborhood or district. Do so by reinforcing existing character or providing compatible features through architectural details, materials, colors, and lighting. In particular, draw on adjacent or nearby building features that are desirable to achieve compatibility.

F-2 Find opportunities for creativity with architectural features, such as integrating art into doors and entrance areas, and through colors and details.

F-3 Use window design and proportions to add architectural interest to the building. Window designs should help differentiate the various components of the building (e.g. ground floor lobbies, stair towers, corners, office suites, or residential units). Window frames, sills, and/or recesses should be used to add visual interest.

SUSTAINABLE DESIGN INFRASTRUCTURE

F-4 Install water saving appliances and systems such as gray water systems, moisture-sensitive irrigation rainwater cisterns, low-flow toilets and faucets. Any exterior systems should be integrated into building design.

F-5 Install timed or motion sensor light fixtures that turn off or dim during daylight hours in interior hallways, foyers, and other spaces that are constantly used.

F-6 Incorporate rain gutters and other drainage devices into the structure and design of the building.

F-7 Use durable materials for fences, such as wood or cast-iron. Chain-link fencing, or razor wire that is visible from the street, is strongly discouraged.

F-8 Building infrastructure, and energy and mechanical systems (including water towers, gutters, etc.) should be architecturally integrated into buildings.

F-9 Design exterior building lighting as an integral part of the façade:

- Design exposed standards and fixtures to be harmonious with the building design, and complement lighting in the public right-of-way.
- Provide lighting at all entryways, alcoves or other features of the building to ensure visual surveillance of the building and its public areas and foster a sense of safety.
- Provide display window lighting in storefronts and lighting under the awning, as security measures.
- Use lighting to highlight architectural detailing and/or unique features.
- Prevent light spillover into windows.
- Discourage up lighting; require dark-sky compliant fixtures.
- Provide no more lighting than is necessary to create a sense of security and ease of use.

DESIRABLE



The windows and materials at this ground floor commercial space along San Pablo Avenue distinguish it from the upper levels and residential uses above.

DESIRABLE



© Dyett & Bhatia

DESIRABLE



Accent materials and colors, whimsical design, and public art add character at the pedestrian level in San Francisco (left) and the Glashaus on Hollis Street (right).

BUILDING MATERIALS

F-10 Use high-quality, durable architectural materials and finishes that provide a sense of permanence throughout the exterior and public interior spaces of the buildings.

- Exterior building materials should be of high quality, durable materials approved by the City as part of the project review. Synthetic stucco is strongly discouraged.

F-11 Minimize the overall environmental impact of development, by giving preference to sustainable building materials.

- Consider using recycled and/or locally obtained materials, sustainably harvested wood, bamboo, and non-toxic, low-VOC (volatile organic compound) glues and paints.
- Divert waste from landfills by promoting reduction, reuse, recycling, and composting of materials during construction and through building materials selection.
- Use sustainable surface materials for paving, such as reclaimed pavers, locally produced materials, or concrete and asphalt with fly ash content.

F-12 Employ accent materials at the ground level to add texture, color, and visual interest at the pedestrian level. Façades should have coherent variety in colors and materials.

F-13 Devise a color palette that reinforces building identity and complements changes in plane.

- Strong, bright colors should be used sparingly.
- For buildings along narrow corridors such as Hollis Street, lighter exterior colors with high reflectance should be used to maximize daylight on streets and open spaces and to reduce heat-island build up.
- Floors above fifth story should use lighter color to enable greater light reflectance, without causing glare.

F-14 Use trellises and vines or other plantings on building exteriors to insulate and cool interiors.

F-15 Glazing should be clear or lightly tinted and non-reflective.

General Plan Guiding Principle #9. Sustainability and innovation, with respect for the past. The Emeryville community strives to live within means that do not compromise the ability of future generations in Emeryville to enjoy a livable, healthy, and vibrant city. The Plan encourages redevelopment of contaminated land as a healthy and cost-effective way of improving the local environment, use of "green" construction techniques, and a lifestyle with low ecological impacts upon energy consumption, climate, and the natural environment. The City will interweave the future and the past, while respecting the scale, character, and use of the historical Doyle and Triangle neighborhoods and other districts.

DESIRABLE



Blue Star Corner was the State's first LEED for Homes certified project, using materials such as bamboo flooring, low-flow plumbing fixtures, Energy Star appliances, fly-ash concrete, and drought-tolerant landscaping.

DESIRABLE



Brick is an appropriate building material in the Park Avenue district.

G OPEN SPACE

Functional outdoor space for gathering and for the extension of indoor activities supports walkability, livability, and pedestrian activity throughout the public realm. Given Emeryville's good weather, open space should be designed as part of developments for private and public use. Landscaping in any type of project can also serve to establish a boundary between public and private spaces, manage stormwater, support passive heating and cooling, improve air quality, and beautify the urban environment. These Guidelines address three types of open space.

PRIVATE OPEN SPACE

G-1 Provide open spaces that enhance the quality of life for residents. Areas may be small, but should be adequately sized to allow movement and usability. Such areas may include balconies, decks, patios, and fenced yards. For larger units, the areas should be designed with consideration for the needs of families with children.

G-2 Balance privacy and safety with air and sunlight access, as well as wind protection. Prioritize south facing open space opportunities and designing balconies with slatted or otherwise partially transparent grating or railing.

G-3 Where balconies are provided, allow room for small gardens for growing plants.

G-4 Orient balcony railing bars vertically to prevent climbing and facilitate vining plants, where appropriate.

G-5 Ensure privacy and sunlight access for open spaces that face the public street by providing partially transparent screening or landscaping, such as tall grasses and fences with openings.

G-6 Separate private open space from common open space with low walls or fencing.

DESIRABLE



© Dyett & Bhatia

In this example from San Diego, balconies—large enough to be usable—are provided for each residential unit.

UNDESIRABLE



© Dyett & Bhatia

In this San Diego example, balconies are too small to be usable and made of opaque materials, eliminating the connection between the tenant and the public street below.

General Plan Guiding Principle #3. Enhanced and connected open space network and green streets. The General Plan outlines strategies for an expanded public realm, building on the strength and connectivity of the city's greenways, with a range of new parks, plazas, community commons, and recreational paths. Open space is strategically located to maximize accessibility and building forms are organized to ensure that sunlight reaches streets and parks. Many more trees along streets and enhanced landscaping will provide a greener city.

DESIRABLE



Even small common open spaces can be useful for seating areas and barbeques when they are accessible, landscaped, and have good sunlight access, like this one near 66th Street.

COMMON OPEN SPACE

G-7 Provide common open space for the sole use of the project's residents or tenants, and design with consideration for families with children.

G-8 Open spaces should be designed as an integrated element of the project (and the street or adjacent building, if applicable). Coordinate landscaping and amenities with the project's architecture and character.

G-9 Design common open spaces, landscaping, and amenities to encourage interaction among occupants.

G-10 If community rooms are planned with developments, they should be located adjacent to open space.

G-11 Design open spaces to have sunlight during at least part of the day and offer wind protection, comfort and safety to residents and tenants.

G-12 Consider safety and security in the design: define and enclose open spaces through building configuration. Ensure that some portion of units or commercial spaces overlook the common open space.

G-13 Design open space to be accessible to all living units in the development, directly or indirectly, through appropriate design and signage.

G-14 Install roof terraces as an efficient way to use the site and to maximize sunlight access. Green roofs can fulfill common open space requirements, as long as they are usable and accessible to all units.

G-15 Provide surfaces that allow convenient use for outdoor enjoyment and/or recreation. Such surface may be any practical combination of lawn, garden, flagstone, wood planking, concrete, or other serviceable surfacing.

G-16 Provide walks, patios, swimming pools, barbeque areas, playgrounds, recreational facilities, turf, or other such improvements as appropriate to enhance the outdoor environment of the residential development.

G-17 Arrange seating for gathering, conversing, and supervising children's play areas.

PUBLICLY ACCESSIBLE OPEN SPACE

G-18 Locate open space along the east, west, or southern block or building face, where feasible, and design to maximize exposure to the sun, especially from the southwest, while protecting from wind (often westerly).

G-19 Ensure that landscaping complements and extends the design of the adjoining public right-of-way.

G-20 Design open space to be physically and visually accessible from the street and designed for public use, with signage, if appropriate.

G-21 Design open space that fronts the sidewalk to be primarily open and free of walls or other obstructions (not including trees, lights, and steps). Use landscaping strategically to identify pedestrian entrances and articulate edges for plazas and courtyards.

G-22 Use landscape materials that are climate appropriate, drought-resistant and that require minimal irrigation and maintenance. (See Bay-Friendly Landscaping guidelines described in Section A:Sidewalks and Landscaping.)

G-23 Provide ample seating, which can be comprised of benches, seating walls, and moveable seating. A portion of seating should have back and arm support. Provide shaded seating areas, in additional to areas with full sun access.

G-24 Encourage a variety of activities and events in open spaces to promote active uses, such as kiosks for private businesses or information and food vendors.

G-25 Provide clear signage that acknowledges that open space is for public use.

G-26 Indoor publicly accessible open spaces are permitted, but should be exceptionally well-designed. They should be adjacent to and visible from streets; have tall ceilings and glazing to allow natural light; provide public art display and seating; and be free of private logos, signs, or markings.

DESIRABLE



Doyle Hollis Park integrates well with the street and buildings around it. It is visible and accessible from the sidewalk, but also has a clear edge, fencing, and landscaped buffer that ensure the safety and security of pedestrians and park users.

DESIRABLE



This park, constructed as part of the Novartis office/technology complex, provides ample seating, drought-tolerant plantings and design that reduce watering needs, and a mix of spaces for passive and active uses.

H SIGNS

These sign guidelines, together with the sign standards contained in the Zoning Ordinance, ensure that signage adds to the city's identity and does not overwhelm or detract from the public realm, particularly along pedestrian-oriented streets. Design guidelines for signs address the following principles.

H-1 Architectural Compatibility

- Signs (including supporting structures, if any) should be designed as an integral design element of a building's architecture and should be architecturally compatible, including color and scale, with the building and surrounding structures.
- A sign that covers a window or that spills over "natural" boundaries or architectural features and obscures parts of upper floors of buildings is detrimental to visual order and should be avoided.
- Signs above the first story should not obstruct views from inside or outside upper stories. Lighted signs should not illuminate upper stories; instead, illumination should focus on the sign itself or downward toward the sidewalk.

H-2 Consistency with Area Character

- Signs should employ designs, features, materials, and colors that are consistent with the scale and character of the district they are located within.
- Where a sign is located in close proximity to a residential area, the sign should be designed and located so it has little or no impact on adjacent residential neighborhoods.
- Freeway-oriented signs should be sited and spaced to avoid an overabundance of such signs and close proximity to residential neighborhoods.

DESIRABLE



These signs on Hollis Street are integrated with building design and business concept, compatible in color, scale, and playfulness.

UNDESIRABLE



This sign on Shellmound Street conflicts with the building's visual order; the size, font, and style are not compatible with the historic architecture.

DESIRABLE



This sign incorporates common design elements, materials, and themes of the North Hollis district.

UNDESIRABLE



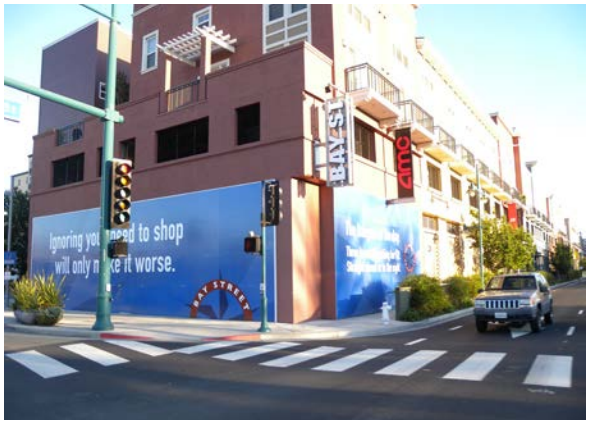
These signs break from theme and use patterns along San Pablo Avenue, reducing the quality of the experience of walking down this well-landscaped street.

DESIRABLE



These sign elements are in proportion to viewer's distance and speed – in this case a pedestrian in the East BayBridge Center..

UNDESIRABLE



These signs outside Bay Street are out of scale to viewers, both pedestrians on the sidewalk and drivers.

DESIRABLE



Signs in Bay Street are easily recognizable, clear and precise.

UNDESIRABLE



These signs on Powell Street appear cluttered. There is little hierarchy among the messages, creating confusion for the viewer.

H-3 Legibility and Readability

- The size and proportion of the elements of the sign's message, including logos, letters, icons, and other graphic images, should be selected based on the anticipated distance and travel speed of the viewer. Sign messages oriented towards pedestrians should be smaller than those oriented towards automobile drivers.
- Colors chosen for the sign text and/or graphics should have sufficient contrast with the sign background in order to be easily read during both day and night hours.
- High quality materials should be used, such as finished wood, metal, and woven fabric.
- Design signs to be readable, unambiguous, and concise, so that a viewer can understand or make sense of what appears on the sign. Excessive use of large areas of several colors can create competition for the eye and significantly reduce readability.

H-4 Visibility

- Ensure that signs are visible and readily distinguishable from their surroundings. Projecting signs should be regulated so that they do not obstruct each other.
- Provide sign illumination appropriate to the building design and location. Discourage any sign that, because of brilliant interior or exterior lighting, interferes with the enjoyment of surrounding property, residential units (in case of a mixed-use building) or traffic.

DESIRABLE



The Pixar sign on Park Avenue is conspicuous and easily distinguishable to pedestrians and drivers.

UNDESIRABLE

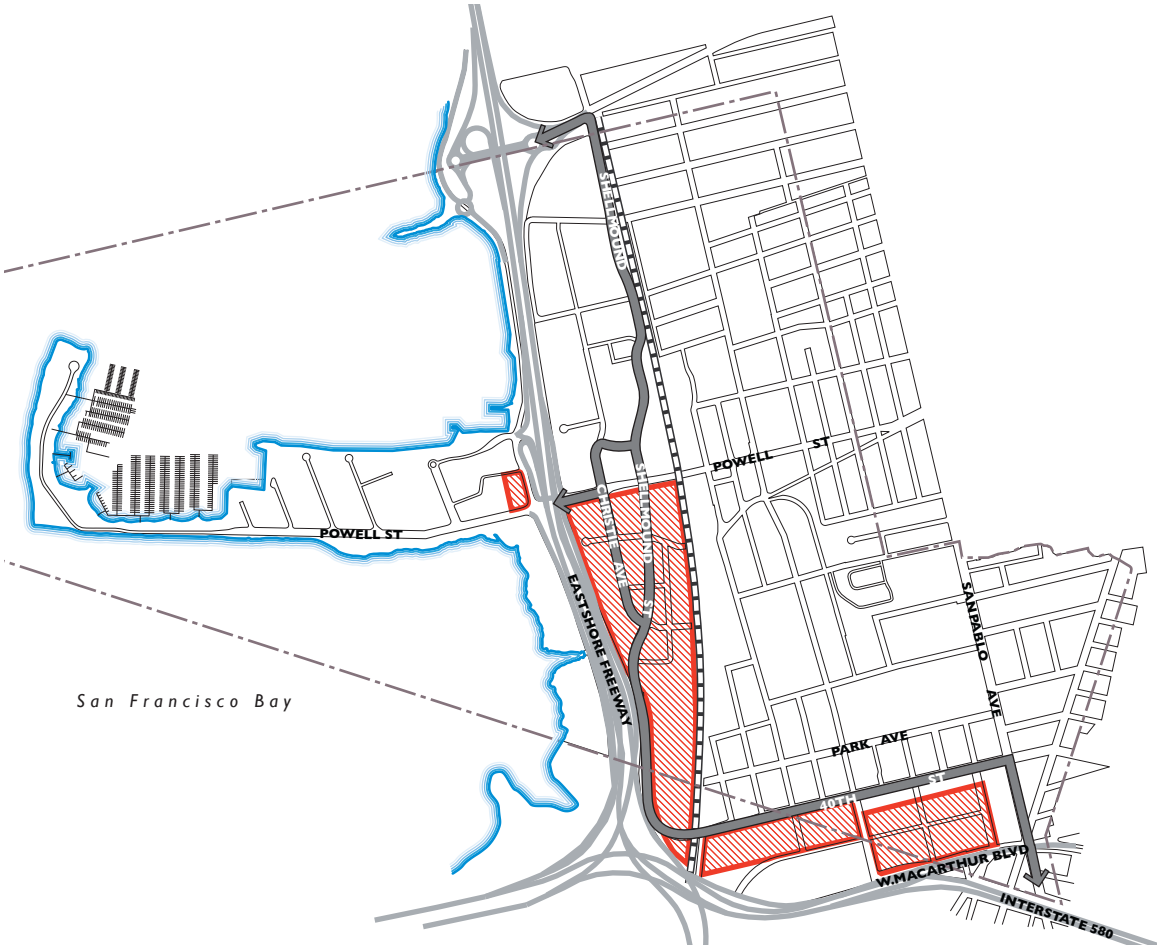


The sign above the awning is poorly placed, obscured to pedestrians passing by on San Pablo Avenue.

3 Area Specific, Building, and Street Type Guidelines

The following guidelines supplement the general guidelines described in Chapter 2. They pertain to sites within specific General Plan designations or which are affected by certain conditions, building types and land uses. Minimum sidewalk corridor dimensions (including dimensions for the building entry/ public space, clear pedestrian path, and landscaping/street furniture segments) are illustrated for the following areas. Sites that lie within more than one area (e.g. a greenway within a Pedestrian Priority Zone), should meet the guidelines as prioritized here:

- Regional Retail Overlay
- Neighborhood Retail Overlay and Neighborhood Centers
- Greenways and Green Streets
- Pedestrian Priority Zones
- Eastern Residential Neighborhoods



I AREA SPECIFIC GUIDELINES

REGIONAL RETAIL OVERLAY

The Regional Retail Overlay is intended for sites that contain retail uses which have a regional draw. Guidelines ensure that large retail and mixed use sites support multi-modal access. Uses in this overlay should be easily accessible for vehicles, as well as by transit, bicycle, or on foot. These guidelines seek to create pedestrian-oriented projects that ensure the safety and comfort of all users.

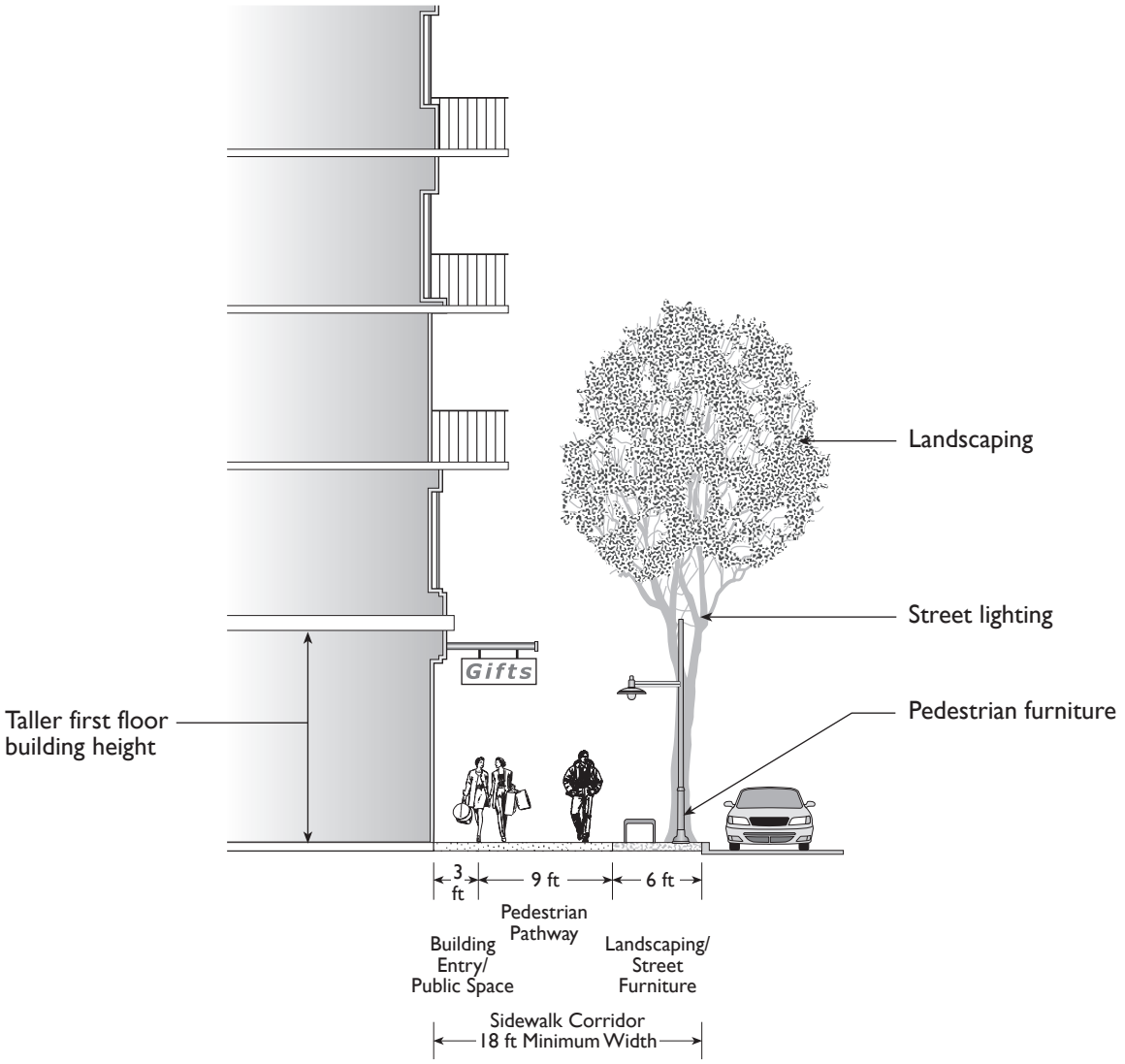
I-1 Design projects and buildings that support access and reduce conflicts between all travel modes.

I-2 Design wide sidewalk corridors in conformance with the minimum widths specified in Figure 3-1.

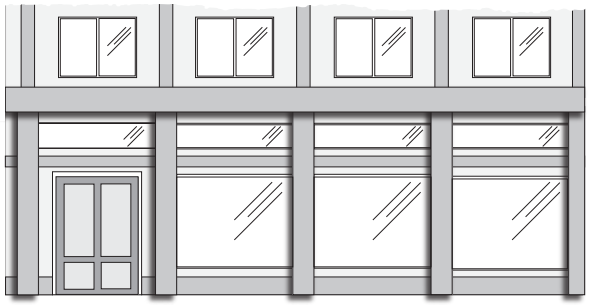
I-3 Locate active uses, such as retail, restaurants, hotel lobbies, offices, and flex space at the ground level, directly adjacent to and facing streets, as appropriate.

I-4 Maximize transparency of retail and public space areas on public streets through architectural features, and large windows.

FIGURE 3-1: Regional Retail Overlay Sidewalk Dimensions



DESIRABLE



Taller ground-floor building heights and large windows allow for retail visibility while also creating an interesting streetscape for pedestrians.

DESIRABLE



Bay Street accommodates vehicles, while also being pedestrian-friendly—with stores fronting the street, landscaping, clear signage, and varied, transparent façades.

UNDESIRABLE



Powell Street Plaza employs variety in the storefronts and landscaping in the parking medians, but the design is auto-oriented. Pedestrians must cross parking areas to enter the shopping center since stores do not face a street.

NEIGHBORHOOD RETAIL OVERLAY AND NEIGHBORHOOD CENTERS

Neighborhood centers are the focal points for residential communities, hosting neighborhood-serving uses, including local shops and services. The Neighborhood Retail Overlay, which encompass the neighborhood centers, supports pedestrian-oriented design and active streets through the following guidelines.

I-5 Design projects and buildings to foster street vibrancy, create attractive and well-landscaped settings, and enhance the neighborhood quality of life.

I-6 Design commercial establishments to complement the pedestrian oriented nature of the neighborhood centers and the scale of the neighborhood. While larger establishments (such as stores and supermarkets), that serve the community are also permitted, these should also be designed with a pedestrian orientation.

I-7 Devote a majority of the ground floor use, and a substantial portion of the frontage along any public street to active commercial uses, including stores, offices, services, flex spaces, and restaurants/cafés that serve the local community.

I-8 Design wide sidewalk corridors in conformance with the minimum widths specified in Figure 3-2. Where desirable, create areas for outdoor dining or other retail uses, while maintaining an adequate continuous walkway for pedestrians.

I-9 Where necessary, provide security screens on commercial spaces that are at least partially transparent. Opaque roll-down doors that cover storefronts are strongly discouraged.

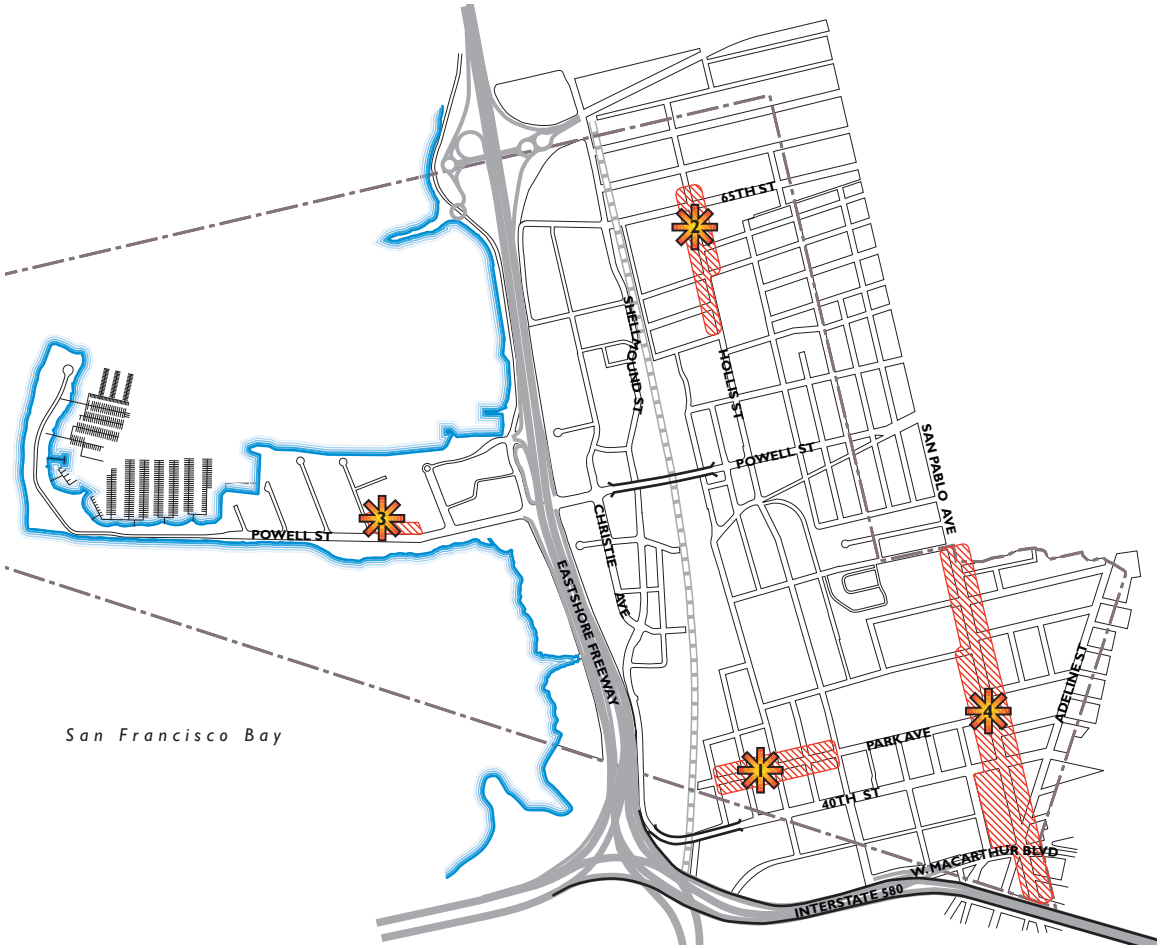
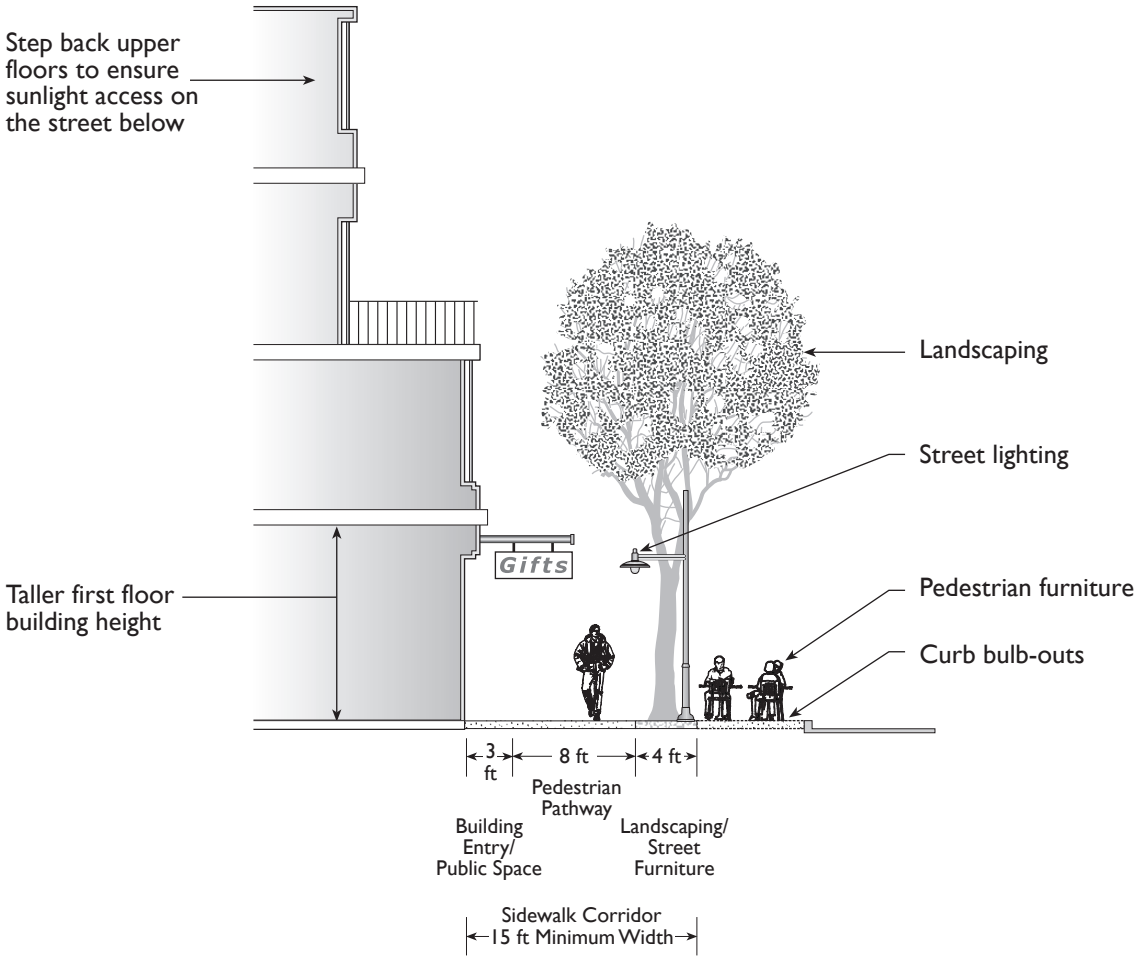


FIGURE 3-2: Neighborhood Retail Overlay and Neighborhood Center Sidewalk Dimensions



DESIRABLE



© Dyett & Bhatia

North Hollis is beginning to emerge as a neighborhood center, with residences, businesses, public parking, landscaping and outdoor seating. As people fill new housing and new business development, the neighborhood will become more vibrant and additional pedestrian amenities may be needed.

DESIRABLE



This street in Santa Cruz exemplifies a good neighborhood center, with wide sidewalks, a verdant tree canopy, ground-floor retail in individual storefronts, a mix of business types, and opportunities for outdoor dining, creating a vibrant streetscape for shopping and gathering.

EASTERN RESIDENTIAL NEIGHBORHOODS

The eastern area of the city is composed of well-established residential neighborhoods with a mix of single-family homes, townhomes and apartments. Although this area is not expected to change substantially in the coming years, new development should respect existing structures and character and find opportunities to enhance the neighborhood. Sidewalk widths are specified in Section A:Sidewalks and Landscaping and in Guideline I-11 below.

I-10 Seek opportunities to improve landscaping, sidewalk condition, and overall streetscape during rehabilitation and new construction.

I-11 Design wide sidewalk corridors in conformance with the minimum widths specified in Figure 3-3.

I-12 Design infill residential development to be sensitive to the scale, character and identity of adjacent existing development.

- Design homes to be generally the same height and massing of adjacent homes.
- If higher heights are permitted, use sloped roofs to create a transition between lower and higher building heights.
- Use commonly found architectural features, such as bay windows and dormers.

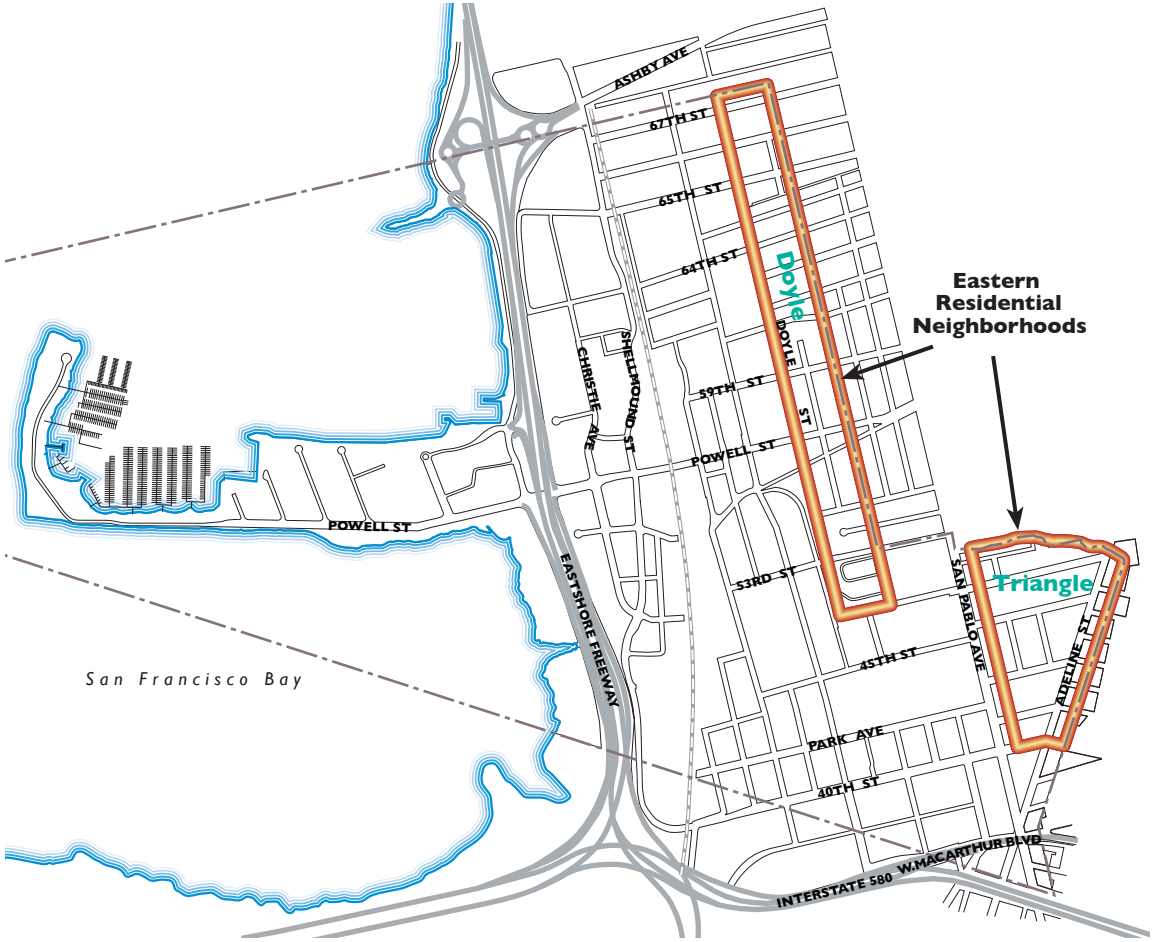
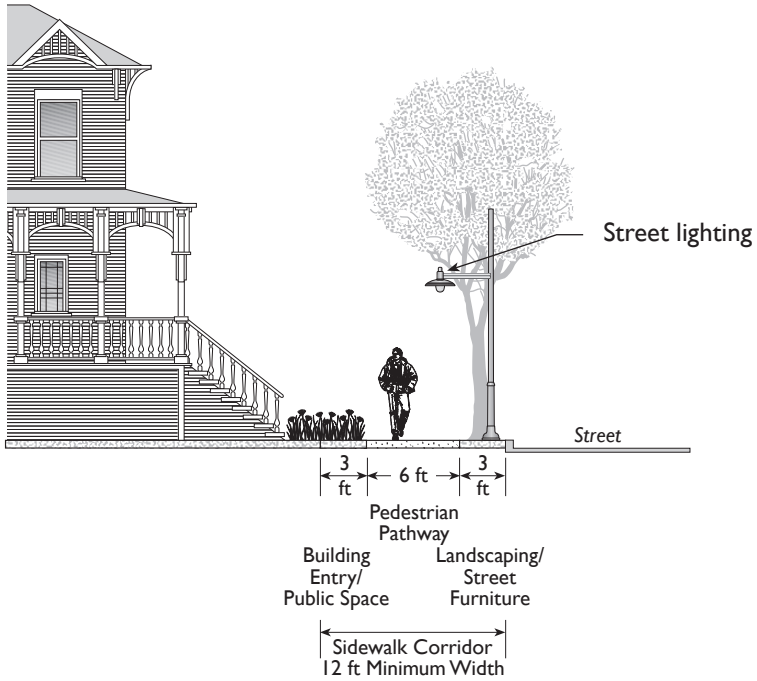


FIGURE 3-3: Eastern Residential Neighborhood Sidewalk Dimensions



I-13 Parking should be located where it has the least visual and physical impact on the street.

- The predominant ground floor features of a home should be windows, doors, porches, stairs, or other architectural features.
- The lot frontage should provide a minimum of 70% active non-parking related uses, provided that a maximum ten-foot width driveway is attainable. (See Urban Design Element Policy UD-P-15.)
- Employ architectural features, such as bay window projections, over garages to reduce their appearance and provide visual interest.

I-14 Utilize bushes, trees, and planting beds to define private areas in the front and rear yards.

DESIRABLE



The prominent features on this Emeryville unit are the landscaping and architecture, since the parking is located behind the building entrance. Although the building is new, the height, colors, windows, porch, and awnings, are compatible with other homes in the neighborhood.

DESIRABLE



Even though the Doyle Street Neighborhood home on the left is larger and higher than the home on the right, its sloped roof helps to transition between the heights.

DESIRABLE

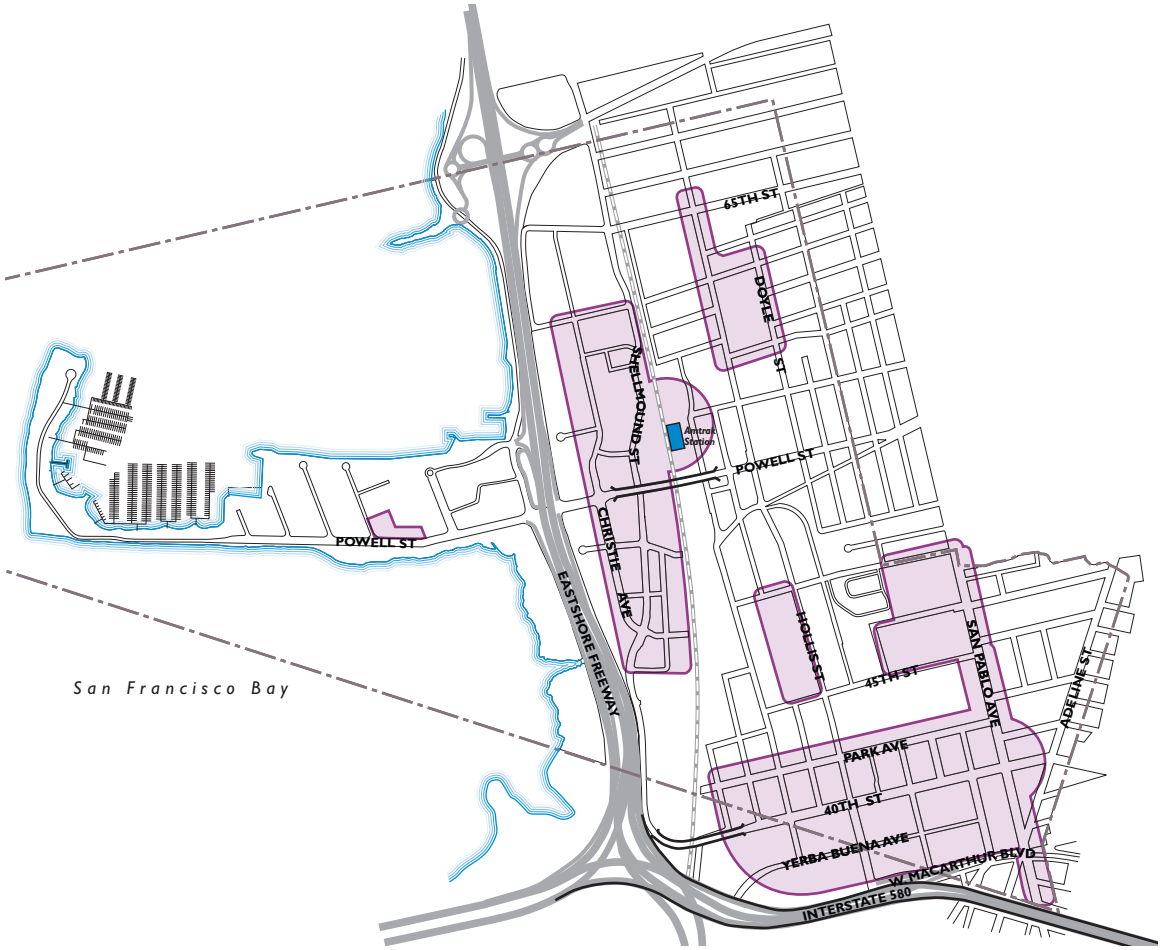


The parking garage is recessed from the entryway of this Emeryville home, which, along with the trellis above the garage door, serve to de-emphasize the prominence of the garage and create visual interest.

UNDESIRABLE



Two car or double wide garages, as the predominant ground-floor feature, should be avoided, as in this example in the Doyle Street Neighborhood.



PEDESTRIAN PRIORITY ZONES

Although the entire city should be amenable to and safe for pedestrians, the Pedestrian Priority Zones highlight areas where pedestrian safety and movement are the top priority. These zones include busy activity centers, such as transit stations, neighborhood centers, schools, and City Hall. (See Figure 1-3 on page 5.)

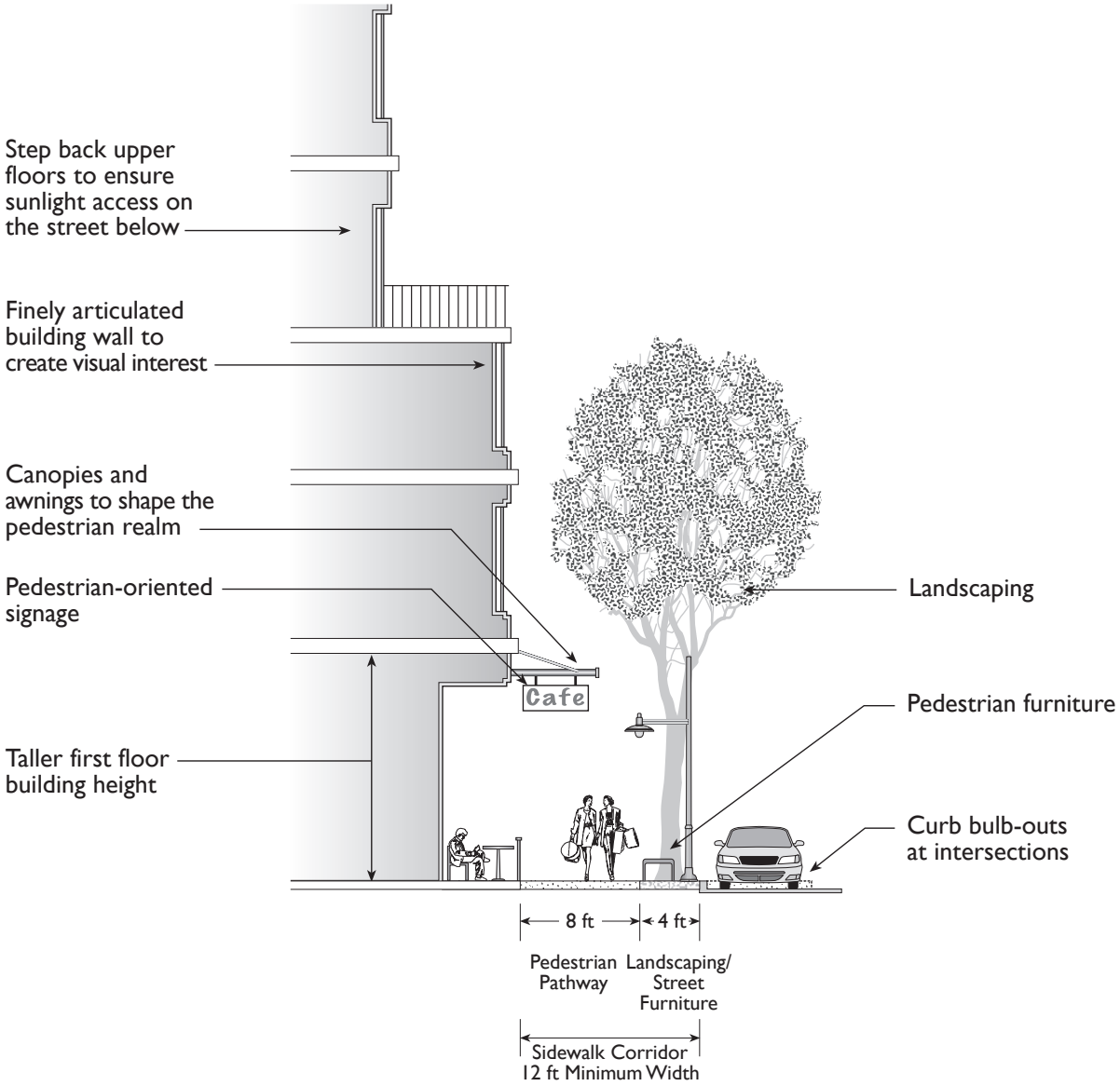
I-15 Design Pedestrian Priority Zones to provide focus to the neighborhoods, and promote them as activity areas. These zones are characterized by:

- Wide sidewalk corridors in conformance with the minimum widths specified in Figure 3-4.
- Outdoor café and restaurant seating, where sidewalk width permits.
- Consistent street tree species, employing Bay-Friendly Landscaping practices, and that provide appropriate shade.
- Consistent street furnishings, lighting fixtures, and landscaping.
- Curb bulb-outs at intersections.
- Places for public art.

I-16 Whenever possible, locate retail, restaurants, and other active uses at the ground level, to provide activity and pedestrian interest.

I-17 In Pedestrian Priority Zones ground floor parking structures should not face the street.

FIGURE 3-4: Pedestrian Priority Zone Sidewalk Dimensions



General Plan Guiding Principle #4: A walkable, fine-grained city, emphasizing pedestrians. The General Plan establishes that all of Emeryville will be easily traversed on foot. A fine-grained pattern of blocks and streets is a fundamental prerequisite of a walkable and accessible city; the General Plan promotes walkability through encouragement of active uses, creation of smaller parcels/blocks and inter-connections as large sites are redeveloped, and improved sidewalks, pathways, and streetscapes. Where larger buildings may be appropriate, these shall be constructed with smaller footprints to preserve views and ensure pedestrian access. Where appropriate, in people-intensive places—such as retail, office, and residential districts—pedestrians will have priority over automobiles, and buildings shall be articulated and designed to visually engage and offer comfort to pedestrians.

General Plan Guiding Principle #1. A cohesive city of distinctive districts and livable neighborhoods. Emeryville's growth is shaped—through land use, urban form, and design—to create a tapestry of distinctive districts, and neighborhoods with a full complement of uses and easy access to parks, stores, and other amenities of everyday living. Development intensities are designed to maximize accessibility to amenities, and provide transition in scale and height to lower-density neighborhoods.

DESIRABLE



© Dyett & Bhatia

In this downtown San Francisco example, a ground-floor restaurant provides outdoor seating for office workers, creating a safe, attractive, and active sidewalk.

UNDESIRABLE



© Dyett & Bhatia

Despite its location near Downtown Oakland, this street is not designed for pedestrians. It lacks wide sidewalks, street trees, and an interesting or varied street wall.

DESIRABLE



© Dyett & Bhatia

Streets should be flexible and multi-functional, allowing space for bikes, pedestrians, cars and transit, as in this Santa Cruz example..

UNDESIRABLE

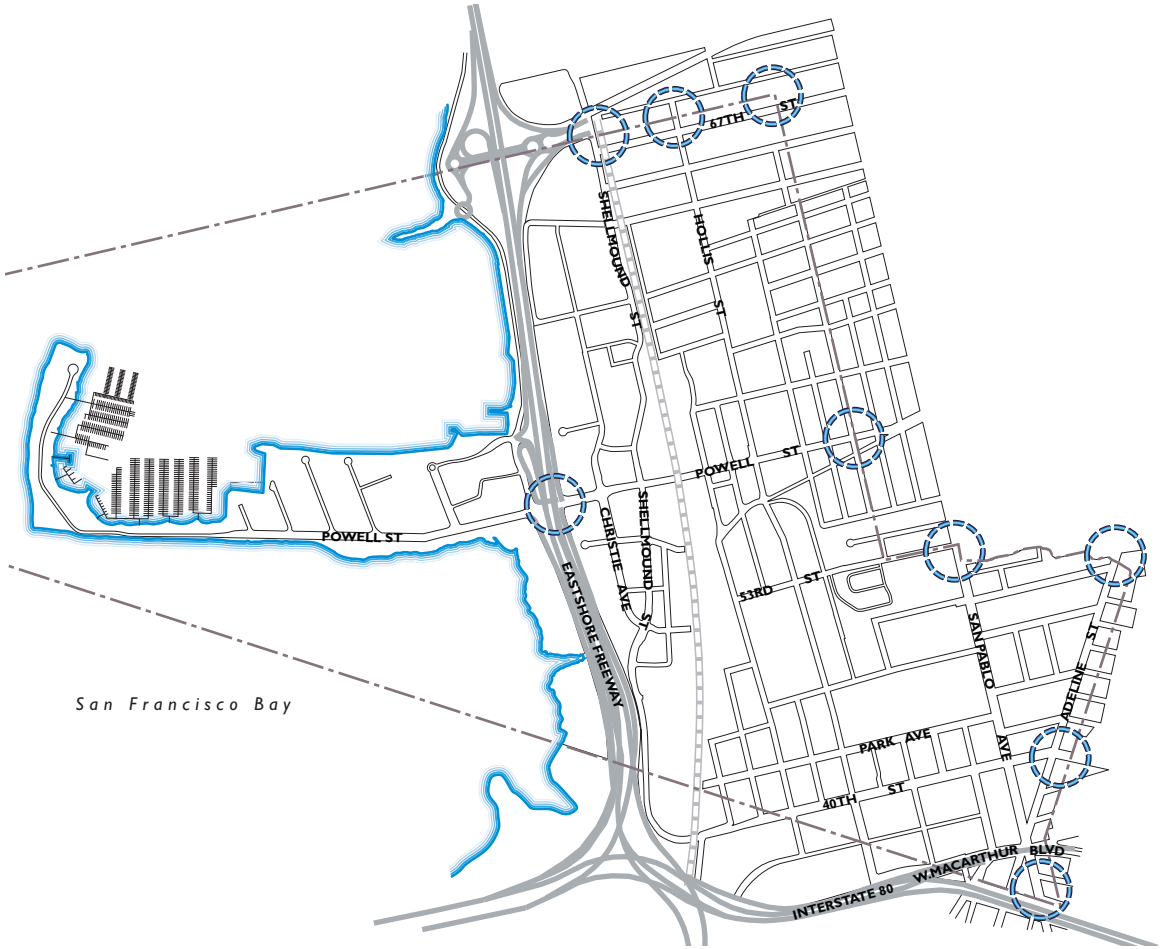


Given its proximity to major shopping areas, this intersection at Powell Street and Christie Avenue is within a Pedestrian Priority Zone. However, with narrow sidewalks and limited pedestrian amenities, this area is not yet comfortable for pedestrians.

GATEWAYS

Gateways denote key entrances to the city where specially designed landmark elements should be focused. There are nine gateway entrances to the city.

1. Powell Street at the off-ramp from I-80
2. Shellmound Street near Ashby Avenue
3. Hollis Street north of 67th Street
4. Greenway north of 67th Street
5. Powell Street at Vallejo Street
6. San Pablo Avenue and 53rd Street
7. Adeline Street north of 47th Street
8. 40th Street east of Adeline Street
9. San Pablo Avenue and 36th Street



DESIRABLE



This entry arch creates a distinctive entrance to the city of San Diego's Gaslamp Quarter.

UNDESIRABLE



This entrance to the city along Hollis Street does little to acknowledge arrival into Emeryville.

DESIRABLE



This gateway entrance into Emeryville along the greenway provides an attractive entry way into the city, but does not successfully announce the arrival into Emeryville. Signs or art work can be used to better signify entries to the city.

I-18 Gateway features should be unique in design, visible to both motorists and pedestrians, and emblematic of the city's cultural and historic identity as well as its role within the region.

- Create visual gateways through streetscape design, public art, signage, landscaping, lighting, and pavers to create a sense of entry and city character.
- Complement street improvements with distinctive building massing and design.
- Emphasize building corners at site entries with vertical architectural elements and massing to create a balanced and well-defined physical gateway.

GREENWAYS AND GREEN STREETS

Greenways and green streets are envisioned as landscaped green oases, offering opportunities for strolling, lingering, sitting, and jogging, while providing environmental benefits such as stormwater treatment.

- Greenways are on- and off-street linear parks—intended for transportation, active recreation, and passive contemplation—containing pedestrian and bicycle paths, small gathering places, and recreational facilities. Two greenways will traverse the city, one north-south and the other east-west.
- Green Streets are designed to improve connectivity between neighborhoods, parks, employment and other activity centers, and to increase the provision of open spaces. This network builds on the greenways to improve connectivity along key streets while using pervious surfaces and vegetation for additional stormwater treatment.

I-19 Building and unit entrances (though not necessarily primary entrances) should front the public pathway.

I-20 Public-oriented uses should be located at the ground level, (e.g. workshops, lobbies, and common areas).

I-21 Street trees and landscaping designs should employ Bay-Friendly Landscaping practices.

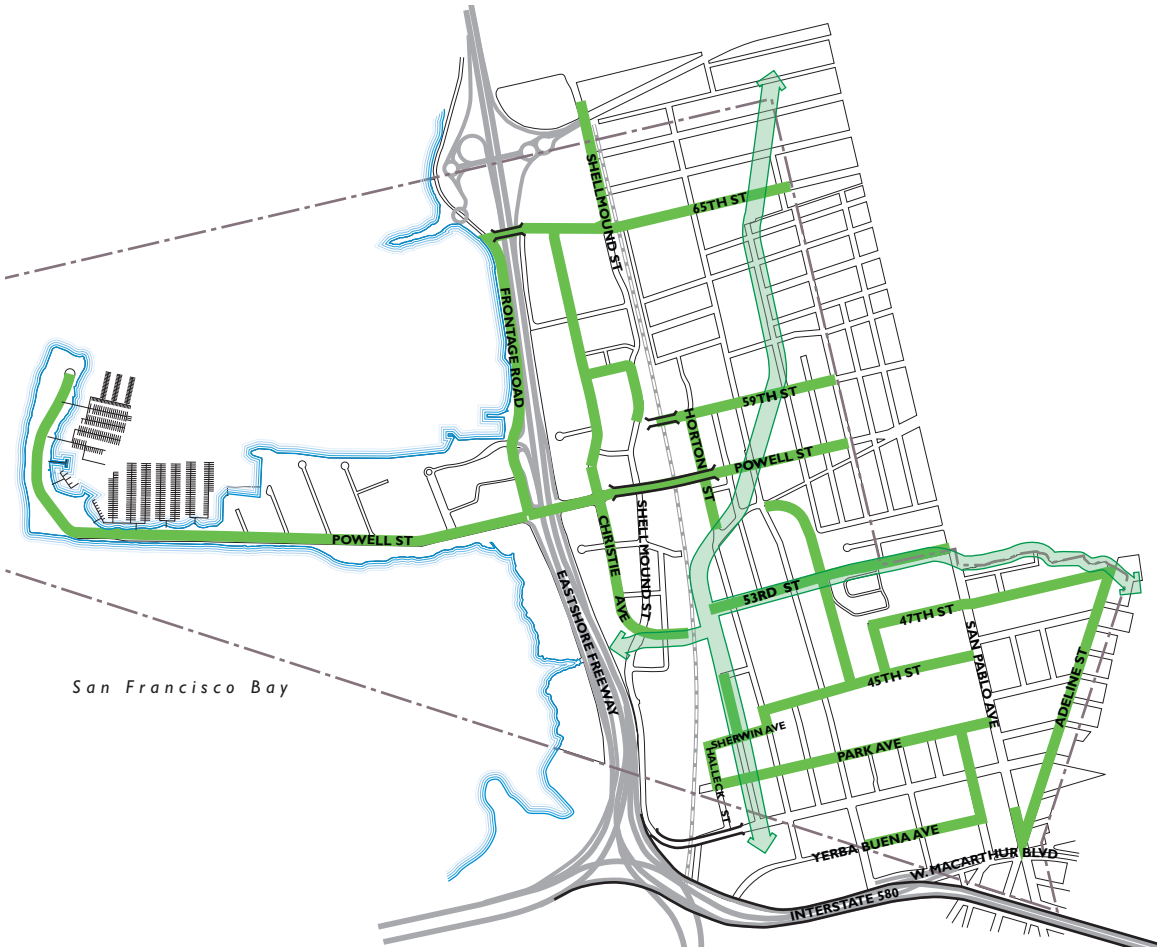


FIGURE 3-5: Greenway Sidewalk Dimensions

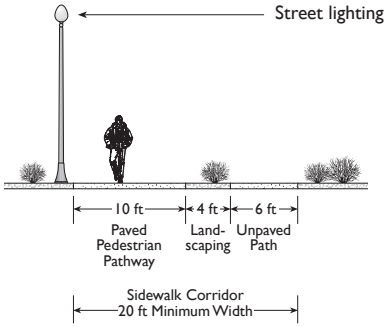
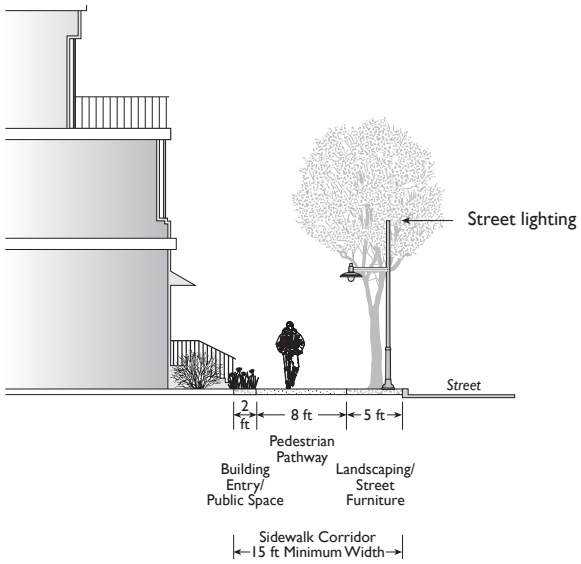


FIGURE 3-6: Green Street Sidewalk Dimensions



> "Greenways are paths where the natural and human landscapes coincide."
>
> **- John Hessin Clarke**

I-22 Where residential developments are located on a greenway, stairs, stoops, or other architectural features which contribute to the pedestrian life of the street or path, are also encouraged.

I-23 Design wide paths and sidewalks in conformance with the minimum widths specified in Figure 3-5 and 3-6, respectively.

I-24 Parks or plazas should be located along greenways and/or green streets, as part of new or rehabilitation projects, to allow for places to linger, sit, and contemplate. Consider using special pavers and other markers to signify this unique amenity.

I-25 Site buildings and design pathways to provide sunlight on greenways and green streets.

I-26 Temescal Creek (flowing in a culvert under 53rd Street) should be represented with a creek feature at the surface.

I-27 Public art should be located along greenways and green streets.

I-28 Appropriate crossings should be provided for bikes and pedestrians.

DESIRABLE



Planters and landscaping can help define the character of green streets while also serving as a buffer between pedestrians and vehicles. Mature trees and large canopies give this Emeryville street an inviting and comfortable feel.

DESIRABLE



Front yard setbacks for these residential units create additional green space along the Emeryville greenway. Lighting provides visibility and safety for nighttime users.

DESIRABLE



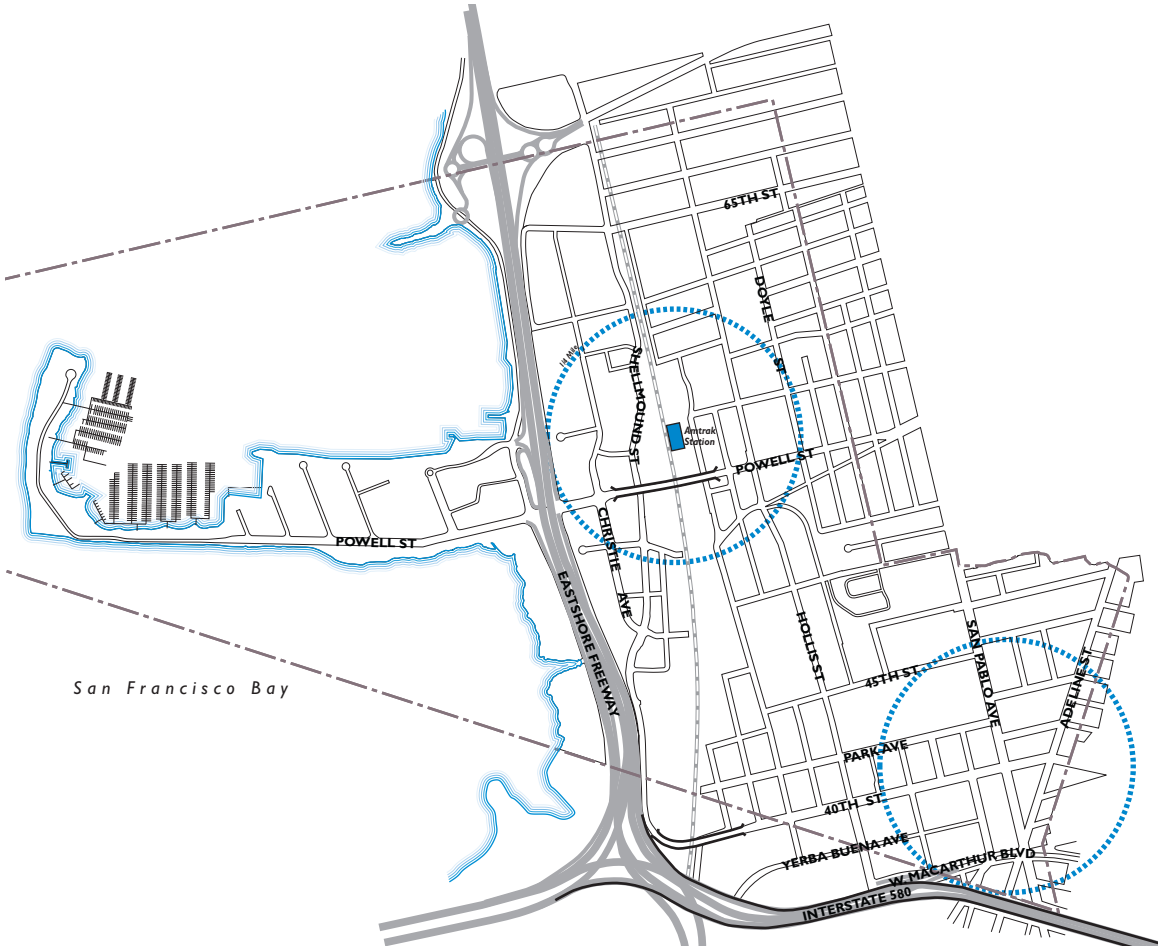
The ground-floor café and residential units in this development off of Powell Street face the greenway, creating opportunities for interaction, recreation, and relaxation.

DESIRABLE



In this Bay Meadows example, a creek feature creates a soothing and attractive addition to a linear park.

© Field Paoli



TRANSIT HUBS

Transit hubs are transfer points where high volume transit lines intersect. Two 1/4-mile radius hubs have been identified in Emeryville: at the Amtrak station and at 40th Street and San Pablo Avenue, where several AC Transit buses and the Emery Go-Round intersect.

I-29 Orient building entrances to provide convenient access to transit.

I-30 Locate active uses, such as retail and restaurants, so that they are visibly accessible to transit users embarking or disembarking trains and buses, and accessing parking facilities.

I-31 Take advantage of reduced parking allowances to construct more building area for residential and commercial uses. (See Zoning Ordinance.)

DESIRABLE



San Pablo Avenue and 40th Street hosts the intersection of several AC Transit and Emery Go-Round lines, as well as restaurants, stores, and residential units.

DESIRABLE



The transit hub at the Amtrak Station has access to several nearby offices, retail establishments, and residences.

DESIRABLE



© Dyett & Bhatia

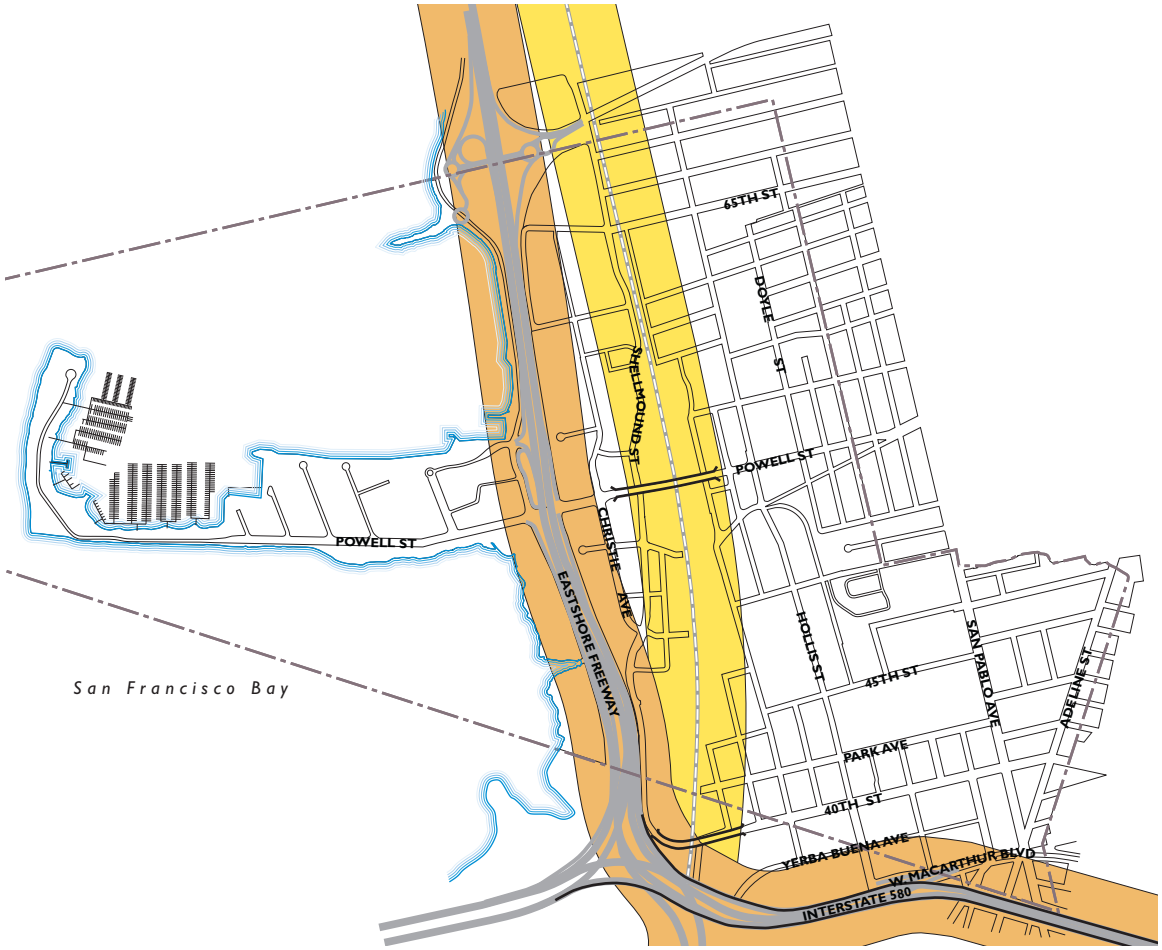
The Fruitvale BART Station includes a pedestrian-only plaza with retail and community services on the ground floor and residential units above.

DESIRABLE



© Dyett & Bhatia

In San Francisco, heavy rail (off screen left), two light rail lines, and several bus lines intersect in this major transit hub. High-density transit-oriented development has ensued in the form of apartment buildings, a supermarket, various retail stores, and a public library.



FREEWAY/RAILWAY ADJACENT

With Emeryville's exceptional accessibility to freeways and the railway line come potential impacts, specifically: noise, air pollutants, obstructed views, and disruption to vehicle and pedestrian mobility. Careful site planning and building design can help reduce these impacts.

I-32 Consider land use compatibility in developments near freeways or railroads.

I-33 In general, buildings directly adjacent to a freeway or railway should not contain residential uses. Where such buildings do contain residential uses:

- Set back buildings from the freeway and buffer with landscaping, open space, and/or off-street parking to provide a visual barrier to the freeway or railway.
- Consider screening from the freeway in the selection and location of planting materials.
- Locate residential units higher than the freeway to avoid obstructed views and air pollutants.
- Offer appropriate level of sound/vibration insulation in windows and walls. Facades should be constructed with substantial weight and insulation. Construct exterior walls with soundboard underlayer or resilient layer.
- Use double doors and/or solid core doors with perimeter weather stripping and threshold seals.

- Limit glass in windows facing the noise source to reduce impacts. Windows should include screens to reduce dust and particulate from entering open windows.
- Mechanically ventilate units that directly face the freeway or provide comfortable temperatures and noise attenuation through some other means, so that residents can leave windows closed, maintain adequate heating and cooling, and ensure good air quality.

DESIRABLE



These commercial and hotel uses in and around the Marketplace are better suited directly adjacent to noisy locations, such as the railroad.

DESIRABLE



Hotels are also an acceptable use adjacent to the freeway in Emeryville, permitting short-term stays and tall buildings that enjoy views of the bay.

J BUILDING AND USE TYPES

These guidelines articulate unique principles for specific building types and land uses.

DESIRABLE





These two Emeryville examples are successful at differentiating between retail spaces at the ground-level and residential uses above in both a neighborhood and regional retail setting, through colors, fenestration and signs.

MIXED-USE DEVELOPMENTS

For retail uses in Regional and Neighborhood Retail Overlay areas, see Section I: Area Specific Guidelines.

J-1 Prioritize active uses on the ground-level.

J-2 Maximize compatibility and mutual benefit in the mix of uses:

- Retail uses should be generally limited to the ground-floor spaces along the street.

J-3 Windows should be designed to highlight the uses within, such as storefront windows at the street level and smaller windows, to allow privacy, in residential areas on upper floors.

J-4 The primary entrances for both first-floor establishments and upper level units should be within the primary façade and should be visible and accessible from the street.

RETAIL

For retail uses in Regional and Neighborhood Retail Overlay areas, see Section I: Area Specific Guidelines.

J-5 Articulate building façades with a combination of windows, entries and bays. Opaque roll-down doors that cover storefronts are strongly discouraged (also see I-8).

J-6 In retail areas composed of several stores (e.g. shopping centers), define individual storefronts, in keeping with the desired pedestrian scale and character.

- Variations in façades at the ground level, such as shallow recesses at entries, are encouraged, to create the appearance of several smaller buildings or shops, rather than a single, large and monotonous building.

J-7 Protect store entrances from wind through site planning, screening, and entrance design.

J-8 Where large retail establishments are constructed, ensure that they are of quality design and pedestrian-oriented:

- Enclose large retail stores within multi-story buildings.
- Provide fenestration (windows, glass storefronts and doors), cohesive signage, and multiple entries.
- Consider a continuous arcade along the front façade and/or a small plaza to visually define store entries.
- Provide variations in roof line to reduce the massive appearance of large buildings.
- Design an appropriate level of design detail on all visible façades, ensuring that loading, storage, and equipment areas are screened and well-integrated into the building.
- Accommodate pedestrian and bicycle traffic, bicycle parking, as well as vehicle traffic. Construct entries from the public street. Provide a plaza at the entry to each anchor tenant that provides for pedestrian circulation. Entry plazas and passenger loading areas should include distinctive paving materials, seating, shade from the summer sun, and attractive landscaping.

General Plan Guiding Principle #8. A balance of regional and local amenities. Given its location, Emeryville will remain a regional destination. However, the City will balance retail uses that draw visitors from throughout the region, with stores and amenities that serve neighborhood needs, while ensuring fiscal health and a sustainable economy. The General Plan emphasizes development of pedestrian-oriented and scaled (rather than auto-oriented) districts and policies to ensure that development provides benefit for the local community, and that small, often local, businesses are viable.

DESIRABLE



© Field Paoli

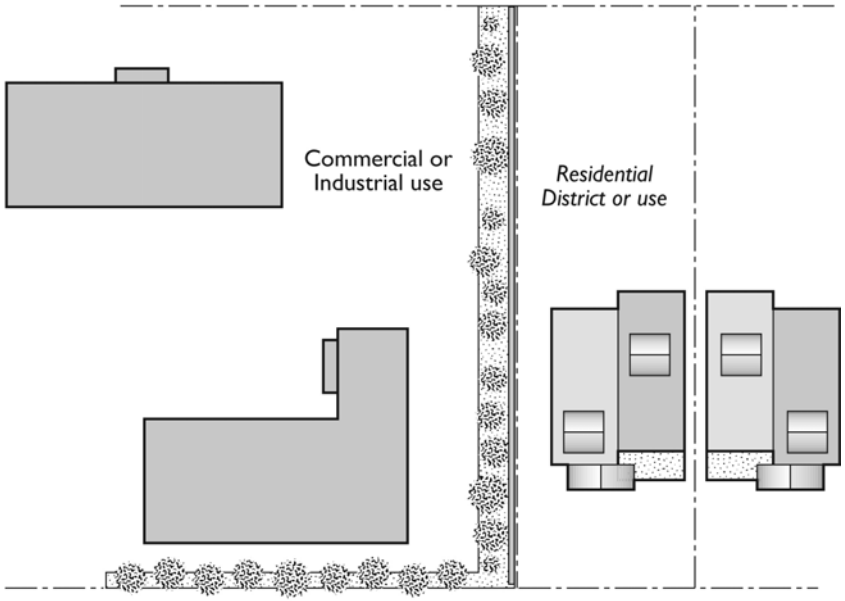
This store in Alameda uses articulation, landscaped planters, high quality wood finishes and a clear entry and awning to create an attractive retail destination.

UNDESIRABLE



This store has several good design features, including a defined corner, awning, plaza, and pedestrian entrance from sidewalk. However, the store's primary façade faces the parking lot, instead of the public street, detracting from the pedestrian experience along San Pablo Avenue.

DESIRABLE



Fencing and landscaping between industrial and residential land uses can reduce noise and visual impacts.

INDUSTRIAL

J-9 Adaptively reuse older industrial structures that contribute to Emeryville's character, where feasible; if reuse of entire structure is not feasible, incorporate features of older buildings to enhance visual richness and connections to the past.

J-10 Use materials and architectural features that respect existing industrial style and character.

J-11 Use landscaping to buffer visual impacts and changes in use, particularly in transition zones between commercial or industrial and residential uses. Window design and ground-floor entries should maximize pedestrian safety and visibility.

J-12 Minimize noise impacts, especially on surrounding residential uses, through the following means:

- Control noises at the source through buffering, dampening, or active cancellation techniques. (This is the most desirable means of noise reduction.)
- Control noises at the receptor ends through setbacks, soundproof windows, screening, and berming. Avoid using sound walls which often restrict access and visibility.

The Zoning Ordinance also contains performance standards that minimize impacts between industrial and sensitive land uses.

DESIRABLE



This industrial use in Emeryville incorporates many of the design principles recommended in these guidelines, including a focused entry, landscaping, and architecturally compatible signage.

UNDESIRABLE



Industrial uses are an essential component of Emeryville's history and its current economy. However, even these areas should include sidewalks for pedestrians.

DESIRABLE



Industrial buildings no longer operating with industrial uses may be repurposed for new uses, such as this Park Avenue District example. Adaptive reuse can preserve the city's culture and respect its history, while also conserving natural resources.

DESIRABLE



Emeryville's City Hall asserts a prominence in its form, while also projecting playfulness through its public art installation and openness in the transparency of the modern wing.

DESIRABLE



The proposed Center of Community Life is expected to be one the City's most important civic project in the near future. It should be designed for a range of users, including children and seniors, and evoke a sense of civic pride.

CIVIC AND PUBLIC BUILDINGS

J-13 Orient primary building entries toward the street, with attractive pedestrian walkways to the sidewalk.

J-14 Line street- and plaza-facing façades with windows.

J-15 Define public buildings with a prominent entrance, through architectural and landscape features, such as tower elements, canopies, columns, recesses, plazas, public art, and landscaped open space.

OFFICE/TECHNOLOGY

J-16 Design the floor-to-ceiling height of the first floor to be of adequate height (generally minimum 14 feet) to enable flexibility for non-office use.

J-17 Use vertical building elements to break up what may otherwise be horizontal architectural composition.

J-18 Incorporate elements such as awnings, porches, or porticos along the street-facing facades.

J-19 Design the base of the building facing the public street to accommodate retail and other non-office uses, where feasible.

J-20 Articulate the building base with a change in materials, color and finishes, fenestration pattern and size, and/or an emphasized building entrance. Additional accent materials such as tile insets or natural stone should be used at the base of the building to provide added texture, color and visual interest at the pedestrian level. Residential

DESIRABLE



© Dyett & Bhatia

The variety of color, materials, articulation, and window height, and the setback that creates an entry plaza, break up the massing of what is otherwise a large building in San Francisco.

UNDESIRABLE



Although the streetscape, building materials, and signs are appropriate and well-designed on this Emeryville building, the lack of differentiation at the ground-level, window pattern, and overall lack of articulation perceptively elongate this already large block.

DESIRABLE



Housing should meet the needs of various ages and groups. The Bayside Park development in Emeryville offers independent and assisted living for seniors, in an attractive design and transit accessible location.

DESIRABLE



High-rises are fronted by townhomes with entrances at the street level in this San Diego development, providing more access points and increasing safety and security, since residents can look directly onto the street.

DESIRABLE



Landscaped walkways add charm to residential projects.

DESIRABLE



Balconies created through building stepbacks, and windows create textured buildings for both the residents and passersby in this Emeryville example.

RESIDENTIAL

SITE & BUILDING DESIGN

J-21 Design housing to support a range of household types, incomes, and sizes.

J-22 Landscape pedestrian walkways to provide attractive spaces, as well as privacy.

J-23 Provide visual privacy between units. Where units face each other across a narrow distance, windows should be offset.

J-24 Place the mailboxes on the path to units from the main pedestrian entrance.

J-25 Arrange parking, pedestrian circulation, and building entrances so that residents and visitors are encouraged to access residential units from a street or greenway.

J-26 Consider additional lighting, changes in plane, and other security measures to ensure safety and security. Avoid using bars or security grills on windows and doors.

J-27 For all multifamily residential development, promote identity and street safety.

- Design a portion of the ground level frontage of all multifamily residential developments (including high-rises) to be residential units or other active uses, with individual or paired entrances from the street edged with landscaping. Alternatively, articulate ground-floor residential building façades to differentiate individual residential units

from each other and from the overall massing of the building, in order to express a rhythm of individual units along the street.

- Design ground floor units to include windows that face onto the street. At the same time, ensure the privacy of residents by considering the interior floor height, window height and other design factors. Maximize views of the street from the interiors of units while minimizing views into units from the street.

J-28 In projects with 30 or more units, provide a community multipurpose room with at least 500 square feet of space, internet access, kitchen facilities and a rest room, for parties, meetings, homework clubs, computer access, art, or other resident activities.

J-29 In corridors serving six units or more, define entries and break up walls by using lighting and articulation of walls and ceiling.

J-30 Provide efficient access from units to exterior common open space, and visual connections from interior hallways and stairs to exterior space.

UNIT DESIGN

J-31 Maximize ventilation and sunlight by providing multiple exposures and shallow unit depths as much as possible. Place living areas along exterior walls and place bath and storage areas along interior walls.

J-32 Take advantage of views and natural light, particularly for living areas, by providing large areas of glazing looking onto streets, yards, or other exterior spaces. Provide shading on south and west exposures.

J-33 Maintain a sense of privacy from within housing units, while allowing views onto streets and interior courtyards.

J-34 Provide visual interest and improve quality of life for inhabitants through the use of stoops, porches, recessed windows, bay windows, and balconies.

J-35 Incorporate architectural features and materials that assure high-quality, human-scale, distinctive design that is comfortable and attractive to residents. Consider vaulted ceilings; arches; corner treatments; window, ceiling, and roof proportions; and the proportional relationship between the façade and the roof, where roof height is less than or equal to floor height, above the first floor.

J-36 For units that are adjacent to common open space, provide access through transition spaces between the units and the common space.

J-37 Kitchens should be well ventilated with windows providing cross ventilation or a quiet, powerful fan venting to the outside.

J-38 In units with two or more bedrooms, include an entry coat closet, a pantry, and a linen closet or cabinet.

J-39 In multi-level units, provide closed stair risers.

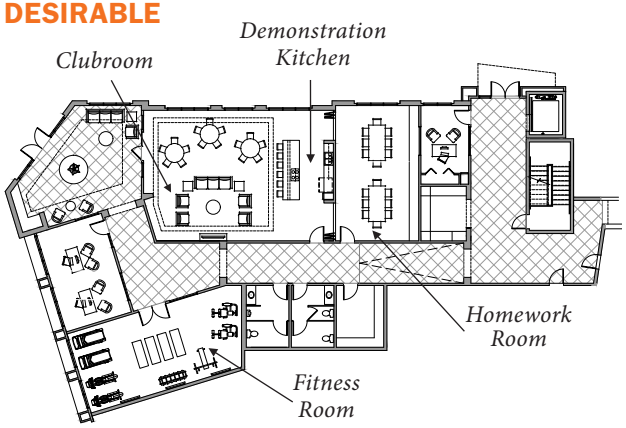
J-40 Show furniture in unit plans submitted for planning approvals.

DESIRABLE



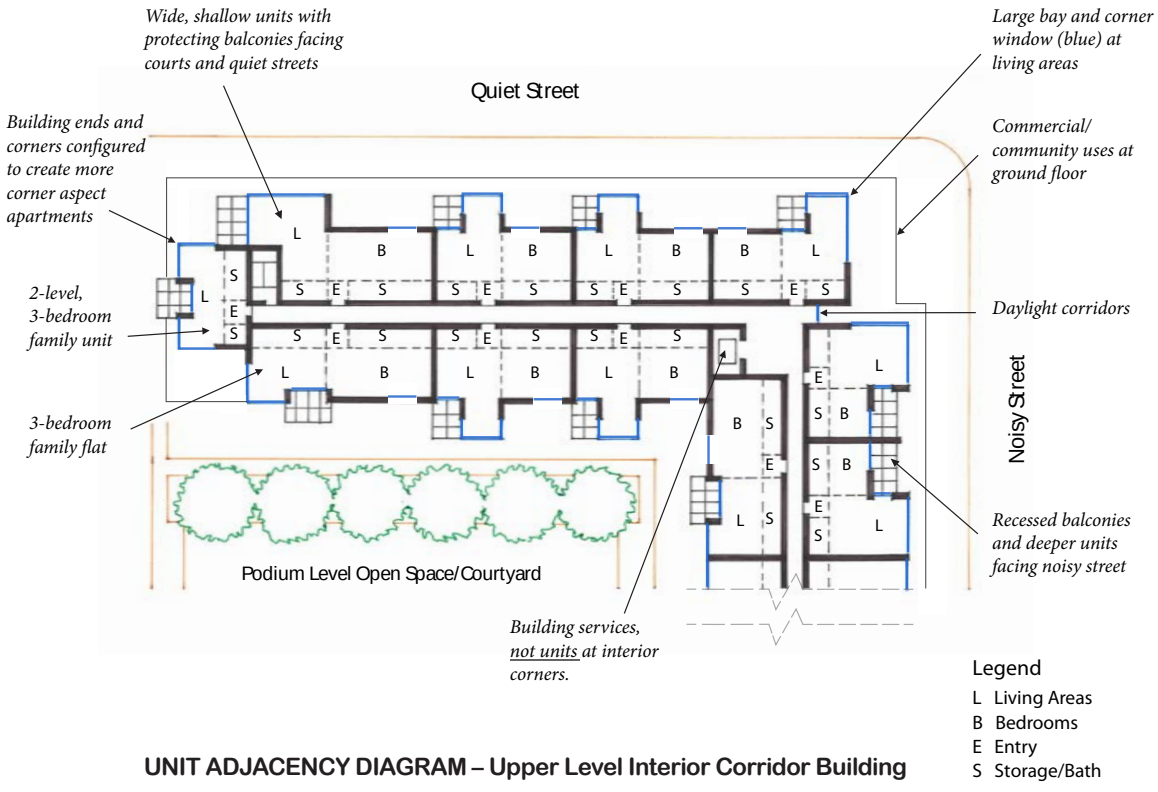
This Emeryville affordable housing project at 3706 San Pablo features an interior courtyard with designated circulation paths and play areas for different age groups.

DESIRABLE



The 3706 San Pablo project offers a variety of amenities to the residents, including a clubroom, a homework room, a demonstration kitchen and a fitness room.

DESIRABLE



UNIT ADJACENCY DIAGRAM – Upper Level Interior Corridor Building

The relation of units to each other, the type of streets and open space is important for successful family-friendly design.

FAMILY-FRIENDLY RESIDENTIAL

SITE & BUILDING DESIGN

J-41 Provide units with two, three or more bedrooms.

J-42 In high density housing, include a variety of unit types. Multi-story units can be included in a larger building with single-story units for greater diversity.

J-43 Place and configure units to relate well to quiet and noisy streets, on-site open space and each other, as shown in the Unit Adjacency Diagram.

J-44 Situate as many family-oriented units as possible adjacent to open spaces designed and landscaped to create active play areas and opportunities for gathering and quiet respite.

J-45 Provide ample exterior play areas that are safe and visible from major spaces in homes, with a variety of age-appropriate equipment.

J-46 Design visible places where pre-teens and teens will want to gather.

J-47 In larger projects (e.g. over a hundred units), consider dividing the project into smaller communities centered around open space, where residents have exclusive access to their common and circulation areas.

J-48 Designate parking for family-friendly units near hallways and elevators. If parking lifts are used for family units, they should not require backing one car out to get to another car.

J-49 Provide more bicycle parking than the code requires, with space for longer family bicycles and trailers.

J-50 Provide ample in-unit or common laundry areas. Common laundry areas should have convenient access, and be located on each floor, or near common gathering space. In-unit laundry facilities are preferred in units with three or more bedrooms.

UNIT DESIGN

J-51 Front doors should not enter directly into a room, but rather should enter into a transitional space, which could be an enclosed foyer.

J-52 Provide indoor space near the entry for tricycles, strollers, outdoor toys, etc., where parked items will not obstruct circulation.

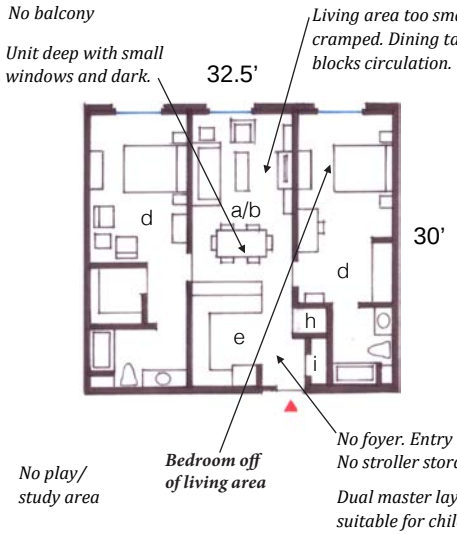
J-53 Provide only one master suite. Other bedrooms should have access to a common bathroom. In three-bedroom units provide at least two full bathrooms.

J-54 Separate sleeping areas from living areas. In two-level units, place bedrooms on a separate floor from living areas, except where a den or study on the living area floor could also function as a bedroom.

J-55 Provide each bedroom with access to a full bathroom without going through the living room, dining room or kitchen. Provide a bathtub in the unit. In multi-level units, provide at least a half bath on the floor with the living room, dining room and kitchen.

UNDESIRABLE

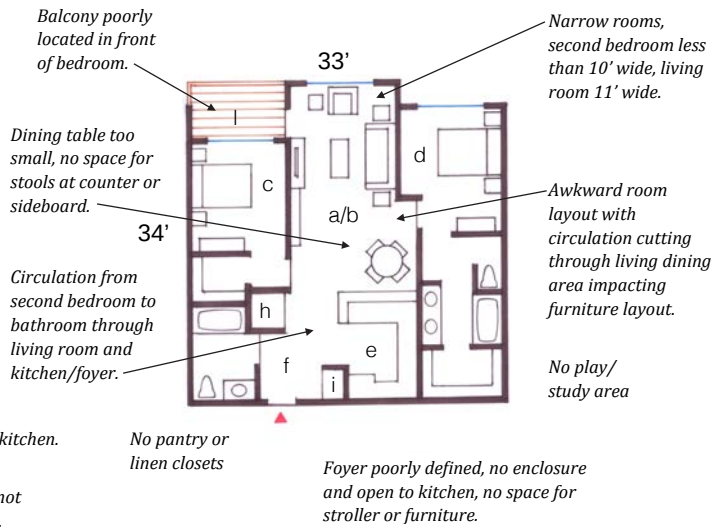
All rooms narrow, minimal space for circulation around furniture.



2 Bedroom/2 Bath Dual Master FLAT – 975 SF
(Interior access from corridor; single aspect)

UNDESIRABLE

Deep unit requires more floor area than shallow unit to fit rooms, but is cramped and has poor daylight potential.

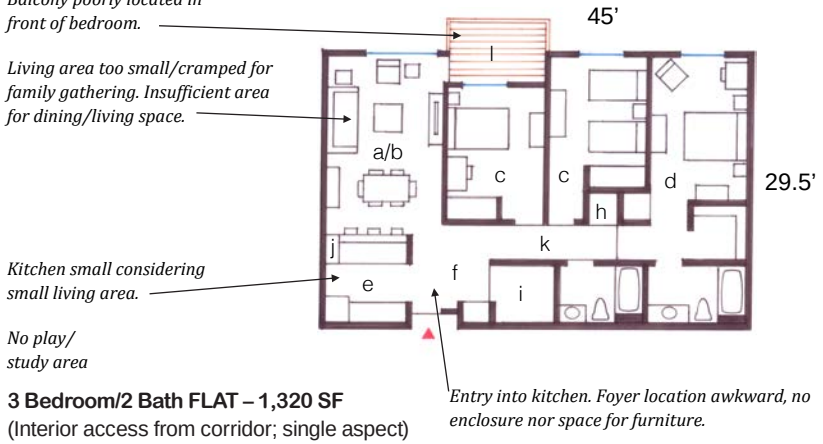


2 Bedroom/2 Bath FLAT – 1,035 SF
(Interior access from corridor; single aspect)

Room Legend

a. Living
b. Dining
c. Bedroom
d. Master Suite
e. Kitchen
f. Foyer
g. Study
h. Laundry
i. Closet/Stroller
j. Pantry/Storage
k. Wide Hallway
l. Patio/Balcony
◀ Entrance

UNDESIRABLE

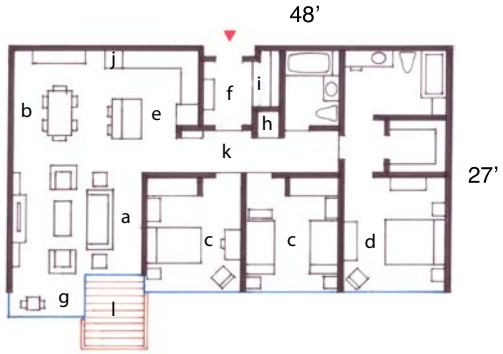


3 Bedroom/2 Bath FLAT – 1,320 SF
(Interior access from corridor; single aspect)

DESIRABLE



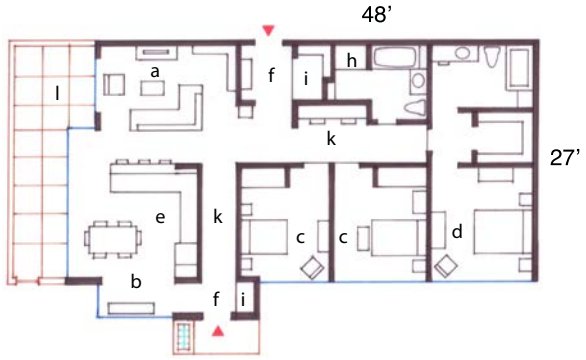
EXAMPLE A
2 Bedroom/2 Bath FLAT – 1,100 SF
(Interior access from corridor; large bay form)



EXAMPLE C
3 Bedroom/2 Bath FLAT – 1,300 SF
(Interior access from corridor; single aspect)



EXAMPLE B
2 Bedroom/2 Bath FLAT – 1,152 SF
(Interior access from corridor; deep unit; adjacent unit set back or shallow to improve daylight)



EXAMPLE D
3 Bedroom/2 Bath FLAT – 1,419 SF
(Exterior access from courtyard/mew; private patio; building corner/end location)

The examples above illustrate ways to arrange one-story family friendly two- and three-bedroom units.

J-56 The dining area should have enough room for a family-sized dining table with all household members seated around it, plus circulation. The living area should also have enough room for seating for all household members plus other furniture and circulation.

J-57 In units near play areas, provide windows that allow for supervision of children outdoors.

J-58 Hallways in units should be well lighted and wide enough for children to play in.

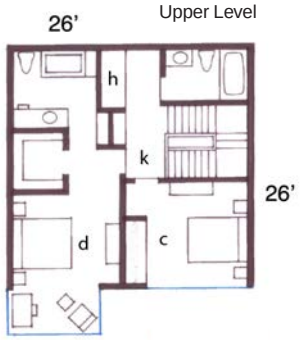
J-59 Provide space that can change use as children grow, such as from toddler play to homework to music making to gathering.

Room Legend
a. Living
b. Dining
c. Bedroom
d. Master Suite
e. Kitchen
f. Foyer
g. Study
h. Laundry
i. Closet/Stroller
j. Pantry/Storage
k. Wide Hallway
l. Patio/Balcony
◀ Entrance

J-60 For units with other units below, provide soundproofing between ceilings and floors with an Impact Insulation Classification that is above the Building Code requirement, except under kitchens and bathrooms.

J-61 Design units with infant and toddler safety in mind (e.g. stairs that easily accept toddler gates, no glass room dividers, and ability to add child safety devices or window locks to prevent toddlers from climbing out of windows).

DESIRABLE

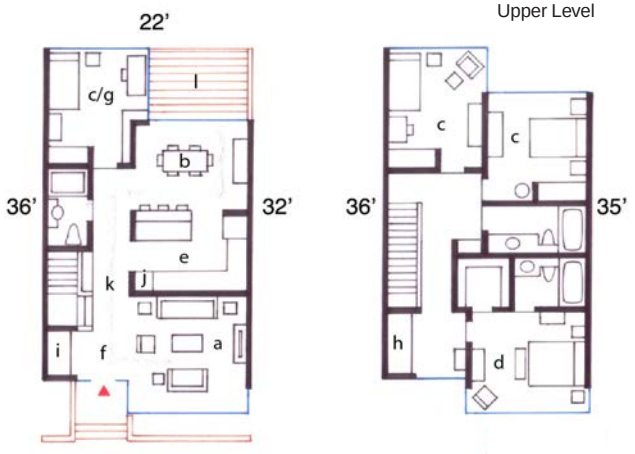




EXAMPLE F
3 Bedroom/2.5 Bath with Study/Play Room 2-LEVEL – 1,437 SF
(Interior access from corridor; single aspect)



EXAMPLE E
2 Bedroom/2.5 Bath 2-LEVEL – 1,263 SF
(Exterior access from courtyard/mew/street)



Note: Ten percent of two-story units must meet accessibility standards at entry level.

EXAMPLE G
4 Bedroom/2.5 Bath 2-LEVEL – 1,548 SF
(Exterior access from courtyard/mew/street;
note: stacked unit above with gallery access possible)

Room Legend
- a. Living
- b. Dining
- c. Bedroom
- d. Master Suite
- e. Kitchen
- f. Foyer
- g. Study
- h. Laundry
- i. Closet/Stroller
- j. Pantry/Storage
- k. Wide Hallway
- l. Patio/Balcony
- ◀ Entrance

The examples above illustrate ways to layout two-story family friendly two-, three-, and four-bedroom units.

> If we can develop and design streets so that they are wonderful, fulfilling places to be—community-building places, attractive for all people—then we will have successfully designed about one-third of the city directly, and will have had an immense impact on the rest.
>
> **- Allan Jacobs**

K STREET TYPES

LOCAL STREETS

Local Streets accommodate low volumes of local traffic and primarily provide access to property and from properties.

K-1 Design ample sidewalks for pedestrians, on both sides of the street.

K-2 Maintain safe streets for children and pedestrians by ensuring low vehicle speeds through traffic calming measures (e.g. chokers, textured pavement).

CONNECTOR STREETS

Connector Streets accommodate moderate to high volumes of through-traffic within and beyond the city. In Emeryville, these streets typically have bike lanes or signed routes.

K-3 Design ample sidewalks for pedestrians, on both sides of the street.

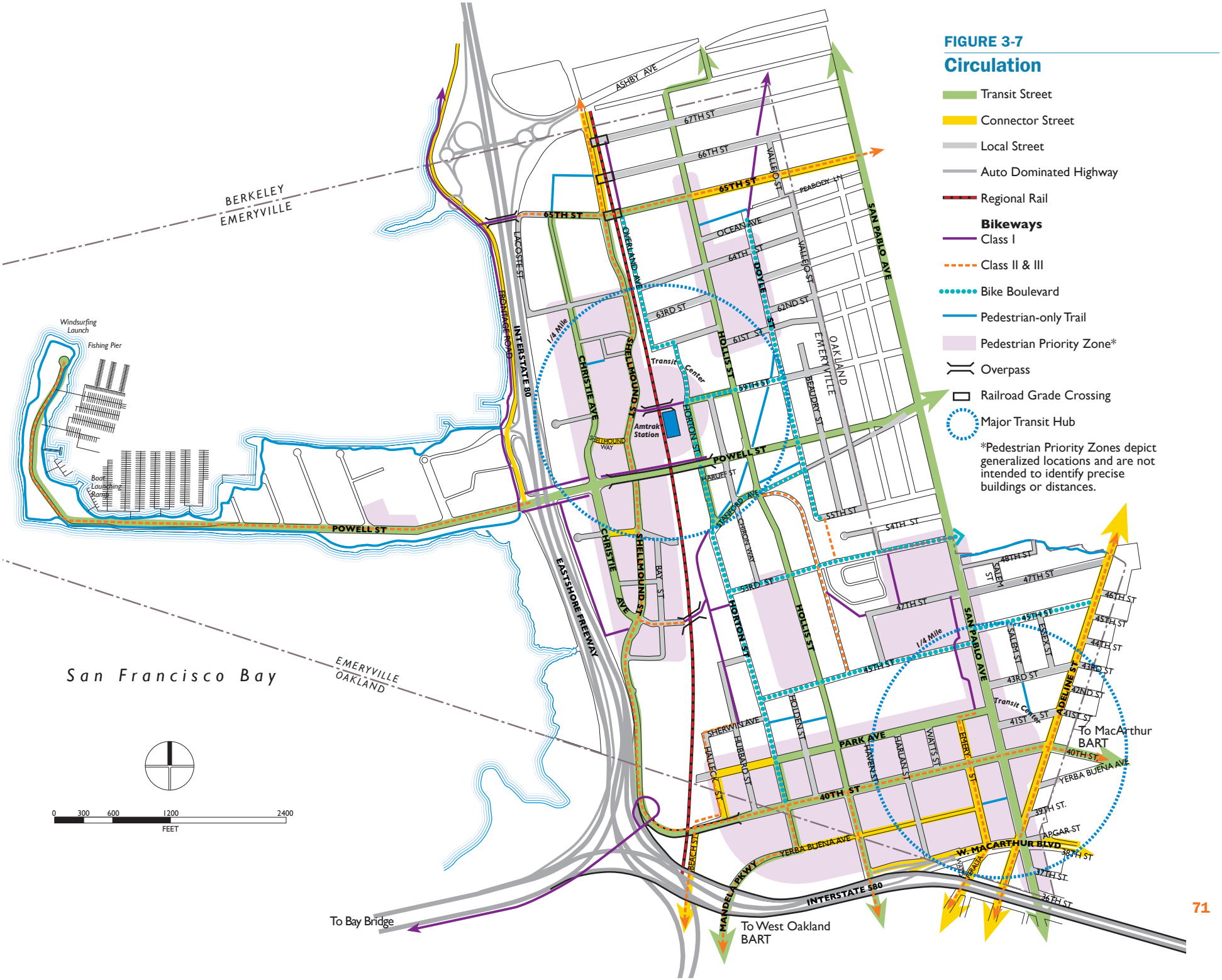
K-4 Prioritize pedestrian crossings at intersections through design elements: bulbouts, textured pavers, raised intersections, and/or highly-visible paints.

AUTO DOMINANT HIGHWAYS

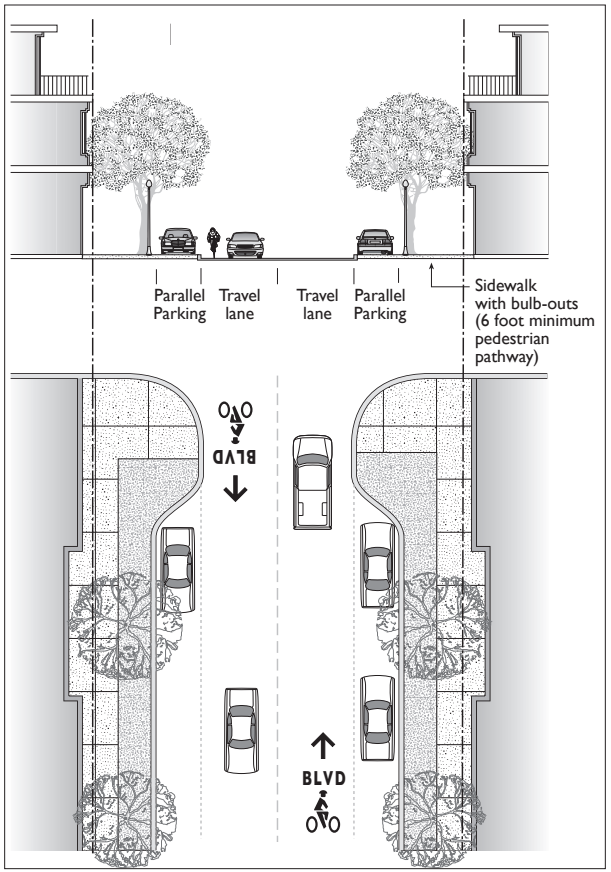
Auto Dominant Highways serve high volumes of high speed regional motor vehicle traffic including automobiles and trucks, as well as AC Transit Transbay and other express buses. These include roadways, freeways (operated by the State and County), and approach roads, such as Ashby Avenue and the West MacArthur Boulevard underpass.

K-5 Although pedestrians are prohibited on these streets, pedestrian safety should be maintained at the transition to City streets, such as at the West MacArthur Boulevard off-ramp, where a community garden is located.

K-6 Highway off-ramps coincide with gateway entrances to the city at Powell Street and Ashby Avenue and should be designed consistent with gateway guidelines, as described in Section I: Area Specific Guidelines.


FIGURE 3-7
Circulation
Transit Street
Connector Street
Local Street
Auto Dominated Highway
Regional Rail
Bikeways
Class I
Class II & III
Bike Boulevard
Pedestrian-only Trail
Pedestrian Priority Zone*
Overpass
Railroad Grade Crossing
Major Transit Hub
*Pedestrian Priority Zones depict generalized locations and are not intended to identify precise buildings or distances.
BERKELEY
EMERYVILLE
EMERYVILLE
OAKLAND
San Francisco Bay
Windsurfing Launch
Fishing Pier
Boat Launching Ramp
POWELL ST
ASHBY AVE
67TH ST
66TH ST
65TH ST
OCEAN AVE
64TH ST
63RD ST
62ND ST
61ST ST
59TH ST
55TH ST
54TH ST
53RD ST
48TH ST
47TH ST
45TH ST
43RD ST
41ST ST
40TH ST
39TH ST.
38TH ST
37TH ST
36TH ST
PEABODY LN
VALLEJO ST
SAN PABLO AVE
OAKLAND
EMERYVILLE
BEAUDRY ST
DOYLE ST
HOLLIS ST
HORTON ST
OVERLAND AVE
FRONTAGE ROAD
INTERSTATE 80
LACOSTE ST
CHRISTIE AVE
SHELLMOUND ST
SHELLMOUND WAY
Transit Center
Amtrak Station
1/4 Mile
STANFORD AVE
CHIRON WAY
ARUFF ST
BAY ST
EASTSHORE FREEWAY
SALEM ST
FAUNTLEROY WAY
ADELINE ST
Transit Center
To MacArthur BART
PARK AVE
SHERWIN AVE
HOLDEN ST
HARLAN ST
WATTS ST
EMERY ST
HALLECK ST
HOBART ST
YERBA BUENA AVE
APGAR ST
W. MACARTHUR BLVD
BEACH ST
MANDELA PKWY
INTERSTATE 580
To Bay Bridge
To West Oakland BART
0 300 600 1200 2400
FEET

General Plan Guiding Principle #5. A diversity of transportation modes and choices. The General Plan fosters and provides incentives for alternative transportation modes, including transit, car/vanpooling, bicycling, walking, and telecommuting. Residents will be able to access stores, offices, the waterfront, or regional transit networks without needing a car. Land uses capitalize on Amtrak, AC Transit, and Transbay bus lines, and proximity to BART, and are integrated with the Emery Go-Round that extends to within walking distance of most locations. Bicycle paths link housing, activity centers, and recreational amenities, and are buffered where feasible from automobiles to further safety.



Bike Boulevard

BICYCLE BOULEVARDS, PATHS AND ROUTES

The General Plan defines three types of streets that accommodate and prioritize bicycles.

1. Bicycle Boulevards are through-routes for bicycles providing continuous access and connections to the local and regional bicycle route network; motor-vehicles are allowed, but discouraged by traffic calming devices.

2. Class I Bicycle Paths, as defined by Caltrans standards, accommodates both bicycles and pedestrians; motor vehicle traffic is prohibited.

3. Class II Bike Lanes and Class III Bike Signed Routes, as defined by Caltrans standards, are overlaid on transit, connector, and local streets. While bicycle use is always accommodated on local and connector streets, it is encouraged along designated bike routes, which provide continuous access and connections to the local and regional bicycle route network.

K-7 Maintain a numbered bicycle route system that is integrated with the regional bike network and clearly signed.

K-8 Use traffic calming techniques to slow and discourage through-automobile and truck traffic on Bicycle Boulevards. Incorporate islands, curbs, and bike-permeable street closures to block through-motor traffic.

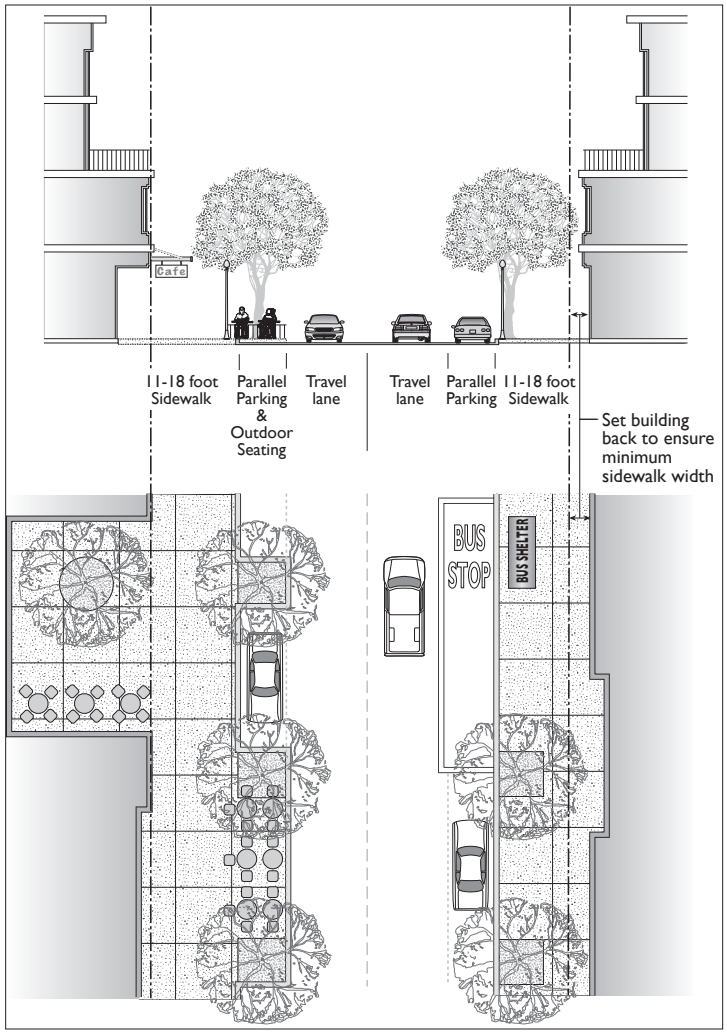
K-9 Allow continuous flow of bicycle traffic along Bicycle Boulevards by removing stop signs, where feasible. Incorporate "Cross Traffic Does Not Stop" warnings below cross-street stop signs to avoid conflicts.

TRANSIT STREETS

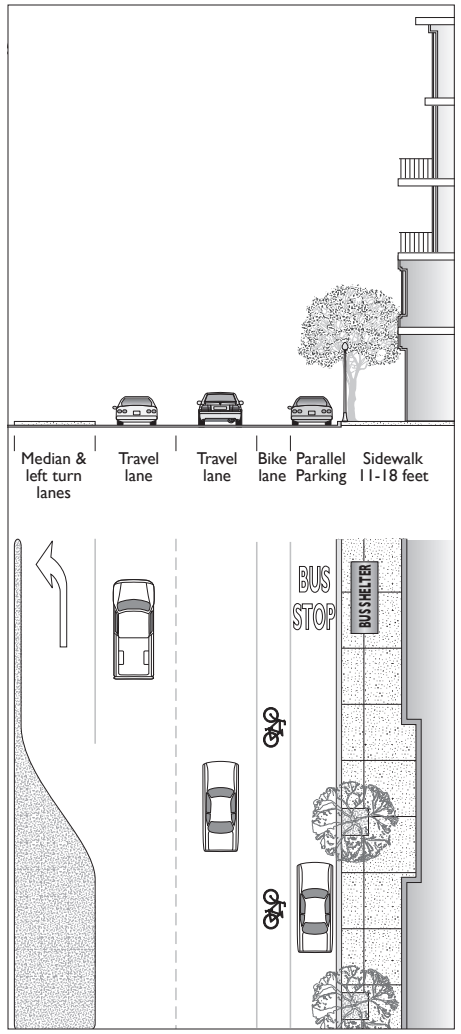
Transit Streets should be prioritized for transit service, but also accommodate pedestrians, with sidewalks and amenities, as well as automobiles, bicycles, and trucks. These streets represent the primary routes for public buses, including AC Transit, and Emery Go-Round.

K-10 Provide signal preemption for transit vehicles, bus stops, and, where appropriate, bus lanes.

K-11 Provide ample sidewalks on both sides of the street and amenities around bus stops, such as shelters, benches, and lighting.



Transit Street (Hollis Street Example)



Transit Street (40th Street Example)

DYETT & BHATIA
Urban and Regional Planners

755 Sansome Street, Suite 400
San Francisco, California 94111
415 956 4300 415 956 7315







Photo credit: Fehr & Peers

City of Emeryville Pedestrian and Bicycle Plan

Adopted: May 15, 2012

May 2012

PREPARED BY:
Alta Planning + Design
IN ASSOCIATION WITH:
Fehr & Peers

alta PLANNING + DESIGN

FEHR & PEERS

City of Emeryville Pedestrian and Bicycle Plan

May, 2012

Prepared by:

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Executive Summary

Introduction

Emeryville is well-positioned to become one of the Bay Area's top walking and bicycling cities due to the city's location, small size, dense development patterns, mix of land uses, and access to local and regional transit. Emeryville benefits from a well-connected network of existing sidewalks and an evolving network of bikeways, including the Bay Trail. The City is commited to developing pedestrian and bicycle infrastructure, investing in infill developments, and engaging with the community to support in-town and inter-jurisdictional walking and bicycling.

Emeryville has the potential to further encourage residents and visitors to walk and bicycle to and through the city for work, shopping, school, and recreational trips. Bicycle commuters from other communities and visitors traveling on the Bay Trail may stop in Emeryville to shop, eat, or play. As the East Bay's portal to the Bay Bridge into San Francisco, Emeryville will be the bicyclist gateway to San Francisco once the Bay Bridge bicycle path is completed.

Purpose

The City has a long history of supporting walking and bicycling. Many of the projects recommended in the City's first Bicycle and Pedestrian Plan in 1998 have been constructed, and others are included in the *Emeryville General Plan*.

This updated *Pedestrian and Bicycle Plan* leverages the work completed to date and details recommended improvements, implementation strategies, and project prioritization, enabling the City to focus on projects that will have the most impact on improving safety and mobility for pedestrians and bicyclists. This Plan is a blueprint for improving pedestrian and bicycle infrastructure and programs over the next ten years. The document complements the *Emeryville General Plan* and guides the implementation of general plan policies that support walking and bicycling.

Why Walking & Bicycling?

Bicycling and walking are low-cost and healthy transportation options that provide economic and livability benefits to communities. When Emeryville residents or visitors choose to walk or bicycle the number of cars on the road is reduced, congestion is alleviated, and greenhouse gas emissions are reduced. Families that can replace some of their driving trips with walking or bicycling trips reduce household expenses.

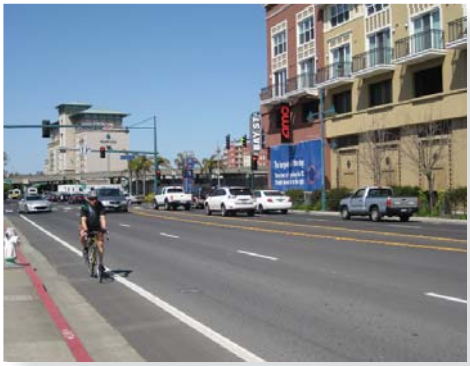
Replacing one daily car trip with a walking or biking trip can help Emeryville residents, workers or visitors get physical activity, reducing their risk of obesity, cardiovascular disease, diabetes, cancer, and osteoporosis.[1,2] The health benefit of bicycling for exercise can reduce the cost of employer spending on health care, which provides a financial incentive to businesses.

1 *Centers for Disease Control and Prevention, How much daily physical activity do you need? http://www.cdc.gov/physical activity/everyone/guidelines/index.html accessed August 2, 2011.*

2 *U.S. Department of Health and Human Services. Surgeon General's Vision for a Healthy and Fit Nation. 2010.*



The Bay Trail is a multi-use path running through Emeryville, and is intended to encircle San Francisco and San Pablo Bays.



Bike lane striping on Shellmound Street provides dedicated space for bicyclists.



Doyle Street has bicycle boulevard markings and signs indicating that bicyclists share the travel lane with cars.



Public Outreach

Emeryville's citizen-based Bicycle and Pedestrian Advisory Committee (BPAC) closely guided the Plan's development through monthly meetings which were open to the public. Residents, property owners, business owners, and employees were invited to participate via the plan website, a community survey, walking and bicycling tours, and two community workshops.

The City also led classroom discussions with students at Emery Secondary School to consider walking and biking issues and to identify potential improvements that would benefit students' travel to and from school. Input from these sources was used to understand barriers to walking and bicycling, and to identify projects and programs for inclusion in the Plan.

Emeryville Pedestrian and Bicycle Plan Vision

The Guiding Principles of the Emeryville General Plan articulate a vision of a livable and diverse city. Those principles are echoed in this Plan's vision statement:

Emeryville is a livable city, with a connected network of green streets and a fine-grained transportation network that emphasizes and supports an active and healthy lifestyle. There are new, safe, and enticing pedestrian and bicycle linkages within the City and to the San Francisco Bay and surrounding communities. Community members have a diversity of transportation choices. Walking and bicycling are integral to daily life.

The goals that support this vision are drawn directly from the general plan, and supported by more detailed policies and actions.

Plan Goals

- **Goal 1: Multi-modal:** A transportation system that eliminates the necessity of owning and/or driving personal vehicles because of the availability of convenient and accessible alternative modes of transportation.
- **Goal 2: A walkable city:** A universally accessible, safe, pleasant, convenient, and integrated pedestrian system that provides links within the city and to surrounding communities, and reduces vehicular conflicts.
- **Goal 3: A safe, comprehensive, and integrated bicycle system:** Develop a safe, comprehensive, and integrated bicycle system — a system and support facilities throughout the city that encourage accessible bicycling for all community members.
- **Goal 4: A regional bicycle and pedestrian network:** Collaborate with countywide regional agencies to coordinate planning and development of County bikeways and trails to support a regional bicycle and pedestrian network.
- **Goal 5: Education, encouragement and enforcement to support walking and bicycling:** Increase the safety of bicyclists and pedestrians and the health of the community through education, encouragement and enforcement to promote walking and bicycling.
- **Goal 6: Funding for pedestrian and bicycle projects and programs:** Fund pedestrian and bicycle projects and programs through existing and new sources of local, regional, state, and federal funding programs.



Existing Conditions and Needs

Pedestrian activity in Emeryville is oriented around major shopping destinations and transit hubs, while bicycling activity is evenly spread along multiple corridors. The Bay Trail is a major attractor and is almost continuous from Richmond to Emeryville. In Emeryville, the existing trail uses both on-street and off-street alignments and could be significantly improved.

The Union Pacific railroad tracks and Interstate 80 present major barriers to east-west travel, with few bicycle and pedestrian crossings. The Powell Street interchange, the only freeway crossing in Emeryville, is a challenging environment due to high speeds and low motorist yielding rates. Future plans for this area will provide better amenities for pedestrians, bicyclists and transit users, as well as additional pedestrian and bicycle connections. Oakland and Berkeley are closely integrated with Emeryville, and the bicycle plans for both cities include connections to employment and shopping destinations in Emeryville.

Education, Encouragement, and Enforcement Programs

Pedestrian and bicycle programs support and encourage walking and biking and complement Emeryville's investments in pedestrian and bicycle infrastructure. The City currently supports Bike to Work Day; solicits public involvement in pedestrian and bicycle planning; maintains facilities and pavement at a high quality; and has strong, supportive design guidelines as well as policies and regulations that support walking and bicycling.



Bicycle tour participants discuss a crossing.



Emeryville supports bicycling by sponsoring events such as Bike to Work Day.

Implementation Strategy

Pedestrian and Bicycle Programs

The following recommended programs will support a pedestrian and bicycle friendly culture and encourage more people to walk or bike in Emeryville:

- **Encouragement programs** provide incentives for people to try walking or bicycling. Examples include car-free street events, applying for Bicycle Friendly Community recognition,[3] establishing a Safe Routes to School Program,[4] and developing a walk/bike to work program.

- **Enforcement programs** enforce legal and respectful walking, bicycling, and driving. The Plan recommends a bicycle patrol, a community-based traffic program, and targeted enforcement.

- **Education programs** seek to improve safety and awareness. The Plan recommends pedestrian and bicycle safety campaigns and adult bicycling skills classes to provide educational opportunities.

- **Evaluation programs** provide support for investments and help secure additional funding. The Plan recommends counting pedestrians and bicyclists annually and publishing a report card with the results.

- **Maintenance** issues can pose safety hazards to pedestrians and bicyclists or make a route inaccessible. The Plan recommends establishing a maintenance schedule for pedestrian and bicycle facilities.

- **Bike sharing** is a system that allows users to check out bikes from publicly accessible stations and return them to other locations within the service area. It may be appropriate for Emeryville due to the city's small size and high concentration of workplaces. A proposed system in San Francisco could support bike sharing in Emeryville through reciprocal memberships.



Bike sharing is increasing in popularity as many cities, including San Francisco, plan to pilot systems.



San Francisco parklet
Source: http://sfpavementtoparks.sfplanning.org/

Citywide Improvements

Improvements to citywide systems are recommended to facilitate and encourage walking and bicycling throughout Emeryville. These range from updating signals to include countdown and audible signal heads, to developing destination signage for both pedestrians and bicyclists. Key citywide recommendations include the following:

- **Signal detection for bicyclists:** Provide all signals with functioning bicycle detection and sufficient signal timing for bicyclists to clear the intersection, and mark loop detectors with a bicycle stencil.

- **Pedestrian directional signage and maps:** Develop a pedestrian signage program that provides information on direct and safe routes between key origins and destinations.

- **Bikeway destination signage:** Install signs with direction and distance to destinations on all bikeways, particularly on bicycle boulevards.

- **Parklets:** Establish a parklet program to temporarily repurpose underused street parking space creating space for pedestrian amenities or outdoor seating for adjacent restaurants and cafes.

- **Bike parking:** Continue enforcing the bicycle parking ordinance and City bike rack and locker programs; expand bicycle parking in public spaces.

3 *The League of American Bicyclists' BFC award program recognizes the efforts cities have made to improve the bicycling environment, including programs.*

4 *Safe Routes to School (SR2S) is a program to help children to get to school by walking and bicycling through education, encouragement, enforcement, and engineering.*



Confirmation signs display mileage to destinations to help route finding.



Pedestrian improvements recommend pavement markings, signs, beacons, and signals to enhance major street crossings.



Bicycle Boulevards include signs and pavement markings, as well as crossing treatments and traffic calming to accommodate all types of bicyclists.



The Emeryville Greenway is a north-south linear park and pedestrian and bicycle path woven through commercial and residential areas utilizing an abandoned railroad.

Site-Specific Improvements

Pedestrian Infrastructure

Upgrades to pedestrian infrastructure for specific locations around the city include sidewalk gap closures, sidewalk upgrades, and new pedestrian-only paths. Pedestrian crossing improvements are recommended along San Pablo Avenue, Powell Street, and 40th Street, as well as selected locations on smaller roadways.

Recommended corridor enhancements on 53rd Street and San Pablo Avenue could entail significant modifications and incorporate a variety of techniques to enhance the pedestrian environment. The Plan recommends transit stop improvements that would provide appropriate amenities for each transit stop, according to ridership, surrounding land uses, and available space.

Bikeways

Once completed, the bikeway network envisioned in the Plan will provide a comprehensive, safe, and logical network of facilities where all types of bicyclists can ride to destinations within the city or seamlessly connect into Oakland or Berkeley.

Emeryville's recommended bikeway network consists of multi-use paths, bike lanes, signed bike routes, bicycle boulevards, and streets with shared lane markings.

Bicycle Boulevards

The Plan provides design guidelines and policies for improving bicycle boulevards in the city. Bicycle boulevards are streets with low traffic volume that are optimized for bicycle travel through signage, pavement markings, intersection crossing treatments, traffic calming, and traffic diversion. They address the needs of those who are interested in bicycling but concerned about riding in traffic.

Improvements are recommended on sections of 45th Street, 53rd Street, Doyle Street, Horton Street/Overland Avenue, Stanford Avenue, and 59th Street.

Multi-use Paths

Multi-use paths permit both bicyclists and pedestrians. Twelve multi-use path projects are recommended, totaling 2.04 miles.

Recommendations include completing the Bay Trail within Emeryville as a multi-use path with appropriate width, signs, and crossings along its length. Recommendations also include completing the north-south Emeryville Greenway to provide a seamless bicycle-pedestrian corridor from 9th Street in Berkeley to 40th Street, and creating an east-west Temescal Greenway as prescribed in the general plan.

Overcrossings

Bicycle and pedestrian travel in Emeryville is significantly limited by two major north-south barriers, Interstate 80 and the Union Pacific railroad tracks.

Recommended overcrossing improvements include the South Bayfront Bridge from Horton Landing Park to Ohlone Way over the railroad tracks, the 65th Street Bridge spanning Interstate-80, and a feasibility study to evaluate options for improving the pedestrian and bicycle access on the Powell Street Pedestrian/Bicycle Bridge over the railroad tracks.

Funding and Implementation

The total cost of implementing the recommendations in this Plan is estimated at $59.1 million including the construction of two major pedestrian/bicycle bridges. As the costs of these projects and programs exceed the City's anticipated bicycle and pedestrian funding, the Plan lays out a strategy that will help the City pursue high-priority projects and projects that cost little but have a big impact, and integrate projects into larger planned roadway and development projects.

The City of Emeryville has been extremely resourceful and strategic in pursuing funding for pedestrian and bicycle expenditures. City staff have successfully secured funds from a number of sources, including the redevelopment funds and the existing Transportation Impact Fee program. Emeryville has also implemented pedestrian and bicycle facilities through a variety of means including redevelopment and private development, and other mechanisms. The City will continue to fund pedestrian and bicycle projects through these sources and explore new sources, such as grant funding and inclusion in the Regional Transportation Plan, and in the Measure B sales tax expenditure plan.

Action Plan

To fully achieve the vision set forth in this Plan, close coordination among City departments, neighboring jurisdictions, and the community-at-large will be required. The Plan defines specific action steps for implementation of Pedestrian and Bicycle Plan goals and policies, as well as identifying the department or agency responsible for implementing each action and a timeframe to strategically develop the City's pedestrian and bicycle network and support programs. Some action items will be completed in the short term—within 2 years of adoption of the Plan, whereas others will be completed within the mid-term—2 to 5 years, or long term—5 to 10 years.

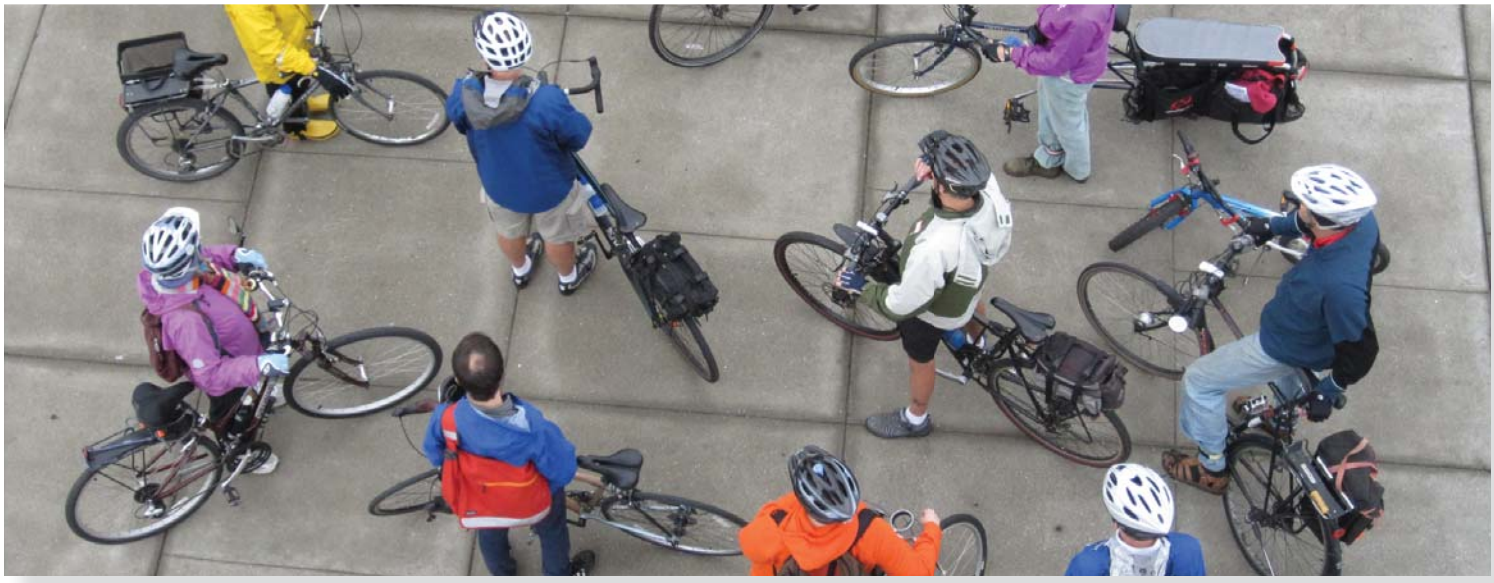
Conclusion

This Pedestrian and Bicycle Plan provides Emeryville with a targeted strategy to build upon the significant work and planning that has already been completed, and primes the city to become the foremost walking and bicycling community in the East Bay.

As the Plan is implemented, Emeryville will become a **more livable city** with a **connected network of green streets** and a **fine-grained transportation network** that emphasizes and supports an active and healthy lifestyle.

The City will have new, safe, and enticing **pedestrian and bicycle linkages** within the City and to the San Francisco Bay and surrounding communities. Community members will have a **diversity of transportation choices**, and **walking and bicycling will be integral to daily life**.

The innovative new strategies and dedication to encouraging non-motorized transportation will make the City a model for pedestrian and bicycle planning.



This Plan is for people of all ages who walk or bicycle in Emeryville and anyone interested in the City's efforts to make these modes safer and more enjoyable.



City of Emeryville Pedestrian and Bicycle Plan

Adopted: May 15, 2012

PART 1: PURPOSE, VISION AND EXISTING CONDITIONS

May 2012

PREPARED BY:
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IN ASSOCIATION WITH:
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FEHR & PEERS

Part 1: Purpose, Vision and Existing Conditions

Part 1 of this Plan sets the background for the improvements recommended in Part 2 of the Plan. Part 1 outlines the importance of walking and bicycling, describes the City's ongoing efforts to support walking and bicycling, and sets a vision, goals and policies to guide the City's future actions. It also summarizes the current conditions for walking and bicycling in Emeryville, including physical conditions, collision statistics, the number of people walking and bicycling, and the community's opinions, needs, and desires related to walking and bicycling.

Part 1 consists of the following chapters:

Chapter 1: Introduction

This chapter describes the purpose of the Plan, summarizes the numerous benefits of walking and bicycling, describes the process of developing the Plan, and provides an outline of the Plan's organization.

Chapter 2: Vision, Goals, and Policies

This chapter sets forth a vision of the City of Emeryville that expresses what walking and bicycling will be like in the City upon implementation of the programs and projects recommended in this Plan. The chapter includes goals and supporting policies that describe ways in which the City can realize the Plan's vision. Action items supporting these policies are listed in Part 2 of the plan, in Chapter 8.

Chapter 3: Existing Conditions and Needs Analysis

This chapter describes physical opportunities and barriers to walking and bicycling in the city, summarizes travel patterns for Emeryville's residents and workers, analyzes the past five years of pedestrian and bicyclist related collisions, and describes the key findings of the extensive outreach process that was undertaken during the development of this Plan.

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1. Introduction

Walking and bicycling are enjoyable, energizing, environmentally friendly, and low-cost forms of transportation. In a dense, urban community like Emeryville, walking and bicycling are often the quickest and most efficient ways to travel between destinations.



Emeryville has a good network of sidewalks, particularly in areas of newer development.

Since the late nineties, the City of Emeryville has been committed to improving transportation choices by developing the pedestrian and bicycle infrastructure, as recommended in the City's 1998 *Bicycle and Pedestrian Plan*, encouraging mixed use development, and engaging with the community to address concerns related to walking and biking. The City has a growing network of sidewalks, parks and open spaces, and an evolving network of bikeways. Emeryville is also in the process of designing and constructing major pedestrian and bicycle projects, which will significantly improve connectivity and enhance walking and bicycling.

This updated *Pedestrian and Bicycle Plan* (Plan) continues the City's work and leverages previous investments by taking stock of current conditions and identifying opportunities for improvements. This Plan sets forth a vision for an Emeryville where walking and biking are integral to daily life.

Emeryville has invested significantly in infill developments, resulting in large employers and major retail centers in a dense urban environment that can support walking and bicycling. The city's location, small size (1.2 square miles), development patterns, and access to local and regional transit, support both in-town and inter-jurisdictional bicycling and walking.

Emeryville has further potential to encourage residents and visitors to walk and bicycle to and through the city for work, shopping, and recreational trips. Bicycle commuters from other communities and visitors traveling on the Bay Trail may stop in Emeryville to shop, eat, or play. As the East Bay's portal to the Bay Bridge into San Francisco, Emeryville will be the bicyclist gateway to San Francisco once the Bay Bridge bicycle path is completed.

1.1. Purpose of Plan

This Plan provides a blueprint for improving pedestrian and bicycle infrastructure and programs in Emeryville over the next ten years. The document complements the *Emeryville General Plan* (2009) and guides the implementation of *General Plan* policies that support walking and bicycling. The improvements recommended in this Plan will ultimately be implemented through the City's Capital Improvement Program (CIP).

1.2. Benefits of Walking and Bicycling

Walking and biking help address increasing traffic congestion and deteriorating air quality, and improve public health.

Supporting walking and bicycling makes environmental sense. When Emeryville residents or visitors choose to walk or bicycle the number of cars on the road is reduced, congestion is alleviated, and greenhouse gas emissions are reduced.

Supporting walking and bicycling makes economic sense. The average cost of owning and operating a new car is almost $8,000 per year.[5] Pedestrian and bicycle infrastructure provides transportation choices to those who cannot or do not drive, such as people with disabilities, youth, seniors, and people with limited incomes. Families that can replace some of their driving trips with walking or bicycling trips spend a lower proportion of their income on transportation, compared to households that rely on cars, freeing additional income for local goods and services.[6] In addition, patrons who walk and bike to local stores have been found to spend more money at local businesses than patrons who drive.[7]

Supporting walking and bicycling makes public health sense. Replacing one daily car trip with a walking or biking trip can help Emeryville residents, workers or visitors get the recommended 150 minutes of weekly physical activity, and reduce their risk of obesity, cardiovascular disease, diabetes, cancer, and osteoporosis.[8,9] The health benefit of bicycling for exercise can reduce the cost of employer spending on health care by as much as $500 a year (by decreased sick leave and compensation), which provides a financial incentive to businesses that provide health coverage to their employees.[10]

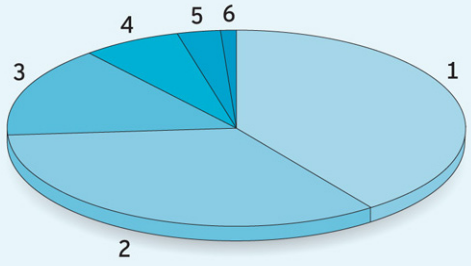
Can Walking and Bicycling Improve Air Quality?

The San Francisco Bay Area has adopted challenging but critical greenhouse gas emissions targets: 7 percent per capita reduction by 2020 and 15 percent per capita reduction by 2035. Walking and bicycling can help realize these goals by replacing short trips and trips to transit.

Most trips in the Bay Area are short; according to the Bay Area Air Quality Management District (BAAQMD), 40 percent of trips are two miles or less. Pollution doesn't increase directly with trip length; a one-mile trip emits up to 70 percent as much pollution as a 10-mile excursion due to cold starts (i.e., when a car hasn't been driven in a few hours and the engine is cool).

BAAQMD estimates that 75 percent of air pollution emissions in the Bay Area are from mobile sources, particularly cars and light duty trucks. Reducing reliance on motor vehicles, particularly for short trips, can significantly reduce greenhouse gas emissions.

CO_2-Equivalent Emissions in the Bay Area, by Major Categories



Pollution Source	CO_2-Equivalent	Percent
1 Transportation	42	40%
2 Industrial/Commercial	35	34%
3 Electricity/Co-Generation	15	15%
4 Residential Fuel Usage	7	7%
5 Off-Road Equipment	3	3%
6 Agriculture	1	1%
Total	103	100%

Source: BAAQMD, 2007 Source Inventory of Greenhouse Gas Emissions

Emissions in million metric tons/year; data is for 2007

[5] *Livable Places. (No Date). The Cost of Car Ownership. http://www.livableplaces.org/policy/carownership.html*

[6] *Center for Neighborhood Technology. (2005). Driven to Spend: Pumping Dollars out of Our Households and Communities.*

[7] *The Clean Air Partnership. (2009). Bike Lanes, On-Street Parking and Business: A Study of Bloor Street in Toronto's Annex Neighborhood.*

[8] *Centers for Disease Control and Prevention, How much daily physical activity do you need? http://www.cdc.gov/physicalactivity/everyone/guidelines/index.html accessed August 2, 2011.*

[9] *U.S. Department of Health and Human Services. Surgeon General's Vision for a Healthy and Fit Nation. 2010.*

[10] *Feifei, W., McDonald, T., Champagne, L.J., and Edington, D.W. (2004). Relationship of Body Mass Index and Physical Activity to Health Care Costs Among Employees. Journal of Occupational and Environmental Medicine. 46(5):428-436*

1.3. History of Bicycle and Pedestrian Planning in Emeryville

The City adopted its first *Bicycle and Pedestrian Plan* in 1998 and has since constructed many of the recommended facilities. The pedestrian and bicycle projects identified in the 1998 plan were reevaluated and incorporated into the *Emeryville General Plan.* The status of the projects in the 1998 Bicycle and Pedestrian Plan is summarized in **Appendix F**.



Proposed pedestrian pathway along Powell Street.
Source: Powell Street Urban Design Plan

The *General Plan* provides the framework for the projects and programs described in **Chapters 4 through 7**. This Plan adds detail to the *General Plan* projects by designating specific facility type classifications for bikeways and by identifying specific sidewalk and crossing treatments within the *General Plan*'s pedestrian priority zones. The recommended projects include some projects not identified in the *General Plan* and exclude or modify others.

Several other plans are closely related to this Plan. Components of these plans have been incorporated into the improvement strategy contained in **Part 2** as follows:

- The City's ***Capital Improvement Program*** (CIP) lists specific infrastructure projects that the City will pursue over a five-year timeframe. All pedestrian and bicycle projects identified in the 2006-2011 CIP have been incorporated into this Plan. New projects identified here will need to be incorporated into future CIPs for implementation. **Chapter 8, Funding and Implementation,** discusses project implementation in more detail.
- In 2010, the City completed an **Americans with Disabilities** (ADA) ***Self Survey*** identifying locations in the public rights-of-way that do not meet the Americans with Disabilities Act (ADA). The survey considers midblock locations, intersections, and pedestrian signals, and it establishes priorities for improvements. The issues identified in the Survey are currently being incorporated into an *ADA Transition Plan*, which will guide the planning and implementation of program, facility, and sidewalk modifications to meet ADA standards. This Plan incorporates ADA-related improvements into the recommendations, but defers to the *Self Survey* and the *ADA Transition Plan* for a comprehensive list of ADA-related right-of-way improvements.
- The ***Powell Street Urban Design Plan*** presents conceptual streetscape designs for Powell Street from Frontage Road to Christie Avenue, one of the most challenging locations in the city for pedestrians and bicyclists. The improvements would be implemented in phases. This Plan incorporates the pedestrian and bicycle-related improvements put forth in the *Powell Street Urban Design Plan*.
- **County and Regional Plans:** Recommendations from several county and regional plans have been incorporated into this plan: the *Alameda Countywide Strategic Pedestrian Plan* (2006), the *Alameda Countywide Bicycle Plan* (2006), and the *Metropolitan Transportation Commission Regional Bicycle Plan for the San Francisco Bay Area* (2009).

The City is also developing a *Sustainable Transportation Plan* and updating the *Traffic Facilities Impact Fee.*

1.4. Summary of Public Outreach

Public outreach was essential to developing this Plan. Emeryville's citizen-based Bicycle and Pedestrian Advisory Committee (BPAC) closely guided the Plan's development, through monthly meetings which were open to the public. In addition, the broader community was invited to participate through several outlets, which were publicized through postcards sent to every resident, property owner, and business in the City.



Postcards announcing public outreach events and resources were sent to every resident, property owner and business in Emeryville.

Components of the public outreach included:

- **Website** to keep the Emeryville community informed at every stage of Plan development and to invite comments.
- **Survey.** Nearly 120 community members responded to a walking and bicycling survey.
- **Tours.** The City hosted one walking and one biking tour with City staff, elected officials, and interested community members.
- **Outreach to Students.** The City led classroom discussions with 6th through 9th grade students at Emery Secondary School to consider walking and biking issues and to identify potential improvements that would benefit students' travel to and from school.
- **Community Workshops.** The City publicized and held two citywide public workshops to provide additional opportunity for comment.

Insights and recommendations from outreach have informed all aspects of the Plan. Findings from these efforts are summarized at the end of Chapter 3.

1.5. Who is This Plan For?

This Plan is for people of all ages that walk or bicycle in Emeryville and anyone interested in the City's efforts to make these modes safer and more enjoyable. Community members may be most interested in **Chapters 4 through 7**, which describe improvement projects and programmatic recommendations.

Developers and designers of private property will also be interested in **Chapters 4 through 7**, and Priority Project Sheets in **Chapter 8**, to identify projects that may be required as a condition of development, and **Appendices A and B**, which provide resources for the design of pedestrian and bicycle infrastructure.

The Emeryville City Council and committee members will be interested in the recommendations contained in **Chapters 4 through 7**, as well as the prioritization and phasing also included in **Chapter 4**, and the funding and implementation plan described in **Chapter 8**.

City staff, who are ultimately responsible for the Plan's implementation will be most interested in **Chapters 4 through 8** and **Appendices A and B**.

1.6. Plan Organization

This Plan is divided into two parts. Part 1, Purpose, Vision, and Existing Conditions, sets the background for the recommendations contained in Part 2: Implementation Strategy.

Part 1 consists of the following chapters:

- **Chapter 1, Introduction**, describes the purpose of this Plan, the history of pedestrian and bicycle planning in the City of Emeryville, and describes the overall structure of this Plan.
- **Chapter 2, Vision, Goals, and Policies**, describes the future vision for walking and bicycling in Emeryville and supportive goals and specific policies that the City will take to meet this vision.
- **Chapter 3, Existing Conditions**, describes existing pedestrian and bicycle infrastructure; summarizes transit counts and travel patterns; presents a historical analysis of pedestrian and bicycle-related collisions; and identifies gaps in pedestrian and bicycle infrastructure. Chapter 3 also includes a summary of the results of the public outreach program, documenting insights, concerns, and suggestions provided by community members.

Part 2 consists of the following chapters:

- **Chapter 4, Pedestrian and Bicycle Programs**, describes programmatic improvements, such as education and enforcement programs, that are essential to increasing the desirability and safety of walking and biking.
- **Chapter 5: Citywide Improvements**, describes citywide infrastructure projects that should be implemented throughout the city to improve pedestrian and bicycle travel.
- **Chapter 6: Bicycle Boulevards**, describes the City's policy for designating, constructing, and monitoring bicycle boulevards. It includes infrastructure improvements that will enhance the City's bicycle boulevard network.
- **Chapter 7: Site-Specific Projects**, describes specific infrastructure projects that are needed to make it safer and more convenient to walk and bike in Emeryville. The chapter includes maps of projects and a prioritized list of recommendations, including cost estimates for individual projects.
- **Chapter 8 Funding and Implementation**, presents a discussion of the tools for implementing the plan including a funding strategy, phasing and grouping of projects, and an action plan to help the City achieve this Plan's goals.

This Plan is supported by the following appendices that provide information for implementing the recommendations enumerated in the Plan:

- **Appendix A, Resources for the Design of Pedestrian Facilities**, provides guidelines for streets, sidewalks and intersection crossing treatments. The appendix also suggests a design review and implementation checklist for providing pedestrian facilities.
- **Appendix B, Resources for the Design of Bicycle Facilities**, outlines design standards and best practices for bicycle facilities, including on-street bikeways, intersections, innovative facilities, and

bicycle parking. The appendix also suggests a design review and implementation checklist for providing bicycle facilities.

- **Appendix C, Bicycle Boulevard Treatments,** provides the bicycle boulevard best practice research and recommendations for Emeryville's bicycle boulevard network.
- **Appendix D, BTA Compliance**, outlines the information required for the Caltrans Bicycle Transportation Account for funding eligibility.
- **Appendix E, Consistency with the General Plan**, summarizes how this Plan's recommendations differ from the recommendations presented in the Emeryville General Plan.
- **Appendix F, Status of Bikeways from 1998 Plan,** summarizes the implementation status of bikeways recommended for the 1998 Bicycle Plan.

2. Vision, Goals and Policies

The vision, goals and policies presented in this Plan are drawn largely from the *Emeryville General Plan*, which contains numerous policy statements that are supportive of walking and bicycling. The *General Plan*'s Guiding Principles articulate a vision of a livable and diverse city. Four of these principles directly relate to the encouragement of walking and bicycling as everyday activities.

General Plan Guiding Principles related to pedestrian and bicycle connectivity are paraphrased as follows:

- **A connected place**: New and safe bicycle and pedestrian linkages to the San Francisco Bay
- **Enhanced and connected open space network and green streets**: Building on the strength and connectivity of the city's greenways
- **A walkable, fine-grained city, emphasizing pedestrians**: Through improved sidewalks, pathways and streetscapes
- **A diversity of transportation modes and choices**: Fosters and provides incentives for alternative transportation modes.

2.1. Vision Statement

The vision statement expresses what walking and bicycling will be like in Emeryville in the future if the City successfully implements this *Pedestrian and Bicycle Plan*. The vision statement is:

> *Emeryville is a livable city, with a connected network of green streets and a fine-grained transportation network that emphasizes and supports an active and healthy lifestyle. There are new, safe, and enticing pedestrian and bicycle linkages within the City and to the San Francisco Bay and surrounding communities. Community members have a diversity of transportation choices. Walking and bicycling are integral to daily life.*

2.2. Goals and Policies

Goals expand on the vision with more detail, while policies provide more specific direction to implement the goals. Most of the goals and policies identified here are from the *General Plan*'s Transportation Element and are noted with the specific *General Plan* Goal and Policy numbers. <u>New goals and policies that supplement the *General Plan* policies are underlined</u>. All projects and programs recommended by this Plan flow from these vision, goals and policies. An action plan to implement these goals and policies is provided in Chapter 8: Funding and Implementation.

Goal 1: Multi-modal

A transportation system that eliminates the necessity of owning and/or driving personal vehicles because of the availability of convenient and accessible alternative modes of transportation. (*General Plan* T-G-3)

Policies:

P1.1 The design, construction, operation, and maintenance of city streets shall be based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities. (*General Plan* T-P-2)

P1.2 To the extent allowed by law, the City's Traffic Impact Fee shall include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimizes travel by all modes. (*General Plan* T-P-6)

P1.3 The City will strive for most trips within Emeryville to occur on foot, on bike, or on transit by providing enticing, safe, and direct pedestrian and bicycle connections to all major destinations and transit, and by making bicycling and walking the easiest and least expensive way to travel within the city.

P1.4 The City will strive to balance the needs of pedestrians, bicyclists, and motorists in all roadway and reconstruction projects.

P1.5 The City will consider health issues in the community design process and in promoting walking and biking as a form of transportation and recreation.

P1.6 The City will implement strategies that manage traffic speed in order to improve safety for pedestrians, bicyclists, and motorists.

P1.7 The City will evaluate the suitability of providing a citywide bicycle sharing system and if feasible, work with local employers, transit agencies, and neighboring communities to plan, fund, and implement a bicycle sharing system.

P1.8 Emeryville will remain up to date on new laws and practice pertaining to pedestrian and bicycle transportation.

P1.9 The City will seek to develop San Pablo Avenue as a green, multi-modal corridor.

Goal 2: A walkable city

A universally accessible, safe, pleasant, convenient, and integrated pedestrian system that provides links within the city and to surrounding communities, and reduces vehicular conflicts. (*General Plan* T-G-4)

Policies:

P2.1 The pedestrian circulation system shall be as set forth in this Plan and the *General Plan* and based on the typologies described in the *General Plan*. (*General Plan* T-P-10)



Crosswalks with good pedestrian access are critical to the pedestrian environment.

P2.2 Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required. (*General Plan* T-P-11)

P2.3 Sidewalks shall be safe, comfortable, and accessible for pedestrians. (*General Plan* UD-P-42)

P2.4 The City will plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, well-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths. (*General Plan* T-P-12)

P2.5 Pedestrian routes will be provided across large blocks, pursuing creative options if necessary such as purchasing private alleys, designating pathways through buildings, and acquiring public access easements. (*General Plan* T-P-13)

P2.6 Establish Pedestrian Priority Zones in Neighborhood Centers, around schools, and in other locations as indicated in the *General Plan*, where wider sidewalks, street lighting, crosswalks, and other pedestrian amenities are emphasized. Link these zones to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible. (*General Plan* T-P-14)

P2.7 Walking will be encouraged through building design and ensuring that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities. (*General Plan* T-P-15)

P2.8 Safe and direct pedestrian access to Aquatic Park and the peninsula will be provided and maintained. (*General Plan* T-P-20)

P2.9 Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development. (*General Plan* T-P-16)

P2.10 The City will require new development to minimize the number and width of curb cuts for vehicles to reduce vehicle conflicts with pedestrians. (*General Plan* T-P-17)

P2.11 The City will use the best possible technology as feasible to create the shortest possible wait time for pedestrians at signalized intersections. Particularly, where pedestrian volumes are high, automatic pedestrian walk signals will be provided, where timing allows. Where activation is needed to get a walk signal, a mechanism will be provided to show activation and pedestrian countdown.

P2.12 Where feasible, the City will provide drinking fountains, public toilets, benches, and other pedestrian amenities on public property.

P2.13 The City will evaluate and improve existing and proposed uncontrolled marked crosswalks with the purpose of improving pedestrian safety and, in doing so, enhance pedestrian accessibility and mobility.

P2.14 The City will provide pedestrian-oriented destination signs and walking maps, especially at the transit hubs.

Goal 3: A safe, comprehensive, and integrated bicycle system

Develop a safe, comprehensive, and integrated bicycle system— A system and support facilities throughout the city that encourage accessible bicycling for all community members. (*General Plan* T-G-5)

Policies:

P3.1 The City will develop the bicycle circulation system set forth in the *General Plan* and based on the typologies described in the *General Plan.* (*General Plan* T-P-21)

P3.2 On-street bike routes in the City's *Bicycle and Pedestrian Plan* shall be designated as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. (*General Plan* T-P-23)

P3.3 The City will construct the network of bicycle boulevards and monitor them for performance goals, as indicated in Chapter 6 of this Plan.



Pedestrian and bicycle facilities can be integrated to improve awareness and visibility of all modes.

P3.4 Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking. (*General Plan* T-P-24)

P3.5 The City will provide showers and changing facilities in civic buildings for employees and, where practical, support the development of such facilities in commercial buildings.

P3.6 A numbered bike route system with destination signs, consistent with the regional bike route numbering system, shall be developed and implemented with clear signage to bicycle boulevards. (*General Plan* T-P-25)

P3.7 The City will seek to attract a bicycle store, community bicycle shop, bicycle station, and/or other gathering/retail/shop space for bicyclists.

P3.8 The City will improve intersection crossings of bikeways and busy streets and ensure bicycle paths, lanes and routes have good accommodations for crossing high-volume or high-speed roadways.

P3.9 All signals shall have functioning bicycle detection and signal timing should be long enough to allow bicyclists to clear the intersection. The City will use the best technology as feasible to create the shortest possible delay for bicyclists.

Goal 4: A regional bicycle and pedestrian network

Collaborate with countywide regional agencies to coordinate planning and development of County bikeways and trails to support a regional bicycle and pedestrian network.

Policies:

P4.1 The City's preferred Bay Trail route through Emeryville is set forth in the *General Plan*, including the main trail between Frontage Road in Berkeley and Mandela Parkway in Oakland, and spur trails to the Marina along Powell Street and to the Bay Bridge along the east side of Interstate 80. (*General Plan* T-P-22)



The Emeryville Greenway is a north-south linear park and pedestrian and bicycle path woven through commercial and residential areas utilizing an abandoned railroad.

P4.2 The City will provide bikeways, bike parking, and pedestrian walkways to support connections with transit, including Amtrak, Emery Go Round, AC Transit, and MacArthur, West Oakland, and Ashby BART Stations.

P4.3 The City, in collaboration with stakeholders and interested agencies and parties, will study the feasibility of a pedestrian/bicycle trail along the west side of I-80, east of the Emeryville Crescent, to provide access from the Bay Trail to the eastern span of the Bay Bridge. (*General Plan* T-P-18)

P4.4 Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay. (*General Plan* T-P-19)

Goal 5: Education, encouragement and enforcement to support walking and bicycling

Increase the safety of bicyclists and pedestrians and the health of the community through education, encouragement and enforcement to promote walking and bicycling.

Policies:

P5.1 Bicycling will be promoted through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling. (*General Plan* T-P-26)

P5.2 The City will promote programs that teach people good walking and bicycling habits to last a lifetime. Examples include "Safe Routes to School," children's bicycle safety rodeos, adult bicycle education courses, and traffic citation diversion programs.

P5.3 The City will continue to develop materials that increase public awareness of available facilities for safe walking and bicycling, such as a walking/biking map, walking tours/bike tours of the city, street

fairs, and pedestrian/bicyclist safety pamphlets, and promote these materials on the City website and at special events.

P5.4 The City will support special events that encourage people to bike or walk instead of drive, such as Bike to Work Day, International Walk and Bike to School Day, and the Bike Commute Challenge.

P5.5 The City will establish a bicycle/pedestrian route around the city, which highlights locations relevant to Emeryville's history and art.

Goal 6: Funding for pedestrian and bicycle projects and programs

Fund pedestrian and bicycle projects and programs through existing and new sources of local, regional, state, and federal funding programs

Policies:

P6.1 The City will continue to apply for county, regional, state and federal funding opportunities, continue to collect Transportation Improvement Fees, include pedestrian and bicycling facilities as conditions of development, and include pedestrian and bicycle projects and programs in the City *Capital Improvement Program.*

P6.2 The City will update its *Pedestrian and Bicycle Plan* at least every ten years, or as changing conditions warrant, to maintain eligibility for Caltrans funding.

3. Existing Conditions and Needs Analysis

This chapter describes and analyzes the existing conditions for walking and bicycling in Emeryville. It begins by discussing pedestrian facilities, multi-use paths and overcrossings, and on-street bikeways, and then presents travel patterns of pedestrians, bicyclists, and transit users in Emeryville. It summarizes pedestrian and bicyclist collision data, key network gaps and opportunities, and the City's existing education, encouragement, and enforcement programs that support walking and bicycling. It concludes with a summary of insights, concerns, and suggestions identified by community members during the development of this Plan.

3.1. Walking Conditions in Emeryville

Emeryville's small size makes it an ideal city for walking. This section reviews the existing pedestrian facilities and amenities and identifies opportunities for improvement. The following review of walking conditions is drawn from fieldwork, the draft *ADA Transition Plan* (2010), and input from City staff, the Bicycle and Pedestrian Advisory Committee, and members of the public. **Map 3-1** shows Emeryville's existing pedestrian conditions.



San Pablo Avenue provides wide sidewalks with retail, trees, lights, and transit accommodations.

3.1.1 Sidewalks

Sidewalks exist along both sides of most streets in Emeryville, with the exception of a few locations in the northeast industrial area of the city, on one side of Shellmound Street, and in the Park Avenue District. Sidewalk design varies from wide sidewalks with street trees— such as along San Pablo Avenue— to narrow sidewalks cluttered with facilities—such as along 40th Street and the North Bayfront area. Traditional residential neighborhoods and areas that have seen recent redevelopment generally have street trees and landscaping, while other areas provide only basic pedestrian amenities.


Sidewalk blocked by building face and parked vehicles.

In some locations sidewalk design is governed by area plans including the *Shellmound Streetscape Design Guidelines* (2007), *Park Avenue District Plan* (2006), *North Hollis Urban Design Program* (2002), and the *Powell Street Urban Design Plan* (2010). In 2010 the City adopted citywide design guidelines, the *Emeryville Design Guidelines*, which include guidelines for sidewalk design for all areas of the city. Off-street pathways provide additional pedestrian connections through the city, and are described in **Section 3.3.**

3.1.2 Intersections

There are a variety of intersection and mid-block crossing treatments throughout Emeryville, including parallel striped crosswalks at signals, countdown signals, pedestrian-actuated signals with audio/visual warnings, bulb-outs, and median refuges that reduce crossing distances.

Prior to the development of this Plan, Emeryville did not have an established crosswalk policy for when, where, and how to mark crossings. However, the City has been generally consistent in marking crosswalks at intersections and key mid-block locations. For busier intersections or mid-block crossings, continental-style crosswalks are often used. These consist of two-foot bars spaced two feet apart. At schools, crosswalks are yellow, as required by the California Department of Transportation (Caltrans).



The Powell Street Interchange presents long crossing distances and high vehicle speeds.

Marked vs. Unmarked Crossings

In California, it is legal for pedestrians to cross at any intersection, whether or not a crosswalk is painted, except where crossing is expressly prohibited. Marked crossings reinforce the location and legitimacy of a crossing.

Innovative Intersection Treatments

The traffic signals at the intersections of Powell Street and Christie Avenue and Shellmound Street and Ohlone Way include a leading pedestrian interval. At these intersections, pedestrians are given a walk signal before parallel traffic is given a green light, which allows pedestrians to enter the crosswalk before the turning vehicles may proceed, thereby reducing the chance that pedestrians will be cut off by turning motorists.

The City has installed an all-way pedestrian phase at the intersection of Christie Avenue and Shellmound Street. While this phase is typically used as a pedestrian scramble, where pedestrians can cross in all directions at once including diagonally, diagonal crossing is not permitted at the Christie Avenue/Shellmound Street intersection. While this treatment allows safer pedestrian movements by limiting conflicts with turning motor vehicles, it also increases the time a pedestrian must wait before they are given a walk signal.

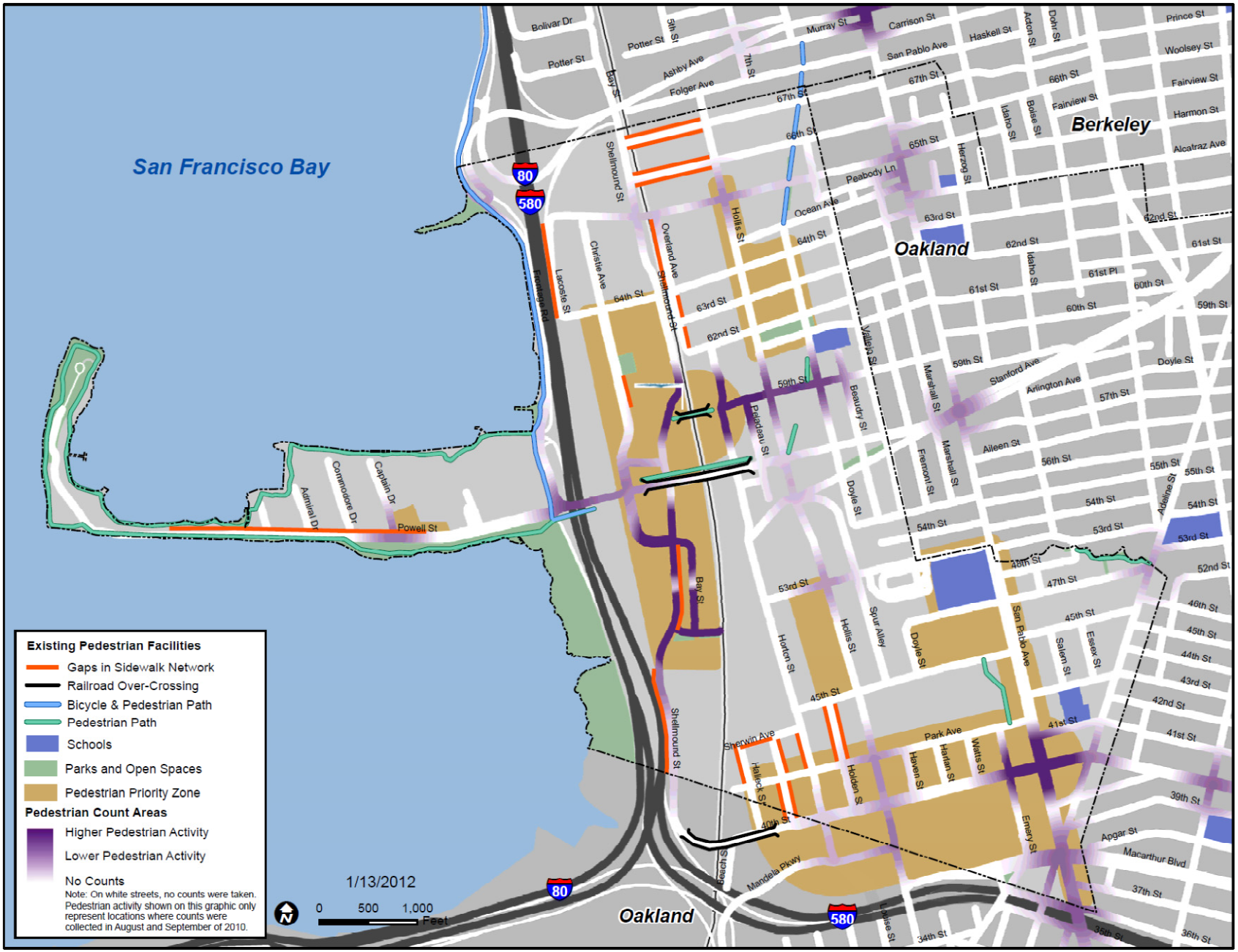


A high-visibility continental-style crosswalk for the Emeryville Greenway crossing at 66th Street.

Traffic Signals

All of the traffic signals in Emeryville require pedestrians to push a button to activate the walk signal. At most signals, a pedestrian arriving immediately after the light turns green must wait a full cycle to get a walk signal. Most pedestrian crossings at signalized intersections use an audible beeper to guide pedestrians with visual impairments across the intersection.

Map 3-1 shows the existing and proposed pedestrian circulation system and identifies sidewalk gaps.



Map 3-1. Existing Pedestrian Conditions

3.2. Connections across Barriers

Because the railroad tracks and I-80 present major barriers to east-west travel in Emeryville, pedestrian and bicycle crossings are especially important. Grade-separated railroad crossings are located at 40th Street, Powell Street, and the Amtrak station. At-grade railroad crossings are located at 65th, 66th, and 67th Streets. The proposed South Bayfront Bridge would connect 53rd Street with Ohlone Way and Bay Street and provide a much-needed connection across the railroad tracks in southern Emeryville. Plans for a transit center (Emery Station West) include improvements to the approach to the existing Amtrak overcrossing.

Currently there is only one freeway crossing in the city, at Powell Street. The Powell Street interchange is a challenging environment for pedestrians and bicyclists due to the on- and off-ramps, high speeds and limited visibility throughout the area. Fortunately, the City has extensive plans to redesign the area to provide better amenities for pedestrians, bicyclists and transit users. The City also has plans to construct a bicycle and pedestrian bridge over I-80, connecting 65th Street with the Bay Trail. Emeryville is working with Caltrans and the City of Oakland to develop a pedestrian and bicycle undercrossing of I-80 connecting the Bay Trail on Shellmound Street at the IKEA entrance to the proposed pathway to the Bay Bridge East Span. This project would be built within Oakland city limits.

Table 3-1 summarizes existing crossings of the railroad tracks and freeway.

Table 3-1. Existing Crossings of Railroad Tracks and I-80

Name	Type of Crossing	Notes
Railroad Crossings		
40th Street	Roadway Crossing	• Buffered bike lanes provided on both sides • Sidewalk provided on north side
Powell Street Bridge	Roadway Crossing Pedestrian-Only Overcrossing	• Roadway crossing has no bike lanes or sidewalks • Pedestrian-only overcrossing only accessible by several flights of stairs, making it inaccessible to bicyclists, people using mobility assistive devices (e.g. wheelchairs) • Can be difficult to find; personal safety concerns due to the poor lighting and sightlines
Bridge at Amtrak Station	Ped/Bike Overcrossing	• Connects Horton Street with the Public Market on Shellmound Street • Has stairs and an elevator • Not easily identifiable from 59th and Horton Streets • Connection to Shellmound Street passes through a parking lot • Plans for the Emery Station West transit center and the Market Place include improvements to the approaches
65th Street	At-Grade	• Class II bike lanes provide bicycle access • Sidewalks on both sides
66th Street	At-Grade	• No sidewalks
67th Street	At-Grade	• No sidewalks
I-80 Crossings		
Powell Street	Undercrossing	• Narrow sidewalks provided on north side, bike path on south side • Ramp and intersection modifications to improve pedestrian and bicycle safety are currently under construction. The *Powell Street Urban Design Plan* (2010) proposes comprehensive redesign of the area to provide better amenities for pedestrians, bicyclists and transit users

3.3. Paths

Paths include pedestrian-only paths, which are intended only for pedestrians—including people using wheelchairs or other assistive devices—and multi-use paths, which permit bicyclists, pedestrians and other non-motorized uses. Pedestrian-only paths can be paved, hard-packed dirt or decomposed granite, while multi-use paths must be paved, and may include a yellow striped centerline or other pavement markings. Multi-use path design should meet Caltrans standards, which are described briefly in Section 3.4.

Table 3-2 lists Emeryville's existing paths. The City's two major paths, the Bay Trail and the Emeryville Greenway, are described in more detail below.

Table 3-2. Emeryville Existing Pedestrian Paths and Multi-Use Paths

Name	Type of Path	Location	Mileage	Notes
Bay Trail	Multi-use	Along bay side of Frontage Road from north city limit to Powell Street, then to Shellmound St	1.2	• Continues north into Berkeley • The entire Bay Trail alignment through Emeryville includes both multi-use paths and bike lane segments. See **Map 3-2** for the alignment.
Joseph Emery Park Path	Multi-use	West of San Pablo Avenue from Park Avenue to 45th Street	0.2	
Marina Park Path	Pedestrian Path	Along Powell Street on peninsula	2.8	
North-South Greenway	Multi-use/ Pedestrian Path	Along former railroad right of way from north city limit to Powell Street at Hollis Street	0.5 (0.2 multi-use)	• Alignment follows railroad right of way and includes Doyle Street Bicycle Boulevard • Between Ocean Avenue and 59th Street, bicyclists are routed to Doyle Street Bicycle Boulevard and pedestrians use sidewalk. • Between 59th Street and Powell Street, the path becomes pedestrian-only and is incomplete • Plans are in place to continue the path to the south
Temescal Creek Park Path	Pedestrian Path	Along Temescal Creek from 48th Street to Adeline Street	0.2	

Bay Trail



Textured pavement on the Bay Trail at Frontage Road.

The Bay Trail is a planned recreational corridor that is intended to encircle San Francisco and San Pablo Bays, with 500 miles of continuous off-street trails. Within Emeryville, the Bay Trail includes both on-street bikeways and off-street paths. Along Powell Street and north of Powell Street, the Bay Trail is a multi-use path that continues north into Berkeley and provides access to Point Emery, the Berkeley Marina, and The Towers office complex. South of Powell Street, the Bay Trail transitions to bike lanes and a sidewalk and travels along Shellmound Street and 40th Street and connects to Mandela Parkway in Oakland. The connection between the multi-use path on Powell Street and the bike lanes on Shellmound Street is convoluted and includes a segment along an easement through the Sheraton Four Points Hotel parking lot.

Emeryville Greenway



Sections of the Emeryville Greenway include a soft-surface pedestrian path and adjacent paved multi-use path.

The City has plans to complete a Greenway composed of paths, green streets, bicycle boulevards and parks which would extend from the 9th Street bicycle boulevard connection in Berkeley to the Bay Trail at the southern City limits. The Greenway is a Rails-to-Trails project that follows the alignment of former railroad right of way. The City has constructed portions of this greenway, including a multi-use path extending from Ocean Avenue at the terminus of the Doyle Street Bicycle Boulevard north to the Berkeley border above 67th Street. The path continues in Berkeley to Murray Street. South of Doyle Street, the Greenway continues as a pedestrian-only pathway to the intersection of Powell and Hollis Streets.

The multi-use path includes separate bicycle and pedestrian paths, landscaping, pedestrian-scale lighting, benches and bicycle racks. Adjacent apartments front the greenway, providing "eyes on the street." Crossings at 65th, 66th, and 67th Streets include curb extensions, advance yield markings, and striped crosswalks.

The path will connect north across Ashby Avenue to the 9th Street Bicycle Boulevard in Berkeley and south to the planned Horton Landing Park and then to Bay Street via the planned South Bayfront bridge. In Emeryville, the long-term plan is to extend the pedestrian-only path south to Horton Street (adjacent to bike lanes on Stanford Avenue), then continuing it as a multi-use path to Halleck or Hubbard Streets at Sherwin Avenue.

3.4. Bikeways and Bike Parking

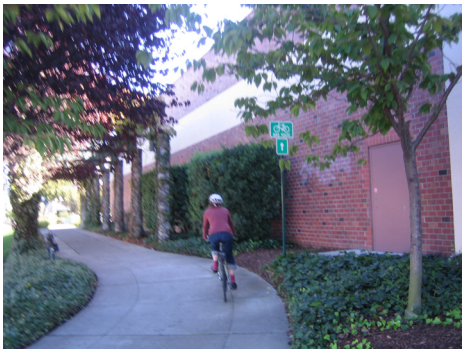
The California Highway Design Manual (HDM) and the California Manual of Uniform Traffic Control Devices (CA MUTCD) present standards that the City of Emeryville is required to follow when designing bikeways. The term "bikeways" refers to three Caltrans defined classifications: Class I bike paths/multi-use paths, Class II bike lanes, and Class III bike routes. Existing bikeways are listed in **Table 3-3** and shown in **Map 3-2**.

Designated Bikeways

In California, unless it is expressly forbidden, bicyclists are legally allowed to ride on any roadway, regardless of whether that roadway has bike lanes or bike route signs.

3.4.1 Class I Multi-Use Paths

Class I bikeways or multi-use paths provide bicycle travel on a paved right of way completely separate from any street or highway. These paths are commonly used by bicyclists, pedestrians, joggers, in-line skaters, and others. Multi-use paths are separated from roadways, paved and at least eight feet wide. Emeryville has 1.6 miles of Class I multi-use paths. The city's multi-use paths are described in **Section 3.3**.



Class I Multi-Use Path.

3.4.2 Class II Bicycle Lanes

Class II bike lanes are striped lanes on roadways for one-way bicycle travel. Bike lanes are at least five feet wide and also include bicycle lane signage. Bike lanes are primarily striped along streets with higher traffic volumes. The buffered bike lane on the 40th Street Bridge is the only one of its kind in the city. It provides crucial protection for bicyclists travelling between destinations along Shellmound Street and residential neighborhoods. Emeryville has 4.0 miles of striped bike lanes.



Class II Bike Lane striping.

3.4.3 Class III Bike Routes

Class III bike routes are roadways where bicyclists and motorists share a travel lane, and are designated by bike route signs. Bicycle routes typically fill in the bicycle network where Class II facilities or bicycle boulevards may not be appropriate. Shared lane markings may be used on Class III bike routes. Emeryville has 0.4 miles of Class III bike routes.



Class III Bike Route sign.

3.4.4 Bicycle Boulevards

Bicycle boulevards are streets with low traffic volume that have been optimized for bicycle travel through traffic calming, diversion, signage, pavement markings, and intersection crossing treatments. When correctly implemented, they are shared roadway facilities that are comfortable and attractive to bicyclists with a wide range of abilities and ages. Through automobile use is discouraged on bicycle boulevards. Bicycle boulevards are not recognized by Caltrans. Emeryville has 2.0 miles of bicycle boulevards.



Bicycle Boulevards include signs and pavement markings.

Table 3-3. Existing On-Street Bikeways

Name	Start	End	Mileage
Class I Multi-Use Paths			
See Table 3-2 on page 3-5			1.6
Class II Bike Lanes			
40th Street	Shellmound St	San Pablo Ave	0.6
65th Street	Shellmound St	Greenway	0.3
Adeline Street	N. City Limit	S City Limits	0.7
Emery Street	40th Street	Macarthur Blvd	0.2
Powell Street	Frontage Rd	Marina Area	0.6
Shellmound Street	N City Limits	S City Limits	1.5
Stanford Avenue	Horton St	Hollis St	0.1
Class II Bike Lanes Total			4.0
Class III Bike Routes			
Spur Alley	53rd Street	45th Street	0.2
Hollis Street	40th St	S. City Limit	0.1
53rd Street	Horton St	Hollis Street	0.1
Class III Bike Routes Total			0.4
Bicycle Boulevards			
45th Street	Hollis St	San Pablo Ave	0.3
59th Street	Horton St	Doyle St	0.2
Doyle Street	59th St	Ocean St	0.3
Horton Street/ Overland Avenue	65th St	40th St	1.2
Bicycle Boulevards Total			2.0
Bikeways Total			**8.2**

3.4.5 Signage

Emeryville uses standard Caltrans signage on bike lanes and bike routes, as well as purple bicycle boulevard signage along the bicycle boulevards. The bicycle boulevard signing conforms with signs used on bicycle boulevards in Berkeley, which indicate direction and distance to key destinations. With the exception of the bicycle boulevard signage, the City has not installed bicycle destination signage. There are no walking maps or pedestrian-oriented destination signs.



Bicycle boulevard signs are purple to correspond with the Berkeley signs.

3.4.6 Connections to Adjacent Communities

Oakland and Berkeley are closely integrated with Emeryville and the bicycle plans for both cities include connections to employment and shopping destinations in Emeryville, shown in **Table 3-4**. Routes identified as countywide corridors in the *Alameda Countywide Bicycle Plan* (2006) are noted in the table.

Table 3-4. Bikeway Connections to Adjacent Communities

Road in Emeryville	Road in Adjacent Community	Notes
Connections in Berkeley		
Shellmound Street (Class II)	Bay Street in Berkeley (no facility)	Access to the Berkeley Aquatic Park, the ped/bike bridge over I-80, and west Berkeley
Hollis Street (no facility)	Folger Avenue (Class III)	Route somewhat confusing. The 9th Street Bikeway will provide a better connection along this corridor
Bay Trail (Class I)	Bay Trail (Class I)	Alameda Countywide Corridor 5 Planned to encircle the San Francisco and San Pablo Bays
Greenway (Class I), 59th Street, Horton Street Bicycle Boulevard	9th Street Bicycle Boulevard	Alameda Countywide Corridor 25
Connections in Oakland		
40th Street (Class II)	40th Street (proposed Class III)	Connects Emeryville to the MacArthur BART station and is slated for restriping in the *Oakland Bicycle Master Plan.*
65th Street (Class II)	Mabel Street (proposed Class III)/ Russell Street Bicycle Boulevard	Alameda Countywide Corridor 45 connecting Russell Street to the Bay Trail
Bay Trail (Class I) & Horton Street(Class II)	Mandela Parkway (Class II)	Access to the Port of Oakland and the West Oakland BART station
Adeline Street (Class II)	Adeline Street (proposed on-street)	Oakland plans to install bike lanes similar to Emeryville's at some point in the future
Hollis Street (Class III)	Hollis Street (proposed on-street)	
53rd Street (Bicycle Boulevard)	53rd Street (proposed Bicycle Boulevard)	Crosses San Pablo Avenue at a traffic signal. Connects with Oakland bike route on 55th St which goes to Rockridge BART
Regional Connections		
Bay Trail (Corridor 5)	Bay Trail (Class I) in Berkeley and Mandela Parkway (Class II) in Oakland	Connections to Albany, San Leandro, Alameda Countywide corridors, Hayward, Union City, Newark, and Fremont. Partially connected segments
66th and 65th Street, planned I-80 Overcrossing	Russell Street Bicycle Boulevard to the Bay Trail	Via the Emeryville Greenway and 9th Street

3.4.7 Bicycle Parking



A staple-style bicycle rack provides two points of contact.

Bicycle parking is provided at many destinations in Emeryville. Parks and public buildings have bicycle racks, though they may be undesirable models in some cases. Most new multi-unit residential buildings and mixed-use or commercial developments include facilities for cyclists pursuant to the City's Bicycle Parking Ordinance. The City has a free bike rack installation program for businesses and a street furniture catalog was recently approved.

Community members have expressed concern about the lack of bicycle parking in Emeryville, in some neighborhood locations as well as at large retail areas such as the East BayBridge Shopping Center and Powell Street Plaza and recently opened cafes. Community members noted that more bike parking was needed at Bay Street.



Map 3-2. Existing Bicycle Conditions

3.5. Walking, Biking, and Transit Patterns in Emeryville

Understanding transportation trends and travel patterns enables the City of Emeryville to craft policies and identify priority projects that will best serve pedestrians and bicyclists. This section incorporates information from the City's 2010 multimodal counts, the *Walking and Biking Survey* conducted for this Plan, the U.S. Census and American Community Survey, and transit ridership data.

3.5.1 Walking and Bicycling Demand

Existing bicycling and walking levels are estimated from available Census data and from counts of motor vehicle traffic and bicycles and pedestrians that were performed in August and September 2010.

Emeryville Residents Journey to Work Mode Split

Table 3-5 presents journey to work data for Emeryville and compares it to Alameda County, California, and the United States. In 2000, approximately 56 residents in Emeryville bicycled to work and approximately 268 residents walked to work. This represents 1.4 percent and 6.7 percent of commuters, respectively. Emeryville's bicycle commuting rate is similar to Alameda County's, and its pedestrian commuting rate is much higher than Alameda County.

Table 3-5. Journey to Work (Place of Residence)

Location	Bike	Walk	Drive Alone	Transit	Carpool and Other
Emeryville	1.4%	6.7%	60.1%	20.1%	11.7%
Alameda County	1.3%	3.4%	68.8%	11.0%	15.5%
California	0.9%	3.0%	74.7%	5.3%	16.1%
United States	0.4%	3.0%	78.2%	4.9%	13.5%

Source: US Census 2000

Given the high level of transit use among Emeryville residents, improving pedestrian and bicycle connections to transit will sustain the high level of transit ridership. Providing convenient and safe bicycle connections to employment in downtown Oakland, south Berkeley, and other nearby employment centers may further improve the bicycle and walking mode share.

Emeryville Workers Journey to Work Mode Split

The 2000 Census also provides data according to employment locations. The data show that Emeryville workers are less likely to use alternative forms of transportation than Emeryville residents. Of 18,100 workers in Emeryville, 250 (1.4 percent) bicycled to work and 505 (2.8 percent) walked. **Table 3-6** shows Journey to Work data for workers in Emeryville and nearby cities. Emeryville workers are more likely to bicycle than Oakland workers, but both walking and biking are much more common in Berkeley. This data suggests that there is potential for Emeryville to shift people toward walking and biking, as has been done in neighboring communities.

Table 3-6. Journey to Work (Place of Work)

Location	Bike	Walk	Drive Alone	Transit	Carpool and Other
Emeryville	1.4%	2.8%	75.2%	6.0%	14.6%
Berkeley	5.0%	10.7%	54.4%	11.8%	18.1%
Oakland	0.8%	3.2%	64.1%	5.3%	26.6%

Source: US Census 2000

3.5.2 Pedestrian Activity

Pedestrian activity in Emeryville is oriented around major shopping destinations and transit hubs: Bay Street, the 40th Street Transit Hub (between San Pablo Avenue and Adeline Street), Hollis Street, Shellmound Street and 59th Street. Count results are shown in **Map 3-3.**

Providing higher quality pedestrian and bicycle connections between activity centers and constructing new connections across barriers will encourage residents and non-residents alike to consider alternate modes of transportation to their shopping and transit destinations.

3.5.3 Bicycle Activity

As shown in **Map 3-4**, most of the bicycling activity is evenly spread along several corridors. This pattern is likely due to less bicycling activity in Emeryville as compared to walking and longer trip lengths for bicycle trips; bicyclists primarily travel cross-town and between neighboring cities.

It is likely that as bicycle connections to neighboring communities are improved, bicyclists will concentrate along specific corridors. In the meantime, improvements should address bicycling throughout the city, with particular attention paid to the corridors that connect across barriers—40th Street, 59th Street, 65th Street—and those that connect to adjacent communities: San Pablo Avenue and Adeline Street.

Pedestrian and Bicycle Counts

The City conducted pedestrian and bicycle counts at 47 intersections in Emeryville in August and September, 2010.

Areas with the most weekday pedestrians include:

- Ohlone Way at Bay St (833 peds)
- 40th St at San Pablo Ave (217 peds)
- Ashby Ave at San Pablo Ave (160 peds)

Areas with the most weekday bicyclists include:

- 40th St at San Pablo Ave (95 bikes)
- Adeline St at San Pablo Ave (78 bikes)
- 40th St at Adeline St (76 bikes)



Map 3-3. Weekday Peak Hour Pedestrian Counts



Map 3-4. Weekday Peak Hour Bicycle Counts

3.5.4 Transit Trips

High-quality, high-frequency, dense transit supports walking and bicycling. Transit extends the reach of pedestrians and bicyclists, and makes it easier for people to live their day-to-day life without needing to drive. Emeryville's transit services are summarized below.

- **Alameda-Contra Costa Transit District (AC Transit)** provides local and transbay buses, including the 72R Rapid along San Pablo Avenue. All buses have bike racks and wheelchair lifts.
- **Bay Area Rapid Transit (BART)** stations do not directly serve Emeryville, but MacArthur Station on 40th Street in Oakland is only two-thirds of a mile from Emeryville. Electronic bicycle lockers are available for rent.
- The **Emery Go-Round** is a free shuttle that operates three routes in Emeryville, connecting the MacArthur BART with the city's employers and shopping centers. Buses have a front-mounted bicycle racks, and bicycles are permitted inside buses at the driver's discretion if the rack is full.
- The **Emeryville Amtrak Station** at Horton and 59th Streets serves four Amtrak routes, including Capitol Corridor trains connecting to Sacramento and San Jose. Passengers traveling to San Francisco transfer to Amtrak busses at this station. Bicycles are permitted on cars and lockers are available at the station. The approved Emery Station West project will include a multi-modal transit center serving the Amtrak station, AC Transit, and Emery Go-Round. A bike station will also be included on-site.

Table 3-7 provides ridership data for primary stops—those with the highest transit ridership, multi-modal transit connections or key shopping and work destinations within the City of Emeryville. (Table C in Appendix D defines bus stops in more detail.)

Table 3-7. Primary Transit Stops

Location	Description	Daily Ridership
40th Street Transit Hub and Rapid Bus Stop on San Pablo Avenue (two stops)	Transit Hub	1,230
Bay Street / Shellmound Street / Ikea (two stops)	Shopping Center	1,100
Amtrak Station / 59th Street / Horton Street /Hollis (three stops)	Transit Hub	620
Towers / Hilton Garden Inn (two stops)	Offices / Hotel	480
40th Street / Emery Street	Shopping Center / Transit Hub	418
Christie Avenue / Shellmound Way / Public Market (four stops)	Offices / Retail	424
Shellmound Street / Christie Avenue / Bay Street / Hotel (3 stops)	Shopping Center/ Retail	440
65th Street / Shellmound Street (three stops)	Housing/College	300

3.6. Collision Analysis

An understanding of pedestrian and bicycle collisions enables the City to identify hot spots and implement countermeasures that will improve pedestrian and bicyclist safety. The most readily available historical collision data is available through the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS). This database provides detailed information about all types of traffic collisions, but only includes collisions on public roadways reported by police officers. Near misses and unreported collisions, and collisions on private property or on paths are not included, thus under-representing the true number of incidents.

Figure 3-1 shows pedestrian- and bicycle-related collisions in Emeryville between 2004 and 2009. While there were approximately the same number of pedestrian and bicyclist collisions over the study period, pedestrian collisions tended to be more severe, resulting in three fatalities and 36 injuries. The number of bicycle collisions is trending upward, but there is no clear trend to pedestrian-related collisions.

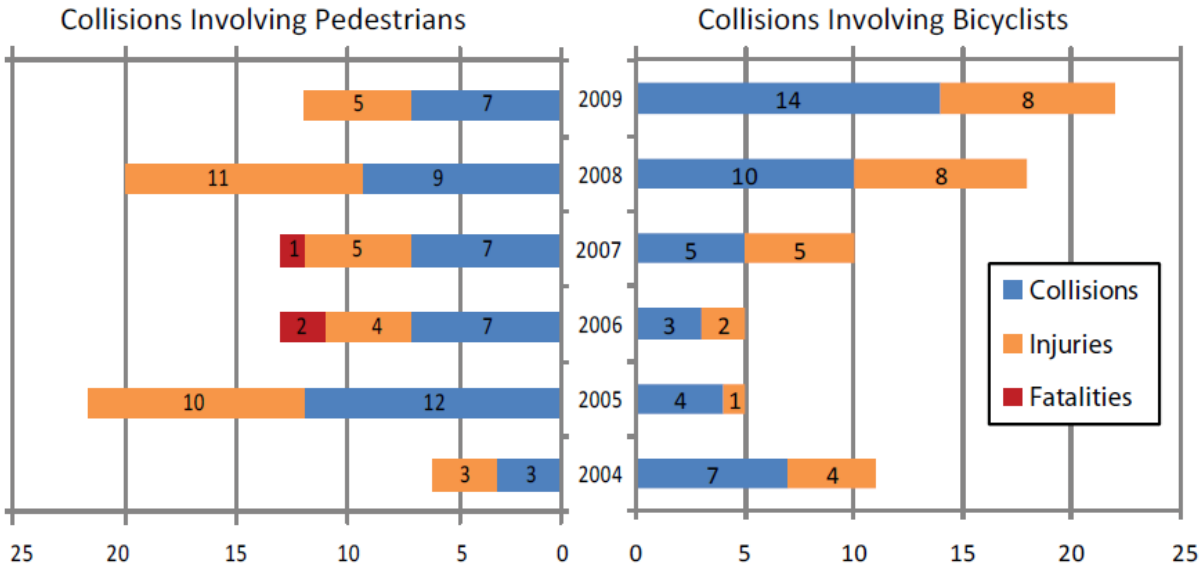


Figure 3-1. Collisions Involving Pedestrians and Bicyclists, 2004-2009

Figure 3-2 shows pedestrian and bicycle collision rates per 1,000 population in Emeryville and neighboring cities. Rates are calculated from the population of each city and therefore do not account for the generally higher rates of walking and biking that occur in Berkeley or the significant number of workers in Emeryville. However, the rates do provide a general comparison of pedestrian and bicycle safety. Emeryville's pedestrian and bicycle collision rates are somewhat higher than those of Oakland and Albany, and lower than those of Berkeley.

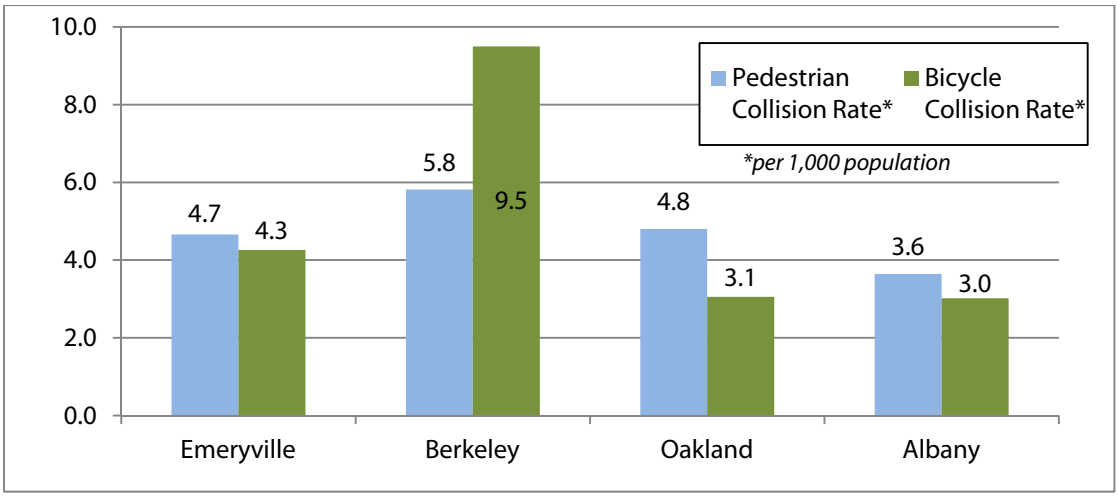


Figure 3-2. Collision rates in Emeryville and nearby cities

3.6.1 Fault of Collisions Involving Pedestrians and Bicyclists

In 67 percent of pedestrian-related collisions in Emeryville, the motorist was deemed to be at fault. For 17 of the 27 such collisions, the motorist was cited for violation of the pedestrian right-of-way. In 12 of the 13 collisions where the pedestrian was deemed responsible, the officer cited a pedestrian violation.

Bicyclists and motorists were deemed to be at fault equally. The most common violation among bicyclists was wrong-way riding, which occurred in 44 percent of bicyclist-at-fault collisions. Improper turning was the most common violation among motorists at fault in a bicycle collision, accounting for 41 percent of motorist-at-fault collisions.

3.6.2 Location of Pedestrian and Bicycle Collisions

Maps 3-5 and 3-6 show the locations with the most collisions involving pedestrians or bicyclists. Many intersections along San Pablo Avenue have experienced crashes involving both types of users. Fortieth Street also has several high-frequency collision intersections, including at Horton Street and at Harlan Street. Several bicycle collisions have been reported adjacent to underpasses and may be a result of reduced visibility.

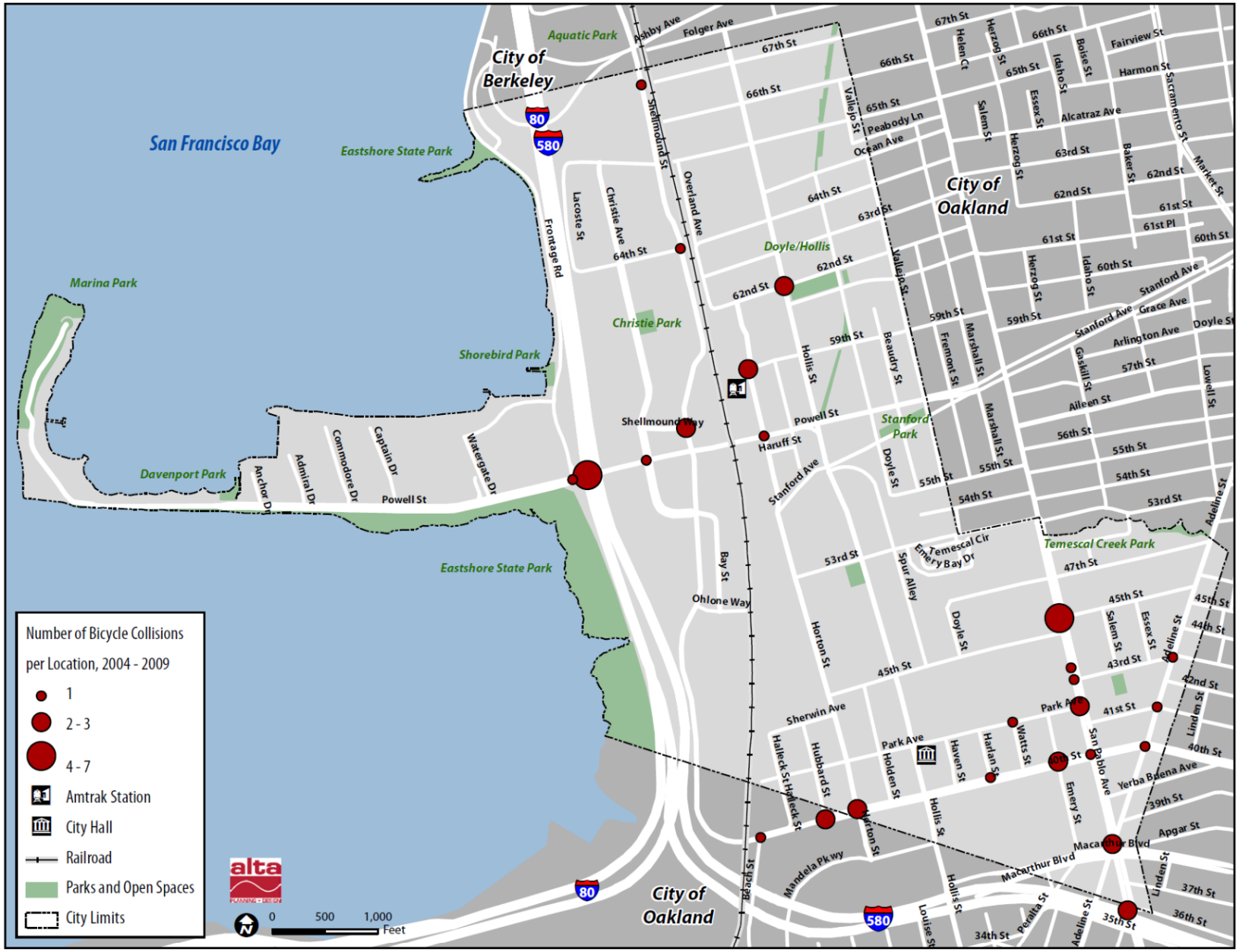
Table 3-8 compares the number of pedestrian and bicycle collisions on San Pablo Avenue to neighboring jurisdictions from 2004 – 2009. While Emeryville and Berkeley have a similar number of pedestrian collisions per mile, Emeryville has more bicycle collisions, perhaps due to a lack of alternative routes. Oakland, where traffic volumes are generally lower, has fewer pedestrian and bicycle crashes than either neighboring city.

Table 3-8: San Pablo Avenue Collisions

City	Pedestrian Crashes	Bicycle Crashes	Length (miles)	Ped. Crashes per Mile	Bicycle Crashes per Mile
Emeryville	17	18	0.71	23.9	25.4
Berkeley	58	49	2.35	24.7	20.9
Oakland	41	38	2.44	16.8	15.6



Map 3-5. Pedestrian Collisions (2004-2009)



Map 3-6. Bicycle Collisions (2004-2009)

3.6.3 Collision Risk

The total number of collisions at a location only tells one part of the story. To fully understand pedestrian and bicycle collision risk, one must also take into account the total number of pedestrians and bicyclists at a particular intersection. Risk can be quantified by the total number of collisions divided by the estimated number of pedestrians and bicyclists using the intersection. The volumes shown in **Table 3-9** have been extrapolated from peak hour counts using factors obtained from 24-hour counts on the Horton-Overland bicycle boulevard to provide a reasonable estimate of weekday and weekend bicycle and pedestrian volumes at each intersection. While it is important to provide pedestrian and bicycle facilities where walking is very popular, the City should also prioritize safety improvements in lesser-used areas that have high collision risk.

Table 3-9. Intersections with the Highest Pedestrian or Bicyclist Collision Risk

Location	Estimated Peds/Bikes 2004 – 2009 (thousands)	Collisions, 2004 -2009	Collisions per million exposures
Pedestrian Risk			
40th Street at Harlan Street	494	2	4.0
Christie Avenue at Powell Plaza	895	2	2.2
Powell Street at Vallejo Street	945	2	2.1
40th Street at Horton Street	989	2	2.0
36th Street at San Pablo Avenue	1,796	3	1.7
Stanford Avenue at Hollis Street	1,277	2	1.6
40th Street at San Pablo Avenue	10,408	4	0.4
Bicyclist Risk			
Powell Street at I-80 Off Ramp	600	4	6.7
45th Street at San Pablo Avenue	1,346	7	5.2
Christie Avenue at Powell Street	209	1	4.8
Shellmound Way at Shellmound Street	431	2	4.6
40th Street at Hubbard Street	683	3	4.4
40th Street at Emery Street	1,017	2	2.0
62nd Street at Hollis Street	1,136	2	1.8
36th Street at San Pablo Avenue	1,051	2	1.9
Powell Street at Frontage Road	567	1	1.8
40th Street at Horton Street	1,366	2	1.5

3.7. Education, Encouragement, and Enforcement Programs

Pedestrian and bicycle programs support and encourage walking and biking and complement a community's investments in pedestrian and bicycle infrastructure. There are a variety of existing bicycle and pedestrian-related programs in Emeryville. The City's current programmatic strengths, areas for enhancement and opportunities are summarized below.

The City is exceeding best practices in several areas. These key strengths include: City support of Bike to Work Day; public involvement in pedestrian and bicycle planning; high quality maintenance of facilities; high pavement quality; strong, supportive design guidelines; and policies and regulations that support walking and bicycling.



An energizer station in Emeryville on Bike to Work Day.

There are several areas where the City is meeting some best practices but could do more. These enhancements include: expanded bicycle education, more special events to promote walking and biking, development of a traffic calming program; continued implementation of ADA improvements; improved inventories of pedestrian and bicycle system facilities and gaps; improvements to traffic signals to facilitate pedestrian and bicycle travel; standardized design of pedestrian crossings; and increased collection of traffic speed and bicycle, pedestrian, and motor vehicle volumes.

The City appears not to meet best practices in a handful of areas, and could do much to improve. Examples of these opportunities include: pedestrian and motorist education; safe routes to schools; pedestrian and bicycle safety campaigns; collision reporting; traffic control devices; speed limits and surveys; bicycle parking inventory; and staffing a pedestrian and bicycle coordinator.

3.8. Key Findings from Outreach

In order to serve the residents, workers, and visitors of Emeryville, the development of this Plan included extensive outreach to the community. Individuals had the opportunity to provide general comments or comment on draft documents through the City's website, the community walking and bicycling survey, city-sponsored walking and biking tours, outreach to Emery Secondary School students, and two community workshops. In addition, all interim materials were presented at the public Bicycle and Pedestrian Advisory Committee meetings throughout the development of this Plan.

3.8.1 Summary of Outreach Methods

This section provides a brief discussion of each outreach method and individuals invited to participate.

Website

Interim materials and Bicycle and Pedestrian Advisory Group (BPAC) meeting notes were available on a dedicated website (www.emeryvillepedbikeplan.org). The survey was posted on the website, as well as related background information.

Walking and Bicycling Survey

The 20-question survey was made available online and in paper form. Postcards publicizing the survey were sent to all residents, property owners and businesses in Emeryville, and paper copies were available at City Hall, Golden Gate Library, the Recreation Center, the Senior Center, the Child Development Center, and by request. The survey was open between mid-October and late November 2010. A total of 119 people responded to the survey.

Walking and Biking Tours

The City hosted one walking and one bicycling tour with City staff, elected officials, and interested community members. During the walking tour the group walked along several roadway segments to provide a snapshot of pedestrian conditions in Emeryville. These segments included San Pablo Avenue between 40th Street and 53rd Street, the area around the Amtrak station, and from the intersection of Shellmound Street and Shellmound Way to Powell Street under I-80 via Christie Avenue.

Eighteen people participated in the bike tour. The Project Team briefly presented background on this Plan's planning process and bicycle planning generally. The group toured all areas of Emeryville and made several predetermined stops to discuss opportunities and constraints. Key topics included the future access to the Bay Bridge Path at the Ikea entrance along Shellmound Way, the Bay Trail, the Amtrak overcrossing, Spur Alley, and several others.



Bicycle tour participants discuss a crossing.

Student Outreach

The City led classroom discussions in Emery Secondary School in June 2011 with students in 6th through 9th grades to consider walking and biking issues and to identify potential improvements that would benefit students' travel to and from school. Participating students were able to provide feedback in one or more of the following ways.

- By writing about pedestrian and bicycle use in Emeryville during class exercises,
- By writing on and marking-up Emeryville maps during class exercises,

- By talking with the City of Emeryville and Alta Planning + Design staff during class, and
- Via homework survey questions asking students about their commutes to and from school.

Public Workshops

The City publicized and held two citywide public workshops to provide additional opportunity for comment. At the first workshop in November 2010, participants were invited to share their experiences of walking and bicycling in Emeryville. Eighteen community members attended, representing most residential areas in Emeryville. The meeting began with an introduction to the plan and an overview of existing conditions, followed by an open house in which participants could discuss a variety of bicycling and walking topics at stations. Several large-scale maps were provided to mark up, and community members, City staff and consultants had informative discussions around these maps. Community input from the meeting was used to inform recommended projects and programs.

The second public workshop was held in May 2011. The meeting began with an overview of draft recommended projects and programs. Following this presentation, participants were asked to mark their support for specific projects by placing a dot sticker on a map or list of recommendations. Responses were used to refine the prioritization of projects.

3.8.2 Key Findings from Public Outreach

This section summarizes key findings from the various public engagement elements. The findings include identification of pedestrians and bicyclists, as well as barriers to walking and bicycling, and improvements participants desired to see.

Who Walks and Bicycles in Emeryville?

Primarily, people responding to the *Walking and Biking Survey* shop in Emeryville (66 percent), while many live (56 percent) socialize (39 percent), work (37 percent), or commute through the City (31 percent).

Students: The classroom outreach found that, while some students at Emery Secondary only need to walk a few blocks to school, many students live far from school and depend on public transit or rides from their parents. While most students have experience walking in Emeryville, very few (if any) bicycle to school. In Emeryville, students specifically mentioned walking across and along San Pablo Avenue (to get home, to bus stops or stores), and along 40th Street and Shellmound Street (to get to Bay Street).

Emeryville Residents: Emeryville residents walk and bike to work less than neighboring communities, suggesting that there is room for Emeryville to shift people toward walking and biking. According to census data, for residents that work outside of the city, 28 percent take transit, 10 percent carpool and less than one percent walk or bike. For this group, improving bicycle and pedestrian connections to transit will sustain the high level of transit ridership, and providing convenient and safe bicycle connections to employment in downtown Oakland, south Berkeley, and other nearby employment centers may improve the bicycle and walking mode share.

Emeryville residents who work within the city have much higher walking and biking mode shares than those working elsewhere, with 37 percent walking and five percent bicycling. Still, 49 percent of these people drive to work. Encouragement campaigns geared toward residents, outreach during the planning phase of

developing major bicycle and pedestrian improvements, and publicity celebrating new bicycle and pedestrian infrastructure may encourage this group to walk and bike more.

Emeryville Workers: Twenty-one percent of survey respondents who work in Emeryville indicated that they drive to work because there is free parking available to them. Charging for parking may be one method of encouraging people to bicycle rather than drive to work.

Major Barriers to Walking

Public outreach respondents generally felt that the length of trips, barriers to pedestrian circulation, and both personal and traffic safety were major factors that kept them from walking in Emeryville more often (See **Figure 3-3**).

- The *Walking and Biking Survey* found that the major barriers to walking in Emeryville are trip distance, safety from cars, and crime. Due to the city's small size, all of the activity nodes are within walking distance to each other (0.5 to 1 mile). However, pedestrians may have to travel further because of circuitous routes to cross railroad tracks, freeways, and major arterials. Concerns about safety from crime ranked high among barriers to walking, with 32 percent of respondents citing it.
- Students at Emery Secondary consistently identified the following barriers to walking to school: crossing San Pablo Avenue at 47th and other intersections, the speed and amount of traffic, and the narrowness of the sidewalk on the 40th Street Bridge.
- Several workshop participants cited major streets as being barriers to crossing, including San Pablo Avenue.
- Some noted that sidewalk obstructions, such as poles, newspaper racks, and driveways are a detriment to walking conditions, and that they have difficulty using the Amtrak overcrossing.

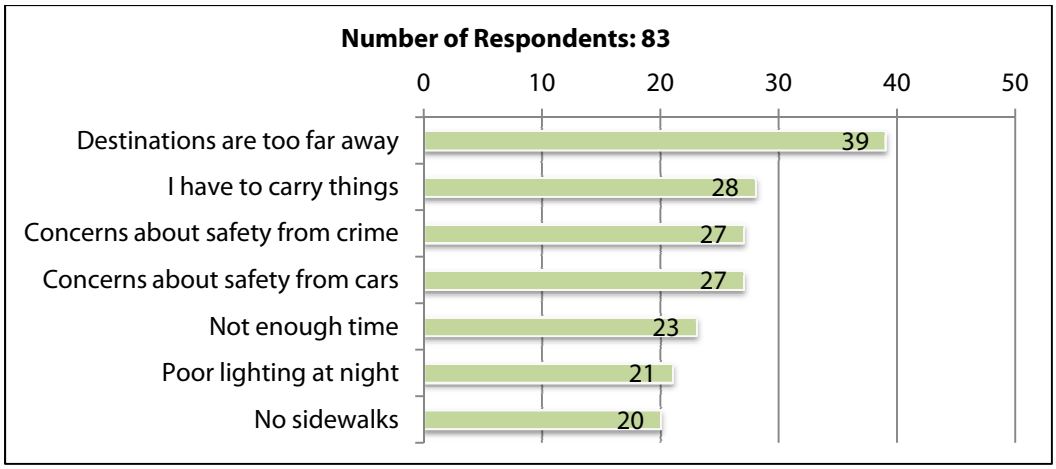


Figure 3-3. Barriers to walking (Source: Emeryville Pedestrian and Bicycle Plan survey)

Major Barriers to Bicycling

A primary barrier to bicycling identified in the public outreach was the lack of signal detection, including existing signals without detection, ineffective or unreliable detection, and signals lacking detection.

Survey respondents cited safety issues such as concerns about safety from cars, lack of bikeways, or poor road conditions as primary factors preventing them from bicycling more. (See **Figure 3-4**)

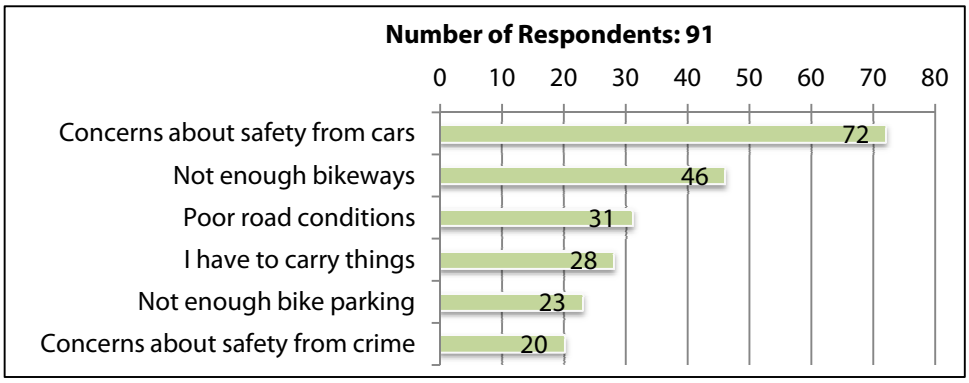


Figure 3-4. Barriers to bicycling

Pedestrian Improvements

In general, public comments about pedestrian facilities involved signal optimization, overcrossings, intersections, and sidewalk width.

Signal Optimization: Several people noted a desire for improved intersections, including countdown signals, reduction of pedestrian wait time, and increasing the pedestrian walk phase. It was recommended that countdown signals be used at more intersections and that pedestrian crossing time be lengthened. The crossing of San Pablo Avenue, particularly at 47th Street received the most complaints due to the long wait between pushing the crosswalk button and the light actually changing. Some students end up walking against the light, or going out of their way to cross at other intersections. There are concerns about routes to schools that require crossing San Pablo Avenue.

Overcrossings: A high level of dissatisfaction was expressed in relation to overcrossings and crosswalks. One survey respondent wrote, "I am apprehensive about walking along the Powell Street pedestrian bridge because it is so deserted and poorly lit." Other survey write-in comments described uncomfortable intersections, particularly along Powell Street, the I-80 ramps, Christie Avenue, and Shellmound Street.

Intersections: A need was expressed for treatments at intersections to increase motorist yielding behavior, ADA accessible curb ramps and more visible crossings. Specific intersections noted to be in need of improvements include along San Pablo Avenue, Shellmound at Christie, Shellmound at Bay, and other locations. Bicyclists expressed a desire for beacons, actuated by loop detectors or infrared posts that register bicyclists in advance of intersection, as well as signs on the cross-streets so pathway users know what street they are crossing.

Sidewalks: Shellmound Street, San Pablo Avenue, 59th Street and 40th Street have the highest pedestrian use. Survey data indicate that better pedestrian access is desired to destinations, including Berkeley Bowl West and the transit hub at San Pablo Avenue and 40th Street, as well as better pedestrian circulation throughout the Amtrak-Powell Street-Bay Trail area. There is also a need for additional sidewalks in industrial areas and along Shellmound Street, as well as access in the commercial shopping area.

Multi-Use Paths

The community suggested improvements to multi-use paths including a desire for improved intersections along existing shared-use paths, as well as connections to the network when the paths end, such as the northbound Bay Trail connection from Shellmound Street to Powell Street. Crossing improvement recommendations for the Emeryville Greenway included higher-visibility crossings (beacons, advance actuation), right-of-way for bicyclists, and street signs at cross streets.

There are concerns about the lack of visibility and awareness of the Bay Trail through Emeryville (particularly connections through the Sheraton parking lot). Recommended improvements include pavement markings separating pedestrians and bicyclists, as well as signs indicating the route.

There was significant support for providing new crossings of major barriers including the planned South Bayfront Bridge at 53rd Street and the proposed 65th Street Bridge.

Bicycling Improvements

The bicycling community recommended improvements to bicycle detection, better bicycle access and more bicycle parking. It was suggested that existing loop detectors be checked and that the City provide additional detection while improving how quickly the signals respond to a bicyclist.

It was noted that at 65th and Hollis Streets bicycle detection stencils are placed at the edge of the roadway, rather than in the location where bicyclists would need to wait to have the signal detect them.

Improving bicycle access to Emeryville's shopping areas, recreational amenities, and employment centers is important. Several survey respondents desired seeing "bicycle highways" where bicyclists can travel for long distances without having to stop and without significant motor vehicle traffic. Others generally recommended more bike paths and bike lanes, and better connections to Berkeley and Oakland. Bicycle detection at intersections was a particularly important improvement for several respondents.

It is notable that survey respondents reported primarily riding on Hollis Street, Shellmound Street, 40th Street, Horton Street, and San Pablo Avenue. While Shellmound and 40th Streets have bike lanes, and Horton Street is a bicycle boulevard, Hollis Street and San Pablo Avenue do not have designated bicycle facilities. Several comments refer to the popularity of roads without formal bikeways, as well as improvements to other existing corridors.

The need for more bicycle parking was cited by survey and workshop participants alike. There is interest in automated bicycle parking and bike corrals. Suggested locations for bike racks include new cafés, Bay Street, Trader Joe's, Pak n Save, malls, movie theaters, and new developments. Convenience, visibility and security of bicycle parking are important.

Programmatic Improvements

Recommendations for programs included prioritizing bicycle and pedestrian road repairs before motorized traffic road repairs. A participant at the first open house recommended that potholes and ruts on the right side of the road be repaired in a timely fashion as a high priority. Two survey respondents noted that glass in the bikeways is a challenge for them. A few respondents recommended developing a pedestrian and bicycle respect campaign. Others noted a desire that the Emeryville Police Department be trained on safe bicycle riding rules and laws.

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City of Emeryville Pedestrian and Bicycle Plan

Adopted: May 15, 2012

PART 2: IMPLEMENTATION STRATEGY

May 2012

PREPARED BY:
Alta Planning + Design
IN ASSOCIATION WITH:
Fehr & Peers

alta PLANNING + DESIGN

FEHR & PEERS

Part 2: Implementation Strategy

Part 2 of this Plan provides solutions for improving pedestrian and bicycle travel in Emeryville. It contains a comprehensive set of programmatic and infrastructure improvements that will bring Emeryville closer to the vision of a community where walking and bicycling are a convenient, safe, and integral part of daily life.

Improvements are presented in the following chapters:

Chapter 4: Pedestrian and Bicycle Programs

This chapter describes programmatic improvements, such as education and enforcement programs, that are essential to increasing the desirability and safety of walking and biking.

Chapter 5: Citywide Improvements

This chapter describes citywide infrastructure projects, such as parklets, pedestrian and bicycle signage, and bicycle parking, which should be implemented throughout the city to improve pedestrian and bicycle travel.

Chapter 6: Bicycle Boulevards

This chapter describes the City's policy for designating, constructing, and monitoring bicycle boulevards. It includes infrastructure improvements that will enhance the City's bicycle boulevard network.

Chapter 7: Site-Specific Infrastructure Projects

This chapter describes specific infrastructure projects that are needed to make it safer and more convenient to walk and bike in Emeryville. Projects include pedestrian improvements, overcrossings, paths, and the recommended bikeway network. The chapter includes maps of projects and a prioritized list of recommendations, including cost estimates for individual projects.

Chapter 8: Funding and Implementation

This chapter summarizes how the City has historically funded pedestrian and bicycle projects and describes potential new funding sources. It summarizes costs for the recommended programs and infrastructure projects described in Chapters 4 through 7. It also includes two key tools for implementing the recommendations of this Plan: the Action Plan, which includes specific action items the City will take to implement the policies described in Chapter 2; and the Priority Project Sheets, which present this Plan's high-priority projects in more detail.

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4. Pedestrian and Bicycle Programs

Pedestrian and bicycle programs, such as education and enforcement programs, are essential in increasing the desirability and safety of walking and biking. Programs support a pedestrian and bicycle friendly culture, and encourage more people to walk or bike. Many programs can be categorized according to the "Four E's":

- **Encouragement** programs provide incentives and support to help people leave their car at home and try walking or bicycling instead. Bicycle encouragement programs, in particular, target "interested but concerned" bicyclists who would like to ride a bike but who may not be confident in their skills or in their interactions with motorists.
- **Enforcement** programs enforce legal and respectful walking, bicycling, and driving. They include a variety of tactics, ranging from police enforcement to neighborhood signage campaigns.
- **Education** programs are designed to improve safety and awareness. They can include in-classroom or after school programs that teach students how to safely cross the street or bicycle in the road. They may also include brochures, posters, or other information that targets pedestrians, bicyclists, or drivers.
- **Evaluation** programs are an important component of any engineering or programmatic investment. They help the City to measure its success at meeting the goals of this plan and to identify adjustments that may be necessary.

The "Four E's" simply provide a convenient framework for programmatic recommendations. Many programs encompass more than one of these categories.

In addition to these "Four E's" programs, this chapter includes recommendations for maintenance of pedestrian and bicycle infrastructure, and recommendations for establishing a bicycle sharing program in the City of Emeryville.

4.1. Encouragement

4.1.1 Car-Free Street Events

Car-free street events promote health by creating a safe and attractive space for physical activity and social contact and are cost-effective compared to the cost of building new parks for the same purpose. These events have many names: Sunday Parkways, Ciclovias, Summer Streets, and Sunday Streets. Car-free street events temporarily close streets to motor vehicles and open them to the public for walking, bicycling, dancing, hula hooping, roller-skating, or other activities. They have been very successful internationally and are rapidly becoming popular in the United States. Events can be regularly scheduled or one-time occasions and are generally very popular and well attended.



Closing streets for a car-free community event like Oaklavia creates a temporary space for walking, cycling, skating, dancing, etc. (Image: Tina Tamale via Flickr)

Recommendation

The City should support a regular, recurring car-free street event. While specific locations and times for these events can be developed through community outreach and support, one possibility for the City of Emeryville would be to combine a car-free street event with its Art in Public Places program. Possible locations include Park Avenue, Doyle Street/Greenway, Hollis Street, and Horton Street. Measure B funds could be used for general outreach and marketing.[11]

4.1.2 Bicycle Friendly Community

The League of American Bicyclists has a well-respected Bicycle-Friendly Communities award program. Communities fill out a detailed application that covers bike-related facilities, plans, education efforts, promotion initiatives, and evaluation work that has been completed by the jurisdiction. The award is designed to recognize progress that has been made, as well as assist communities in identifying priority projects to improve bicycling conditions. Receiving the award is a media-worthy event, and may give elected officials the opportunity to receive media coverage for the positive work they are doing. Awards are granted for Bronze, Silver, Gold and Platinum bicycle-friendly communities.

Receiving a Bicycle Friendly Community designation affirms a city's support for bicycling

Recommendation

As part of this Plan, the City has evaluated the potential of applying to become a designated bicycle-friendly community. The City should apply for Bicycle Friendly Communities designation after several of the improvements recommended in this Plan have been implemented.

4.1.3 Safe Routes to School Programs

Safe Routes to School (SR2S) is a program that helps children to get to school by walking, bicycling, carpooling, or transit. It envisions active kids using safe streets, helped by engaged adults including teachers, parents, and police officers, complemented by responsible drivers. Every state has a SR2S coordinator and grant program. The City of Emeryville does not currently have any existing Safe Routes to School programs.

Emeryville is unique in that the schools are located in close proximity to one another. Emery Secondary (grades 6-12), Anna Yates Elementary (grades K-5), the private Escuela Bilingue (pre-K to 8th grade, opening fall 2011), the City's Child Development Center (a preschool), and the planned Emeryville Center for Community Life are all within a few blocks of San Pablo Avenue between 41st and 53rd Streets. San Pablo Avenue is a major impediment to pedestrian travel in the area, and many students have to cross to access their schools.

Example Safe Routes to School programs that could be implemented in Emeryville include:

- **School Travel Plans** – Travel plans are collaborative efforts between school administrators, parents, students, and the City to identify issues related to walking and biking to school and brainstorm

[11] *Sample programs include San Francisco Sunday Streets: http://sundaystreetssf.com and Oakland's Oaklavia: http://oaklavia.org/media.*

solutions. Planners and engineers can assist with identifying and prioritizing projects to improve conditions around the school.

- **Walking Audits** –Walking Audits are often the starting point of a Safe Routes to School Program as they help students, parents, and neighbors assess routes to schools and identify safety considerations. Stakeholders walk the main routes to school to discuss safety issues and develop possible short-term and long-term solutions. Stakeholders may also use walking audits to evaluate the effectiveness of engineering improvements.
- **Bicycle Rodeos** – Bicycle rodeos are events where police officers or bicycling instructors teach children safe bicycling skills and the rules of the road. The Emeryville Police Department conducts bicycle rodeos. The East Bay Bicycle Coalition offers free bicycle rodeos, which could supplement the City's efforts.[12]
- **Youth Bicycle Safety Education Classes** – Typical school-based bicycle education programs educate students about the rules of the road, proper use of bicycle equipment, biking skills, street crossing skills, and the benefits of biking.[13]
- **Walking School Buses** – Walking School Buses are formed when a group of children walk together to school and are accompanied by one or two adults (usually parents or guardians). The walking school bus picks up students at designated meeting locations. Walking School Buses can be implemented informally among parents or neighbors or as official school-wide endeavors with trained volunteers and structured meeting times and locations.
- **Student Safety Patrols** – Safety Patrols consist of specially trained students, usually 5th grade and above, who escort students to buses and assist adult crossing guards in helping students cross streets.





Bike rodeos (top) and youth bicycle safety classes provide children with knowledge and training about safe and proper bicycle use.

- **Friendly Walking/Biking Competitions** – Walking and biking competitions track and reward kids for the number of times they walk, bike, carpool, or take transit to school. Contests can be individual, classroom competitions, or interschool competitions. Local businesses may be willing to provide incentive prizes for these activities.

[12] *An application to have the East Bay Bicycle Coalition hold a Bike Rodeo can be found here: http://www.ebbc.org/rodeoapplication.*

[13] *Sample programs include League of American Bicyclists: http://www.bikeleague.org/programs/education/courses.php#kids1 and Bicycle Transportation Alliance – Portland, OR: http://www.bta4bikes.org/resources/educational.php.*

Recommendation

The City should collaborate with the Emery Unified School District and Escuela Bilingue to establish a formal Safe Routes to School program. This program can take advantage of existing resources, such as Alameda County's ongoing Safe Routes to School Program, currently implemented by the non-profit TransForm.

4.1.4 Walk and Bike to Work Programs

Emeryville's large employment base means that working with employers may be an effective means of achieving the goals of this Plan. Walking and biking to work has many benefits, including reducing the stress associated with driving in rush-hour traffic, reducing health costs by improving worker health, and helping businesses market their environmental sustainability.

The City already supports alternative commute modes. Every year, the City sponsors Bike to Work Day and contributes to the East Bay Bicycle Coalition's promotion of this event. The City also provides incentives to developers to encourage walking and bicycling to work. Emeryville currently has policies that require bicycle parking and is developing more flexible automobile parking requirements.

Recommendation

The City should continue to work with or provide information to employers about alternative commute options, with the intention of reducing the number of Emeryville workers to drive alone to work. It should continue to support Bike to Work Day and explore additional policies and programs that can encourage walking and biking to work.[14]

The City should serve as a role model by actively promoting alternative commute modes for City employees.



The City of Portland, OR makes yard signs available for $25 or in exchange for five completed "I Share the Road" pledges.

4.2. Enforcement

4.2.1 Bicycle Patrol

Police bicycle patrols not only increase the mobility of officers in dense areas but also provide law enforcement officers with an opportunity to display safe and legal bicycle skills. Furthermore, bicycle patrols show the community that the City actively supports sustainable transportation.

Recommendation

The Emeryville Police Department should establish a bicycle patrol. Given Emeryville's small area and numerous paths, this may be an effective way to police the community.

[14] *Information about the commuter choice program can be found here: http://www.fta.dot.gov/news/colleague/news_events_4627.html*

4.2.2 Community-Based Traffic Program

Community-based traffic programs are focused on developing relationships between a city's Public Works and Police Departments and its residents. Residents work with City staff to identify problem areas to target for police enforcement, community policing, and potential infrastructure priorities. For example, in response to mounting complaints about speeding and commute traffic, the City of Sacramento implemented a Neighborhood Traffic Management Program.[15] The program also informs the community about how Public Works operates to encourage community members to be proactive about the problems they see in their community.

One possible outcome of the community-based process is the deployment of mobile speed feedback signs or yard signs in response to concerns about traffic speed. Speed feedback signs display the speed of passing motor vehicles, with the intent that motorists will slow down if they are aware of their speed. These can either be permanent signs or trailers that can be periodically moved to new locations.

Recommendation

The City should establish a community-based traffic program that formalizes the way in which the community and the City can work together to identify traffic-related problems, and create effective, low-cost solutions to those problems.

4.2.3 Targeted Enforcement

Targeted enforcement refers to focused efforts of police officers. For example, the Police Department may conduct pedestrian stings at locations where there is a history of pedestrian-motorist conflicts. Similar strategies may be applied to areas with bicycle traffic, perhaps focusing on citation of issues deemed to cause most accidents. In the case of bicyclists, the most dangerous violation is wrong-way riding and for motorists, improper turning and crosswalk violations.

Recommendation

The Police Department should conduct targeted enforcement at locations known for noncompliance with traffic laws and at high conflict or high pedestrian- or bicycle-related collision areas. The Department currently targets enforcement on San Pablo Avenue at 43rd, 45th, and 47th Streets when school is in session. Possible additional locations include minor street crossings of 40th Street, which are uncontrolled intersections with high collision rates.



Road safety campaigns increase the general public's awareness of bicycling and walking and can be used to promote safe roads by and for all users.

4.3. Education

Education programs are recommended to inform motorists and bicyclists of the rights and responsibilities of bicyclists and pedestrians. This section describes strategies to achieve this.

[15] *Information about the Neighborhood Traffic Management Program is available at: http://www.ite.org/traffic/documents/CCA96B62.pdf*

4.3.1 Pedestrian and Bicycle Safety Campaign

A well-produced safety campaign will memorably and effectively highlight walking and bicycling as viable forms of transportation and reinforce safety for all road users. One good example is Sonoma County Transit Agency's "You've got a friend who bikes!" campaign. It combines compelling ads with an easy-to-use website focused at motorists, pedestrians, and bicyclists. Safety and awareness messages should be displayed near high-traffic corridors, printed in local publications, broadcast as radio and/or television ads and be available in Spanish and other languages.

The City of San Jose created a pedestrian and bicycle safety campaign called Street Smarts. The program emphasizes the shared responsibilities of all road users, incorporating a website, flyers, and billboards that remind pedestrians, bicyclists, and motorists of safe travel behaviors.

Recommendation

The City should consider developing a pedestrian and bicycle safety campaign.[16] The campaign could be based on the successful Street Smarts program, or other local efforts.

4.3.2 Adult Bicycling Skills Classes

Adult bicycling skills classes enable community members to learn safe bicycling skills. The most common program is the League of American Bicyclists courses, taught by League Certified Instructors. Courses cover bicycle safety checks, fixing a flat, on-bike skills, crash avoidance techniques, and traffic negotiation.[17]



Adult bicycle skills courses can help bicyclists have the information and skills they need to avoid hazards and follow the law.

Recommendation

The Police Department currently conducts bicycle skills classes. Bicycle skill classes can be taught by other qualified instructors in addition to the Police Department. To supplement existing efforts, the City should find funding to support classes through the East Bay Bicycle Coalition or other qualified instructors (in addition to the police).

4.3.3 Citation Diversion Program

A diversion class can be provided to motorists in lieu of a citation and/or fine. Individuals would have the option of taking a onetime, free or inexpensive class instead. In Marin County, interested citizens can take the class even if they did not receive a ticket. This program is a good way to educate road users about bicycle rights and responsibilities, and can also increase public acceptance of enforcement actions.

Recommendation

The City should pursue establishing a Citation Diversion Program to educate drivers who drive unsafely about safe driving around pedestrians and bicyclists.

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[16] *Sample program: Sonoma County (CA) Transit: http://www.sctransit.com/bikesafe/bikes.htm and San Jose Street Smarts: http://www.getstreetsmarts.org/.*

[17] *Information about this program is available here: http://www.ebbc.org/safety*

4.4. Evaluation

Evaluation programs measure and evaluate the effectiveness of projects, policies and programs. They may include comparing travel mode data over time, collecting bicycle and pedestrian counts, and administering community surveys.

4.4.1 Annual Traffic Counts

Pedestrian and bicycle counts and community surveys act as methods to evaluate not only the effectiveness of specific pedestrian and bicycle improvement projects but can also function as way to measure progress towards reaching City goals. The City of Emeryville has recently adopted a policy requiring all new large developments to conduct pedestrian and bicycle counts as part of the traffic impact analysis. Multimodal counts were conducted in August 2010.

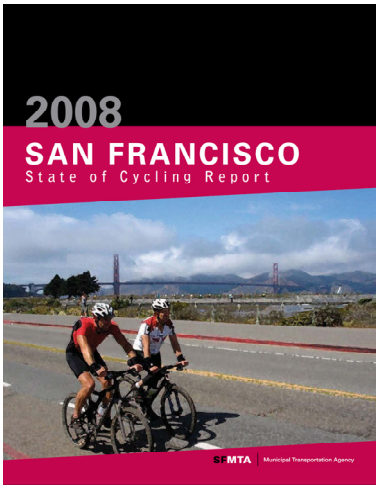
Recommendation

The City should continue to require new large developments to conduct pedestrian and bicycle counts, and should expand traffic counts by:

- Conducting before and after pedestrian, bicycle, and vehicle counts on all roadway projects.
- Conducting annual pedestrian and bicycle counts at count locations included in this Plan.
- Exploring the possibility of using automatic counters to collect data on key pedestrian and bicycle corridors. Automatic count technologies can be useful for bicycle count efforts. In-pavement loop detectors accurately count bicycle activity on-street and infrared counters can count pedestrian and bicycle activities on paths.[18]

4.4.2 Pedestrian and Bicycle Report Card

Cities around the world have begun monitoring their bicycle and pedestrian programs in order to track the number of non-motorized users, gauge user perceptions of the bicycle and pedestrian networks and identify trends in safety. Results are often published in a periodic bicycle and pedestrian account or report card, which can be distributed to the public as a means of publicizing the city's commitment to improving walking and bicycling conditions.



The San Francisco State of Cycling Report (2008) provides a snapshot of bicycling conditions in the city

Recommendation

The City should establish an annual or semi-annual pedestrian and bicycle report card to track progress toward meeting the goals, policies and action items presented in this Plan. Data collection may include a

[18] *The National Bicycle and Pedestrian Documentation Project provides a methodology for conducting counts. Nationwide, most pedestrian and bicycle counts occur in May and the City may consider adopting the same month to allow comparisons between jurisdictions. Resources from National Bicycle and Pedestrian Documentation Project: www.bikepeddocumentation.org*

community and workforce survey, pedestrian and bicycle counts, and summary of collision and hospital records.

4.4.3 Monitoring Bicycle Boulevard Metrics

The City of Emeryville is poised to take a leadership role in the development and implementation of bicycle boulevards. Chapter 6 of this Plan presents three goals for evaluating the City's bicycle boulevards: speed goals, motor vehicle volume goals, and major intersection goals.

Recommendation

The metrics used to monitor the bicycle boulevard goals should be measured regularly at a minimum of every two years to determine whether additional treatments are necessary to bring the street to the target goal. Emeryville should collect this data and evaluate each bicycle boulevard in the case of any of the following:

- Development occurs that is projected to increase motor vehicle volumes on the bicycle boulevard
- The *Pedestrian and Bicycle Plan* is updated
- Substantial community concern is brought to the City

The City can solicit volunteers to assist with these measurements.

4.5. Maintenance

Maintenance issues that may appear minor to motorists, such as overhanging vegetation or debris in the side of the road, can pose safety hazards to pedestrians and bicyclists or make a route inaccessible.

Table 4-1. Suggested Maintenance Schedule

Item	Responsible Party	Frequency
Pedestrian Facility Maintenance		
Sidewalks in non-residential areas: Cracking and ADA accessibility issues.	Adjacent property owners	Ongoing
Sidewalks in residential areas: Cracking and ADA accessibility issues.	City	Ongoing
Curb ramps: bring to ADA compliance during reconstruction, particularly where the ramp meets the roadway	City, Developers	Ongoing
Landscaping: Maintain 8 feet clear overhead	City	1-4 years

Item	Responsible Party	Frequency
Multi-Use Path Maintenance		
Sign replacement/repair	City	1-3 years
Pavement marking replacement	City	1-3 years
Pavement sealing and potholes	City	5-15 years/30-40 years for concrete
Sweeping	City	Monthly – Quarterly (weekly on major routes)
Irrigate/water plants	City	As required while establishing
Planted tree, shrub, and grass trimming/fertilization	City	5 months - 1 year
Maintain furniture	City	Annually
Graffiti removal	City	Weekly/ As needed
Maintain emergency telephones	City	Annually
Bicycle Facility Maintenance		
On-street pavement marking replacement	City	1-3 years
Clean drainage system	City	Annually
Pavement sweeping	City	Monthly
Pavement sealing and potholes	City	As needed, with citywide pavement resurfacing schedule
Tree maintenance on bicycle routes	City	Annually

Recommendation

The City should establish a maintenance schedule for pedestrian and bicycle infrastructure based on best practices, and make this schedule available to the community. **Table 4-1** presents a suggested maintenance schedule.

4.6. Bicycle Sharing

Bike sharing is a system that allows users to check out bikes from publicly accessible stations and return them to other locations within the service area. Such systems have become increasingly popular throughout the North America, with successful programs implemented in Washington D.C., Boston, Minneapolis, Montreal, and other programs planned for Seattle, New York, and San Francisco. Policy 1-6 of this Plan guides the City to evaluate the feasibility of providing a citywide bike sharing system, expanding on the initial analysis presented in this Plan.

Difficulty providing bike sharing stations outside the city limits ordinarily prevents cities of Emeryville's size from implementing bike sharing. However, the city has certain advantages that may improve the feasibility of a system:

- A proposed system in San Francisco; although the two cities are not directly connected by bicycle, reciprocal memberships would enhance the utility of the system for all users.
- Employment density and workplace characteristics may drive bike sharing demand significantly more than residential density. Emeryville's daytime population is much higher than its evening population and demand may therefore be much higher than its population would suggest.

4.6.1 System Size and Demand

Other North American cities that have pursued bike sharing and that have comparable employment and projected population densities as Emeryville, such as Montreal and Washington D.C., have typically spaced stations approximately a quarter-mile apart from one another. This distance allows users to be generally no more than a 5 minute walk from a bicycle and represents a stations density of approximately 16 stations per square mile.

A potential bike share system should have approximately 17 stations located throughout the City. The number of bikes provided at each station can vary considerably from station to station depending on the characteristics of the area. Other cities have deployed approximately 10 bicycles per station, which translates to 170 bikes in Emeryville.

The first season of bike sharing in Minneapolis recorded 1.1 trips per bike per day. The first season of Capital Bike Share in Washington recorded 1.75 trips per bike per day, though rates are higher now. Assuming a 170 bike system in Emeryville and 1 to 2 trips per bike per day, annual demands could range from 60,000 to 120,000 trips per year. Empirically-derived demand models can be used at a later planning stage to more accurately forecast demands and potential user-generated revenues.

4.6.2 Planning Level Costs

Cost Precedents

Capital costs include provision of bicycles, manufacture and installation of bike-stations, purchase of service and distribution vehicles, development of a website, and purchase and installation of necessary hardware and software. Estimated capital costs for bike sharing programs in Montreal, Washington D.C. and Paris average $3,600 per bicycle. [19]

Operating costs include salaries for maintenance and administrative staff, insurance, replacement costs for broken or stolen equipment, debt-service, gasoline and upkeep costs for redistribution vehicles, website hosting and maintenance, electricity charges for the bike-stations, membership cards and warehouse/storage fees. Across bike-share programs, the average annual operating cost is around $1,600/bicycle. Operating costs are lowest in Montreal, where solar-powered stations are used.

Assuming a 170 bicycle (17 station) bike share system in Emeryville, capital costs could be in the order of $600,000 with an annual operating cost of approximately $270,000.

Funding

There are a number of funding models available under which bike-share programs have successfully operated. Many European systems are entirely funded by advertising in that advertising companies are given a street advertising contract in return for providing and operating a bike share program. In many cities, this is not feasible, as street advertising contracts are already set and the opportunity for additional street advertising is not available. There have also been questions about whether cities get full value for money from this arrangement (i.e. are they selling their advertising contracts too cheaply?).

[19] *New York City Department of Planning: Bike-Share Opportunities in New York City, 2009.*

More recent bike share programs have investigated different funding models and have utilized the following funding sources:

- Federal, state, or local grants: generally used to cover capital costs of the initial system setup.
- Steady public agency income sources: these include using a portion of parking revenues or bus bike rack advertising revenue to contribute to operating the system.
- User fees: collected from subscribers who purchase annual, monthly, or daily passes and from users who exceed the generally free first thirty minutes of a trip. A typical bike-share pricing structure costs approximately $70 per year for annual membership and approximately $5 for a day pass. These would likely need to be lower for Emeryville as the program would not provide as extensive a reach as systems in larger cities. However, Emeryville's high employment density and corporate environment also provide valuable opportunities to leverage sponsorship.

Sponsorship

Similar to advertising, companies or individuals can sponsor the system as a whole or as individual stations, the fees going towards covering maintenance and operating costs. These opportunities are likely to be an important component of a bike sharing program implemented in Emeryville. Employers could sponsor bike share stations, either in a publicly accessible location on their campus or at a nearby public location. Two notable case studies are:

- **Nice Ride Minnesota** in Minneapolis is the first example of a public/private bike-share partnership. Capital costs were partially funded by a federal grant and partially by a title sponsor (in exchange for advertising placed on all bicycles in the fleet). Individual station sponsorship is also available to other companies, with that revenue going towards maintenance and operation of the system.
- The **London bike share system** is an example of a naming rights sponsor that paid a premium to have their name associated with the title of the system, i.e. the Barclays London Cycle Hire. This covers the costs of establishing and operating the system at no additional expense to the public agency.

4.6.3 Potential Station Locations

Bike sharing is most effective when combined with a good walking environment and nearby transit facilities. Stations should serve a high density and diversity of users to maintain demand (as much as possible) throughout the day. The following characteristics are attractive for potential bike share stations.

- **High Residential Density**: Proposed station locations should be accessible to the several pockets of high residential density that exist in Emeryville.
- **Employment Centers:** Employment centers can attract bicycle sharing trips as workers may use bikes to commute, as an extension of transit, or to make trips at lunch or other times during the day. The City should inquire among its major employers and office buildings about the potential to provide a bike share station on private property. Such opportunities should balance security needs of the site with public accessibility and visibility of the system.

- **Large Hotels:** Hotels can be a major generator of bike sharing trips, particularly casual users who tend to contribute disproportionately to user-generated revenues. Four large hotels within the City limits and one additional hotel just across the Oakland border present possible locations.

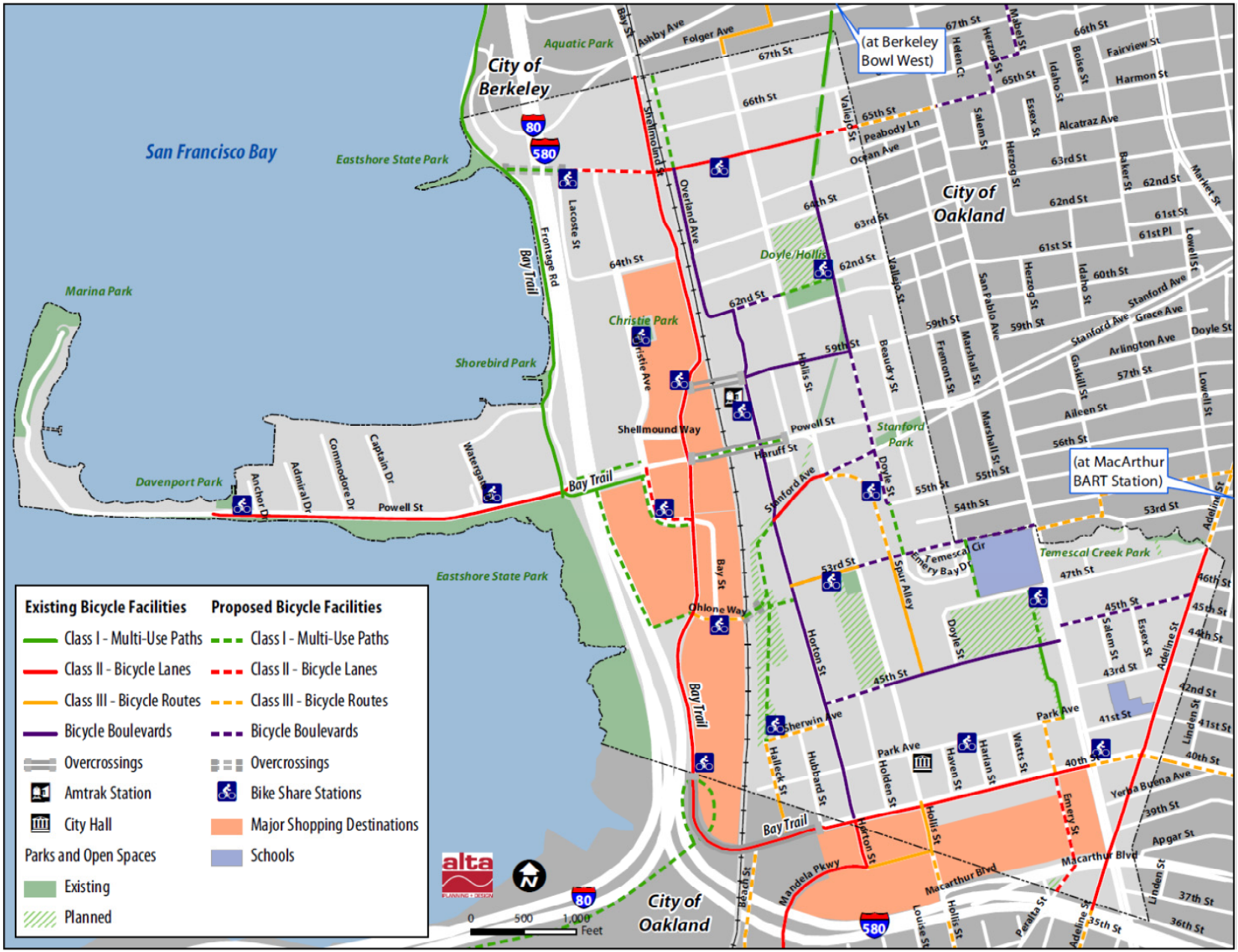
Existing and Proposed Bicycle Facilities: As many bike sharing users may not be experienced bicyclists, it is important to locate stations along protected bikeways where they are most likely to feel comfortable. Locations on multi-use paths, Class II Bikeways, and bicycle boulevards are ideal for station placement. Similarly, placing stations near future bicycle facilities can prompt quicker investment into expanding the bicycling network.

A final consideration for the placement of bike sharing stations is that some key destinations for Emeryville residents and workers may be located outside of the city limits. These include Berkeley Bowl West in Berkeley, the Macarthur BART station in Oakland and even the entrances to many of the large retail stores at the East BayBridge Shopping Center. Stations are therefore recommended at these locations as well. Potential station locations for the 17 station Emeryville bike share system are shown in **Map 4-1,** on the next page.

4.6.4 Station Design

Stations should be visible and accessible and are ideally located as close as possible to major trip generators. The first preference for station placement is generally within the sidewalk space, although this needs to consider the impact on pedestrian through-fare and the placement of utilities and other street features. Stations can also be placed in the street in place of (generally) two to three parking spaces. Public spaces such as parks and plazas or stations on private property may also be appropriate.

There have been significant advancements in the physical needs of a station with the latest generation of technology utilizing a modular station format, solar power, and wireless communication technology to make stations completely portable (they are bolted into place rather than requiring expensive excavation and wiring), cost-effective, and environmentally sustainable.



Map 4-1. Potential Bike Sharing Locations

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5. Citywide Improvements

This chapter recommends physical upgrades to the walking and bicycling environment that can be made on a citywide basis. Recommendations include:

- Signalized intersection improvements for pedestrians
- Treatment guidelines for uncontrolled and mid-block crosswalks
- Parklets
- Pedestrian signage
- Bikeway signage
- Bike parking
- Bike maintenance stations
- Signal detection for bicyclists

5.1. Signalized Intersection Improvements

Signalized intersections provide key pedestrian crossing opportunities across Emeryville's major roadways: San Pablo Avenue, 40th Street, Hollis Street, Powell Street.

Recommendation

The City should upgrade all signals as they are replaced to include pedestrian countdown signal heads and audible pedestrian signals. Pedestrian countdown signals display the number of seconds remaining to cross a street until the end of the pedestrian phase, usually when the traffic signal turns yellow. Countdown signals have been shown to reduce the likelihood that a pedestrian will be caught in the crosswalk when the opposing traffic gets a green light, and can reduce the incidence of pedestrian injuries at an intersection.[20]

The City should adjust signal timing to provide a longer walking signal, to accommodate slower pedestrians, particularly at locations where seniors, children, and people with disabilities may be present. The California Manual of Uniform Traffic Control Devices permits using a walking speed of 2.8 feet per second in these circumstances.

The City should seek to reduce pedestrian wait time at signals. This can be achieved by either providing a walk light if the button is pushed within a few seconds after the light turns green, providing two walk lights per cycle, or providing the walk light whenever the light is green, eliminating the need for a pedestrian button.

5.2. Treatment Levels for Uncontrolled and Mid-Block Crossings

Uncontrolled intersections are locations without a stop sign or signal. Mid-block crossings are locations where there is a marked crosswalk in between intersections. Uncontrolled locations and mid-block crossings require unique treatments to ensure that pedestrians are visible within the roadway.

This section provides guidance about appropriate crossing treatments for uncontrolled and mid-block crossings. Recommendations are drawn from several major studies of pedestrian collision rates at marked and unmarked crosswalks. In 2002, the Federal Highway Administration (FHWA) published a comprehensive

[20] *http://www.popcenter.org/problems/pedestrian_injuries/PDFs/Markowitz_etal_2006.pdf*

report on the relative safety of marked and unmarked crossings.[21] In 2006, another study was completed that further assists engineers and planners in selecting the right treatment for marked crosswalks based on studies of treatment effectiveness.[22]

5.2.1 Recommended Guidelines for Marking and Enhancing Crosswalks

The California Vehicle Code requires vehicles to yield the right-of-way to pedestrians at any intersection where crossing is not prohibited, whether a crosswalk is painted on the roadway or not.[23] The primary purpose of painting a crosswalk is to channelize pedestrians. Well-marked pedestrian crossings prepare drivers for the likelihood of encountering a pedestrian, and reinforce the location and legitimacy of a crossing.

The City should consider uncontrolled and mid-block crossings as a candidate for marked (painted) crosswalks if there is a demonstrated need for a crosswalk including:

- Location near existing or proposed land uses or buildings with high pedestrian volumes (e.g. transit stops, schools)
- High existing pedestrian volumes
- High number or rate of pedestrian-vehicle collisions at this location (over several years)
- Nearest (adequately) marked or controlled crosswalk is far away
- Requests from the community (e.g. community surveys, direct requests, findings from walking audits, etc.)

The City should mark crosswalks at uncontrolled intersections and mid-block crossings where some of the following occur:

- Sufficient demonstrated need exists to justify the installation of a crosswalk (see above)
- The location has sufficient sight distance and/or sight distance will be improved with treatments
- Safety considerations do not preclude a crosswalk

5.2.2 Selecting Crosswalk Enhancements

When evaluating an uncontrolled or mid-block crossing for improvements, as a first step, the City should determine if the pedestrian volumes and vehicle volumes warrant installing a signal. If they do not, and the crossing is to be kept unsignalized, then the City should follow the treatment levels described below to select crosswalk enhancements.

Determining the appropriate treatment level relies on two pieces of information: the length of time a pedestrian (or bicyclist) must wait before they can cross a street (pedestrian delay), and the likelihood that motorists will yield to pedestrians or bicyclists who are crossing the street (motorist compliance). Locations with high pedestrian delay and low motorist compliance require higher level treatments, while locations with low pedestrian delay and high motorist compliance require lower level treatments.

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[21] *Zegeer, C.V., J.R. Stewart, H.H. Huang and R.A. Lagerwey. "Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines." Report No. FHWA-RD-01-075. Washington, DC, USA: Federal Highway Administration, March 2002. http://www.walkinginfo.org/pdf/r&d/crosswalk_021302.pdf.*

[22] *Fitzpatrick, Kay, et al. Improving Pedestrian Safety at Uncontrolled Crossings. TCRP Report 112/NCHRP Report 562. 2006. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf.*

[23] *More information on the California Vehicle Code sections related to pedestrian right-of-way is available at http://www.walksf.org/vehicleCodes.html.*

Pedestrian delay is measured using Pedestrian Level of Service (PLOS) methodology.[24] PLOS is the average delay experienced by pedestrians as they are waiting to cross the street. For crossings at bicycle boulevards and multi-use paths, the City should count bicyclists as well as pedestrians when calculating pedestrian delay.

Motorist compliance is based on field observations and engineering judgment. If drivers are likely to stop for a pedestrian, the compliance is rated "high." If drivers rarely stop for pedestrians, compliance is "low." A default compliance rate of low is suggested for all locations where the speed limit is 35 mph or greater.

Treatment levels range from Level 1, which consist of minor improvements, to Level 4, which include more intense treatments. **Table 5-1** presents a matrix that can be used to identify which treatment level is appropriate for a particular location. The treatment levels provide a list of possible treatments; the exact treatments installed at a crossing need to be based on site feasibility and engineering judgment.

Descriptions and images of treatments are included in Appendix A.

Level 1 Treatments:

- High visibility crosswalk markings, advance yield limit lines, advance signage

Level 2 Treatments:

- Curb extensions, bus bulbs, reduced curb radii, staggered pedestrian refuges, pedestrian refuge island

Level 3 Treatments:

- In-pavement flashing lights, overhead flashing beacons (on two-lane roads)
- Rectangular rapid flashing beacons (RRFB) (on multi-lane roads)

Level 4 Treatments:

- Pedestrian Hybrid Beacons,[25] also known as High Intensity Actuated Crosswalks (HAWKs; see Appendix A for a picture and more information), RRFB, new signal, or direct pedestrians to the nearest safe crossing

[24] *Note: The pedestrian level of service calculation is set forth in the Highway Capacity Manual (HCM), published by the Transportation Research Board.*

[25] *Pedestrian Hybrid Beacons are now included in the CA MUTCD*

Table 5-1. Treatment Identification Matrix for Uncontrolled and Mid-Block Crossings

Pedestrian Level of Service	Expected Motorist Compliance		
	High	Moderate	Low (or Speed ≥ 35 MPH)
LOS A-D (average delay up to 30 seconds)	**LEVEL 1** High Visibility Crosswalk Markings, Advance Yield Lines, High Visibility Signage	**LEVEL 2** Curb Extensions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge (or Pedestrian Refuge Island) **Plus LEVEL 1**	**LEVEL 3** Two-lane street: In-pavement flashers, overhead flashing beacons Multi-lane street: RRFB **Plus LEVEL 1 AND 2**
LOS E-F (average delay greater than 30 seconds)	**LEVEL 2** Curb Extensions, Reduced Curb Radii, Staggered Pedestrian Refuge (or Pedestrian Refuge Island) **Plus LEVEL 1**	**LEVEL 3** Two-lane road: In-pavement flashers, overhead flashing beacons Multi-lane road: RRFB **Plus LEVEL 1 AND 2**	**LEVEL 4** HAWK, RRFB, New Signal, or Direct Pedestrians to Nearest Safe Crossing **PLUS LEVEL 1 AND 2**

Notes:

For candidate crosswalk locations on either a multi-lane street (three or more lanes), or on two-lane streets with average daily traffic volumes greater than 12,000 or with posted speed limit of 35 miles per hour or more, enhanced treatments beyond Level 1 striping and signing may be needed. Failing to provide an enhanced crosswalk and/or removing a crosswalk because it cannot be enhanced should be an option of last resort.

A pedestrian refuge island is recommended for consideration in all scenarios where at least six feet of right-of-way is available.

A road diet is recommended for consideration in all scenarios with four or more lanes of traffic and a daily traffic volume of less than 15,000 vehicles. With a road diet, the number of travel lanes is reduced and replaced with one or more of the following: a two-way left turn lane, wider sidewalks, new bicycle or parking lanes, conversion of parallel parking to angled or perpendicular parking. A daily traffic volume of 15,000 or less is a general guideline for identifying eligible multi-lane roadways where lanes could be removed and vehicle level of service would remain the same or improve.

5.3. Parklets

Parklets are the temporary repurposing and transformation of underused street parking spaces to extend the sidewalk and create more space for pedestrian amenities or outdoor seating for adjacent restaurants and cafes. The spaces are often in the public right-of-way between the curb and travel lanes in commercial and retail areas. They occupy on-street parking spaces and excess roadway area. Parklets are intended to increase public space, enhance the pedestrian environment, and improve corridor aesthetics.



San Francisco parklet
Source: http://sfpavementtoparks.sfplanning.org/

Parklets have been implemented successfully in New York City and San Francisco. The City of Oakland developed a pilot parklet program in late 2011, and expects implementation by 2012.

San Francisco's Pavement to Parks program recommends parklets only in areas that have limited public space, narrow sidewalks, or no parks. The areas should have existing conditions that will attract people to the space, such as retail and high pedestrian activity. Parklets are generally sponsored and implemented by community benefit districts, storefront business owners, non-profit institutions, and community organizations.

Recommendation

The City should establish a parklet program, based on lessons learned from San Francisco's and Oakland's parklets program. Prior to establishing a formal citywide program the City may wish to work with local businesses to permit individual parklets on an ad-hoc basis.

In addition to areas that lack public space and have the potential for open space demand, the following characteristics are recommended for parklet locations:

- Streets with speed limits of 25 mph or less
- Streets with parking lanes
- Site is not in front of a fire hydrant or would restrict access to utility covers and valves
- Site should be a minimum of two parking spaces in length or equivalent

5.4. Pedestrian Directional Signage

Pedestrian directional signage and maps enable people to navigate through public and private space and can enhance the walking experience to help make trips safe and easy. Most cities lack sufficient signage and map information for pedestrians. Pedestrian-oriented signage can help conceptualize a space, area or city as a whole. Maps and signage can help orient both residents and visitors and enable them to calculate the time to reach a destination.

Recommendation

The City should consider a pedestrian signage program within its Pedestrian Priority Zones that provides information on direct and safe routes between key origins and destinations, and where it is possible to cross streets and railroad tracks, access buildings, connect to public transit, and find community facilities such as public bathrooms.

The City should install walking maps, starting with the Amtrak Station and the transit hub at 40th Street and San Pablo Avenue. Pedestrian-oriented directional signs, similar to those used in Oakland, are also recommended.

5.5. Bikeway Destination Signage

Given the unintuitive nature of Emeryville's street and path network, destination signage for bicyclists can significantly improve navigation around the city. Destination signs may display directional or mileage information.

Recommendation

The City should consider installing destination signs on all bikeways. Along bicycle boulevards, the City should continue to install the purple bicycle boulevard directional signs. Signage programs should be coordinated with adjoining jurisdictions. See **Appendix B** for additional recommendations and guidelines for the use of bikeway signage



Directional Signs
Directional signs should be installed before intersections at decision points such as the junction of two or more bikeways. They include destinations and associated directional arrows.



Confirmation signs
Confirmation signs display mileage to destinations and should be installed regularly along the network, including where a bikeway turns. They are located midblock or on the far side of intersections and include destinations and distances.

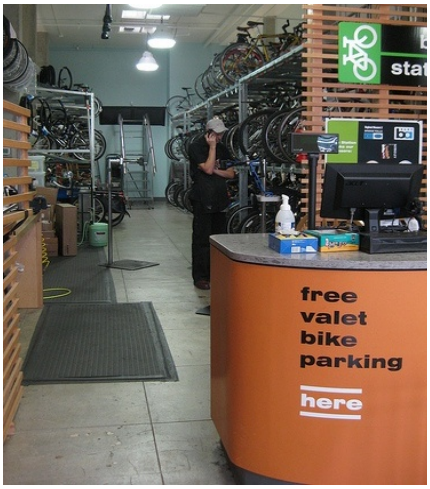
5.6. Bike Parking

Bicyclists need convenient, secure places to store their bicycles at the end of their trips; 22 percent of respondents to the *Emeryville Pedestrian and Bicycle Survey* reported that insufficient bike parking prevented them from making more bicycle trips. The City has a bicycle parking ordinance for private development.

Recommendation

The City should continue to enforce its bicycle parking ordinance and expand bicycle parking in public spaces. Additional bike parking should be provided at major transit hubs and car share locations, as well as locations identified in fieldwork and community outreach.

- Locations identified for bike parking include:
    - 40th Street at San Pablo Avenue
    - The Bay Street area
    - 40th Street at Emery Street
    - Emeryville Public Market
    - 65th Street at Hollis Street
    - 53rd Street and Hollis Street
    - Shellmound Way at Shellmound Street
    - Emeryville Amtrak station
    - 59th Street at Doyle Street
    - 45th Street at Spur Alley
    - Triangle Neighborhood
    - East BayBridge Shopping Center
    - Powell Street Plaza
    - Christie Avenue at 64th Street



The Berkeley Bike Station provides parking and other services.

- Consider establishing a bike station (an attended or restricted-access facility that offers secure bicycle parking and other amenities) at a centrally located site near transit and casual carpool locations, at the MacArthur Bart Station, and at large entertainment venues such as theaters.
- Consider bike stations (or Bike Link lockers or equivalent secure bicycle storage) to be a requirement for large developments.
- Potential locations for bike corrals (bicycle racks grouped within a parking space) include Bay Street, 59th Street between Hollis and Doyle Streets, and 65th Street between Hollis Street and Overland Avenue.
- See **Appendix B** for a detailed discussion of bike corrals, bike stations, and general design.

5.7. Bicycle Maintenance Stations

The installation of bicycle maintenance systems would support and make it easier for Emeryville residents and visitors to bicycle. These stations generally provide tire wrenches and pumps, Allen wrenches, and a few other tools allow minor adjustments. They can be installed for approximately $1,000 each and have been used successfully in Cambridge, MA. Bicycle maintenance stations are recommended at the Emeryville Public Market, along Doyle Street near Doyle-Hollis Park, and on the Bay Trail.


A bicycle repair station in Cambridge.

5.8. Signal Detection for Bicyclists

Bicycle detection at actuated traffic signals permits bicyclists to trigger a green light, even when no motor vehicle is present. California Assembly Bill 1581 requires all new and replacement actuated traffic signals[26] to detect bicyclists and to provide sufficient time for a bicyclist to clear an intersection from a standing start (see Appendix B for details). Caltrans Policy Directive 09-06 clarifies the requirements and permits any type of detection technology. The most common technologies are in-pavement loop detectors and video detection, both of which are used by the City. More recently, microwave detection has been used to detect and differentiate between bicyclists and motor vehicles.

Recommendation

The City should implement Policy 3.9 of this Plan, which states that "all signals should have functioning bicycle detection and signal timing shall be long enough to allow bicyclists to clear the intersection." Where bicyclists are required to wait over a loop detector to request a green light, a bicycle stencil should be painted on the roadway to indicate proper positioning. Bicycle detection with stencils is needed in through lanes and turning lanes. Consider installing signage to instruct bicyclists on positioning their bicycles to activate detection.

Fieldwork indicates that the following intersections do not detect bicyclists or have other issues that interfere with bicycle detection. The City should evaluate bicycle detection at these locations and improve detection if it is faulty:

- 40th Street (Some loop detectors are in poor condition and subject to stress from high traffic volumes)
- 45th Street at San Pablo Avenue (EB)
- 47th Street at San Pablo Avenue (EB and WB)
- 65th Street at Overland Street (WB)
- 65th Street at Shellmound Street (EB and WB) *
- 65th at Hollis Street (EB and WB) *
- Christie Avenue at Powell Street (SB)
- Bay Street at Shellmound Street (WB)
- Park Avenue at Hollis Street (EB and WB)
- Hollis Street at 40th Street (SB)
- Park Avenue at San Pablo Avenue (EB)
- 59th Street at Hollis Street (EB and WB)
- 53rd Street at Hollis Street (EB)
- 53rd Street at San Pablo Avenue (EB)
- Stanford Avenue at Hollis Street (EB and WB)**

Advance Signal Detection

In addition to ensuring bicyclists can trigger signals and have sufficient time to cross the street, the City should consider bicycle advance signal detection. This emerging technology detects a bicycle before the intersection, and extends the green phase to allow the bicyclist adequate time to clear the intersection. Technologies can also be programmed to collect bicycle volumes. Recent applications include City of Portland, and City of Pleasant Hill.

For more information, see http://bikeportland.org/2010/11/16/pbot-project-would-improve-signals-and-reduce-delay-for-bike-traffic-42822

** At this intersection, the stencil is not positioned over the loop detector. The existing stencil should be removed and repainted to communicate to bicyclists how to request a green light.*

[26] *Actuated traffic signals stay red until the signal detects a car or bicyclist that is waiting for the light to turn green.*

***At this intersection, bicyclists are not detected in the bike lane, but are detected in the motor vehicle lane.*

The City should replace loop detectors with video detection, microwave detection, or other effective technology. The City should also pursue an education campaign to teach bicyclists how to position their bicycles to activate loop detectors. This may include signage indicating stencils and positioning for loop detectors or video with messaging such as "Wait here for green."

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6. Bicycle Boulevards

Bicycle boulevards are generally defined as low-volume, low-speed streets that have been optimized for bicycle travel using treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. Bicycle boulevards are an integral part of the City's bicycle network.

This chapter supports Policy 3.3 of this Plan, which states, "the City will construct the network of bicycle boulevards and monitor them for performance goals, as indicated in **Chapters 4, 5,** and **6** of this Plan."

This chapter provides specific guidelines for application of treatments on Emeryville's bicycle boulevards. The material is drawn from the *Bicycle Boulevard Treatments Memorandum*, written during the development of this Plan and presented as **Appendix C**.

6.1. Bicycle Boulevard Standards and Best Practices

Bicycle boulevards have been implemented in several cities throughout the country, and while no federal guidelines exist, several best practices have emerged for their development. This section summarizes standards and best practices for the development of bicycle boulevards, drawn from published materials and interviews with agency staff working to implement bicycle boulevards in eight communities throughout North America.

As demonstrated through the range of experiences and techniques used to develop bicycle boulevards in different jurisdictions, there are no strict standards or warrants for use of bicycle boulevard treatments. Commonalities that emerge among the jurisdictions include:

- Bicycle boulevards are low-speed, low-volume streets that encourage use by bicyclists.
- Distinctive signs and pavement markings are essential components of designating a bicycle boulevard.
- Most municipalities are looking into improving crossings of arterial streets and applying traffic calming and diversion techniques to improve the bicycling environment.
- Public input is a key component of identifying streets and treatments for bicycle boulevards.

However, the jurisdictions differed in terms of street selection, intersection treatments, speed control measures, and volume control measures, as described following.

6.1.1 Street Selection

Most municipalities identified bicycle boulevards through the bicycle master plan process. All municipalities considered local streets with existing traffic calming, closures, or signalized crossings of major streets for bicycle boulevard designation. Streets that improve connectivity to key destinations, provide a direct route for bicyclists, or where residents have expressed a desire for traffic calming are also good candidates.

Most bicycle boulevards are located on residential streets, although Austin, Berkeley, and Portland all have boulevards along commercial streets.



Figure 6-1. Emeryville's existing and proposed bicycle boulevards

6.1.2 Intersection Treatments

Major Street Crossings

The quality of treatments at major street crossings can significantly affect a bicyclist's choice to use a bicycle boulevard or not. If the delay for a bicyclist to cross a major street on a bicycle boulevard is considerably longer than the delay for crossing at an adjacent street, some bicyclists are less likely to use the bicycle boulevard.

Some jurisdictions have prioritized improving bicycle boulevard crossings of arterial streets when establishing a bicycle boulevard, while others began with signs and pavement markings, and are more recently focusing on improving major street intersections. Common treatments include curb extensions, crosswalks, median islands, and signals. Treatment selection is based on engineering judgment as well as manuals, primarily the Manual on Uniform Traffic Control Devices (MUTCD) and National Cooperative Highway Research Program (NCHRP) Report #562, *Improving Pedestrian Safety at Unsignalized Crossings* (2006). Several jurisdictions use pedestrian half-signals, while others use or are considering implementing Pedestrian Hybrid Beacons, also known as High-Intensity Activated Crosswalk or HAWK signals.

Minor Street Crossings

Municipalities differ significantly on use of stop control on bicycle boulevard intersections with other local streets. CAMUTCD Section 2B.05 *Stop Application* specifies when a stop sign can be used at the intersection of two streets with relatively equal traffic volumes and/or characteristics. Some municipalities, including Portland and Vancouver, stop control one direction of every intersection with a minor street.

Many municipalities turn stop signs or remove four-way stop-controlled intersections to give right-of-way to the bicycle boulevard, reducing the delay for bicyclists on the bicycle boulevard.

6.1.3 Speed Control Measures

Motor vehicle speeds are critical to the bicycling environment because of the likelihood of injury resulting from a high-speed crash, as well as turning, passing, and other potential conflicts between motor vehicles and bicyclists.

Automobile speed has a significant impact on the likelihood a fatality will result from a crash (see **Figure 6-2**).

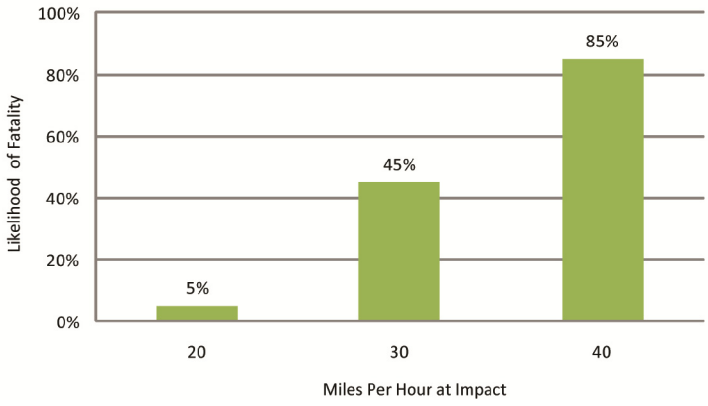


Figure 6-2. Likelihood of pedestrian fatality resulting from crash based on automobile impact speed.
Source: U.K. Department of Transport

Roads selected for bicycle boulevards tend to have maximum motor vehicle speeds of 25 mph, although some communities such as Albuquerque are reducing speeds through traffic calming or posting reduced speed limits. **Table 6-1** summarizes guidance for speeds on bicycle boulevards from the communities interviewed and key resources.

In general, a speed differential between motor vehicles and bicyclists of 15 mph or less is desirable to reduce turning conflicts and the number of passing events; the San Francisco Bicycle Plan recommends re-designing a street for maximum speed of 15 mph unless volumes are low.

Table 6-1. Posted Speeds and Speed Thresholds

Source	Posted Speed	Speed Threshold/Goal
Albuquerque, New Mexico	18	None specified
Austin, Texas	25	85th percentile 25 mph or less
Berkeley, California	25	None specified
Palo Alto, California	25	85th percentile 32 mph or less
Portland, Oregon	25	85th percentile25 mph or less; 15-20 mph preferred
Seattle, Washington	25	85th % speeds <5mph over posted
Vancouver, British Columbia	25	None specified
AASHTO *Guide for the Development of Bicycle Facilities*	25	None specified

6.1.4 Volume Control Measures

Motor vehicle traffic volumes affect the comfort of a bicyclist, particularly for roadways with shared travel lanes, such as bicycle boulevards. Higher vehicle volumes are less comfortable and mean more potential conflicts. To illustrate, on a 25 mph street with 1,000 vehicles per day (vpd), during peak hour a bicyclist traveling at 12 mph would be passed by a car traveling in the same direction about every two minutes.[27] By comparison, at 3,000 vpd, a bicyclist would be passed by a car every 46 seconds, and at 5,000 vpd, a bicyclist would be passed by a car every 28 seconds.

Table 6-2. Traffic Volume Guidelines

Source	Volume Threshold
Albuquerque, New Mexico	500+ vpd threshold for speed humps; 1,500 for diversion
Austin, Texas	None
Berkeley, California	None
Palo Alto, California	None
Portland, Oregon	1,000 vpd goal, depends on street
Seattle, Washington	None
Vancouver, British Columbia	< 3,000 vpd
AASHTO *Guide for the Development of Bicycle Facilities*	generally < 3,000 vpd

There is a wide variation in vehicle volume goals for bicycle boulevards considered by different jurisdictions, shown in Table 6-2. Goals range from 1,000 to 3,000 vpd, with the majority of jurisdictions lacking a volume goal. No jurisdiction has a specific set threshold that triggers implementation of volume control treatments. Instead, the decision to implement volume control treatments is based on the context of the bicycle boulevard, and engineering judgment plays heavily in the decision.

The majority of cities interviewed have a traffic calming program that is separate from bicycle boulevard implementation programs. Portland has modified its traffic calming program to permit traffic calming to be installed on a bicycle boulevard at the City's discretion, rather than just as a response to community request.

[27] *At peak hour, assuming peak hour is 10 percent of vpd, the street is two-way with traffic volumes split evenly between each direction, and cars are evenly spaced along the street.*

6.1.5 Impacts to Neighboring Streets

Some cities consider how traffic calming and/or diversion can affect traffic on adjacent streets; in Palo Alto, an increase of up to 25 percent of existing volume (under 2,500 vpd) is generally considered acceptable.[28] The Traffic Calming Program manual estimates that traffic calming treatments such as a series of speed humps can be expected to divert 10 to 20 percent of traffic onto other routes, while full and partial street closures result in a 50 to 90 percent diversion.

Portland's Neighborhood Traffic Management Program has defined an 'impact threshold curve' to evaluate what impacts are acceptable to neighboring streets. The City's standard impact curve is expressed in terms of total traffic volume. The parameters allow for an increase of up to 150 vpd on any street, while an increase of over 400 vpd on a local street is unacceptable, and the resulting traffic volume on any local street should not exceed 3,000 vpd.[29]

6.1.6 Impacts to Emergency Response Vehicles

Jurisdictions consider traffic calming impacts to emergency vehicle routes in one or more of the following ways:

- Treatments on emergency response routes must be approved by emergency response officials
- A limited set of emergency-vehicle-friendly traffic calming techniques are allowed

Examples of emergency-vehicle-friendly traffic calming techniques include 22-foot speed tables in lieu of speed humps, laterally offset speed tables (also called split humps), speed lumps (which have a gap that emergency vehicles' wheels can fit through), and other treatments.

The Palo Alto Traffic Calming Program Manual notes that emergency "vehicles are particularly susceptible to the vertical displacement of speed humps because of the weight and length of fire trucks, and the delicate instruments and patients in paramedic vans and ambulances." Emergency vehicles must reduce speeds more than a passenger car would to travel over a speed hump. The manual also states that intersection treatments have less of an impact on emergency vehicles than corridor treatments, as the vehicles already slow for intersections. Emeryville's emergency vehicle response time goals are an average of five minutes or less.[30]

It is estimated that a ladder truck may be delayed up to ten seconds at a speed hump and an ambulance may be delayed up to five seconds.[31]

6.1.7 Other Lessons Learned

Experience in several communities indicates that it is important to record where automobile speed measurements are taken in relation to the traffic calming or diversion treatment and replicate for before and after trials. In addition, traffic calming and diversion measures can be implemented on a trial basis to gauge residents' support prior to finalizing the design. Temporary speed humps, tables, and lumps are available, and temporary closures can be created with construction barrels or planters. However, if not aesthetically appealing, the temporary measures can diminish residents' opinions.

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[28] *Based on the Traffic Infusion on Residential Environments (TIRE) index, which shows that most residents do not notice an increase of 25 percent.*
[29] *http://www.portlandonline.com/transportation/index.cfm?&a=85375&c=35934*
[30] *City of Emeryville Website. Accessed March 15, 2011. http://www.ci.emeryville.ca.us/index.aspx?NID=359*
[31] *Ewing, Reid. (1999). p.142 Traffic Calming: State of the Practice. http://www.ite.org/traffic/tcsop/Chapter7.pdf*

6.2. Recommended Bicycle Boulevard Policies and Treatments for Emeryville

This section recommends policies for bicycle boulevard development in Emeryville. None of the case study cities have strict policies that require specific action if bicycle boulevard goals are not met. Similarly, because of the variety of conditions and importance of context-sensitive design, Emeryville's policies are meant to serve as guidelines, rather than standards. If a bicycle boulevard goal is not met, the City should consider treatments that will allow the bicycle boulevard to meet goals. If goals cannot be met, the City should consider a different type of bicycle facility.

This section first identifies Emeryville's existing and proposed bicycle boulevards. It then presents three goals for bicycle boulevards that address speeds, volumes, and intersection delay.

6.2.1 Street Selection

Emeryville's General Plan and the 1998 *Bicycle and Pedestrian Plan* identify bicycle boulevards based on traffic conditions and proximity to key destinations, including schools and parks. **Table 6-3** lists the bicycle boulevards. Note that bicycle boulevards on 66th Street and 55th Street are not included in this Plan and the extents of others have been modified.

Table 6-3. Emeryville's Bicycle Boulevards

Street	Extents	Notes
45th Street	Horton Street to San Pablo Avenue	Modified from General Plan. Changed Eastern extent to San Pablo Avenue.
45th Street	San Pablo Avenue to Adeline Street	
53rd Street	Horton Street to San Pablo Avenue	Included in General Plan.
Doyle Street	Ocean Avenue to 55th Street	Included in General Plan.
Horton Street/Overland Avenue	40th Street to 65th Street	Included in General Plan.
Stanford Avenue	Horton Street to Doyle Street	Included in General Plan.
59th Street	Horton Street to City Limits	Modified from General Plan. Changed eastern extent from City Limits to Doyle Street.

The General Plan includes bicycle boulevards on 55th Street from Doyle Street to the City Limits and on 66th Street from Shellmound Street to the City Limits. These facilities are not supported by this Pedestrian and Bicycle Plan. The General Plan will be amended to reconcile the inconsistencies.

6.2.2 Bicycle Boulevard Goals and Metrics

This section outlines recommended bicycle boulevard goals and metrics for Emeryville based on the best practices resources surveyed. The bicycle boulevard goals address metrics for motor vehicle speeds, motor vehicle volumes, and major intersection delay, described below.

Speed Goals

Streets developed as bicycle boulevards should have posted speeds of 20 mph or less, with 85th percentile speeds at 22 mph or less. If the street has relatively high volumes (over 3,000 vehicles per day) 85th percentile speeds should be further reduced below 22 mph where feasible.

- **Rationale**: Higher vehicular speeds increase the frequency of automobiles passing bicyclists and increase the severity of crashes that occur. Bicyclists generally travel at approximately 12 mph, and maintaining vehicular speeds at a speed closer to bicyclists' speeds greatly improves bicyclists' comfort on a street. Slower vehicular speeds also improve drivers' ability to see and react to bicyclists and minimize conflicts at driveways and other turning locations.

Motor Vehicle Volume Goals

Traffic volumes on bicycle boulevards east of Hollis Street should be below 1,500 vehicles per day. West of Hollis Street, traffic volumes should be below 3,000 vehicles per day. Higher volumes can be permitted for short segments with additional treatments.

- **Rationale**: Volumes of motor vehicles determine the frequency of passing events; at 1,000 vehicles per day, cars pass a bicyclist approximately every two minutes, while at 3,000 vehicles per day, cars pass a bicyclist every 46 seconds. The rate of automobiles passing a bicyclist indicates the number of potential conflicts and affects the comfort of the bicycling environment.

  Bicycle boulevards with volumes higher than 3,000 vehicles per day are not recommended, although a segment of a bicycle boulevard may accommodate more traffic for a short distance if necessary to complete the corridor. Providing additional separation with a bike lane, raised bike lane, cycle track, or other treatment is recommended where traffic calming or diversion cannot reduce volumes below this threshold.

Monitoring

As noted in Chapter 4, Section 4.4.3, the City should regularly monitor traffic volumes, and speeds on its bicycle boulevards to determine if they are meeting the goals listed above or not. Counts should be conducted every two years. If a bicycle boulevard goal is not met, the City should consider treatments that will allow the bicycle boulevard to meet goals. If additional treatments are not possible, or if treatments are unlikely to result in conditions that meet the above goals, the City should consider a different type of bicycle facility.

Emeryville should collect this data and evaluate each bicycle boulevard in the case of any of the following:

- Development occurs that is projected to increase motor vehicle volumes on the bicycle boulevard
- The *Pedestrian and Bicycle Plan* is updated
- Substantial community concern is brought to the City

6.2.3 Bicycle Boulevard Treatment Selection

This section identifies five levels of treatment for bicycle boulevards. The appropriate treatment level is dependent on how well the bicycle boulevard meets the above speed, volume and delay goals. If one treatment does not address out-of-compliance bicycle boulevards, the next treatment level should be used. This phased approach promotes implementation of the least intensive treatment to achieve the desired outcome. **Table 6-4**

shows the hierarchy of application levels. Appendix B includes descriptions and illustrations of the individual treatments. If increased levels of treatment fail to achieve the goals, re-designation should be considered.

The minimum standard to designate a street as a bicycle boulevard, Level 1 treatments consist of "Bicycle Boulevard" or other identification signs and pavement markings. The second level includes these items, plus wayfinding signage and treatments to major street crossings. All bicycle boulevards in Emeryville should meet Level 2 treatments at a minimum.

Traffic calming and diversion treatments (Levels 3, 4, and 5) should be implemented on bicycle boulevards as necessary when the street exceeds the target vehicular speed and volume thresholds. If an analysis shows that the bicycle boulevard does not meet the thresholds, the City should consider applications for the next treatment level.

Note that while traffic calming treatments primarily affect motor vehicle speeds, they also reduce volumes, as drivers avoid slower streets. Speed humps can lead to a 20 percent reduction in vehicular speeds, while chicanes, traffic circles, and other narrowing can reduce vehicle volumes by 10 percent.[32]

Level 1. Basic Bicycle Boulevard

Signs and pavement markings represent the least physically intensive treatments and should be included in all bicycle boulevard treatments. Emeryville's pavement stencils and purple bicycle boulevard signs provide a strong visual identity for the street and designate the corridor as a bicycle route. This is the minimum treatment for a street to be considered a bicycle boulevard.

Level 2. Enhanced Bicycle Boulevards

Wayfinding signs and directional pavement markings improve the experience of a bicycle boulevard and passively market the facility. Intersection treatments that reduce delay can be a major determinant of whether a bicyclist uses the bicycle boulevard rather than a parallel street. Emeryville should build all bicycle boulevards to a Level 2 minimum standard.

Level 3. Limited Traffic Calming

If speeds and volumes on a bicycle boulevard rise above the City's goals, Level 3 treatments should be implemented. Traffic calming should be considered on bicycle boulevards that have 85th percentile speeds greater than 22 mph. Limited traffic calming can also reduce volumes 10 to 20 percent.

Specific treatments depend on public input, whether the street is a transit street, vehicular speeds, and lane widths. Where on-street parking is important, minimize loss of parking by using vertical speed control where appropriate, minimizing impacts to bicycle travel where possible.

[32] *Berkeley Bicycle Boulevard Design Tools and Guidelines.*

Table 6-4. Application of bicycle boulevard treatment levels

Level	Signs	Pavement Markings	Intersection Treatments	Traffic Calming	Traffic Diversion
Level 1 Basic Bicycle Boulevard	• identification	• shared lane markings			
Level 2 Enhanced Bicycle Boulevard	• identification • wayfinding	• shared lane markings • directional markings for bicyclists	• crossing improvements at major streets (high-visibility crosswalks, median islands, HAWK and standard signals)		
All bicycle boulevards in Emeryville should meet level 2 treatments at a minimum					
Level 3 Limited Traffic Calming	• identification • wayfinding	• shared lane markings • directional markings for bicyclists	• crossing improvements at major streets (high-visibility crosswalks, median islands, HAWK and standard signals) • improve visibility of bicyclists (forward stop bars, bicycle crosswalks)	• vertical speed control (speed humps/ cushions/ tables) • horizontal speed control (chicanes, traffic circles, curb extensions)	
Level 4 Significant Traffic Calming	• identification • wayfinding	• shared lane markings • directional markings for bicyclists	• crossing improvements at major streets (high-visibility crosswalks, median islands, HAWK and standard signals) • improve visibility of bicyclists (forward stop bars, bicycle crosswalks)	• vertical speed control (speed humps/ cushions/ tables) • horizontal speed control (chicanes, traffic circles, curb extensions) • narrowings (chokers, neckdowns, pinchpoints, center island narrowing)	
Level 5 Traffic Diversion	• identification • wayfinding	• shared lane markings • directional markings for bicyclists	• crossing improvements at major streets (high-visibility crosswalks, median islands, HAWK and standard signals) • improve visibility of bicyclists (forward stop bars, bicycle crosswalks)	• vertical speed control (speed humps/ cushions/ tables) • horizontal speed control (chicanes, traffic circles, curb extensions) • narrowings (chokers, neckdowns, pinchpoints, center island narrowing)	• full and partial closures, diagonal diverters

Level 4. Significant Traffic Calming

If treatments indicated in Level 3 do not reduce speeds and volumes below the City's goals, Level 4 treatments should be implemented. On bicycle boulevards west of Hollis Street where automobile speeds and volumes are identified issues, neck-downs can reduce speeds significantly, as drivers must slow and wait for one car to pass the treatment at a time. This treatment is not recommended on bicycle boulevards east of Hollis due to limited effectiveness because of low traffic volumes.

Treatments shall not significantly hinder emergency vehicle access or bus routes and the Emeryville Fire Department, AC Transit, and Emery Go-Round should be consulted in the design, as appropriate. Neck-downs shall be designed to permit a 20 foot clear access for emergency vehicles.

Level 5. Traffic Diversion

If treatments indicated in Level 4 do not reduce speeds and volumes below the City's goals, Level 5 treatments should be implemented. Where a bicycle boulevard has high traffic volumes, particularly cut-through traffic, diversion should be considered to substantially reduce volumes on the road. Diversion should only be implemented after a thorough traffic analysis and public outreach process, and traffic conditions should be evaluated after six months to determine whether neighboring streets were negatively impacted.

Alternatively, a treatment can be implemented based on engineering judgment and monitored to determine impacts to neighboring streets. Based on the *Traffic Infusion on Residential Environments* (TIRE) index, an increase of up to 25 percent of existing volume on an adjacent local street is generally acceptable.

6.3. Recommended Design Treatments for Emeryville's Bicycle Boulevards

This section provides existing conditions and general recommendations for Emeryville's existing and proposed bicycle boulevards, based on automobile speeds and volumes, number and location of crashes, and other factors. **Table 6-5** summarizes proposed treatments for all bicycle boulevards. Proposed treatments are also included in **Chapter** 7.

All bicycle boulevards in the City need some level of treatment to be brought up to Level 2: Enhanced Bicycle Boulevard Design treatments. Sections of several bicycle boulevards are also designated as transit streets in the City's General Plan. Treatments on these streets should allow for wider travel lanes, limit horizontal traffic calming treatments, and depending on bus volumes, should consider separation of bicyclists and motor vehicles. Angled parking shall not be developed on bicycle boulevards.

The primary emergency response routes used by the Emeryville Fire apparatus include the following:

- Hollis Street (entire length)
- San Pablo Avenue (entire length)
- Powell Street (from tip of peninsula to San Pablo Avenue)
- Park Avenue (Hollis Street to San Pablo Avenue)
- 40th Street (entire length, including overcrossing)

- Christie Avenue (Shellmound Street to 65th Street)
- Shellmound Way (entire length)
- Shellmound Street (Ashby/I-80 off-ramp/Aquatic Park to 40th Street)

Secondary access routes include 45th Street between Horton Street and San Pablo Avenue, 53rd Street between Horton Street and San Pablo Avenue, and Horton Street/Overland Avenue.

At this time, all of Emeryville's bicycle boulevards with vehicle volume data except Horton/Overland meet vehicle volume goals. Vehicle volumes on 45th Street and Stanford Avenue, and vehicle speeds and intersection delay on all bicycle boulevards should be measured to determine if additional treatments are necessary.

More extensive treatments are required along Horton/Overland to meet the proposed bicycle boulevard goals. The background supporting recommendations for Horton/Overland is described after the table. Prior to installation of any diverters a traffic study will be needed to determine the effects.

Table 6-5. Recommended Treatments for Existing and Proposed Bicycle Boulevards

Bicycle Boulevard	Recommended Treatments
45th Street Horton Street to Adeline Street	• Measure speeds and traffic volumes. • Install bicycle boulevard signage and pavement markings to bring up to Level 2 Treatments. • Consider speed lumps (similar to a speed hump with a gap that allows vehicles with a wider wheel bed to pass unencumbered) if measured speeds are higher than 20 mph. • If Spur Alley bicycle route is implemented, improve crossing with high visibility crosswalks and consider raised intersection.
53rd Street Horton Street to San Pablo Avenue	• Measure speeds and traffic volumes. • Install bicycle boulevard signage and pavement markings to bring up to Level 2 Treatments. • Consider green street treatments such as narrowing street and removing parking to provide bioswales or to daylight Temescal Creek. • If Spur Alley bicycle route is implemented, install high-visibility crosswalks and consider raised intersection. • At San Pablo Avenue, add bicycle pocket or narrow 53rd Street to one lane in either direction with shared lane marking. Adjust signal timing to provide enough time for bicyclists to cross San Pablo Avenue.
Doyle Street Ocean Avenue to 55th Street	• Measure speeds and traffic volumes. • Install wayfinding signage. • Add HAWK signal or full signal at Powell Street. • Install bicycle boulevard signage and pavement markings south of 59th Street to bring up to Level 2 Treatments.

Bicycle Boulevard	Recommended Treatments
Horton Street/Overland Avenue 65th Street to 40th Street	• Measure speeds and traffic volumes • Consider the installation of traffic diverters at key locations. • Explore roadway widening on Horton between 59th Street and Powell Street to better accommodate bicycle lanes. • At Horton and 40th Street install video detection and stripe a bicycle lane between right and left turn lanes to allow bicyclists to continue through northbound. Mark street to emphasize no through motor vehicles. • At Overland and 65th Street, evaluate the need for improvements to bicycle detection and turning movements. • Install three-way stop at intersection of 62nd Street and Horton Street • Enforce restrictions on parking and loading in bike lanes. • See Section 6.3.1 for background
Stanford Avenue Horton Street to Doyle Street	• Measure speeds and traffic volumes • Install bicycle boulevard signage to bring up to Level 2 Treatments. • Continue bicycle boulevard markings between Hollis Street and Doyle Street and include shared lane markings east of Doyle Street • Install bicycle detection in bicycle lane at Hollis Street.
59th Street Horton Street to Doyle Street	• Measure speeds and traffic volumes. • Install bicycle detection at Hollis Street. • Install bicycle boulevard signage to bring up to Level 2 Treatments.

6.3.1 Horton/Overland Treatments

The Horton/Overland bicycle boulevard provides a continuous north-south connection through most of Emeryville, and is a very important bicycle connection, providing access to the Transit Center, the future South Bayfront Bridge, and to Mandela Parkway/Bay Trail in Oakland. The entire bicycle boulevard is currently signed. Bicyclists share the travel lane with motorists north of 62nd Street and south of 53rd Street. Bike lanes are striped between 62nd Street and 53rd Street.

Twenty-four hour traffic counts conducted in fall 2010 show that sections of the bicycle boulevard exceed the 3,000 vehicles per day goal. Within a 24-hour weekday period 3,177 motorists were counted between Park Avenue and 40th Street, 4,859 motorists were counted between Stanford Avenue and 53rd Street, and 3,742 motorists were counted between 59th Street and Powell Street. Volumes along the bicycle boulevard are expected to increase with the construction of Emery Station West. The entrance for the transit center will be located on Horton Street at 59th Street, and the entrance to the garage that will serve the facility will be located along Horton Street just south of 62nd Street.

Delivery drivers and other motorists commonly park on the bicycle lanes on Horton Street between 62nd Street and Powell Street. Bicyclists have noted that it is difficult to merge with traffic to travel around parked vehicles.

The following treatments are recommended along the Horton/Overland bicycle boulevard:

- Measure speeds and traffic volumes
- Consider the installation of traffic diverters at key locations. Suggested locations are at 62nd Street and Stanford Avenue, and enhancements to the existing signed diversion at 40th Street. First develop a traffic study to analyze the impacts of traffic diversion. Then, any installation should be done on a trial basis, with final decisions after evaluation.
- Explore roadway widening on Horton between 59th Street and Powell Street to better accommodate bicycle lanes on both sides and loading lane on east side.
- At Horton and 40th Street install video detection and stripe a bicycle lane between right and left turn lanes to allow bicyclists to continue through.
- At Overland and 65th Street, evaluate the need for improvements to bicycle detection and turning movements.

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7. Site-Specific Projects

This chapter describes upgrades to bicycle and pedestrian infrastructure for specific locations around the city. Because of the large number and variety of these projects they have been classified by type. Some projects, such as overcrossings and paths, are both pedestrian and bicycle projects, and other projects may include both pedestrian and bicycle improvements.

This chapter is organized as follows:

- Pedestrian Projects—this includes sidewalks, pedestrian crossings, transit stop improvements, and corridor enhancements
- Overcrossings
- Paths—this includes pedestrian-only paths and multi-use paths
- Bicycle Projects—this includes bike lanes, signed bike routes, bicycle boulevards, intersection improvements, and spot improvements

All site-specific projects identified in this chapter have been prioritized based on criteria agreed upon by the City and the Bicycle and Pedestrian Advisory Committee. Section 7.5, beginning on page 7-9, includes maps of the projects and detailed project tables that describe the location, recommendation, and cost for each project.

7.1. Pedestrian Projects

The pedestrian improvements will enhance pedestrian access and circulation within Emeryville. These improvements are divided into sidewalks (S), pedestrian crossings (C), transit stop improvements (T), and corridor enhancements (E). Specific project recommendations are listed in **Table 7-3** and their locations are shown on **Map 7-1.**

7.1.1 Sidewalks (S)

Sidewalk projects include gap closures: sidewalk installation where none exist, directional signage where sidewalks are not planned, and sidewalk upgrades to widen or otherwise improve them to meet ADA requirements or City design guidelines.

Twelve sidewalk gap closure projects, totaling 2.26 miles, are recommended. Most of the City's sidewalk gaps have been closed as new developments are built and developers construct adjacent sidewalks. Gaps that remain are the focus of recommended projects, especially along Horton or Holden Streets near Park and Overland Avenues along the railroad tracks.

One sidewalk upgrade project, totaling 0.60 miles, is recommended. Guidelines for minimum sidewalk widths are included in the *Emeryville Design Guidelines*. Generally they require a minimum 6-foot through-zone width for the lower density residential neighborhoods and 7.5 feet on all



Sidewalks that do not provide sufficient space are recommended for upgrades.

other streets in the city, although wider minimums are identified for certain specific areas. Some parts of Emeryville are governed by area plans, and have wider width requirements. Appendix A expands these guidelines with additional recommendations for pedestrian best practices.

7.1.2 Pedestrian Crossings (C)

Crossing improvements are recommended at 15 locations, mostly along San Pablo Avenue, Powell Street, and 40th Street, as well as selected locations on smaller roadways. General guidelines for treating uncontrolled intersections and mid-block crossings are described in Section 5.2.



Rectangular Rapid Flashing Beacons (RRFB) improve motorist yielding rates at uncontrolled crosswalks.

7.1.3 Transit Stop Improvements (T)

Convenient transit is a hallmark of a walkable community, and expands the range of both pedestrians and bicyclists. High-quality transit stops with easy access promote the use of public transportation.

Transit stops are categorized as Primary, Secondary, Tertiary or Local, based on location and ridership counts from a ridership study conducted in 2010, as follows:

- **Primary Stops:** highest transit ridership, multi-modal transit connections or key shopping and work destinations within the City of Emeryville. High priority for new amenities.
- **Secondary Stops:** moderate transit ridership and shopping, work, and medium to high-density residential destinations. Medium priority for new amenities.
- **Tertiary Stops:** low to medium transit ridership and local commercial and residential neighborhoods. Lower priority for new amenities.
- **Local Stops:** lower daily transit ridership and local commercial and residential neighborhoods. Lowest priority for new amenities.

Amenities provided for each bus stop will depend on funding and available space. **Table 7-1** provides guidance for the amenities to be provided by the type of bus stop, while **Table 7-2** lists stops by type. In addition to this general guidance, specific improvements for primary and secondary stops are described in **Table 7-3**.

Table 7-1. Recommended Bus Stop Amenities by Type of Stop

	Primary Stop	Secondary Stop	Tertiary Stop	Local Stop
Bench	X	X	X	X
Trash Bin	X	X	X	X
Lighting	X	X	X	X
Bike Racks	X	X	X	
Shelter	X	X	X	
Real Time Bus Info	X	X		
Landscaping	X			

Table 7-2. Transit Stop Types

Transit Stop Type	Description	Stops
Primary Stops	Bus stops with the very highest transit ridership, as well as multi-modal transit connections or key shopping and work destinations within the City of Emeryville. High priority for new amenities.	• San Pablo Avenue / 40th Street Transit Hub (T.1) • Christie Avenue / Shellmound Way/ Public Market (T.2) • Shellmound St / IKEA/Bay Street (T.3) • 59th St / Horton St and 59th St / Hollis St (T.4) • Powell St at Watergate Drive (T.5) • 40th Street / Emery Street (T.6) • 65th Street / Shellmound Street (T.7) • Shellmound Street / Christie Avenue to Powell Street (T.8)
Secondary Stops	Bus stops with moderate transit ridership, as well as shopping, work, and medium to high-density residential destinations. Medium-high priority for new amenities.	• Hollis Street / 53rd Street (T.9) • Powell Street - Police & Fire Station/ Watergate Condos (T.10) • Hollis Street / 40th Street (T.11) • Christie Ave - Trader Joe's / Powell Street Plaza (T.12) • Christie Avenue / 64th Street (T.13) • Hollis Street / 65th Street (T.14) • Shellmound Street - Public Market (T.15)
Tertiary Stops	Low-medium priority bus stops with lower daily transit ridership and local commercial and residential neighborhoods. Low priority for new amenities.	• Hollis Street / 45th Street • 40th Street / Horton Street • Park Avenue / San Pablo Avenue • Hollis Street and 63rd Street to 64th Street • Vallejo Street / 66th Street • Christie Avenue / 65th Street • San Pablo Avenue / 37th Street • San Pablo Avenue / 45th Street
Local Stops	Lowest priority.	• 40th Street / Harlan Street • San Pablo Avenue / 47th Street • Park Avenue at Pixar • Stanford Avenue / Peladeau / Novartis • Powell Street / Admiral Way • Hollis Street / 67th Street

Notes:

Pairs of bus stops have been consolidated (i.e. eastbound/westbound or northbound/southbound stops at the same intersection or two stops within a block) since these stops will have similar pedestrian and transit access recommendations.

New transit stops are envisioned in the Shellmound Streetscape Design Guidelines (2012). These should be considered primary stops and developed in accordance with the principles provided in the Shellmound Streetscape Design Guidelines.

7.1.4 Corridor Enhancements (E)

Two corridor enhancement projects are recommended, one for 53rd Street and one for San Pablo Avenue. These projects entail significant modifications and incorporate a variety of techniques to enhance the pedestrian environment. They are briefly described below, with details provided in **Table 7-3** in this chapter and in Priority Project Sheets in Chapter 8.

53rd Street Greenway

Fifty-third Street is classified as a greenway, a green street and a bicycle boulevard in the *Emeryville General Plan*. When complete, the improvements will run from Temescal Creek Park on the east end to the planned South Bayfront Bridge on the west end, which will provide bicycle and pedestrian access over the railroad tracks to Bay Street and the Bay Trail.

Recommended corridor enhancements include:

- Improving the intersection at Horton Street and connection to the planned South Bayfront Bridge by narrowing 53rd Street, extending the sidewalk on the west side of Horton Street, and creating a raised intersection.
- Between Hollis Street and San Pablo Avenue, three alternatives are proposed. All alternatives would maintain 53rd Street as a bicycle boulevard. Alternative A would selectively narrow the street at select locations by installing storm water curb extensions. Alternative B would widen the sidewalks on both sides and install bioswales. Alternative C would involve widening the sidewalk on the south side only and creating a creek feature similar to Frog Park along Temescal Creek in Oakland. More detail is provided in **Table 7-3** and Section **8.7.**

San Pablo Avenue

San Pablo Avenue is a key transportation corridor for Emeryville, Oakland, Berkeley, and other communities in Alameda and Contra Costa County. Emeryville has made significant improvements to this corridor, including pedestrian crossing improvements, landscaped medians, and sidewalk improvements. This Plan recommends that the City continue to improve San Pablo Avenue to make it a more complete street—one that accommodates pedestrians, bicyclists and transit in addition to motorists.

To accomplish this, pedestrian improvements are recommended on San Pablo Avenue from 53rd Street to 36th Street. Additionally, a greening study shall be considered for San Pablo Avenue, which would consider improvements such as installing bioswales in bulb-outs at intersections, to improve the aesthetic of the street and reduce run-off, provide pedestrian improvements, and calm traffic. Bicycle projects recommended along San Pablo Avenue include installing "Bicycles May Use Full Lane" signs and painting shared lane markings in the outside lanes.

San Pablo Avenue is a Caltrans-owned roadway (State Route 123); therefore, the City is currently limited in the changes it can make. In the long term, the City shall take the steps necessary to acquire the roadway from Caltrans and develop a greening study.

7.2. Overcrossings

Bicycle and pedestrian travel in Emeryville is significantly limited by two major North-South barriers, Interstate 80 and the Union Pacific railroad tracks. Recommended overcrossing improvements include:

- **65th Street Bridge:** This bridge would span I-80, connecting 65th Street to Frontage Road and the Bay Trail. The City is currently planning this bridge.

- **South Bayfront Bridge:** This bridge from Horton Landing Park to Ohlone Way would provide a connection over the railroad tracks between major mixed-use destination at Bay Street and employment centers on Horton Street.
- **Powell Street Pedestrian/Bicycle Bridge:** A substandard pedestrian/bicycle bridge exists on the Powell Street Bridge over the railroad tracks. The City should conduct a feasibility study for improved pedestrian and bicycle crossing at this location. In conjunction with adjacent development, the City should seek to improve pedestrian and bicycle access. Any improvements to this bridge are long-term and the need for the improvements should be re-evaluated after construction of the South Bayfront Bridge.

These recommendations are included in the project lists and maps for both pedestrian and bicycle facilities.

7.3. Paths

Paths include both pedestrian-only paths which are restricted to pedestrian use, and multi-use paths, which permit bicyclists and other non-motorized users.

7.3.1 Pedestrian Paths

Eight pedestrian-only paths are recommended (0.96 miles). These include segments of the Emeryville Greenway, an extension of the Temescal Creek Path, and short mid-block connections. These recommendations are included in the project lists **(Table 7-3)** and map **(Map 7-1)** for pedestrian projects.



A pedestrian-only path on the Emeryville Greenway

7.3.2 Multi-Use Paths

Multi-use paths are recommended to complete the Bay Trail within Emeryville and to provide key connections between on-street bikeways. Twelve multi-use path projects are recommended, totaling 2.04 miles.

Major multi-use path recommendations include the following:

- Through Emeryville, the **Bay Trail** currently includes a mix of multi-use paths, sidewalks and bike lanes. In accordance with the *Emeryville General Plan*, and the *Powell Street Urban Design Plan*, the Bay Trail should be improved to be a multi-use path for much of its length. Improvements to the Bay Trail include:
    - Spot improvements along the existing Bay Trail along Frontage Road between Shorebird Park and Powell Street.
    - Widening and straightening the existing multi-use path on the south side of the Powell Street undercrossing of I-80 and constructing a multi-use path on the north side of Powell Street.
    - Improvements to the Bay Trail connection between Christie Avenue and Shellmound Street.

    - Construction of a new multi-use path from Powell Street to Shellmound Street at Ohlone Way, west and south of the Powell Street Plaza.

- The **AC Transit/ Joseph Emery Park Path** would extend the existing multi-use path adjacent to Pixar north to 47th Street. Implementation requires an easement or redevelopment of the AC Transit bus yard.
- The **Emery Bay Village Path** will connect the corner of 47th Street and Doyle Street with Spur Alley, providing a convenient bicycle and pedestrian connection between neighborhoods.
- **The Pickleworks Path** from Doyle Street and 55th Street to 53rd Street would extend the Doyle Street bicycle boulevard. Implementation requires an easement.
- A diagonal path from the west end of 47th Street to Spur Alley, adjacent to Emery Bay village.
- Completion of the **Emeryville Greenway** includes construction of multi-use paths from Stanford Avenue to Park Avenue and Halleck or Hubbard Street, via Horton Landing Park and redevelopment of the Sherwin Williams site.
- The **Secondary School/Emeryville Center for Community Life Path** will connect 47th and 53rd Streets along the western edge of Emery Secondary School. Implementation will require coordination with Emery Unified School District and the Emeryville Center for Community Life.
- Over the long term, the Emeryville Transit Center should conveniently connect with the Peninsula. Consider the development of a multi-use path that crosses under the railroad tracks and over the freeway. While no specific alignment is proposed in this Plan, the path is envisioned as part of a newly connected City.

7.4. Bicycle Projects

This section includes bikeway network projects (B), intersection improvements (I), and spot improvements (SP).

7.4.1 Bikeway Network

The recommended bikeway network envisions a comprehensive, safe, and logical network of facilities wherein all types of bicyclists can ride to destinations within the city or seamlessly connect into Oakland or Berkeley. Emeryville's recommended bikeway network consists of Class I multi-use paths, Class II bike lanes, Class III signed bike routes, bicycle boulevards and streets with shared lane markings. The three bikeway classes are illustrated in **Figure 7-1**.

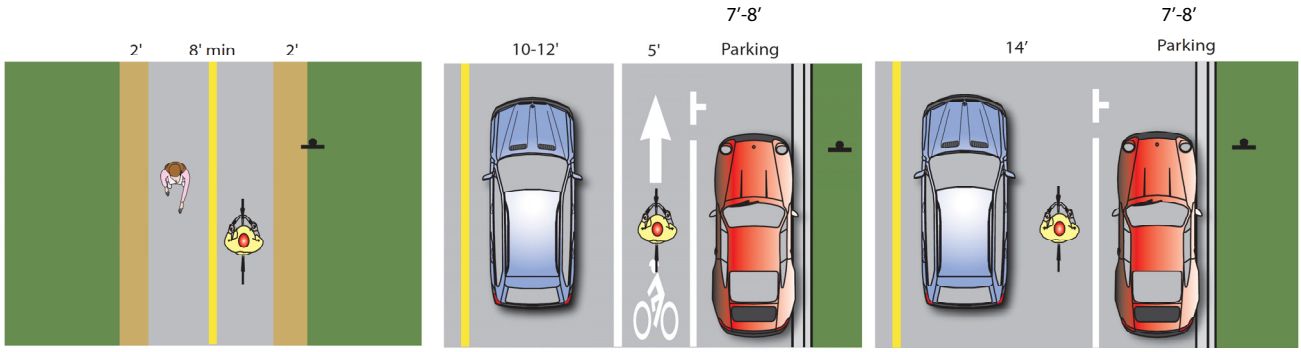


Figure 7-1. Caltrans Bikeway Classifications

The recommended network includes 2.04 miles of new multi-use paths, 0.61 miles of new bike lanes, improvements to 1.17 miles of bicycle boulevards, and nearly a mile (0.95) of new bike routes. Recommendations are summarized briefly below.

Multi-Use Paths

Multi-use paths are described in detail in Section 7.3. Much of the recommended network consists of multi-use paths. Key recommendations include:

- Improvements to the **Bay Trail**, which would improve safety and comfort along Powell Street under I-80, provide an improved connection between Powell Street and Shellmound Street along Christie Avenue, and, in the long-term, provide a multi-use path between Powell Street/I-80 ramps and Shellmound Street/Ohlone Way.
- Extension of the **AC Transit/ Joseph Emery Park Path**, which would provide a parallel route to San Pablo Avenue.
- Construction of the **Pickleworks Path**, which would extend the Doyle Street bicycle boulevard to 53rd Street.
- Completion of the **Emeryville Greenway**, which would connect the planned South Bayfront Bridge to points north and south.

Bicycle Boulevards

Bicycle boulevard improvements are described in detail in Chapter 6. Bicycle boulevard improvements range from installing signage and stenciling bicycle boulevard markings on the roadway, to more extensive treatments, including traffic diversion. Improvements are recommended on:

- **45th Street** from Horton Street to Doyle Street
- **47th Street** from San Pablo Avenue to Adeline Street
- **53rd Street** from Horton Street to San Pablo Avenue
- **Doyle Street** from Ocean Avenue to 55th Street
- **Horton Street/Overland Avenue** from 63rd Street to 40th Street
- **Stanford Avenue** from Horton Street to Doyle Street
- **59th Street** from Horton Street to Doyle Street
- **62nd Street** from Horton Street to Hollis Street

Bike Lanes

Bike lanes provide a striped and stenciled lane for one-way travel on each side of a roadway. The recommended bike lanes fill in gaps in the existing bikeway network, provide connections to Oakland, and provide improved connections along the Bay Trail. Specific recommendations include:

- Striping bike lanes on the west and east ends of **65th Street** to fill in gaps
- Striping bike lanes on **Emery Street and Peralta Street** to connect to proposed bike lanes in Oakland
- Striping a contra-flow bicycle lane on **Christie Avenue** between Shellmond Street and Powell Street to improve the Bay Trail

In addition, several other projects include short "bicycle pockets."

Bike Routes/ Shared Lane Markings

Class III Bike routes provide for shared roadway use and are generally only identified with signage, but may include shared lane markings. Bike routes may have a wide car travel lane or shoulder that allows for bicyclists and motorists to travel side-by-side. Recommended bike routes to provide connections between the City's longer bicycle facilities. Specific recommendations include:

- Signing **Spur Alley** as a bike route to provide improved north-south bike access
- Signing **Sherwin Avenue and Halleck Street** as a bike route to connect to planned bike routes in Oakland
- Signing **Emery Street** north of 40th Street as a bike route, to improve north-south bike access
- Painting shared lane markings on **Ohlone Way** to provide connections between the South Bayfront Bridge and bike lanes on Shellmound Street

Although this Plan does not officially designate San Pablo Avenue or Hollis Street as bicycle routes, the following spot improvements are recommended (see Section 7.4.3):

- Installing Bikes May Use Full Lane" signs and painting shared lane markings on **San Pablo Avenue**
- Installing "Bikes May Use Full Lane" signs on **Hollis Street**

7.4.2 Intersection Improvements for Bicyclists (I)

Intersection improvements consist of enhancements to make crossing or navigating through specific intersections on the bikeway network safer or more convenient. This Plan recommends nine intersection improvements for bicyclists, which largely consist of improving detection of bicyclists at signalized intersections and striping bicycle lanes up to the intersection. Key intersection improvements include:

- Emeryville Greenway at 65th, 66th, and 67th Street crossings (signage, beacons, pavement markings)
- AC Transit/Joseph Emery Park Path midblock crossing of 45th Street (crosswalk, curb extensions)
- San Pablo Avenue / 53rd Street (design study)
- San Pablo Avenue / 45th Street (signal detection, crosswalk, further study)
- 65th St at Overland Ave (signage, shared lane markings)
- Adeline/San Pablo/ Macarthur/Peralta "Star Intersection" (landscaping, intersection redesign)
- Doyle St at Powell St (signal or beacon)
- Emery St: Park Ave at Joseph Emery Park Path (left-turn lane for eastbound bicyclists)

- Spur Alley at 45th St (raised intersection, crosswalk)
- Spur Alley at 53rd St (raised crosswalk, signage)

Specific details are provided in **Table 7-4**. Note that many of these improvements are contingent on associated bicycle infrastructure projects being constructed, and will be implemented with larger projects. See also Section 5.7, in Chapter 5, for a description of a citywide program to improve bicycle detection at signalized intersections.

7.4.3 Spot Improvements for Bicyclists (S)

The following spot improvements are small-scale interventions recommended to improve bicycling conditions, and are targeted to specific locations where a linear bikeway may not be appropriate.

- **"Bicycles May Use Full Lane" signs** remind bicyclists and motorists that bicyclists are allowed use of the full travel lane. They are recommended on Hollis Street, and on San Pablo Avenue for northbound traffic at Macarthur Boulevard and for southbound traffic at 53rd Street. The City should also explore transferring ownership of San Pablo Avenue so that more intensive improvements can be considered, as described in Section 7.1.4
- **40th Street Transit Zone:** Shared lane markings are recommended within the right travel lane in both directions to bridge the gap between existing bike lanes in Emeryville and planned bike lanes in Oakland.
- **Frontage Road north-south path (Bay Trail)**: Existing sidewalk will be improved to accommodate bicyclists on a multi-use path and the turning radius on the southwest corner of Access Road/Frontage Road will be reduced.

7.5. Detailed Project Lists and Maps

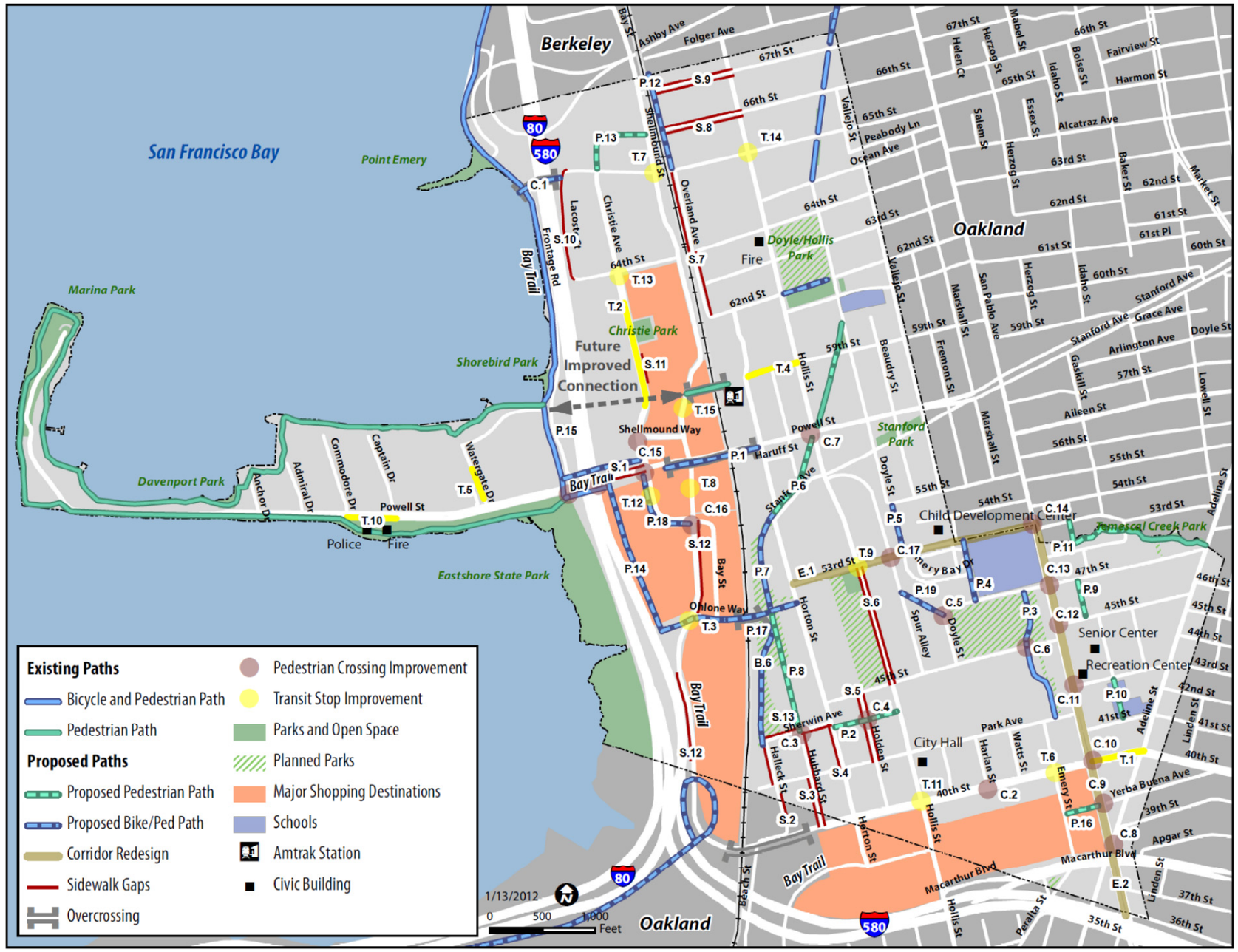
This section provides details for the site-specific projects described in the prior sections. Due to the number of recommended site-specific projects, they have been prioritized.

7.5.1 Detailed Project Lists and Maps

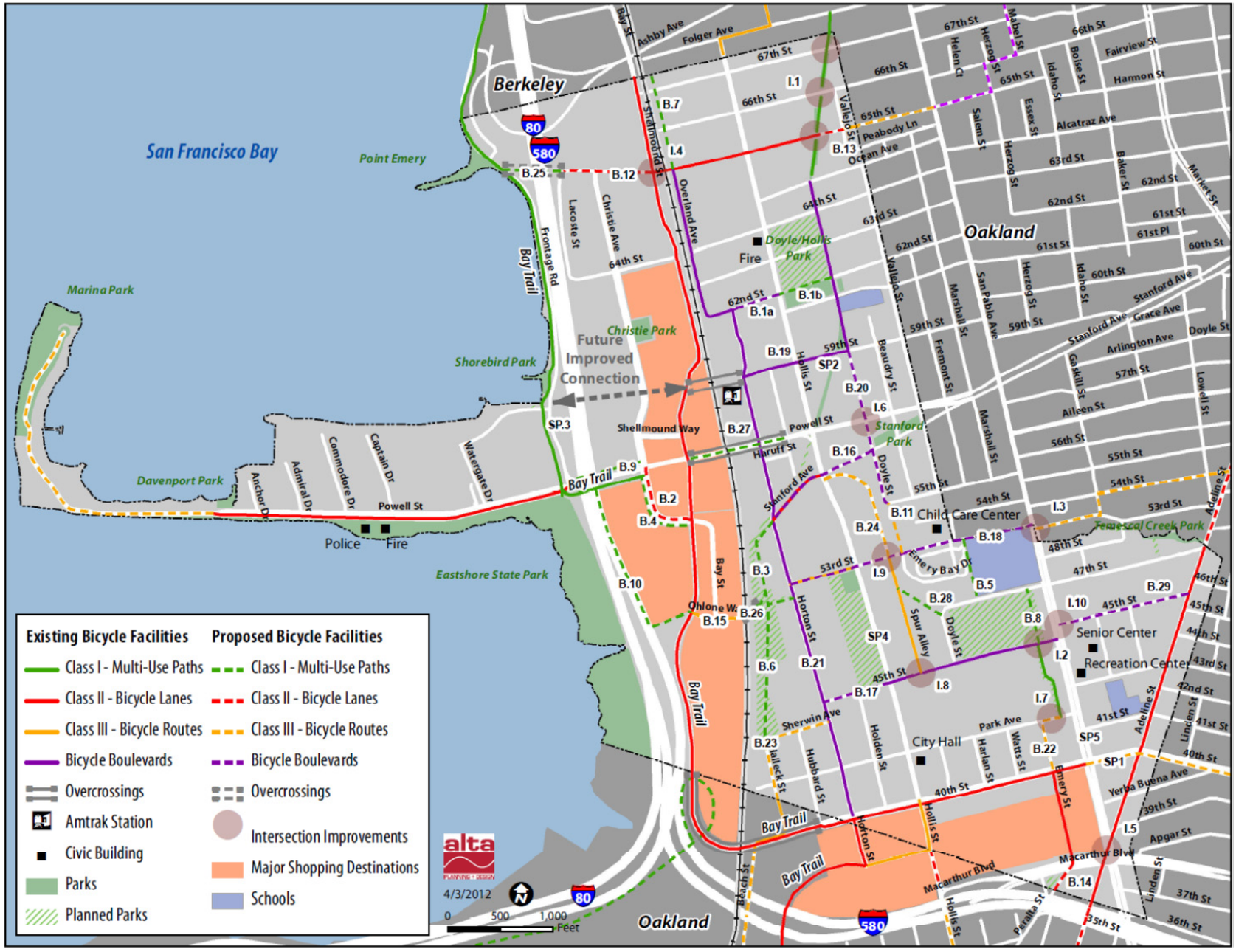
The recommended bicycle and pedestrian projects are shown in **Map 7-1** and **Map 7-2**, respectively, on the following pages. **Table 7-3,** starting on page **7-13,** lists pedestrian projects by priority order. **Table 7-4**, on page **7-20**, lists bicycle projects by priority order. The project tables include project numbers that can be cross-referenced to the project maps, a description of each project, and estimated cost.

Note that overcrossings and multi-use paths are shown on both maps, and included in both tables. Pedestrian paths are only shown on the pedestrian map and included in the pedestrian project table. Citywide improvements described in Chapter 5 are not shown on the maps or included in the tables.

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Map 7-1. Recommended Pedestrian Improvements



Map 7-2. Recommended Bicycle Improvements

Table 7-3: Detailed Pedestrian Project List

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
Crossing Improvements								
High	C.1	B.25	Ped-Bike Bridge over I-80: 65th St to Frontage Rd	Freeway is major barrier to Bay Trail; there is only one freeway crossing in Emeryville - at Powell Street.	Build pedestrian/bicycle bridge over I-80 to connect with Bay Trail	Included in General Plan	Bridge	$18,500,000
Medium	C.2		40th St at Harlan St	This unsignalized intersection incluides long crossing distances across 40th St and a higher than average rate of vehicle/pedestrian collisions within Emeryville.	Install new signal and coordinate timing with signals at Emery Street and Hollis Street		Xing	$375,000
Low	C.3		Sherwin Ave at Halleck St and at Hubbard St	Missing crosswalks	Install crosswalks on all legs of Halleck and Hubbard Streets at Sherwin Avenue	To be developed in coordination with Sherwin Williams Redevelopment See also S.13	Xing	$1,500
Low	C.4		Holden St at mid-block pedestrian path	Installation of a mid-block path will necessitate a crossing	Provide a high visibility crosswalk with bulb-outs and shark's teeth.	See P.2	Xing	$152,600
Medium	C.5		Doyle Street / 47th Street	Poorly defined roadway at access point to surface parking lot Paved area ranges from 48 feet to 75 feet No crosswalks at intersection	· Articulate northwest corner through construction of curb, gutter and sidewalk · Replace off-street parking with on-street parking · Install crosswalk on east leg of intersection		Xing	$106,000
Medium	C.6	I.2	AC Transit / Joseph Emery Park Path mid-block crossing of 45th St	Proposed path will require a mid-block crossing	Provide high visibility crosswalk with bulb-outs and shark's teeth when path is extended through AC Transit facility	See also pedestrian project P.3 and bicycle project B.8	Xing	$181,200
Medium	C.7		Emeryville Greenway crossings at Hollis St and Powell St, SW corner	Greenway crossing of Powell and Hollis Sts should be enhanced	Alternative A: Provide a raised crosswalk across the right-turn slip lane on the southwest corner and lengthen the refuge to improve pedestrian visibility and slow vehicles around the turn Alternative B: Eliminate slip lane to provide protected signalized crossing for pathway users		Xing	$250,000
High	C.8	I.5	Intersection of Macarthur Blvd/San Pablo Ave / Adeline St	Wide intersection with many vehicle appropaches make it difficult for pedestrians to cross.	Construct landscaping and crossing improvements.		Xing	$500,000
High	C.9		San Pablo Ave/ Yerba Buena Ave between 40th St and Adeline St	Candidate location for mid-block crossing to provide direct connection from pedestrian path in front of Pak N Save across San Pablo Ave	· Install HAWK Beacon. Alternatively, consider pedestrian actuated signal that is timed with adjacent signals · High visibility crosswalk markings · Remove parking spaces and install curb extensions · Install curb cuts in sidewalk and cut in median for pedestrian refuge	Also see project P.16	Xing	$334,100
High	C.10		San Pablo Ave/40th St Transit Hub	Intersection needs pedestrian improvements	See intersection improvements in project T.1			See T.1
High	C.11		San Pablo Ave at 43rd St	At this unsignalized location, it is challenging for pedestrians to cross San Pablo Ave. Currently, in-pavement flashers alert drivers to the crossing, but they are difficult to see in the day time and the multi-lane configuration continues to present sightline and visibility issues.	Upgrade in-roadway warning lights, install an overhead flashing beacon on a masthead and/or Rectangular Rapid Flashing Beacons (RRFB) Replace out-of-compliance warning signs with pedestrian warning signs compliant with the most recent CA MUTCD Refresh the existing crosswalks with new paint and install yield line enhancements		Xing	$180,000
High	C.12		San Pablo Avenue / 45th Street	Pedestrian crossing needs improvement	Install new in-roadway warning lights, overhead flashing beacon and/or RRFBs, curb extensions, and median tip		Xing	$152,400
High	C.13		San Pablo Avenue / 47th Street	Pedestrian wait time to cross San Pablo Ave is too long.	Reevaluate signal timing and pedestrian recall to reduce the wait time for pedestrians crossing San Pablo Avenue, and install new audible pedestrian heads.		Xing	$30,000

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
Medium	C.14	I.3	San Pablo Avenue / 53rd Street	53rd Street is skewed at its intersection with San Pablo Avenue, creating long crossing distances. Poorly placed curb ramps and pedestrian call buttons make this intersection difficult for disabled pedestrians. Offset intersection creates difficult environment for pedestrians and bicyclists to cross San Pablo Avenue.	Look for opportunity to reconcile skewed intersection by clipping southwest corner or use of wedge shaped crosswalks Install a new crosswalk on north leg of intersection Add push buttons and curb ramps to all crossings Move existing push buttons if they are not directly adjacent to the curb ramp Consider narrowing 53rd Street on the west side of San Pablo Avenue with a curb extension on the north side of the street, and realign approach to one lane in each direction	Coordinate improvements with 53rd Street/ Temescal Greenway recommendations (E.1) and bicycle recommendations. Coordinate with City of Oakland, ECCL, and Caltrans	Xing	$126,300
High	C.15		Christie Avenue between Powell St and Shellmound Way	The north approach at Powell St and the west and south approaches at Shellmound Way do not have marked crosswalks, limiting pedestrian movement across Christie Ave	Stripe a crosswalk across the north leg of intersection Improve sidewalks	Phase improvments with recommendations from *Powell Street Urban Design Plan*	Xing	$141,000
Medium	C.16		Shellmound Street / Christie Avenue	The north side of the intersection does not have a marked crosswalk	Install crosswalk on north leg of intersection and square off northwest corner to reduce crossing distance		Xing	$78,000
Medium	C.17	I.9	Spur Alley at 53rd St	Uncontrolled intersection with limited visibility and no advance warning of pedestrian or bicyclist crossing	Acquire easement north of 53rd St for pedestrian and bicycle access and install high-visibility marked crossing, raised crosswalk and advance warning signage	See also B.24	Xing	$320,500
Corridor Enhancements								
High	E.1	B.18	53rd Street/Temescal Greenway from San Pablo Ave to Horton St	Opportunities to improve 53rd St and create Temescal Greenway	**53rd Street between Horton Street and Hollis Street** Install creek feature and create a bicycle & pedestrian street with connection to the future South Bayfront Bridge across the railroad tracks · At Horton Street, extend sidewalk area on west side of Horton Street, and raise the intersection of 53rd St and Horton St to create a seamless gateway to Horton Landing Park **53rd Street / Hollis Street** · Improve west leg of the intersection by extending curbs and improving crosswalk markings · Relocate utility boxes on the southeast corner to provide adequate pedestrian path of travel **53rd Street between San Pablo Avenue and Hollis Street** · Alternative A: Narrow the roadway at select location(s) along 53rd Street by installing storm water curb extensions. On-street parking would be removed within the narrowed area. Curb could extend further into the roadway to slow vehicle speeds (effectively making the street a single lane) but be mountable to allow for emergency vehicle access. This treatment could be considered at the proposed Spur Alley crossing. Maintain Bike Boulevard designation. See Appendix A for examples of this treatment. · Alternative B: Widen sidewalks on both sides to meet Design Guidelines; bioswales; Maintain Bike Boulevard designation. On-street parking would need to be removed where bioswales are installed. · Alternative C: Widen sidewalk on south side only to Design Guidelines and daylight creek; Maintain Bike Boulevard designation. On-street parking would need to be removed on one side of street to provide room for creek. **53rd St/ San Pablo Avenue** · Intersection improvements (see C.14 San Pablo Avenue recommendations)	53rd Street is classified as a Greenway, Green Street and Bicycle Boulevard in the Emeryville General Plan. Example: NE Siskiyou Green Street Project, Portland OR (See *Pedestrian Design Guidelines*) Coordinate recommendations with City of Oakland, Caltrans, and Center of Community Life traffic study to determine circulation issues.	Corridor	$2,318,100

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
High	E.2		San Pablo Ave from 36th St to 53rd St	Pedestrian environment needs improvement	Consider greening study for San Pablo Avenue (e.g. installation of bioswales in bulb-outs at intersections) to improve aesthetic of street and reduce run-off, provide pedestrian improvements, and calm traffic. Install parklets where feasible.		Corridor	$1,800,000
Pedestrian Paths								
Medium	P.1	B.27	Powell Street Bridge and Pedestrian/ Bicycle Path	Cantilevered ped/bike facility on bridge is substandard	Conduct feasibility study for improved ped/bike crossing of railroad at Powell St Bridge. In conjunction with adjacent development, seek to improve pedestrian and bicycle access	Cost is for feasibility study. Once South Bayfront Bridge is constructed, need for this improvement lessens. Recommend evaluating the need for it after construction of SBF Bridge.		$25,000
Low	P.2		North-South midblock pedestrian path from Horton St to Hollis St between Park Ave and 45th St	Opportunity for midblock pedestrian path	Construct pedestrian path	See also C.4. City has ROW easement and $100,000 for this project	Ped Path	$162,000
Medium	P.3	B.8	AC Transit/ Joseph Emery Park Path Extension to 47th Street	Path terminates at 45th Street and northern extensions would serve Emery Secondary School and provide a north-south alternative to a stretch of San Pablo Avenue	Construct new multi-use path with redevelopment or modification of AC Transit facility	Included in General Plan See C.6, bike project B.8	Multi-Use Path	$611,600
Low	P.4	B.5	North-South multi-use path at west side of Secondary School from 47th St to 53rd St	Opportunity for mid-block access	Construct new multi-use path	Path is being planned in conjunction with ECCL (Emery Unified School District property)	Multi-Use Path	$151,100
Medium	P.5	B.11	North-south path connecting Doyle St to 53rd St at Pickleworks property	Opportunity for improved north-south pedestrian and bicycle connection	Acquire easement through property, remove fencing, construct short connector path between Doyle Street and the parking lot.	Private property--easement required Acquisition costs not included	Multi-Use Path	$30,000
High	P.6		Emeryville Greenway extension from Powell St south to Stanford Ave at Horton St	Opportunity to extend greenway to the south to connect with Horton Landing Park	Construct new ped path	Project designed See recommendation C.7 for crossing improvements at Hollis Street and Powell Street Costs include remediation	Ped Path	$1,100,000
High	P.7	B.3, B.6	Horton Landing Park paths: - Greenway north-south from Stanford Ave at Horton St to South Bayfront Bridge - East-west connection from Horton St, south of 53rd St to South Bayfront Bridge	Opportunity to extend Greenway and provide pedestrian and bicycle access to planned South Bayfront Bridge	Construct new multi-use paths	Project planned	Multi-Use Path	$1,049,000
High	P.8		North-south pedestrian path through Sherwin Williams property from Horton Landing Park to Sherwin Ave	Opportunity to extend pedestrian access south from Horton Landing Park	Construct north-south pedestrian path in conjunction with redevelopment of Sherwin Williams property	Bicycle access from Horton Landing Park to Sherwin Ave is project B.6	Ped Path	To be provided by developer of Sherwin Williams Site
Medium	P.9		North-South pedestrian path from 45th St to 47th St east of San Pablo in Triangle Neighborhood	Opportunity for better North-South pedestrian access in Triangle Neighborhood	Construct new pedestrian path in conjunction with private development.	Approved development required to make this improvement	Ped Path	$94,500

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
Low	P.10		North-south pedestrian path through Anna Yates School Between 43rd and 41st Sts, south of Salem Street in Triangle neighborhood	Opportunity for better north-south pedestrian access in Triangle Neighborhood	Work with the school district to construct path	Emery Unified School District property Does not include acquisition costs	Ped Path	$94,500
Medium	P.11		East-west pedestrian connection from Temescal Creek Park to San Pablo Ave	Opportunity to extend east-west pedestrian access along Temescal Greenway	Work with Alameda County Flood Control to construct path	On Alameda County Flood Control property	Ped Path	$620,000
Low	P.12	B.7	North-south multi-use path east of railroad tracks from Overland Ave at 65th St to Berkeley border	Opportunity to extend pedestrian/bicycle access from Overland Ave at 65th St north to 66th and 67th Sts	Construct new multi-use path	May not be adequate room between existing buildings and tracks Coordinate with Berkeley to connect to Folger Street Included in General Plan	Multi-Use Path	$198,200
Low	P.13		Pedestrian path north from 65th St at Christie Ave and east through Ex'pressions College to Shellmound St at 66th St.	Opportunity for mid-block pedestrian access	Construct new path in conjunction with redevelopment	Proposed as multi-use path in General Plan. Changed classification from multi-use path to pedestrian-only path.	Ped Path	$202,500
High	P.14	B.10	North-south Bay Trail realignment between Powell Street Plaza and I-80, Powell St to Shellmound St at Ohlone Way	Opportunity to improve Bay Trail alignment	Construct new multi-use path along west and south perimeter of Powell Street Plaza in phases.	See Bike Project B.10 for more details.	Multi-Use Path	$1,027,000
High	P.15	SP.3	North-south path on west side of Frontage Rd from Powell Street to Shorebird Park	Opportunity to improve walking conditions	Improve existing sidewalk to accommodate multi-use path, by replacing pavers with concrete or asphalt multi-use path and installing a landscaped buffer between Frontage Road and sidewalk path. At southwest corner of Access Road/Frontage Road, reduce turning radius and realign pedestrian push button		Multi-Use Path	$200,000
Low	P.16		Mid-block north-south pedestrian path between San Pablo Ave and Emery St at Pak N Sav	Opportunity to improve existing pedestrian connection	Construct pedestrian path through existing parking lot	See also C.9	Ped Path	$67,500
High	P.17	B.26	South Bayfront Bridge across railroad: Horton Landing Park to Ohlone Way	Railroad is major barrier between east and west sides of city. No connection over railroad tracks between major mixed-use destination at Bay Street and employment centers on Horton Street.	Build the South Bayfront Bridge over railroad from Ohlone Way to Horton Landing Park.	Included in General Plan	Crossing	$13,500,000
Medium	P.18	B.4	Christie Ave Path: Powell St - Shellmound St, west/south side	Poor Bay Trail connections to Shellmound St and poor on-street connections to Powell Street Plaza businesses from north. Christie Avenue has high traffic volumes.	Widen the sidewalk on the west/south sides of Christie Avenue between Powell Street and Shellmound Street to eight feet and set back from street to provide a multi-use path.	Consider as an interim step to B.10. See also B.2	Multi-use Path	$355,300
Medium	P.19	B.28	Path from Spur Alley to Doyle Street/47th Street Intersection	Large blocks increase distances for pedestrians and bicyclists	Install pedestrian and bicycle path connecting 47th Street to Spur Alley	Coordinate with Emery Bay Village	Multi-use Path	$150,000
Sidewalk Gap Closure								
High	S.1A	B.9a	South side of Powell St from Christie Ave to I-80	Powell St Urban Design Plan Phase I	Upgrade/ straighten walkway, new multi-use path, signage as prescribed. Phase I of plan.		Multi-Use Path	$163,800

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
High	S.1B	B.9b	North side of Powell St from Christie Ave to I-80	Powell St Urban Design Plan, Phase II	Install new multi-use path as prescribed in Phase II of plan		Multi-Use Path	$163,800
Medium	S.2		North-south on Halleck St between 40th St and Sherwin Ave, both sides	Sidewalk gaps	Install sidewalk per Park Avenue District Plan, Phase II	*Park Avenue District Plan* calls for this to be funded as part of City Phase II improvements	Sidewalk	$592,998
Medium	S.3		North-south on Hubbard St between 40th St and Sherwin Ave, both sides	Sidewalk gaps	Install sidewalk per *Park Avenue District Plan*	*Park Avenue District Plan* calls for this to be split into two phases, City's Phase II and a Banker Marks funded phase	Sidewalk	$571,550
Low	S.4		North-south on Horton St between Park Ave and Sherwin Ave, west side	Narrow sidewalk	Install new sidewalk per *Park Avenue District Plan*	This improvement may require the narrowing of the vehicle travel lanes and parking lanes, or the removal of parking lane one side. *Park Avenue District Plan* calls for this to be funded by Banker Marks	Sidewalk	$300,000
Low	S.5		North-south on Holden St between 45th St and Park Avenue, both sides	Sidewalk gaps	Install sidewalk per *Park Avenue District Plan*	*Park Avenue District Plan* calls for this to be funded as part of City's Phase II	Sidewalk	$663,200
Medium	S.6		North-south on Hollis St from 45th St to 53rd St	Narrow sidewalks	Widen sidewalks from 5 feet to 6 feet wide to a minimum of 12 feet wide with street trees and lighting to match recommendations in *Park Avenue District Plan*	Coordinate with redevelopment of adjacent properties	Sidewalk	$603,000
Low	S.7		North-south on Overland Ave between 62nd St and 65th St, both sides	Sidewalk gaps	Install a sidewalk south of 64th Street on the east side of Overland Avenue and north of 64th Street on the west side of the street.		Sidewalk	$712,800
Low	S.8		East-west on 66th St between Hollis St and Shellmound St, both sides	Sidewalk gaps	· **Alternative A**: Add six-foot sidewalks on both sides of the street and maintain perpendicular parking. · **Alternative B:** Match sidewalks on 66th Street to the east of Hollis Street by adding 16 foot sidewalks to both sides of the street. This would require reconfiguring the parking to be parallel on one side of the street with angled parking on the other.		Sidewalk	$399,200
Low	S.9		East-west on 67th St between Hollis St and Shellmound St, both sides	Sidewalk gaps	· **Alternative A**: Add six-foot sidewalks on both sides of the street and maintain perpendicular parking. · **Alternative B:** Match sidewalks on 67th Street to the east of Hollis Street by adding 16 foot sidewalks to both sides of the street. This would require reconfiguring the parking to be parallel on one side of the street with angled parking on the other.		Sidewalk	$399,200
Low	S.10		North-south on Lacoste St between 64th St and 65th St, west side	Sidewalk gap	Provide signage to direct pedestrians to use sidewalk on east side of street where appropriate.		Sidewalk (signage only)	$500
High	S.11		Christie Ave south of 63rd St adjacent to open lot	Sidewalk gap	Install permanent sidewalk		Sidewalk	$102,600
Low	S.12		Shellmound St south of Christie Ave to Emeryville border	Need directional signage to direct pedestrians to other side of the street. There is not room for sidewalks due to the freeway retaining wall on the west side of Shellmound St south of Bay St and building frontages between Ohlone Way and Christie Ave on the east side of Shellmound St	Install signage on either side of sidewalk gap directing pedestrians to use crosswalk and sidewalk on east side of Shellmound St. Between Ohlone Way and Christie Ave, install signage directing pedestrians to use Bay St or sidewalk on west side of Shellmound St		Sidewalk (signage only)	$2,400

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
Low	S.13		Sherwin Ave from Halleck St to Hubbard St (north side) and from Hubbard Street to Horton Street (south side)	Missing sidewalk	Install sidewalk per Park Avenue District Plan	To be developed in conjunction with Sherwin Williams redevelopment See also C.3	Sidewalk	$400,000
Transit Stop Improvements								
High	T.1		San Pablo Avenue / 40th Street Transit Hub	This intersection has Primary Transit Stops on both 40th Street between San Pablo Avenue and Adeline Street and on San Pablo Avenue, and has some of the highest pedestrian volumes in the city. The bus stops on San Pablo Ave are the only Rapid Bus stops in Emeryville, serving AC Transit Line 72R.	Install primary stop improvements as shown in Table 7-1 · Enhance medians and streetscape along 40th Street · Install electronic signage with transit information · Redesign curb ramps to direct users into crosswalk on all approaches, as feasible · Adjust signal timings at major intersections to improve pedestrian crossings · Install advance stop lines on San Pablo Avenue where feasible. Consider the feasibility of installing bike boxes on 40th Street · Improve maintenance of tree grates and sidewalks for ADA accessibility		Transit Stop	$178,900
Medium	T.2		Christie Avenue / Shellmound Way/ Public Market	High pedestrian volumes and casual carpool location.	Move Casual Carpool pick up area to north, adjacent to Transbay bus stop. Install benches and information kiosk; install long-term bike parking next to U-racks		Transit Stop	$17,100
Low	T.3		Shellmound St / IKEA/Bay Street		One northbound and one southbound stop on Shellmound Street at Bay Street. Install primary stop improvements shown in Table 7-1 · Benches – Increase number of seats and size of benches as existing shelters only provide 2 or 3 seats at each. Provide at least 12 seats as space permits. · Shelters – Increase size of shelters to accommodate the high levels of demand at these stops · Long- and short-term bike parking (long-term parking should be consolidated at Bay Street) · Increase wheelchair accessibility at northbound stop by providing a clear path in shelter		Transit Stop	$41,000
Medium	T.4		59th St / Horton St and 59th St / Hollis St	High volumes associated with Amtrak station	Four north and southbound stops located at the corners of 59th / Horton and Hollis Install primary stop improvements as shown in Table 7-1 · Install Benches – add to three of the four stops (southwest corner of Hollis/59th has an existing bench) · Install Shelters – Add to all four stops. Prioritize for closest to the Amtrak station. · Install Long- and short-term bike parking	This area will be significantly improved with implementation of Emery Station West project. Improvements suggested here could be provided in the interim.	Transit Stop	$41,000
Low	T.5		Powell St at Watergate Drive	Need improved bus stop amenities	Two stops located near the Towers Office Complex and Hilton Garden Inn Install primary stop improvements as shown in Table 7-1 · Bench & shelter – add to westbound stop at the Hilton along Powell Street · Additional landscaping · Provide a sidewalk connection from Powell Street to the Watergate stop · Install long- and short-term bike parking (consolidate some long term parking at the Office Tower stop)		Transit Stop	$41,000

Priority	Ped Map ID	Bike Map ID	Location	Issue	Recommendation	Notes	Type	Cost (not including land acquisition)
Low	T.6		40th Street / Emery Street	Need improved bus stop amenities	Three stops located on either side of 40th Street and one on Emery Street. Install primary stop improvements as shown in Table 7-1 · Benches – add to three of the four stops (southwest corner of Hollis/59th has an existing bench.) · Shelters – Add to all four stops		Transit Stop	$41,000
Low	T.7		65th Street / Shellmound Street	Need improved bus stop amenities	There is one stop at the corner of Shellmound and 65th Install primary stop improvements as shown in Table 7-1 · Benches · Shelters		Transit Stop	$41,000
Medium	T.8		Shellmound St from Christie Ave to Powell St	Need improved bus stop amenities	There are two separate stops located on this block. Install primary stop improvements as shown in Table 7-1		Transit Stop	$14,000
Low	T.9		Hollis Street / 53rd Street	Need improved bus stop amenities	Two stops in the north and southbound directions Install secondary stop improvements as shown in Table 7-1 · Benches – add benches to both stops · Shelter – add to the southbound stop		Transit Stop	$21,500
Low	T.10		Powell Street - Police & Fire Station/ Watergate Condos	Need improved bus stop amenities	Two stops located on either side of Powell Street. Install secondary stop improvements as shown in Table 7-1 · Bench and shelter in front of the Watergate condos · Long- and short-term bike parking due to location on the Bay Trail		Transit Stop	$21,500
Low	T.11		Hollis Street / 40th Street	Need improved bus stop amenities	Two stops along 40th Street. Install secondary stop improvements as shown in Table 7-1		Transit Stop	$21,500
Low	T.12		Christie Ave - Trader Joe's / Powell Street Plaza	Need improved bus stop amenities	Install secondary stop improvements as shown in Table 7-1		Transit Stop	$21,500
Low	T.13		Christie Avenue / 64th Street	Need improved bus stop amenities	Install secondary stop improvements as shown in Table 7-1		Transit Stop	$21,500
Low	T.14		Hollis St /65th St	Need improved bus stop amenities	Install secondary stop improvements as shown in Table 7-1		Transit Stop	$21,500
Medium	T.15		Shellmound Street at Public Market	New primary bus stop	Install new transit stops on Shellmound Street in accordance with the principles of the Shellmound Streetscape Design Guide		Transit Stop	$41,000
	T.16		Citywide	Need improved bus stop amenities	Install tertiary stop improvements as shown in Table 7-1		Transit Stop	$132,000
	T.17		Citywide	Need improved bus stop amenities	Install local bus stop improvements as shown in Table 7-1		Transit Stop	$40,500

Table 7-4. Detailed Bicycle Project List

Priority	BikeID	PedID	Location	Description of Issue	Recommendation	Notes	Type	Cost (Does not include land acquisition, unless otherwise noted.)
Linear Bikeways								
Low	B.1a		62nd St: Horton St - Doyle St	The current alignment of the Horton-Overland bicycle boulevard includes a short jog on 62nd Street. Eastward extension would serve Doyle-Hollis Park	In short term, extend bike boulevard to Doyle Street		Bicycle Boulevard	$1,300
Low	B.1b		62nd St: Hollis St - Doyle St	Planned expansion of Doyle-Hollis Park will close one block of 62nd Street, providing an opportunity for a Class I path	In conjunction with expansion of park, replace bike boulevard with Class I path		Multi-Use Path	$134,700
High	B.2		Bay Trail connection from Shellmound St to Powell St at Christie Ave	Existing Bay Trail connection through Sheraton parking lot is problematic.	Restripe Christie Ave between Shellmound St and Powell St to accommodate bike lanes on northeast side. Bike lane will be contraflow between Shellmound St and Powell St Plaza access drive.	See also Pedestrian Projects: P.14, S.1A, S.1B, C.16, and Bicycle Projects: B.4, B.9a, B.9b, and B.10	Bike Lane	$10,900
High	B.3	P.7	Horton Landing Park paths: - Greenway north-south from Stanford Ave at Horton St to South Bayfront Bridge - East-west connection from Horton St, south of 53rd St to South Bayfront Bridge	Opportunity to extend Greenway and provide ped/bike access to planned South Bayfront Bridge	Construct new multi-use paths	Project planned See also Bicycle Project B.6, Pedestrian projects: P.6, P.7, P.8, E.1	Multi-Use Path	$1,049,000
Medium	B.4	P.18	Christie Ave Path: Powell St - Shellmound St, west/south side	Poor Bay Trail connections to Shellmound St and poor on-street connections to Powell Street Plaza businesses from north. Christie Avenue has high traffic volumes.	Widen the sidewalk on the west/south sides of Christie Avenue between Powell Street and Shellmound Street to eight feet and set back from street to provide a multi-use path.	Consider as an interim step to B.10. See also B.2	Multi-Use Path	$355,300
Low	B.5	P.4	North-South multi-use path at west side of Secondary School from 47th St to 53rd St	Opportunity for mid-block access	Construct new multi-use path	Path is being planned in conjunction with ECCL (Emery Unified School District property)	Multi-Use Path	$151,100
Low	B.6		Greenway connection from Horton Landing Park south to Sherwin Avenue at Halleck St. Between railroad and Sherwin Wiliams site	Opportunity to extend Greenway to the south and provide connections from south to South Bayfront Bridge	Install a Class I path from Horton Landing Park to the intersection of Sherwin Avenue and Halleck Street	Pedestrian access from Horton Landing Park to Sherwin Ave is project P.8	Multi-Use Path	$640,000
Low	B.7	P.12	North-south multi-use path east of railroad tracks from Overland Ave at 65th St to Berkeley border	Opportunity to extend pedestrian/bicycle access from Overland Ave at 65th St north to 66th and 67th Sts	Construct new multi-use path	May not be adequate room between existing buildings and tracks Coordinate with Berkeley to connect to Folger Street Included in General Plan	Multi-Use Path	$198,200
Low	B.8	P.3	AC Transit/ Joseph Emery Park Path Extension to 47th Street	Path terminates at 45th Street and northern extensions would serve Emery Secondary School and provide a north-south alternative to a stretch of San Pablo Avenue	Construct new multi-use path with redevelopment or modification of AC Transit facility	Included in General Plan Pedestrian project P.3	Multi-Use Path	$611,600
High	B.9A	S.1A	South side of Powell Street: Christie Avenue to I-80	Powell Street Urban Design Plan, Phase I	Upgrade/ straighten walkway, new multi-use path, signage as prescribed. Phase I of plan.		Multi-Use Path	$163,800
High	B.9B	S.1B	North side of Powell Street - Christie Avenue to I-80	Powell Street Urban Design Plan Phase II	Install new multi-use path as prescribed in Phase II of plan		Multi-Use Path	$163,800
High	B.10	P.14	Bay Trail realignment between Powell St Plaza and I-80, Powell St to Shellmound St at Ohlone Way	Opportunity to improve Bay Trail alignment	Phase I: Install Class III facility with sharrows through parking lot and behind hotel Phase II: When Powell Street Plaza redevelops, install Class I path	Ultimately, will require acquisition of ROW Included in General Plan Cost includes land acquistion.	Multi-Use Path	$1,027,000
Medium	B.11	P.5	North-south connection between Doyle St and 53rd St at Pickleworks property	Opportunity for improved north-south pedestrian and bicycle connection	Construct Class III facility connecting Doyle St with 53rd St Install sharrows through parking lot	Private property--easement required Acquisition costs not included	Multi-Use Path	$230,000

Priority	BikeID	PedID	Location	Description of Issue	Recommendation	Notes	Type	Cost (Does not include land acquisition, unless otherwise noted.)
High	B.12		East-west on 65th St from Lacoste St to Shellmound St	Would provide east-west connection to the future bridge over I-80 at 65th Street	When bridge over I-80 is constructed, install bike lanes on 65th St. Will require removal of parking on one side of 65th St.	On-street facility/bike boulevard included in General Plan.	Bike Lane	$25,600
Medium	B.13		East-west on 65th St from Emeryville Greenway to Oakland border	Signalized crossing of San Pablo Avenue and connection to Emeryville Greenway and planned Oakland bike facilities provide excellent opportunities for improved connections in northern Emeryville and surrounding cities.	Extend Class II bike lanes to Vallejo Street.	On-street facility included in General Plan. Will require changing diagonal parking to parallel parking at Oliver lofts (not included in costs).	Bike Lane	$3,500
High	B.14		North-south on Peralta Street from Macarthur Boulevard to the Oakland border	Peralta Street has unused capacity. Oakland's Bicycle Plan includes bike lanes on Peralta Street, which connects directly to West Oakland	Install bike lanes on Peralta Street to Oakland border. Peralta Street has a 48-foot paved width but only two travel lanes. Facility should take into account occasional truck traffic on Emery.	On-street facility included in General Plan	Bike Lane	$12,000
Medium	B.15		West on Ohlone Way from Shellmound St to the South Bayfront Bridge	Proposed Powell-Shellmound path and South Bayfront Bridge should be connected with an on-street facility on Ohlone Way.	When South Bayfront Bridge is built, install sharrows on Ohlone Way in the westbound right lane and center left turn lane.	On-street facility included in General Plan	Shared Lane Marking	$6,000
Low	B.16		East on Stanford Ave from Holllis St to Doyle St	Opportunity to extend Stanford route to the east. Bike lanes striped between Hollis Street and Horton Street. Bicyclists are not detected in bike lanes at Hollis Street.	· Measure speeds and volumes · Install bicycle boulevard signage. · Install traffic calming treatments and shared lane markings · Install bicycle detection in bike lane at Hollis Street.	Included in General Plan See also Chapter 6, Bicycle Boulevards	Bicycle Boulevard	$6,400
Medium	B.17		East-west on 45th St from Horton St to San Pablo Ave	Opportunity to improve east-west bicycle boulevard; 45th St has two lanes with parallel parking on both sides. Bike boulevard stencils and signs east of Hollis Street. Nearby destinations include the AC Transit facility and Pixar campus.	· Install bicycle boulevard signage and pavement markings west of Hollis Street. · Measure speeds and traffic volumes. Consider speed lumps if measured speeds are higher than 20 mph. · If Spur Alley bike route is implemented, improve crossing with high visibility crosswalks and consider raised intersection.	Included in General Plan. See also Chapter 6, Bicycle Boulevards	Bicycle Boulevard	$7,500
High	B.18	E.1	East-west on 53rd St from Horton St to San Pablo Ave	Opportunities to improve 53rd St and create Temescal Greenway. 53rd St is a bike route between Horton Street and Hollis Street and has speed bumps between Boyer St and San Pablo Ave. 53rd Street/San Pablo Avenue intersection is skewed. Identified as Greenway in General Plan. Connects to planned bike route in Oakland. 53rd Street is a key corridor because it crosses both Hollis Street and San Pablo Avenue at signalized intersections. Nearby destinations include Novartis and Emery Secondary School/ECCL Site	· Measure speeds and volumes. · Install bicycle boulevard signage and pavement markings to bring up to Level 2 Treatments. · Consider green street treatments such as narrowing street and removing parking to provide bioswales or to install creek feature. · If Spur Alley path is extended to the north of 53rd St, install high-visibility crosswalks and consider raised intersection. · Improve intersection with San Pablo Avenue per bicycle project I.3 and pedestrian project C.14	See also pedestrian project E.1 and C.14, bicycle project I.3, and Chapter 6, Bicycle Boulevards North side of 53rd Street east of Boyer Street is in Oakland. Included in General Plan Need to coordinate with ECCL, Oakland, and Caltrans	Bicycle Boulevard	$2,318,100
Low	B.19		East-west on 59th St from Horton St to Doyle St	Opportunity to improve east-west bicycle travel. Bicycle boulevard pavement stencils east of Hollis Street. Bike lanes west of Hollis Street. Diagonal parking between Hollis Street and Doyle Street.	· Measure speeds and volumes. · Install video detection on 59th St at Hollis St. · Install bicycle boulevard signage.	Modified from General Plan by not extending to city limits. Costs do not include video detection.	Bicycle Boulevard	$3,000

Priority	BikeID	PedID	Location	Description of Issue	Recommendation	Notes	Type	Cost (Does not include land acquisition, unless otherwise noted.)
Medium	B.20		North-south on Doyle Street from Ocean Ave to 55th St	Opportunity to improve north-south bicycle travel. Between Ocean Avenue and 59th Street: Bicycle boulevard signage and stencils installed. Traffic calming includes curb extensions and roadway narrowing. Stop signs turned to favor bicycle boulevard traffic. Between 59th Street and 55th Street: No signage, pavement stencils or traffic calming. Powell Street intersection difficult to cross.	· Measure speeds and volumes · Add HAWK signal or full signal on Doyle St at Powell Street. · Install bicycle boulevard signage and pavement markings south of 59th Street.	Included in General Plan. Papermill development required to install traffic signal at intersection with Powell Street See also Chapter 6, Bicycle Boulevards Cost does not include signal; see I.6 for more detail on Doyle St/Powell St signal	Bicycle Boulevard	$3,000
High	B.21		North-south on Horton St and Overland Ave from 62nd St - 40th St	Opportunity to impove function of major north-south bicycle boulevard. The entire route is currently signed as bicycle boulevard. Bicycle boulevard pavement markings north of 62nd St and south of 53rd St. Bike lanes striped on Horton St from 62nd to 53rd St. Section from 59th St to Stanford Ave identified as Green Street and Transit Street in General Plan.	Implement bicycle boulevard treatments as described in Chapter 6 · Measure speeds and volumes · Consider diversion at 62nd St, Stanford Ave, 45th St, and 40th St. Diversion to be installed on a trial basis only after evaluation with community input and traffic analysis. · Reconfigure roadway between 59th St and Powell St to prevent loading/parking in bike lanes. Widen to include bike lanes on both sides and loading zone on east side. · Consider speed cushions, tables, split lumps, curb extensions, median islands and permanent speed feedback signs to reduce vehicle speeds. · Improve bicycle detection at 40th St and 65th St · Install 3-way stop at 62nd St and Horton · Study measures to discourage through motor vehicle movement northbound on Horton at 40th St.	Included in General Plan See also pedestrian projects S.4 and S.7.	Bicycle Boulevard	$2,015,000
Medium	B.22		North-south on Emery St from 40th St to Park Ave	Opportunity to improve north-south bicycle travel. Parallel stretch of San Pablo Ave has frequent bicycle-related collisions and the completion of the Joseph Emery Park path provides an opportunity to complete an alternative route for cyclists. Major destinations in the area include East BayBridge Center, Oaks Card Club, Emery Secondary School/ECCL site, and San Pablo Ave businesses	Sign Class III bike route on Emery St and install bicycle left-turn pocket eastbound on Park Avenue for left onto path.	Included in General Plan Cost does not include left turn bike pocket; see I.7 for bike pocket details and cost	Bike Route	$1,800
Medium	B.23		Sherwin Ave and Halleck St from Horton St to the Oakland border	Opportunity to connect with future bike route on Beach Street and connections to West Oakland.	Sign Class III bike route on Sherwin Avenue and Halleck Street. Improve lighting and examine parking and loading practices on Halleck Street.	Work with Oakland to improve lighting and pavement on Beach and Wood Streets Included in General Plan See also pedestrian projects C.3, S.2, P.8	Bike Route	$3,100
Medium	B.24		North-south Spur Alley Extension from 53rd St to Hollis St at Stanford Ave	Opportunity to improve north-south bike travel. Current bike route on Spur Alley terminates at 53rd Street.	Acquire easement and extend bike route on Spur Alley north of 53rd St to Hollis Street.	Spur Alley is privately owned. South of 53rd Street, City has easement for bike/ped access. North of 53rd Street, City has no easement. Does not include acquisition costs. See also I.9	Bike Route	$3,300
High	B.25		Ped-Bike Bridge over I-80: 65th St to Frontage Rd	Freeway is major barrier to Bay Trail; there is only one freeway crossing in Emeryville - at Powell Street.	Build pedestrian/bicycle bridge over I-80 to connect with Bay Trail	Included in General Plan	Crossing	$18,500,000

Priority	BikeID	PedID	Location	Description of Issue	Recommendation	Notes	Type	Cost (Does not include land acquisition, unless otherwise noted.)
High	B.26	P.18	South Bayfront Bridge across railroad: Horton Landing Park to Ohlone Way	Railroad is major barrier between east and west sides of city. No connection over railroad tracks between major mixed-use destination at Bay Street and employment centers on Horton Street.	Build the South Bayfront Bridge over railroad from Ohlone Way to Horton Landing Park.	Included in General Plan	Crossing	$13,500,000
Medium	B.27	P.1	Powell Street Bridge and Pedestrian/ Bicycle Path	Cantilevered ped/bike facility on bridge is substandard	Conduct feasibility study for improved ped/bike crossing of railroad at Powell St Bridge. In conjunction with adjacent development, seek to improve pedestrian and bicycle access	Cost is for feasibility study. Once South Bayfront Bridge is constructed, need for this improvement lessens. Recommend evaluating the need for it after construction of SBF Bridge.		$25,000
Medium	B.28	P.19	Spur Alley to 47th Street/Doyle Street intersection	Large blocks increase distances for pedestrians and bicyclists	Install pedestrian and bicycle path connecting 47th Street to Spur Alley	Coordinate with Emery Bay	Multi-use Path	$150,000
Medium	B.29		East-West on 45th Street from San Pablo Avenue to Adeline Street	45th Street offers connection across San Pablo Avenue to Adeline Street and into Oakland.	Implement Bicycle Boulevard treatments as described in Chapter 6		Bicycle Boulevard	$3,000
Intersection Improvements								
Medium	I.1		Emeryville Greenway at 65th, 66th, 67th St crossings	Uncontrolled intersections of bicycle and pedestrian path	· Install in-pavement or beacon flashers, either motion-activated or with push-button · Modify warning signage to indicate that bicyclists and pedestrians may be crossing · Consider installing yield control for motorists that refers to bike/ped crossing · Consider raised crosswalks to slow motorists · Consider "Cross Traffic Does Not Stop" signage for path users. · Add street identification signs at Greenway for 65th 66th, and 67th streets.		Intersection Improvement	$115,200
Low	I.2	C.6	AC Transit/Joseph Emery Park Path midblock crossing of 45th Street	Proposed path will require a mid-block crossing	Provide high visibility crosswalk with bulb-outs and shark's teeth when path is extended through AC Transit facility	See also pedestrian projects P.3 and bicycle project B.8	Intersection Improvement	$181,200
High	I.3	C.14	San Pablo Avenue / 53rd Street	Poorly designed intersection. The east-west bicycle boulevard crosses San Pablo Ave at 53rd St, and connects to Oakland bike route.	Continue to study alternatives for improvement: - Look for opportunities to clip the southwest corner to better align the intersection across San Pablo Avenue. - Consider bicycle pocket or narrow 53rd Street to one lane in each direction with shared lane marking (per pedestrian recommendations). - Easrbound on 53rd Street, consider restriping for one left turn lane and one through-right lane. - Implement new citywide policy on traffic signals	Coordinate with ECCL, City of Oakland, and Caltrans. See also ped projects C.14, E.1	Intersection Improvement	$126,300
Low	I.4		Westbound on 65th St at Overland Ave	Challenging for bicyclists to turn left onto the Overland Avenue Bicycle Boulevard	· Move signage directing westbound bicyclists to Overland Avenue further east to provide advance notice · Stencil Shared Lane Markings in westbound left turn lane on 65th Street to indicate to motorists that bicyclists may be using the lane		Intersection Improvement	$9,000

Priority	BikeID	PedID	Location	Description of Issue	Recommendation	Notes	Type	Cost (Does not include land acquisition, unless otherwise noted.)
High	I.5	C.8	Adeline/San Pablo/ Macarthur/Peralta "Star Intersection"	· Wide lanes with little landscaping · Complicated intersection with multiple turning motions	· Landscape unused paved right of way to improve safety and character, in keeping with City plans for this intersection · Preserve cyclists' path of travel in design	See also pedestrian project C.8	Intersection Improvement	$500,000
Medium	I.6		Doyle St at Powell St	· Extending Doyle Street bicycle boulevard will necessitate crossing Powell Street · Uncontrolled multi-lane intersection is difficult for bicyclists to cross	Install traffic signal, stencils, and markings	Approved development required to contribute to cost of traffic signal. Otherwise, install HAWK signal/ actuated flashing beacon See also B.20	Intersection Improvement	$189,000
Medium	I.7		Park Ave at Emery St: Park Ave at Joseph Emery Park path	Cyclists traveling southbound on Joseph Emery Park Path must make a right turn on Park Avenue and quick left onto path	Provide center left-turning lane for eastbound cyclists	See also B.22	Intersection Improvement	$12,900
Medium	I.8		Spur Alley at 45th St	Uncontrolled "T" intersection with limited visibility and no advance warning of bicyclist crossing	Raise intersection, install high visibility crossing		Intersection Improvement	$320,500
High	I.9	C.17	Spur Alley at 53rd St	Uncontrolled intersection with limited visibility and no advance warning of pedestrian or bicyclist crossing	If easement is acquired north of 53rd St, install high-visibility marked crossing, raised crosswalk and advance warning signage	Contingent on B.24.	Intersection Improvement	$320,500
High	I.10	C.12	San Pablo Ave at 45th Street	Most bicycle collisions of any intersection with Emeryville.	Ensure that cycle length allows adequate time for bicyclists to cross San Pablo Avenue safely. Conduct study to determine whether traffic signal on westbound leg is warranted. Consider establishing a bicycle refuge in the median opposite the Walgreen's driveway, allowing bicyclists to turn left onto San Pablo Avenue.		Intersection Improvement	$70,000
Spot Improvements								
High	SP1		40th St Transit Zone between San Pablo Avenue and Adeline Street	Conflict with buses	Install shared lane markings in right lane in both directions		Shared Lane Marking	$10,200
Low	SP2		59th St Bicycle Boulevard between Hollis St and Doyle St	Conflict with diagonal parking	Reconfigure parking from diagonal to parallel		Special Project	$2,700
High	SP3	P.15	North-south path on west side of Frontage Rd from Powell Street to Shorebird Park	Opportunity to improve bicycling conditions	Improve existing sidewalk to accommodate multi-use path, by replacing pavers with concrete or asphalt multi-use path and installing a landscaped buffer between Frontage Road and sidewalk path. At southwest corner of Access Road/Frontage Road, reduce turning radius and realign pedestrian push button		Special Project	$200,000
Medium	SP4		Hollis St, full length	Not enough room for bike lanes	Install signage: "Bicycles May Use Full Lane"		Signage	$7,500
Medium	SP5		San Pablo Ave	No opportunity for bike lanes at this time.	Install signage: "Bicycles May Use Full Lane" Install shared lane markings in right lane in both directions		Shared Lane Marking	$36,800

8. Funding and Implementation

This Plan recommends pedestrian and bicycle projects and programs that will make walking and bicycling an integral part of everyday life in Emeryville. This chapter presents a general funding and implementation plan that will assist the City in securing funding for projects and in determining which projects and programs to pursue first. The projects and programs will be implemented over a number of years, through a variety of means including private development, grants and other mechanisms described in this chapter.

As the costs of these projects and programs likely exceed the City's anticipated bicycle and pedestrian funding, the City should pursue high-priority projects and projects that cost little but have a big impact, and projects that can be integrated into larger planned roadway and development projects first. This Plan provides two tools for assisting the City in determining a sequence for these improvements: First, the detailed project listings in **Chapter 7 (Table 7-3** and **Table 7-4)**, are organized by priority and can be used as a chronology for implementing the projects. Second, the Priority Project Sheets located at the end of this chapter provide groupings of projects by location. These sheets can be used when applying for grants or identifying improvements to be made as part of development or redevelopment projects.

This chapter also includes an Action Plan that lists specific actions that the City will take to implement the goals and policies of this Plan. Each action is assigned to a City department and given a timeframe for implementation.

8.1. Cost Summary

Planning level costs have been developed for recommended programs and projects, using the cost assumptions from similar programs and projects implemented in the Bay Area. Costs for infrastructure recommendations include construction materials, plans, specifications and estimates, traffic control, inspection, mobilization and contingency.[33] Total cost of implementing the recommendations in this Plan is $59.1 million in 2011 dollars. Costs by project type are shown in **Table 8-1**.

[33] *Additional cost burden was included as follows: 10% to 15% for plans, specifications, and estimates, 20% for traffic control, mobilization and inspection combined, and 20% to 30% for contingency.*

Table 8-1. Cost Summary

Type of Improvement	Cost	Notes
Programs		
Encouragement, enforcement, education, evaluation programs	$319,500	Annually. Annual bike sharing operating costs estimated at $270,000. Many programs require staff time only.
Bike sharing - start-up	$600,000	One-time capital cost of establishing bike sharing.
Maintenance of new infrastructure projects	$80,600	Annually
Subtotal	**$4,601,000**	Includes program costs over 10 years
Citywide Infrastructure Improvements		
Signalized intersections	varies	Capital costs dependent on selected treatments.
Treatments for uncontrolled and mid-block crosswalks	varies	Capital costs dependent on selected treatments.
Parklets	varies	Staff time for permitting, inspection.
Pedestrian directional signage	$24,000	
Bikeway destination signage	$24,000	
Bike parking	varies	Capital costs dependent on type and quantity of bicycle parking.
Signal detection for bicyclists	varies	Capital costs dependent on whether improvements require calibration only or installation of new technologies.
Subtotal	**$48,000+**	
Site-Specific Projects		
Sidewalks	$4,547,400	
Pedestrian Crossings	$2,928,600	
Transit Stop Improvements	$757,500	
Corridor Enhancements	$4,118,100	
Overcrossings	$32,000,000	
Pedestrian Paths	$2,341,000	
Multi-Use Paths	$4,099,800	
Bikeway Network	$2,880,400	Includes costs for bicycle boulevards, bike lanes, bike routes, and shared lane markings. Does not include costs for multi-use paths.
Intersection Improvements for Bicyclists	$716,600	
Spot Improvements for Bicyclists	$57,200	
Site-specific projects (excluding overcrossings)	**$22,446,600**	
Subtotal	**$54,446,600**	
Total cost over 10 years	**$59,095,600**	Includes annual programs costs over 10 years.

Maintenance Costs

Maintenance is essential to providing a pedestrian and bicycle network that is safe and reliable for users. Table 8-2 summarizes the projected annual cost for Emeryville to maintain the proposed projects.

Table 8-2. Pedestrian and Bicycle Facility Maintenance Cost Estimates (Proposed Projects)

Facility	Cost Per Mile	Miles	Annual Cost Estimates	Notes
Paved paths (multi-use and pedestrian paths)	$25,000	3.0	$75,000	Sources: Alameda CTC Bicycle and Pedestrian Plans Update (2011), based on countywide average costs EBRPD per-mile estimates Includes landscaping & reserve fund contributions
Sidewalks	$1,000	2.26	$2,260	
Class II Bike Lanes/ Bicycle Boulevards/ Bike Routes with SLMs	$1,500	1.78	$2,670	Source: Alameda CTC Bicycle and Pedestrian Plans Update (2011), based on countywide average costs.
Class III Bike Routes	$700	0.95	$665	Source: Alameda CTC Bicycle and Pedestrian Plans Update (2011), based on countywide average costs. Includes sign replacement.
Total Estimated Annual Additional Maintenance Cost			$80,595	

8.2. Past Expenditures

This section summarizes the City's past expenditures for pedestrian and bicycle projects. The City of Emeryville has been extremely resourceful and strategic in pursuing funding for pedestrian and bicycle expenditures. City staff have successfully secured funds from a number of sources, as described below. In general, much of the financing for capital projects comes from local sources including the former Redevelopment Agency and the existing Transportation Impact Fee program, which is currently being updated. City staff noted the overall difficulty of securing regional or non-local funding due to Emeryville's small size and the lack of regional connections when compared to larger neighboring jurisdictions.[34] However,

[34] *This information was collected during a conversation with City staff from the Economic Development and Housing Department, Public Works Department, and Planning Department on April 18th, 2011.*

the city actively lobbies for both state and federal funding for pedestrian and bicycle infrastructure improvements.

8.2.1 Capital Improvement Program (CIP)

The City's Capital Improvement Program establishes the infrastructure funding plan over a five-year timeframe. All pedestrian and bicycle projects are listed in the CIP with a variety of funding sources. The CIP is primarily funded through the general fund, and in the past, Redevelopment Agency funds. Under the CIP (2006-2011), $3.5 million in City funds and $15.6 million in Redevelopment Agency funds were spent on pedestrian and bicycle improvements, out of a total of $15.6 million and $84.2 million in funds from these two funding sources, respectively. Recently completed CIP projects include the Emeryville Greenway Multi-Use Path, Park Avenue Beautification Phase I, Powell Area Pedestrian Safety Improvements project, the pedestrian signal at Christie Avenue, the Triangle Traffic Calming program, and lighted crosswalks.

The CIP will be updated once the City determines the effect of the State changes to redevelopment agencies. Understanding the City's investment in the existing pedestrian and bicycle system and what is required to complete the system is important in developing a funding strategy.

8.2.2 Redevelopment Agency Funds

In the past, Emeryville was split into two large redevelopment zones that covered the entire City except for the Marina and the Watergate Condominiums. Redevelopment Agency funds were used for projects that require new right-of-way or to acquire land for large infrastructure projects. However, due to the State dismantling of Redevelopment Agencies, this funding source has been eliminated. The City will need to determine alternative funding sources.

8.2.3 Conditions of Approval (COA)

Emeryville has included pedestrian and bicycle improvements as a condition of approval for developers. Improvements include new sidewalks or bicycle facilities along the project frontage, or intersection improvements to facilitate project site access. In commercial areas, property owners are required to maintain street trees and sidewalks along their frontage. Recent projects include the Pixar Path, Bike Boulevard on 45th Street, and 65th Street bike lanes.

8.2.4 Measure B Funds

Measure B one half cent sales tax for Alameda County is passed through to all jurisdictions. Emeryville often uses its Measure B funds to slurry seal a portion of roadways each summer. The slurry seal projects are often combined with other transportation improvement projects such as roadway restriping or bicycle lanes. The Adeline Street Reconstruction, which consisted of a "road diet" and new bike lanes, was funded through Measure B funds.

8.2.5 Regional Transportation Plan (RTP)

The Metropolitan Transportation Commission (MTC) adopted the 2009 *Transportation 2035 Plan for the San Francisco Bay Area* to specify how the approximately $218 billion in anticipated federal, state, and local transportation funds will be spent in the San Francisco Bay Area. Eighty percent of these funds will be used to maintain and operate the existing transportation system.

Due to the uncertainty of redevelopment funds, the City has submitted 12 to 15 pedestrian and bicycle related projects for inclusion in the Regional Transportation Plan (RTP) and subsequent eligibility for Federal funding. The City also recently submitted a request for $13 million in the RTP for funding of the I-80 / 65th Street Bridge.

8.2.6 Transportation Development Act Article 3

The City of Emeryville receives between $5,000 and $7,000 in pass-through funds annually as a part of TDA Act 3. The City also receives $10,000 annually through the related Transportation Fund for Clean Air.

8.2.7 Proposition 84

The City has secured funds from the Proposition 84 Urban Greening for Sustainable Communities Grant Program for landscaping and planning projects.

8.2.8 Federal Earmarks

In addition, funding for the planned Transit Center and Plaza has been partially covered by a Federal Earmark through the federal funding and authorization bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

8.3. Estimated Revenue

Beyond the funding sources which the City has already pursued, there are other numerous sources at the local, county, regional, state, and federal levels that are potentially available to the City of Emeryville to implement the projects and programs in this Plan. Potential local, countywide, regional, state and federal funding sources are described below.

8.3.1 Local Funding Sources

A variety of local sources may be available for funding pedestrian and bicycle improvements; however, their use is often dependent on political support.

Traffic Impact Fee

The City's Traffic Impact Fee (TIF) program is currently being updated and will be used to finance transportation infrastructure projects through the *General Plan* horizon year (2030). The TIF is funded through development fees to lessen the impacts to the transportation system caused by new development. The updated TIF includes improvements to all transportation modes, reflecting that the motorized roadway system has limited ability to expand and that multiple transportation options are required to provide continued mobility for Emeryville residents, employees, and visitors. Key areas where the TIF will focus the transportation funding in the future include:

- Limited intersection capacity improvements for vehicles, primarily around the Powell Street interchange.
- Improvements to the transit system that focus on improving pedestrian connections to/from transit stops and providing better transit stop amenities to attract choice riders.

- Improvements to the bicycle and pedestrian system focused on reducing barriers to east-west travel across the city, closing gaps in the existing system, and providing high visibility crossings of the existing roadway network.

This source is proposed to be the primary funding source for improvements included in this Plan. Since revenue from the TIF will be tied to development, it will be difficult to forecast the timing of revenue as development patterns will likely change year to year. This will affect the implementation timeframe for projects funded through the TIF.

Planned Roadway Improvements

Pedestrian and bicycle improvements can often be included in ongoing roadway projects or planned roadway improvements for a nominal cost. This may include adding curb ramps during a utility reconstruction or marking bicycle lanes or stencils during routine roadway paving projects. The City of Emeryville should review planned roadway projects to determine if there are opportunities for coordination between these planned projects and the pedestrian and bicycle recommendations presented in this Plan.

Capital Improvement Program (CIP)

The CIP sets priorities for building the City's infrastructure, including pedestrian and bicycle improvements. A majority of funding for the CIP previously came from the City's Redevelopment Agency, with some funding also coming from the City's General Fund or federal, state, or regional grants. As noted, Redevelopment Agency funding has been eliminated with the State's dismantling of Redevelopment Agencies.

Private Financing Mechanisms

New construction can be used to finance new pedestrian and bicycle infrastructure through several key mechanisms:

- Developer financed infrastructure on- or off-site. This could include on-site pedestrian or bicycle connections to existing infrastructure or entirely new infrastructure in the project vicinity. Emeryville has used this mechanism to require Pixar to construct the multi-use path between Park Avenue and 45th Street.

In addition to the upfront infrastructure costs, the financing for the maintenance of new facilities may be provided for by private developments. Funding for long-term operations and maintenance can be financed through several mechanisms:

- Condition of approval that the new development maintains the infrastructure along the project frontage or in the project vicinity. It is currently the City's policy for nonresidential uses to maintain sidewalks along the establishment's frontage.
- Require resident and employee AC Transit "Easy Pass" for new developments. This would include monthly passes that are included in rental or homeowner fees and could provide a source of funding for transit service, or the development of an on-site bicycle station or bike sharing facility.
- Implement parking pricing policies for on-street and off-street facilities. Revenue from meters or parking garages could be used to finance on-going maintenance of bicycle and pedestrian facilities.

- Under the General Plan and Zoning Regulations, developers may voluntarily agree to build pedestrian and bicycle infrastructure in order to earn "bonus points" for increased height, intensity and density of development.

Other Funding Sources

Local sales taxes, developer or public agency land dedications, private donations, and fund-raising events are other local options to generate funding for pedestrian or bikeway projects. Creation of these potential sources usually requires substantial local support.

8.3.2 Countywide Funding Sources

Alameda County Measure B Bicycle and Pedestrian Program

Measure B is a half-cent sales tax that was passed in 1986 by Alameda County voters and reaffirmed by voters in 2000. Funds are distributed through the Alameda County Transportation Commission. Seventy-five percent of these funds are distributed to cities and the County based on population, while twenty-five percent are allocated for regional projects.

Measure WW

In 2008, Contra Costa and Alameda County voters approved EBRPD's Measure WW, the "Regional Open Space, Wildlife, Shoreline and Parks Bond." This extension of a similar 1988 bond measure allocates $33 million specifically to trail projects in the county. In addition, the measure will provide $48 million directly to cities, the county and special park and recreation districts for their park and recreation needs, including trails and other non-motorized transportation projects.

- Measure WW: www.ebparks.org/ww

8.3.3 Regional Funding Sources

Transportation for Livable Communities

MTC created the Transportation for Livable Communities (TLC) program in 1998. It provides technical assistance and funding to cities, counties, transit agencies and nonprofit organizations for capital projects and community-based planning that encourage multimodal travel and the revitalization of town centers and other mixed-use neighborhoods. The program funds projects that improve bicycling to transit stations, neighborhood commercial districts and other major activity centers.

- MTC's TLC program: www.mtc.ca.gov/planning/smart_growth/ tlc_grants.htm

Climate Action Program

In partnership with the Bay Area Air Quality Management District, Bay Conservation Development Commission and the Association of Bay Area Governments, MTC is sponsoring a transportation-oriented Climate Action Program, designed to reduce mobile emissions through various strategies, including a grant program. The grant program will provide funding for bicycle projects through new Safe Routes to School and Safe Routes to Transit programs, with total funding expected to be approximately $400 million. This funding

will be in addition to the state and federal Safe Routes to School programs and MTC's existing Safe Routes to Transit program.

Safe Routes to Transit (SR2T)

SR2T is a grant-funding program that emerged out of the Bay Area's Regional Measure 2, which instituted a $1 toll increase on the Bay Area's seven state-owned toll bridges. Through the SR2T program, up to $20 million is to be allocated through 2013 on a competitive basis to programs, planning efforts and capital projects designed to reduce congestion on toll bridges by improving bicycling and walking access to regional transit services that serve toll-bridge corridors. Funds can be used for secure bicycle storage at transit; safety enhancements and barrier removal for pedestrian or bicycle access to transit; and system-wide transit enhancements to accommodate bicyclists. The SR2T program is administered by two nonprofit organizations, TransForm and the East Bay Bicycle Coalition, with MTC serving as the fiscal agent. The program awarded approximately $12 million during its first three cycles, in 2005, 2007, and 2009. The fifth and final funding cycle will occur in 2013.

- Bay Area Safe Routes to Transit funding program: www.transformca.org/campaign/sr2t

Regional Bikeway Network Program

MTC's "Regional Bicycle Plan for the San Francisco Bay Area" designates a regional bikeway network covering approximately 2,140 miles throughout the nine Bay Area counties. MTC has pledged $1 billion to fully fund this regional bikeway network (with the exception of links on toll bridges) and will create a funding program with the intention of completing construction of the network by 2035. This program was completed in 2009 and replaced the expired Regional Bicycle and Pedestrian Program. The Bay Trail through Emeryville is a part of the regional bikeway network. The South Bayfront Bridge and 65th Street Bridge are both identified for funding in the Plan.

Bay Trail Grants

The San Francisco Bay Trail Project—a non-profit organization administered by the Association of Bay Area Governments—provides grants to plan, design, and construct segments of the Bay Trail. The amount and availability of Bay Trail grants vary from year to year, depending on whether the Bay Trail Project has identified a source of funds for the program. In recent years, grants have been made using funds from Proposition 84, the 2006 Clean Water, Parks and Coastal Protection Bond Act; however, this is a limited-term source of funds.

- Bay Trail grants: www.baytrail.org/grants.html

Transportation Fund for Clean Air (TFCA)

TFCA is a grant program administered by the Bay Area Air Quality Management District (BAAQMD). The purpose of the program, which is funded through a $4 surcharge on motor vehicles registered in the Bay Area, is to fund projects and programs that will reduce air pollution from motor vehicles. Eligible projects include including the purchase or lease of clean air vehicles; shuttle and feeder bus service to train stations; ridesharing programs to encourage carpool and transit use; bicycle facility improvements such as bike lanes, bicycle racks, and lockers; arterial management improvements to speed traffic flow on major arterials; smart growth projects; and transit information projects to enhance the availability of transit information. Grant

awards are generally made on a first-come, first-served basis to qualified projects. Funding for projects is also available through the TFCA's County Program Manager Fund. Under that sub-program, 40 percent of TFCA revenues collected in each Bay Area county is returned to that county's congestion management agency (CMA) for allocation (the Alameda County CMA in Emeryville's case). Applications are made directly to the CMAs, but must also be approved by the BAAQMD.

- TFCA Bicycle Facility Program: www.baaqmd.gov/pln/grants_and_incentives/bfp/index.htm
- TFCA County Program Manager Fund: www.baaqmd.gov/pln/grants_and_incentives/tfca/cpm_fund.htm

8.3.4 Statewide Funding Sources

Below is a list of Statewide Funding sources available for transportation related improvements.

Proposition 1B Transportation Infrastructure Bond

Proposition 1B is a statewide bond passed by the voters of California in 2006 to provide money for transportation improvements. This money can be used for such activities as improving rail-highway crossings, retrofitting local bridges, modernizing transit services to improve pedestrian or bicycle access, as well as provide matching funds for locally nominated projects.

Proposition 1C Housing/Transit Oriented Development Bonds

Proposition 1C is a statewide bond passed by the voters of California to provide money for affordable housing and transit oriented development. Of this bond, $850 million is available in grants for the development of public infrastructure projects that facilitate or support infill housing construction. This program has been used previously to finance construction of roadways as well as pedestrian and bicycle facilities to support affordable housing and transit oriented development.

Transportation Enhancements (TE)

Under the Transportation Enhancements program, California receives approximately $60 million per year from the federal government to fund projects and activities that enhance the surface transportation system. The program funds projects under 12 eligible categories, including the provision of bike lanes, trails, bicycle parking and other bicycling facilities; safety-education activities for pedestrians and bicyclists; landscaping and other scenic beautification projects; and the preservation of abandoned railway corridors and their conversion to trails for non-motorized transportation. In California, 75 percent of TE funding is distributed by the regional transportation planning agencies. For the Bay Area, MTC allocates the money through its Transportation for Livable Communities program (see above). The remaining 25 percent is allocated by Caltrans at the district level.

Bicycle Transportation Account (BTA)

The BTA is a Caltrans-administered program that provides funding to cities and counties for projects that improve the safety and convenience of bicycle commuting. Eligible projects include secure bike parking; bike-carrying facilities on transit vehicles; installation of traffic-control devices that facilitate bicycling; planning, design, construction and maintenance of bikeways that serve major transportation corridors; and elimination

of hazards to bike commuters. In fiscal year 2010/11, the BTA provided $7.2 million for projects throughout the state. To be eligible for BTA funds, a city or county must prepare and adopt a bicycle transportation plan that meets the requirements out-lined in Section 891.2 of the California Streets and Highways Code.

- Bicycle Transportation Account: www.dot.ca.gov/hq/LocalPrograms/bta/btawebPage.htm

Safe Routes to School (SR2S)

California's Safe Routes to Schools program (SR2S) is a Caltrans-administered grant-funding program established in 1999 (and extended in 2007 to the year 2013). Eligible projects include bikeways, walkways, crosswalks, traffic signals, traffic-calming applications, and other infrastructure projects that improve the safety of walking and biking routes to elementary, middle and high schools, as well as "incidental" education, enforcement and encouragement activities. Planning projects, on the other hand, are not eligible. In fiscal year 2009/10, approximately $24.25 million was available in grant funding.

- Caltrans Safe Routes to School program: www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm

Transportation Development Act (TDA), Article 3

TDA Article 3 is perhaps the most readily available source of local funding for pedestrian and bicycle projects. TDA funds are derived from a statewide quarter-cent retail sales tax. This tax is returned to the county of origin and distributed to the cities and county on a population basis. Under TDA Article 3, two percent of each entity's TDA allocation is set aside for pedestrian and bicycle projects; this generates approximately $3 million in the Bay Area annually. Eligible projects include the design and construction of walkways, bike paths and bike lanes, and safety education programs. According to MTC Resolution 875, these projects must be included in an adopted general plan or pedestrian and bicycle plan and must have been reviewed by the relevant city or county pedestrian and bicycle advisory committee.

- MTC's Procedures and Project Evaluation Criteria for the TDA Article 3 program: www.mtc.ca.gov/funding/STA-TDA/RES-0875.doc

State Transportation Improvement Program (STIP)

Every two years, the California Transportation Commission programs funds for a variety of projects that relieve congestion on state highways and local streets, which must provide accommodations for pedestrians and bicyclists to receive the funds. Seventy-five percent of STIP funds are distributed to the counties. The remaining 25 percent is programmed for intercity highway and rail improvements.

Highway Safety Improvement Program (HSIP)

In 2009, the HSIP replaced the Hazard Elimination Safety program which provided funds to eliminate or reduce the number and severity of traffic collisions on public roads and highways. Cities and counties compete for HSIP funds by submitting candidate projects to Caltrans for review and analysis. Caltrans prioritizes these projects statewide and approves priority projects for funding through its annual HSIP program plan. Historically, only about 20 percent of applications are approved for funding. In February 2011, Caltrans released the fourth cycle of projects approved for funding. The list contained 179 projects totaling nearly $75 million in federal funds

- Hazard Elimination Safety program: www.dot.ca.gov/hq/LocalPrograms/hesp/hesp.htm

8.3.5 Federal Funding Sources

Below is a list of Federal Funding sources available for transportation related improvements.

Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU)

SAFETEA-LU provides funding for roads, transit, safety, and environmental enhancements. These are generally state and local improvements for highways and bridges that accommodate additional modes of transit. Improvements include capital costs, publicly-owned intercity facilities, and pedestrian and bicycle facilities. This legislation also includes a Safe Routes to School program, with funding for projects that improve pedestrian and bicycle access and safety around primary and middle schools. Cities, counties, and transit operators can apply for SAFETEA-LU funds. An 11.5 percent local match is required for these funds. Several key SAFETEA-LU programs include the following:

- *Surface Transportation Program Fund, Section 1108 (STP)* – STP are block grant funds that are used for roads, bridges, transit capital, and bicycle projects. SAFETEA-LU allows the transfer of funds from other SAFETEA-LU programs to the STP Fund. Cities, counties, metropolitan planning organizations, and transit operators can apply for STP funds.
- *National Highway System Fund (NHS)* – NHS funds provide for an interconnected system of principal arterial routes. The goal of the program is to afford access to major population centers, international border crossings, and transportation systems, meet national defense requirements, and serve interstate and inter-regional travel. Facilities must be located and designed pursuant to an overall plan developed by each metropolitan planning organization and state, and incorporated into the RTP. Both state and local governments can apply for NHS funds. A 20 percent local or state match is required for these funds.
- *Congestion Mitigation and Air Quality Improvement Program, Section 1110 (CMAQ)* – CMAQ funds are available for projects that will help attain National Ambient Air Quality Standards (NAAQS) identified in the 1990 Federal Clean Air Act Amendments. Projects must be located within jurisdictions in non-attainment areas. Cities, counties, MPO, state, and transit operators can apply for SAFETEA-LU funds. An 11.5 percent local or state match is required for these funds. Note that this program will likely be discontinued.
- *Transportation Enhancements Program, Section 1201 (TE)* – The TE Program is a 10 percent fund set aside from the STP. Projects must have a direct relationship to the intermodal transportation system through function, proximity, or impact. This program has 12 activities that are eligible for funding. Local, regional, and state public agencies, special districts, non-profit and private organizations can apply for TE funds. Cities, counties, or transit operators must sponsor and administer the proposed projects. A 12 percent local match is required for these funds. Additional detail on this program is provided below, relating to the statewide distribution from the TE Program.
- *Bridge Repair and Replacement Program (BRRP)* – BRRP funds are available for bridge rehabilitation and replacement. Bridge projects must be incorporated into the Regional Transportation Improvement Program (RTIP). Cities may apply for these funds.

- *National Recreational Trails Fund, Section 1112* – Funds are available for recreational trails. Projects must be consistent with a Statewide Comprehensive Outdoor Recreation Plan (SCORP). Projects include development of urban trail links, maintenance of existing trails, restoration of trails damaged by use, trail facility development, provision of access for people with disabilities, administrative costs, environmental and safety education programs, acquisition of easements, fee simple title for property, and construction of new trails. Private individuals/organizations, cities, counties, and other governmental agencies can apply for these funds. There are no specific local match requirements for these funds.
- *National Highway Safety Act, Section 402* – The Highway Safety Program is a non-capital safety project grant program under which states may apply for funds for certain approved safety programs and activities. Eligible states must adopt a Highway Safety Plan (HSP) reflecting state highway problems. State departments, cities, counties, and school districts may apply for these funds. No local match is required.
- *Transit Enhancement Activity, Section 3003* – The Transit Enhancement Activity fund can be used for a variety of transportation activities including improving pedestrian and bicycle access to mass transportation, landscape and scenic beautification, historic preservation, and environmental mitigation. Regional transportation planning agencies, state, and local agencies may apply for these funds. A 5 percent local match is required for these funds.
- *Highway Safety, Research, and Development Fund, Section 2003* – This fund can be used to study and research multi-modal transportation safety. Projects must be incorporated into the RTIP. Cities, counties, and state agencies can apply for these funds. A 25 percent local match is required for these funds.
- *Section 3 Mass Transit Capital Grants* – This fund can be used for to improve mass transit station areas including access to the station. States, regional, local governments, and transit operators can apply for these funds. A 10 percent local match is required for bicycle related projects using these funds.

Safe Routes to Schools

The Federal Safe Routes to Schools (SRTS) program, established by Section 1404 in SAFETEA-LU, is funded at approximately $150 million dollars annually, through Federal-aid highway funds. The Federal Highway Administration (FHWA) apportions funds annually to each state, with California receiving on average, $23 million dollars per year. The program emphasizes the 5E's – education, encouragement, engineering, enforcement, and evaluation; therefore, both infrastructure and programmatic projects are eligible for funding; however, only projects located within a two mile radius of elementary and middle schools are eligible. The third cycle call for projects occurred in 2011. No local match is required to receive program funds.

- Federal Safe Routes to School program: http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/srts.htm

8.4. Funding Strategy

With this understanding of Emeryville's funding opportunities and challenges, the City should consider the following options for fulfilling the funding commitment necessary to complete the proposed systems:

- For multi-agency projects, prepare joint applications with other local and regional agencies, such as the Cities of Oakland and Berkeley, Alameda County, and the East Bay Regional Park District for competitive funding programs at the State and Federal levels. Joint applications often increase the competitiveness of projects for funding; however, coordination amongst the participating jurisdictions is often challenging. The City should act as the lead agency, with a strong emphasis on coordination between participating jurisdictions and agencies (including transit and public health organizations), to ensure projects are implemented as quickly as possible.
- Use existing funding sources as matching funds for State and Federal funding.
- Include pedestrian and bicycle projects in local traffic impact fee (TIF) programs and assessment districts.
- Include costs of facility maintenance in the updated TIF. The feasibility of this approach is currently being studied as a part of the on-going TIF update process.
- Require construction of pedestrian and bicycle facilities as part of new development.
- Continue to include proposed pedestrian and bicycle improvements as part of roadway projects involving widening, overlays, or other improvements.

Continue to coordinate the maintenance of pedestrian and bicycle facilities as part of standard roadway maintenance efforts. For example, prioritize paving improvements along designated bikeways, and stripe bike lanes when repaving.

The City should also take advantage of private contributions, where appropriate, in developing the proposed system. This could include a variety of resources, such as volunteer labor during construction, right-of-way donations, or monetary donations towards specific improvements.

8.5. Implementation Steps

Most recommended projects will require further exploration and analysis by the City before they can be implemented. While this Plan identifies recommended treatments for specific projects, all design level issues will be determined during project implementation by the City. Unanticipated opportunities and challenges will arise during the City's analysis, design and funding of each project, and as a result, the specific designs recommended in this Plan, and the implementation schedule described in this chapter may change.

The steps required to implement recommended projects will vary by project. Many of the projects in this plan are relatively easy to implement and can be completed under the discretion of City staff. Such projects can be implemented using City or grant funds with project level review by the BPAC.

Other projects in the plan, such as multi-use paths and bicycle boulevards, require additional study, a more involved public outreach process, and significant engineering. The City may wish to hold public meetings early in the planning process for such projects. City staff and City Council may wish to involve an appropriate committee to assist with gathering public input and making recommendations. Depending on the nature of the project, this would most likely involve the BPAC, Transportation Committee, Public Works Committee, and/or the Planning Commission.

More complex projects with greater associated impacts typically include the following steps:

1. Preparation of a Feasibility Study involving a conceptual design (with consideration of possible alternatives and environmental issues), public input, and cost estimate for individual projects as needed.
2. Securing, as necessary, outside funding and any applicable environmental approvals.
3. Additional public outreach and approval of the project by the BPAC, Transportation Committee, Planning Commission (as appropriate) and the City Council, including the commitment by the latter to provide for any unfunded portions of project costs.
4. Completion of final plans, specifications and estimates, advertising for bids, receipt of bids and award of contract(s).
5. Project construction.

8.5.1 Implementation Steps by Project Type

Implementation steps for specific bicycle and pedestrian project types are described below.

Sidewalks

Sidewalk projects should be coordinated with planned roadway work or developments. A majority of the sidewalk gaps are in areas that are slated for redevelopment, and new sidewalk construction will be part of the developments' conditions of approval. For projects not adjacent to redeveloping properties, the City will pursue grants for design and construction. Adjacent property owners will be contacted during project design, and the City will work closely with the adjacent property owners on specific project issues (e.g. landscape restoration, driveway reconstruction) at that time. All improvements should meet Americans with Disabilities Act (ADA) requirements and, in some cases, improvements related to ADA compliance may provide an occasion for other planned improvements.

Intersection Improvements and Pedestrian Crossings

Intersection improvements and pedestrian crossings should be incorporated into existing roadway improvement plans when possible. When this approach is not available, Safe Routes to Schools grants would be appropriate for areas adjacent to Emeryville schools such as the intersections along San Pablo Avenue. Other grant funding sources or the updated Transportation Impact Fee (TIF) can provide additional funding sources for other intersection improvements.

Pedestrian Pathways/Corridor Enhancements

A variety of funding sources are available for off-street pedestrian paths including grants for paths adjacent to schools, the updated TIF, or private financing as a part of developer agreements. Adjacent property owners will be contacted during project design, and the City will work closely with the adjacent property owners on specific project issues (e.g. landscape restoration) at that time.

Transit Stop Improvements

Transit stop improvements should be coordinated with transit studies currently underway in Emeryville including the *Sustainable Transportation Strategy*. Funding may be provided through a variety of grants sources such as Safe Routes to Transit grants or the updated TIF.

Overcrossings

Overcrossings include the 65th Street Bridge and South Bayfront Bridge. The City is currently in the process of applying for regional grant funding for the 65th Street Bridge. Grant funding priorities will have to be weighed with other construction projects in the CIP.

Multi-Use Paths (Class I Bikeways)

Multi-use paths will be funded through several mechanisms, including but not limited to the updated TIF and as a condition of approval for new development, and grant programs such Measure B and the Caltrans Bicycle Transportation Account.

Bikeways and Spot Improvements

Bikeway stencils and striping in neighborhoods whose streets are scheduled to be resurfaced should be implemented at the time of resurfacing. Residents and businesses will be notified during the resurfacing project design phase about the new striping and stencils. Bike facilities in neighborhoods whose streets have recently been resurfaced will be added as an un-funded project in the CIP and the City will apply for grant funding to implement these projects.

8.6. Action Plan

To fully achieve the vision set forth in this Plan, close coordination among City departments, neighboring jurisdictions, and the community-at-large will be required. **Table 8-3** identifies action steps to support this Plan's goals and policies. The Action Plan identifies the department or agency responsible for implementing each action and a timeframe. Some action steps are ongoing activities. Others are identified as short-term, within the first two years of adoption of this Plan; medium term, within two to five years; and long-term, within six to 10 years. Actions that call for the implementation of the site-specific projects, as listed in **Chapter 7**, will be carried out in accordance with the priority tier established for each project in **Table 7-3** and **Table 7-4**.

Table 8-3. Action Steps for Implementation of PBP Goals and Policies

Key:

PW: Public Works

P&B: Planning and Building

EDH: Economic Development and Housing

Policy	Action Step	Responsible Party	Time-frame
Goal 1: Multi-modal			
1.1	*The design, construction, operation, and maintenance of city streets shall be based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities.*		
	1. Implement the street improvement projects identified in this Plan.	PW	by tier
	2. Collect and analyze pedestrian and bicycle data on an annual basis and utilize to improve the pedestrian and bicycle system. Continue to work with Alameda CTC and MTC on regional count efforts.	PW	ongoing
	3. Identify funding and assign a part-time staff position to coordinate the implementation of this Plan	PW	short
1.2	*To the extent allowed by law, the City's Traffic Impact Fee shall include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimizes travel by all modes.*		
	Continue to collect traffic impact fees and use as a funding source for improvements that support all modes.	P&B PW	ongoing
1.3	*The City will strive for most trips within Emeryville to occur on foot, on bike, or on transit by providing enticing, safe, and direct pedestrian and bicycle connections to all major destinations and transit, and by making bicycling and walking the easiest and least expensive way to travel within the City.*		
	1. Continue to work with the BPAC to implement this Plan.	PW	ongoing
	2. Refer to this Plan when reviewing new development and seek opportunities for its implementation.	P&B PW	ongoing
1.4	*The City will strive to balance the needs of pedestrians, bicyclists, and motorists in all roadway and reconstruction projects*		
	Refer to the Pedestrian and Bicycle Plan prior to construction to identify opportunities to implement pedestrian and bicycle projects	PW	ongoing
	Consider and make accommodations for the needs of all roadway users in new construction projects	P&B PW	ongoing
1.5	*The City will consider health issues in the community design process and in promoting walking and biking as a form of transportation and recreation.*		
	Work with Alameda County Public Health Department to conduct a Health Impact Assessment for the City.	P&B PW	short
1.6	*The City will consider strategies that manage traffic speed in order to improve safety for pedestrians, bicyclists, and motorists.*		
	1. Consider pedestrian and bicyclist volumes when setting speed limits.	PW	ongoing

Policy	Action Step	Responsible Party	Time-frame
	2. Implement traffic calming measures as proposed in this Plan.	PW	by tier
	3. Monitor speeds on bicycle boulevards and class III bike routes, and address overly high speeds with effective traffic calming devices.	PW	ongoing
	4. Prohibit angled parking on bicycle boulevards; reconfigure angled parking where it does not comply.	PW	by tier
1.7	*The City will evaluate the suitability of providing a citywide bicycle sharing system and if feasible, work with local employers, transit agencies, and neighboring communities to plan, fund, and implement a bicycle sharing system.*		
	Expand the initial analysis of bicycle sharing presented in this Plan and work with employers, local jurisdictions, and non-profit agencies to plan and implement.	P&B PW	mid
1.8	*Emeryville will remain up to date on new laws and practice pertaining to pedestrian and bicycle transportation*		
	1. Monitor laws and practices through relevant sources and workshops.	P&B	ongoing
	2. Advocate for change in law that would allow bicyclists to treat stop signs as yield signs.	P&B PW	ongoing
1.9	*The City will seek to develop San Pablo Avenue as a green, multi-modal corridor.*		
	1. Work with Caltrans to develop improvements for San Pablo Avenue and take steps to acquire San Pablo Avenue from Caltrans to facilitate other strategies.	P&B	mid
	2. Coordinate with Berkeley and Oakland on San Pablo Avenue bicycle and pedestrian safety.	P&B PW	ongoing
	3. Develop conceptual plans and designs for improved pedestrian and bicycle facilities and green street treatments.	P&B PW	long
Goal 2: A walkable city			
2.1	*The pedestrian circulation system shall be as set forth in this Plan and the General Plan and based on the typologies described in the General Plan.*		
	Implement the pedestrian improvement projects identified in this Plan.	PW	by tier
2.2	*Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required.*		
	Implement the sidewalk improvement projects identified in this Plan.	PW	by tier
2.3	*Sidewalks shall be safe, comfortable, and accessible for pedestrians.*		
	Implement the ADA transition plan improvements.	PW	ongoing
2.4	*The City will plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, well-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths.*		
	Implement the pedestrian crossing projects identified in this Plan.	PW	by tier
2.5	*Pedestrian routes will be provided across large blocks, pursuing creative options if necessary such as purchasing private alleys, designating pathways through buildings, and acquiring public access easements.*		
	Implement the pedestrian path projects identified in this Plan.	PW	by tier

Policy	Action Step	Responsible Party	Time-frame
2.6	*Establish Pedestrian Priority Zones in Neighborhood Centers, around schools, and in other locations as indicated in the General Plan, where wider sidewalks, street lighting, crosswalks, and other pedestrian amenities are emphasized. Link these zones to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.*		
	Implement the projects identified in this Plan that are located in pedestrian priority zones.	PW	by tier
2.7	*Walking will be encouraged through building design and ensuring that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.*		
	Develop a mechanism for the entitlement process to confirm that new developments conform to the Emeryville Design Guidelines and this Plan.	P&B	short
2.8	*Safe and direct pedestrian access to Aquatic Park and the peninsula will be provided and maintained.*		
	Implement the projects identified in this Plan for the Marina area and work with the City of Berkeley to improve access to Aquatic Park.	PW	by tier
2.9	*Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development.*		
	Through the entitlement process, ensure that new developments provide safe and comfortable pedestrian access to adjacent streets and bus stops.	P&B PW	ongoing
2.10	*The City will require new development to minimize the number and width of curb cuts for vehicles to reduce vehicle conflicts with pedestrians.*		
	Develop a mechanism for the entitlement process to confirm that new developments conform to the Emeryville Design Guidelines.	P&B	ongoing
2.11	*The City will use the best possible technology as feasible to create the shortest possible wait time for pedestrians at signalized intersections. Particularly, where pedestrian volumes are high, automatic pedestrian walk signals will be provided, where timing allows. Where activation is needed to get a walk signal, a mechanism will be provided to show activation and pedestrian countdown.*		
	Using available pedestrian count data, evaluate which signals should be the highest priority for improvements.	P&B	short
	Commit a percentage of the annual budget for signalized intersection improvements.	PW	mid
2.12	*Where feasible the City will provide drinking fountains, public toilets, benches, and other pedestrian amenities on public property.*		
	Develop an inventory of existing pedestrian amenities in public areas, and create a plan for improving and installing amenities. Identify priority areas for additional amenities such as pedestrian Priority Zones and high volume locations.	PW	mid
2.13	*The City will evaluate and improve existing and proposed uncontrolled marked crosswalks with the purpose of improving pedestrian safety and, in doing so, enhance pedestrian accessibility and mobility.*		
	Improve crossings in accordance with the treatment levels in Chapter 5 of this Plan.	PW	ongoing
2.14	*The City will provide pedestrian-oriented destination signs and walking maps, especially at the transit hubs.*		
	Develop and implement a pedestrian signage program starting at transit hubs and Pedestrian Priority Zones.	P&B PW	mid

Policy	Action Step	Responsible Party	Time-frame
Goal 3: A safe, comprehensive, and integrated bicycle system			
3.1	*The City will develop the bicycle circulation system set forth in the General Plan and based on the typologies described in the General Plan.*		
	Implement the bicycle improvement projects identified in this Plan.	PW	by tier
3.2	*On-street bike routes in the City's Bicycle and Pedestrian Plan shall be designated as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate.*		
	Implement the improvements to Class II bike lanes and Class III bike routes identified in this plan.	PW	by tier
3.3	*The City will construct the network of bicycle boulevards and monitor them for performance goals, as indicated in this Plan.*		
	Monitor bicycle boulevards' performance for speed, volume, and intersection goals, described in Chapters 4 and 6 of this Plan, and pursue appropriate treatments if bicycle boulevards exceed the thresholds for these goals.	PW	ongoing
3.4	*Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking.*		
	1. Create a bicycle parking plan which identifies specific locations, and funding sources for public bicycle parking. Consider secure parking at shopping areas, use of on-street parking lanes, and use of bicycle pods.	PW	mid
	2. Update the bike parking requirements in the zoning code.	PW	short
3.5	*The City will provide showers and changing facilities in civic buildings for employees and, where practical, support the development of such facilities in commercial buildings.*		
	1. Inventory showers and changing facilities in civic buildings, and develop a plan for upgrading or providing these facilities for employees in civic buildings.	PW	mid
	2. Work with developers of non-residential buildings to provide showering facilities for employees.	P&B	ongoing
3.6	*A numbered bike route system with destination signs, consistent with the regional bike route numbering system, shall be developed and implemented with clear signage to bicycle boulevards.*		
	Develop and implement a bicycle destination signage plan that is coordinated with neighboring jurisdictions.	PW	short
3.7	*The City will seek to attract a bicycle store, community bicycle shop, bicycle station, and/or other gathering/retail/shop space for bicyclists.*		
	1. Evaluate opportunities for a bicycle station in the City of Emeryville, in addition to the future bike station at the Transit Center.	P&B	mid
	2. Pursue a community-based bicycle shop, with consideration of providing subsidized space for a community-based non-profit bicycle repair/retail shop.	EDH	short
	3. Install public bicycle maintenance stations at the Emeryville Public Market, on Doyle Street, and on the Bay Trail.	PW	short

Policy	Action Step	Responsible Party	Time-frame
3.8	*The City will improve intersection crossings of bikeways and busy streets and ensure bicycle paths, lanes and routes have good accommodations for crossing high-volume or high-speed roadways.*		
	Implement the intersection improvements identified in Chapters 5, 6, and 7 of this Plan.	PW	by tier
3.9	*All signals shall have functioning bicycle detection and signal timing should be long enough to allow bicyclists to clear the intersection. The City will use the best technology as feasible to create the shortest possible delay for bicyclists*		
	Implement the citywide program to improve signal detection for bicyclists, described in Chapter 5 of this Plan.	PW	ongoing
Goal 4: A regional bicycle and pedestrian network			
4.1	*The City's preferred Bay Trail route through Emeryville is set forth in the General Plan, including the main trail between Frontage Road in Berkeley and Mandela Parkway in Oakland, and spur trails to the Marina along Powell Street and to the Bay Bridge along the east side of Interstate 80.*		
	Implement the Bay Trail as identified in this Plan, and work with ABAG and Oakland to identify this alignment on their maps.	P&B PW	by tier
4.2	*The City will provide bikeways, bike parking, and pedestrian walkways to support connections with transit, including Amtrak, Emery Go Round, AC Transit, and MacArthur, West Oakland, and Ashby BART Stations.*		
	1. Implement the projects identified in this Plan that connect to transit.	P&B	by tier
	2. Implement the transit stop improvements identified in this Plan.	P&B	by tier
	3. Continue to work with Caltrans to move forward on pedestrian and bicycle improvements along the San Pablo Avenue corridor and other locations within the Caltrans right-of-way.	PW	ongoing
4.3	*The City, in collaboration with stakeholders and interested agencies and parties, will study the feasibility of a pedestrian/bicycle trail along the west side of I-80, east of the Emeryville Crescent, to provide access from the Bay Trail to the eastern span of the Bay Bridge.*		
	Identify a funding source for studying the feasibility of a multi-use path along the west side of I-80 to extend the Bay Trail to the eastern span of the Bay Bridge.	P&B	mid
4.4	*Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay.*		
	Actively lobby for and support efforts to construct a bicycle and pedestrian pathway on the west span of the Bay Bridge.	CM	ongoing
Goal 5: Education, encouragement and enforcement to support walking and bicycling			
5.1	*Bicycling will be promoted through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling.*		
	Work with EBBC, Alameda County Public Health Department, Alameda County Transportation Commission, and other organizations and agencies to distribute literature and information related to bicycling and safety, health, and the environment.	PW	ongoing
	Use Measure B funds for more general outreach and marketing of Emeryville as a pedestrian/bicycle friendly city	EDH	ongoing

Policy	Action Step	Responsible Party	Time-frame
5.2	*The City will promote programs that teach people good walking and bicycling habits to last a lifetime. Examples include "Safe Routes to School," children's bicycle safety rodeos, adult bicycle education courses, and traffic citation diversion programs.*		
	1. Establish and fund a Safe Routes to School Program which includes involvement by City staff, school district staff, PTA leaders, and other stakeholders. Consider scheduling regular ongoing meetings to maintain stakeholder involvement.	EDH	short
	2. Organize, advertise, and host bicycle safety training classes taught by trainers certified by the League of American Cyclists.	PD	ongoing
	3. Implement the pedestrian safety education programs recommended in Chapter 4.	PD	ongoing
	4. Consider a Traffic Diversion Program to offer drivers education in lieu of a citation.	PD	ongoing
5.3	*The City will continue to develop materials that increase public awareness of available facilities for safe walking and bicycling, such as a walking/biking map, walking tours/bike tours of the city, street fairs, and pedestrian/bicyclist safety pamphlets, and promote these materials on the City website and at special events.*		
	1. Develop a walking/bicycling map. Include basic information, definitions, and rules.	EDH	mid
	2. Use Measure B funds for more general outreach and marketing of Emeryville as a pedestrian- and bicycle- friendly city.	EDH P&B	mid
	3. Pursue the recommendations in this Plan that increase public awareness of available safe walking and bicycling facilities.	PW	mid
5.4	*The City will support special events that encourage people to bike or walk instead of drive, such as Bike to Work Day, International Walk and Bike to School Day, and the Bike Commute Challenge.*		
	Continue to support Bike to Work Day, Bike Commute Challenge, and work with schools to celebrate International Walk and Bike to School Day.	P&B PW CS	ongoing
5.5	*The City will establish a bicycle/pedestrian route around the city, which highlights locations relevant to Emeryville's history and art.*		
	Expand upon the Public Art Walking Guide by including bicycling and including historic sites.	EDH	mid-long
Goal 6: Funding for pedestrian and bicycle projects and programs			
6.1	*The City will continue to apply for county, regional, state and federal funding opportunities, continue to collect Transportation Improvement Fees, include pedestrian and bicycling facilities as conditions of development, and include pedestrian and bicycle projects and programs in the City Capital Improvement Program.*		
	1. Apply for bicycle or pedestrian related grants as they come available (such as Safe Routes to Schools, Safe Routes to Transit, and Measure B Bicycle and Pedestrian Countywide Discretionary Fund).	EDH	ongoing
	2. Actively lobby for state and federal funding for pedestrian and bicycle improvements and programs	PW	ongoing
6.2	*The City will update its Pedestrian and Bicycle Plan at least every ten years, or as changing conditions warrant, to maintain eligibility for Caltrans funding.*		

Policy	Action Step	Responsible Party	Time-frame
	Update the Pedestrian and Bicycle Plan every five to ten years, or as needed to be eligible for Caltrans funding.	P&B PW	mid-long

8.7. Priority Project Sheets

The Priority Project Sheets in this section present high-priority projects, grouped by location. These sheets can be used when applying for grants or identifying improvements to be made as part of development or redevelopment projects.

Priority Project Sheets include:

Pedestrian Project Sheets

- San Pablo Avenue – 40th Street to Adeline Street
- Powell Street at Christie Avenue
- South Bayfront Area
- Bay Trail from Powell Street to Shorebird Park
- Park Avenue District Pedestrian Improvements
- San Pablo Avenue – Safe Routes to School Project

Bicycle Project Sheets

- Bay Trail – Christie Avenue
- Horton/Overland Bicycle Boulevard Treatments
- Emery Street Corridor
- Doyle Street Connections

Pedestrian Project Sheets

8.7.1 San Pablo Avenue - 40th Street to Adeline Street

Description

In Emeryville there are two adjacent major intersections on San Pablo Avenue. One is the 40th St. transit hub and the other is the Star Intersection formed where Adeline St. and MacArthur Blvd. intersect at San Pablo Ave. Both intersections are auto-dominated with conflicts between motorists and pedestrians. Walking distance between these intersections is long; pedestrians would benefit by a crossing at mid-block.

San Pablo Avenue at 40th Street Transit Hub

Proposed Improvements

T.1 Install primary bus stop improvements (see Table 7.1) and include electronic signage with transit information.

San Pablo at 40th Street Transit Hub:

C.10 Enhance medians and streetscape along 40th St.

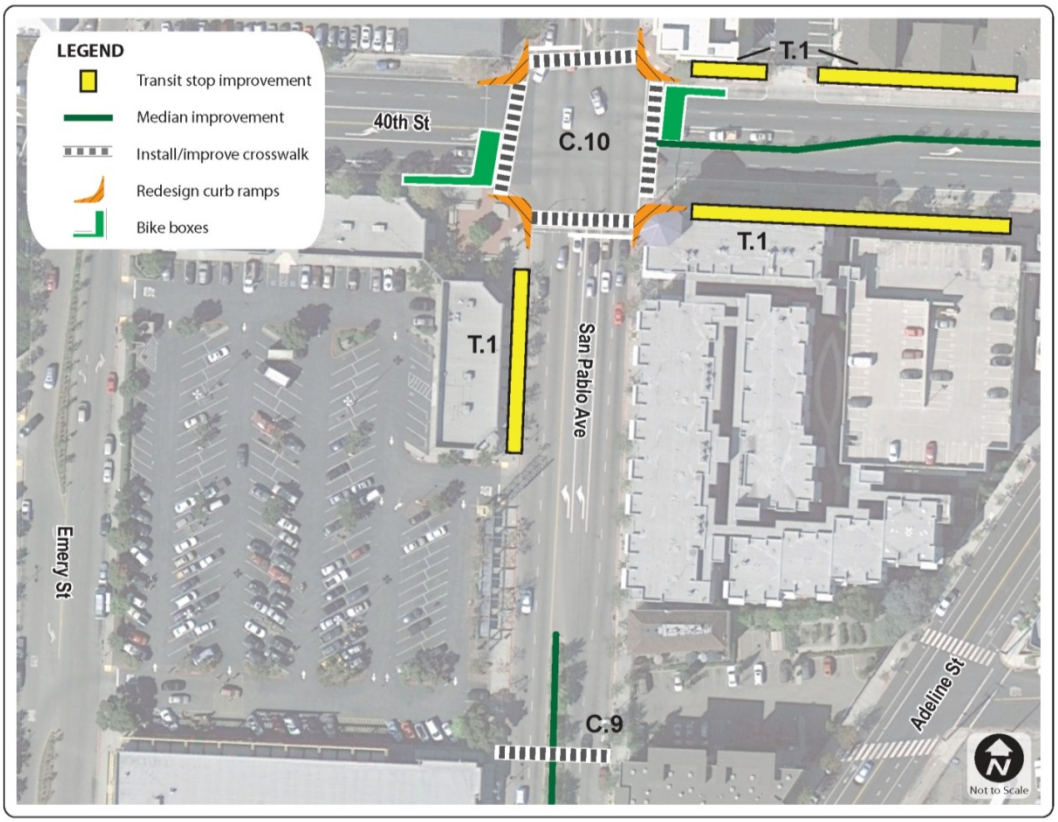
- Redesign curb ramps to direct users into crosswalk on all approaches, as feasible
- Adjust signal timings to improve pedestrian crossings
- Install advance stop lines on San Pablo Ave.
- Consider the viability of installing bike boxes on 40th St.
- Improve maintenance of tree grates and sidewalks

C.9 At San Pablo at Yerba Buena install mid-block crossing of San Pablo Ave.

Install hybrid beacon. Alternatively, consider pedestrian actuated signal that is timed with adjacent signals

- Install high visibility crosswalk markings
- Remove on-street parking and install curb extensions
- Install curb cuts in sidewalk and cut in median for pedestrian refuge.

Design Treatment



8.7.1 San Pablo Avenue - 40th Street to Adeline Street

San Pablo Avenue at Star Intersection

Proposed Improvements

San Pablo Avenue at Stanford Intersection:

C.8 Install and improve crosswalks
Construct medians and install landscaping improvements

Design Treatment



8.7.2 Powell/Christie

Description

Powell St. between I-80 and the railroad is one of the most challenging roadway segments in the City due to high traffic volumes associated with freeway access. The City has adopted the *Powell Street Urban Design Plan* to improve multi-modal travel through phased improvements. Christie Ave. north of Powell St. is a north-south, two-lane street located between I-80 and the railroad. Due to the high residential densities and broad mix of land uses, including office, retail and entertainment, this area has the capacity to support a large percentage of walking trips. There are opportunities for pedestrian improvements throughout the area.

Proposed Improvements

C.15 Improve sidewalks; install crosswalk on north leg of Powell/Christie intersection.

P.1 Powell Street Bridge. Conduct feasibility study for improved pedestrian /bike crossing of railroad; in conjunction with adjacent development seek to improve pedestrian/bike access.

S.1A/B Implement multi use paths, and median and intersection improvements per the Powell Street Urban Design Plan, Phases I and II.

S.11 Install permanent sidewalk adjacent to vacant property.

T.2 Install primary bus stop improvements and casual carpool pick up area. Install long-term bike parking, benches, and information kiosks. Install curb extension in yellow zone in front of Pacific Park Plaza.

Design Treatment



8.7.3 South Bayfront

Description

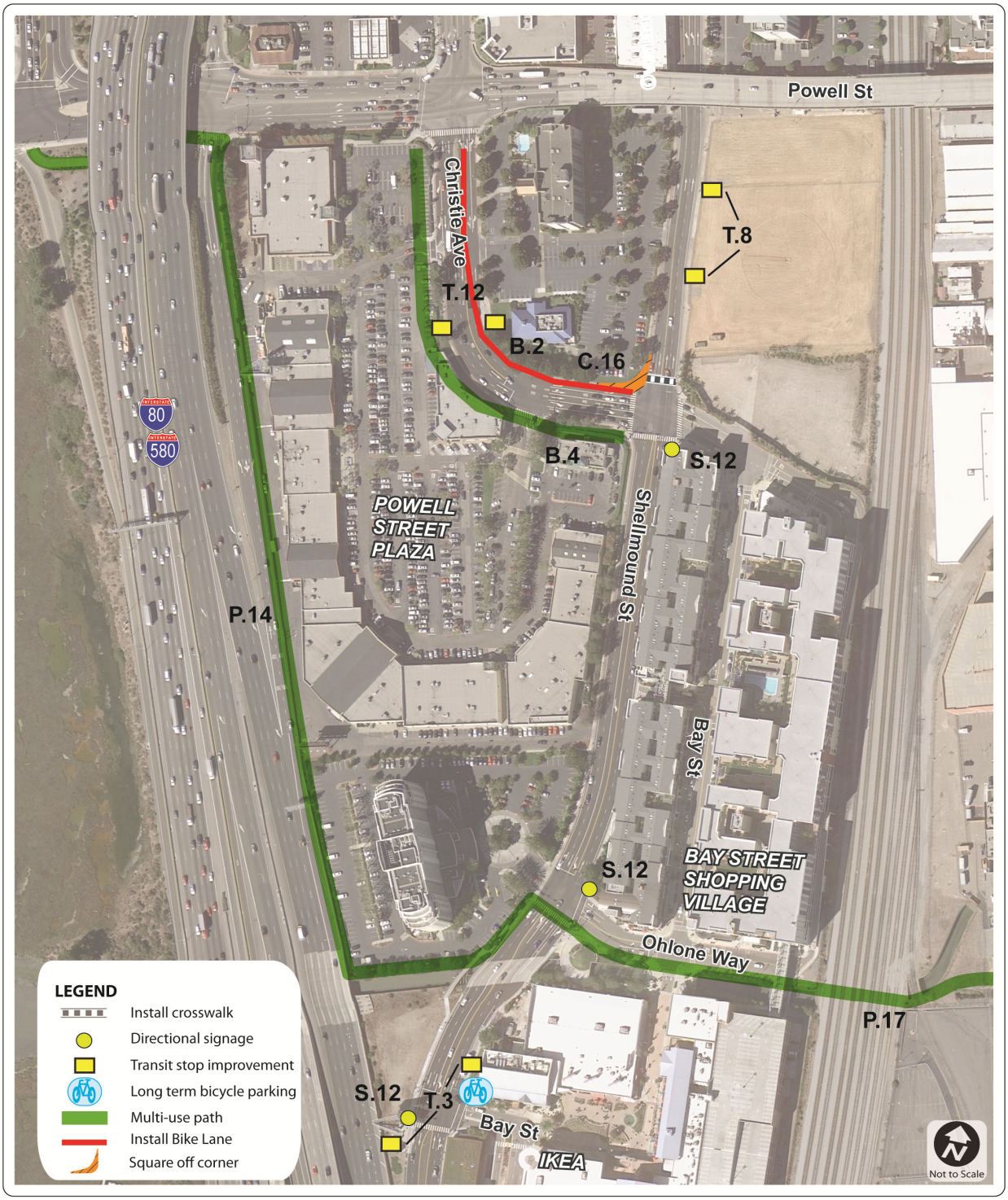
The South Bayfront area, between I-80 and the railroad and south of Powell St., is a regional retail center which includes Bay Street, IKEA, and the Powell Street Plaza. As a destination for out-of-town drivers, the area was designed primarily for auto access. Pedestrian facilities need to be better integrated into this district.

Proposed Improvements

B.2	Restripe Christie Avenue between Shellmound Street and Powell Street to accommodate a bike lane on the north and east sides. The bike lane will be contra-flow between Shellmound Street and the Powell Street Plaza access drive.
B.4	Widen the sidewalk on the west and south sides of Christie Avenue between Powell Street and Shellmound Street to eight feet and set back from the street to provide a multi-use path.
C.16	Shellmound Street at Christie Ave: Install crosswalk on north leg of intersection and square off northwest corner to reduce crossing distance.
P.14	Bay Trail realignment: Construct new multi-use path along west and south perimeter of Powell Street Plaza, in phases, to connect to Ohlone Way and South Bayfront Bridge.
P.17	Build the South Bayfront Bridge over the railroad from Ohlone Way to Horton Landing Park.
S.12	Shellmound St. south of Powell: Install signage on either side of sidewalk gap directing pedestrians to use crosswalk and sidewalk on east side of Shellmound St. Between Ohlone Way and Christie Ave. Install signage directing pedestrians to use Bay Street or sidewalk on west side of Shellmound St.
T.3	Northbound and southbound bus stops on Shellmound at Bay St: Install primary bus stop improvements (see Table 7-1). Include: Benches, providing at least 12 seats Shelters to accommodate the high levels of demand Long- and short-term bike parking Increase wheelchair accessibility at northbound stop by providing a clear path in shelter
T.8	Install primary bus stop improvements (see Table 7-1) at two northbound stops.
T.12	Install secondary bus stop improvements (see Table 7-1) at northbound and southbound stops.

8.7.3 South Bayfront

Design Treatment



8.7.4 Bay Trail from Powell Street to Shorebird Park

Description

The off-street portions of the Bay Trail from Powell Street to just north of Shorebird Park run along a sidewalk parallel to Frontage Road. While the portion of the sidewalk fronting the Hilton Garden Inn has been improved, areas that still need improvement include the segment to the south that fronts the Shell Station and the segment extending north of the hotel to the north end of Shorebird Park.

Proposed Improvements

P.15 Improve existing sidewalk to accommodate multi-use path:

- Shell Station frontage: Install landscaped buffer between path and street. Investigate reducing curb cut area.
- North of Hilton Garden Inn: Replace pavers with smooth surface to better accommodate bicyclists. Install landscaped buffer between path and street. Remove street trees from center of path and relocate to landscaped buffer at roadway edge. At southwest corner of intersection of Frontage Road and the private drive (accessing Chevy's and office complex) tighten turning radius and realign pedestrian push button.

Design Treatment



8.7.5 Park Avenue District Pedestrian Improvements

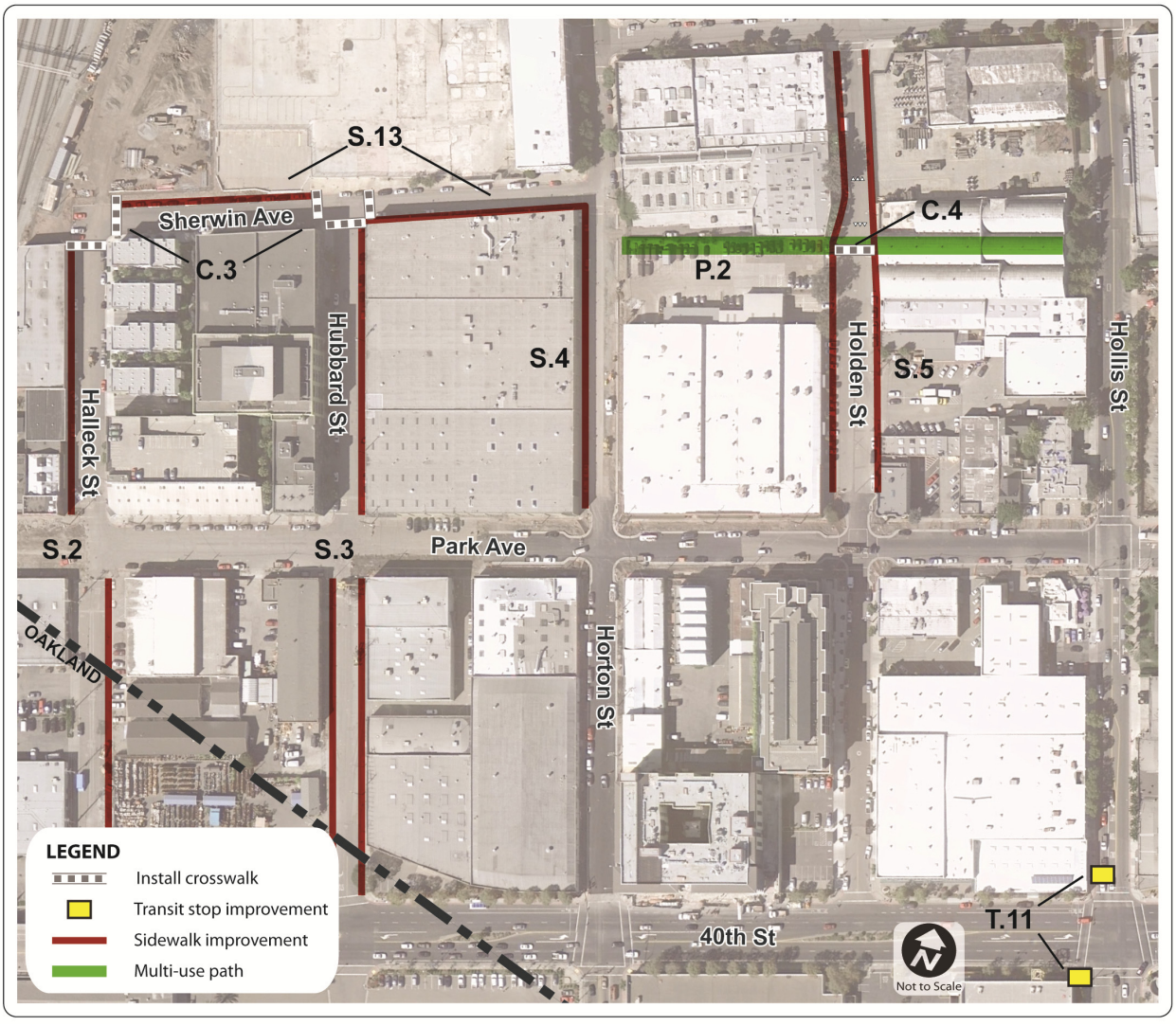
Description

The Park Avenue District is a mixed use neighborhood within the City's historic center. The *Park Avenue District Plan* delineates a series of public improvements to be developed in phases, including improvements to pedestrian facilities. Completion of sidewalks and improved crossings will enhance the pedestrian environment in this fine-grained district.

Proposed Improvements

P.2	Construct mid-block pedestrian path connecting Horton St. to Hollis St. between Park Ave. and 45th St.
C.4	Install high visibility crosswalk with bulb-outs and shark's teeth at mid-block pedestrian path.
S.2	Install sidewalks on Halleck St. between Sherwin Ave. and 40th St. per *Park Avenue District Plan.*
S.3	Install sidewalks on Hubbard St. between Sherwin Ave. and 40th St. per *Park Avenue District Plan.*
S.4	Install sidewalk on Horton St. between Park Ave. and Sherwin Ave. per *Park Avenue District Plan.*
S.5	Install sidewalks on Holden St. between Park Avenue and 45th St. per *Park Avenue District Plan.*
S.13	Install sidewalks on Sherwin Ave. between Halleck St. and Horton St. per *Park Avenue District Plan.*
T.11	Install secondary bus stop improvements (see Table 7-1) eastbound and westbound on 40th St.

Design Treatment



8.7.6 53rd Street Corridor – West and East

Description

Fifty-Third St. traces the approximate historic location of Temescal Creek prior to culverting. This corridor is envisioned as an east-west greenway connecting Temescal Creek Park on the east to Horton Landing Park and the South Bayfront Bridge.

Proposed Improvements

53rd Street Corridor West

C.17 Spur Alley crossing: If easement acquired north of 53rd St. install high-visibility marked crossing, raised crosswalk and advance warning signage.

E.1 Redesign of the 53rd St. corridor as follows:

- Horton St. to Hollis St.: Create bicycle and pedestrian greenway with connection to Horton Landing Park and South Bayfront Bridge. Extend sidewalk area on west side of Horton St. and raise the intersection at Horton St. to create a seamless gateway to Horton Landing Park. Maintain Bike Boulevard designation.
- 53rd St. at Hollis St.: Improve west leg by extending curbs and improving crosswalk markings. Relocate utility boxes on southeast corner to provide adequate pedestrian path of travel.
- Hollis to San Pablo Ave.:
  - Alternative A: Narrow the roadway at selected locations by installing storm-water curb extensions and removing on-street parking. Curb could extend further into roadway to slow vehicle speeds but be mountable to allow for emergency vehicle access. This treatment could be considered at the Spur Alley crossing.
  - Alternative B: Widen sidewalks on both sides. Install bioswales, removing on-street parking in these locations.
  - Alternative C: Widen sidewalk and remove on-street parking on south side only and install faux creek feature along south side.
- 53rd St. at San Pablo Ave.: Improve intersection per C.14 described in 53rd St. Corridor East.

P.5 Construct new north-south multi-use path connecting Doyle St. to 53rd St. at Pickleworks property.

P.7 Construct new east-west multi-use path connecting Horton St., south of 53rd St., to Horton Landing Park and South Bayfront Bridge

B.24 Acquire easement to extend ped/bike access on Spur Alley north of 53rd St. Sign as Class III.

T.9 Northbound and southbound bus stops: Install secondary bus stop improvements (see Table 7.1). Add benches at both stops and shelter at southbound stop.

53rd Street Corridor East

C.14 Improve intersection at San Pablo Ave.:

- Reconcile skewed intersection by clipping southwest corner or use of wedge-shaped crosswalk
- Install new crosswalk on north leg
- Add push buttons and curb ramps to all crossings
- Move existing push buttons if they are not directly adjacent to the curb ramp
- Narrow 53rd St. on west side of San Pablo Ave. with a curb extension on the north side of the street, and realign approach to one lane in each direction.

E.1 As described in 53rd Street Corridor Wast.

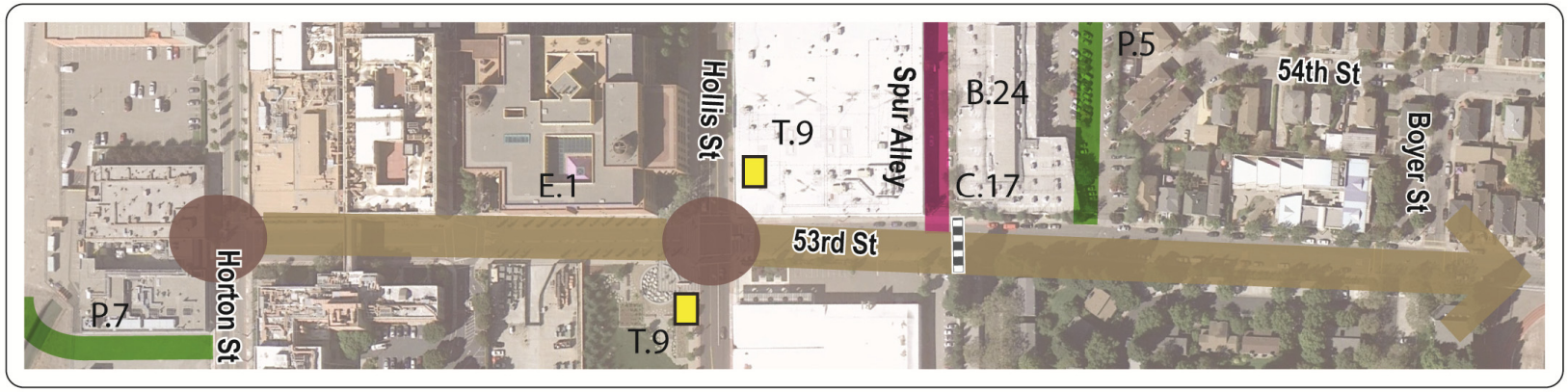
P.4 Construct new north-south multi-use path at west side of Secondary School from 47th St. to 53rd St.

P.11 Install pedestrian path connecting Temescal Creek Park to 53rd St.

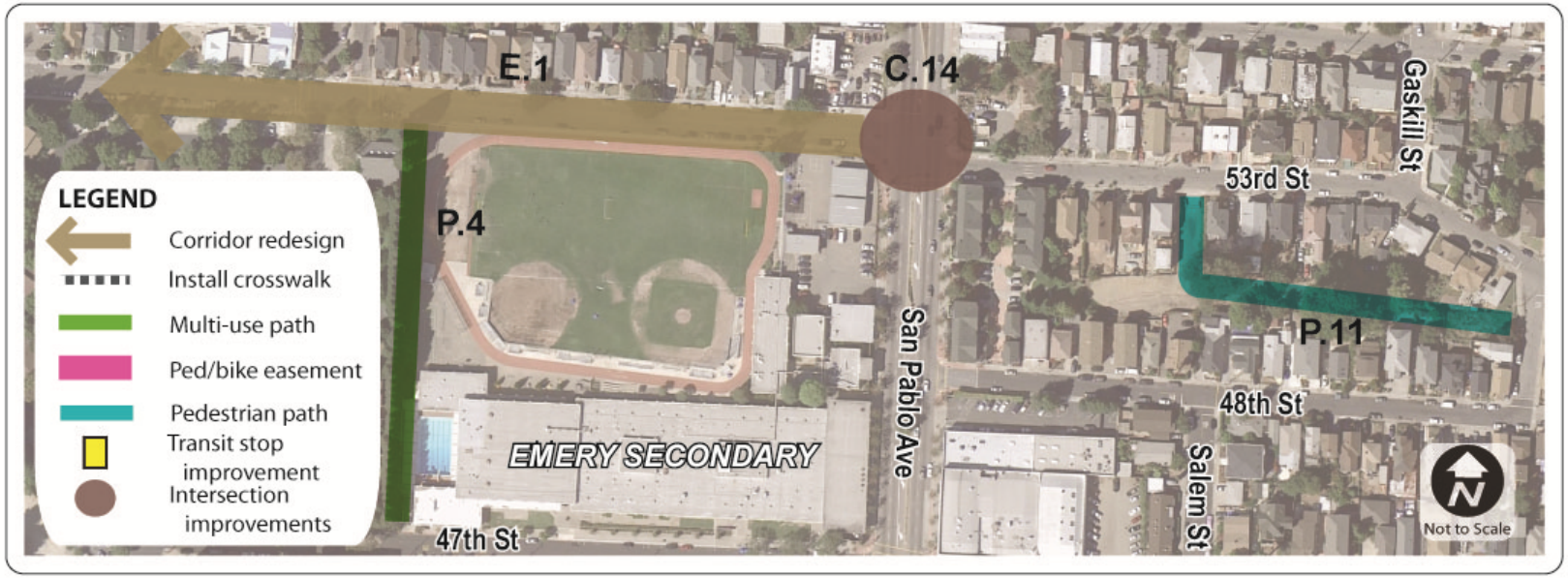
8.7.6. 53rd Street Corridor – West and East

Design Treatment

Design Treatment – 53rd Street West



Design Treatment – 53rd Street East



8.7.7 San Pablo Avenue - Safe Routes to School Project

Description

San Pablo Ave. (State Route 123) is adjacent to Emery Secondary School (grades 6-12) and a private school with pre-K to 8th graders. Anna Yates Elementary School with grades K through 5, is a half block away. Enrollment areas for these schools extend across San Pablo Ave. The road has high traffic volumes (over 20,000 vehicles per day) and motorist compliance with uncontrolled crossings is low.

Proposed Improvements

San Pablo Ave at 43rd St.

C.11 Upgrade in-roadway warning lights, install an overhead flashing beacon on a masthead and/or Rectangular Rapid Flashing Beacons (RRFB)
Replace out-of-compliance warning signs with pedestrian warning signs compliant with the most recent California MUTCD
Refresh the existing crosswalks with new paint and install yield line enhancements.

San Pablo Ave. at 45th St.

C.12 Install new in-roadway warning lights, overhead flashing beacon and/or RRFBs, curb extensions, and median tip.

San Pablo Ave. at 47th St.

C.13 Reevaluate signal timing and pedestrian recall to reduce the wait time for pedestrians. Install new audible pedestrian heads.

8.7.7 San Pablo Avenue - Safe Routes to School Project

Design Treatment



Bicycle Project Sheets

8.7.8 Horton/Overland Bicycle Boulevard Treatments

Description

The Horton/Overland bicycle boulevard provides a continuous north-south connect through Emeryville. This is an important bicycle connection, providing access to the Amtrak Station, the future South Bayfront Bridge, and Mandela Parkway and the Bay Trail in Oakland. Bicyclists share the roadway with motorists except where bike lanes are striped between 62nd St and 53rd St. This corridor exceeds the desire threshold of vehicles per day and volumes are expected to increase with future development. Treatments are needed to improve bicycle safety and circulation.

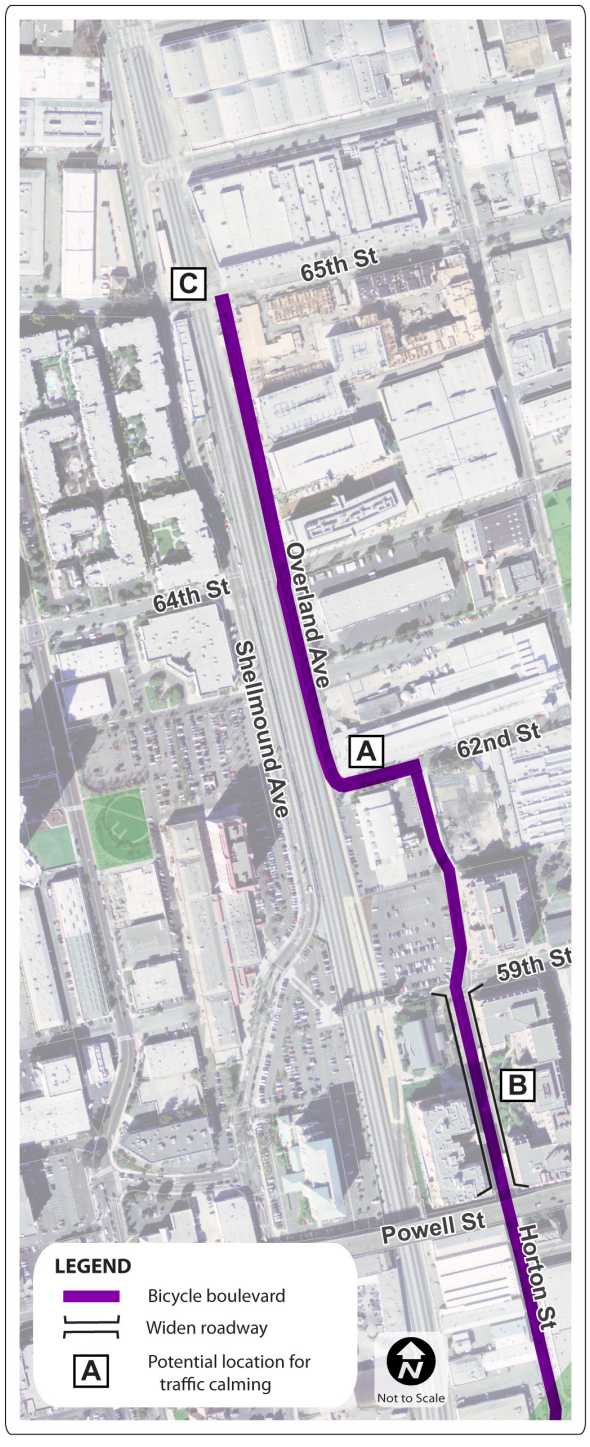
Proposed Improvements

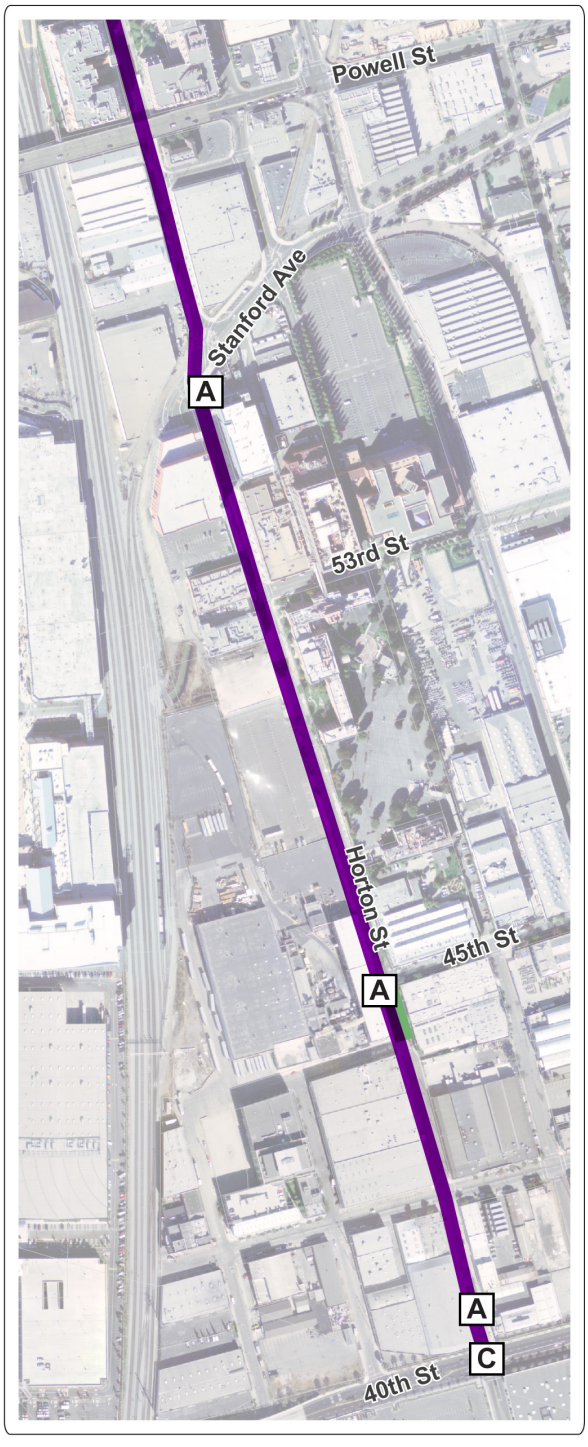
B.21 Implement the bicycle boulevard treatments as described in Chapter 6. Measure speeds throughout and, to slow traffic, consider speed cushions, tables, split lumps, curb extensions, median islands and permanent speed feedback signs to reduce vehicle speeds.

A. Consider diversion at 62nd St, Stanford Ave, 45th St, and 40th St. Diversion to be installed on a trial basis only after evaluation with community input and traffic analysis.
B. Explore roadway widening between 59th St and Powell St to better accommodate bicycle lanes on both sides and a loading lane on the east side.
C. Improve bicycle detection and turning movements at 40th St and at 65th St.

8.7.8 Horton/Overland Bicycle Boulevard Treatments

Design Treatment





8.7.9 Emery Street Corridor

Description

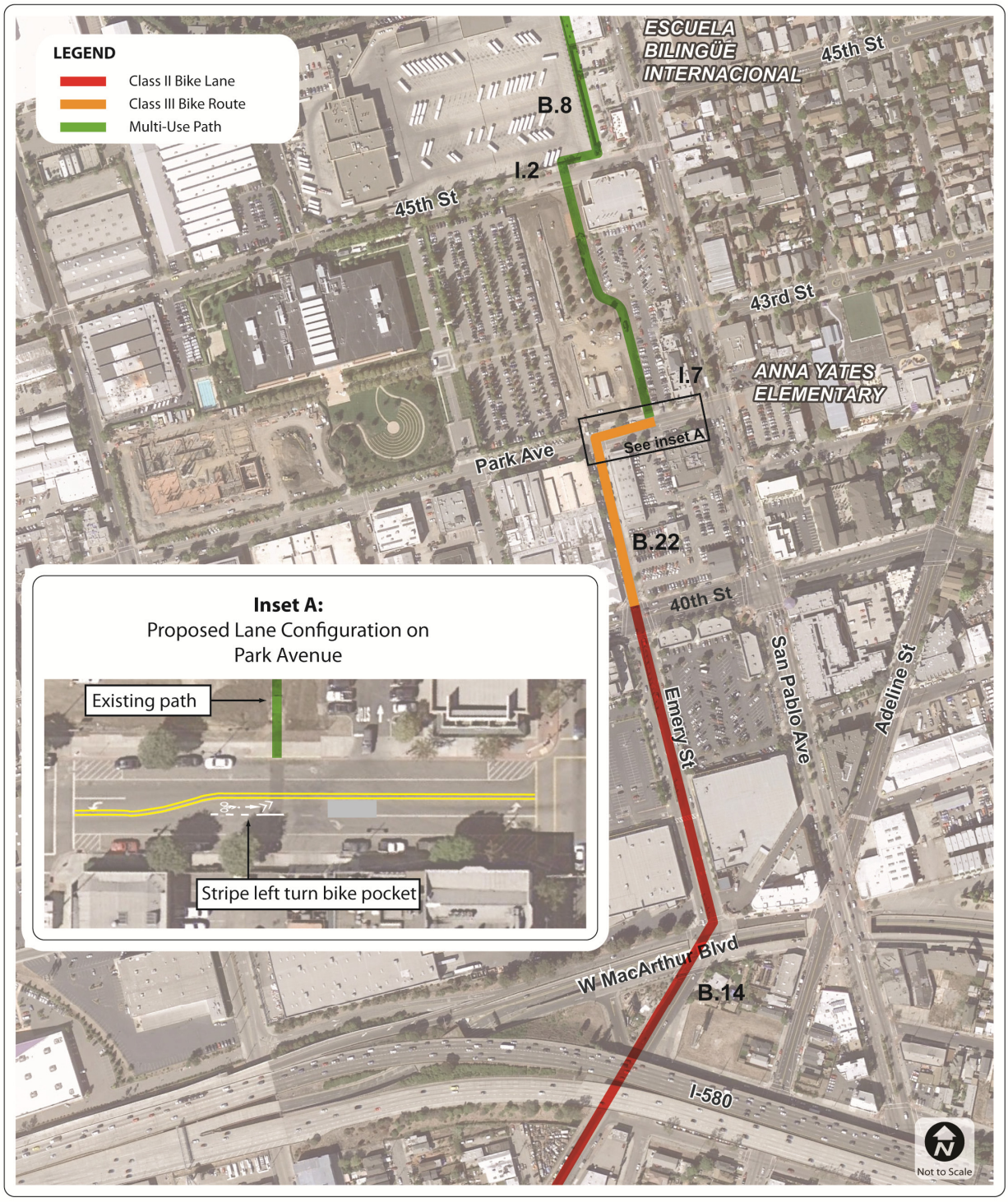
One block west of San Pablo Ave, Emery St provides an alternative parallel bicycling route. Although Emery St is only two blocks in length, it is extended to the south into Oakland via Peralta St. The northern terminus joins with the Joseph Emery multi use path from Park Ave to 45th St. There is potential for a northerly extension of this multi use path to connect with Emery Secondary School and the Emeryville Center for Community Life.

Proposed Improvements

B.8	Construct new multi use path between 45th and 47th Streets through modification or redevelopment of the AC Transit facility.
B.14	Install bike lanes on Peralta St to Oakland border. Peralta St has a 48-foot paved width but only two travel lanes.
B.22	Sign Class III bike route on Emery St and install bicycle left-turn pocket eastbound on Park Ave for left turn into Joseph Emery Park Path.
I.2	When multi use path is extended to 47th St (B.8 above) install high visibility crossing with bulb-outs and shark's teeth.
I.7	On Park Ave provide center left-turn lane for eastbound cyclists turning north onto Joseph Emery Path.

8.7.9 Emery Street Corridor

Design Treatment



8.7.10 Doyle Street Connections

Description

The Doyle St bicycle boulevard provides good bicycle access in the northeast part of the city. Connections to the south and west can be improved.

Proposed Improvements

B.11 Acquire easement and construct Class III facility connecting Doyle St with 53rd St through the Pickleworks property. Install sharrows through parking lot.

B.16 Improve bicycle boulevard on Stanford between Hollis and Doyle Streets.
Measure speeds and volumes
Install bicycle boulevard signage
Install traffic calming treatments and shared lane marking
Install bicycle detection in bike lane at Hollis St.

B.20 Measure speeds and volumes on Doyle St bicycle boulevard. Install hybrid beacon or full signal at Powell St. Install bicycle boulevard signage and pavement marking south of 59th St.

B.24 Acquire easement and extend bike route on Spur Alley north of 53rd St to Hollis St.

I.6 Install traffic signal, stencils, and markings where Doyle St bicycle boulevard crosses Powell St. (Note: approved development is required to contribute to the cost of a traffic signal. Otherwise, install hybrid beacon or signal/actuated flashing beacon.)

8.7.10 Doyle Street Connections

Design Treatment



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Proposed Updates to the CEQA Guidelines

August 11

2015

Section 21083 of the Public Resources Code requires regular updates to the Guidelines Implementing the California Environmental Quality Act. This is a preliminary discussion draft of potential updates.

Preliminary Discussion Draft

August 11, 2015

LETTER FROM THE DIRECTOR

The Governor's Office of Planning and Research is pleased to provide this discussion draft of changes to the CEQA Guidelines. In recent years, updates have responded to specific statutory directives to address new topics. In 2013, OPR and the Natural Resources Agency broadly solicited suggestions from stakeholders regarding what updates, if any, should be made to the CEQA Guidelines. This package reflects input received from stakeholders. The concepts in this package have been discussed in various forums, including professional conferences hosted by the Association of Environmental Planners, the California Chapter of the American Planning Association and the California State Bar. Today, we ask for your input on this draft.

This is, first and foremost, a *discussion* draft. We seek input from all parts of California and all aspects of our economy, population, and environment. Please let us know what you think. Send comments to: CEQA.Guidelines@resources.ca.gov by October 12, 2015.

We look forward to hearing from you.



Ken Alex
Director

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Executive Summary

Preliminary Discussion Draft of Amendments to the CEQA Guidelines

Background

The last comprehensive update to the CEQA Guidelines occurred in the late 1990s. Since 2011, the Governor's Office of Planning and Research (OPR) has informally collected ideas on possible improvements to the CEQA Guidelines. In 2013, OPR distributed a formal Solicitation for Input on possible improvements. Specifically, OPR asked for suggestions on efficiency improvements, substantive improvements, and technical improvements. Stakeholders offered many ideas. After considering this input, OPR developed a possible list of topics to address in the update, and again sought and received substantial public input. This document contains initial thoughts on possible amendments to the CEQA Guidelines. It reflects not only input that the OPR received during public comment on the Solicitation for Input and possible list of topics, but also input received during informal stakeholder meetings, conferences, and other venues.

What is in this Package?

The preliminary discussion draft contains changes or additions involving nearly thirty different sections of the Guidelines addressing nearly every step of the environmental review process. It is a ***balanced*** package that is intended to make the process easier and quicker to implement, and better protect natural and fiscal resources consistent with other state environmental policies.

Efficiency Improvements

The discussion draft proposes several changes intended to result in a smoother, more predictable process for agencies, project applicants and the public.

First, the package promotes use of existing **regulatory standards** in the CEQA process. Using standards as "thresholds of significance" creates a predictable starting point for the analysis, and allows agencies to rely on the expertise of the regulatory body, without foreclosing consideration of possible project-specific effects.

Second, the package proposes to update, consolidate and streamline the **environmental checklist** that most agencies use to conduct their environmental review. Redundant questions in the existing checklist would be eliminated, some questions would be updated to address contemporary topics, and some topics would be reorganized to make better use of existing data, particularly related to open space. The checklist has also been updated with new questions related to tribal cultural resources, transportation and wildfire, pursuant to Assembly Bill 52 (Gatto, 2014), Senate Bill 743 (Steinberg, 2013), and Senate Bill 1241 (Kehoe, 2012), respectively.

Third, the package includes several changes to make existing programmatic environmental review easier to use for later projects. Specifically, it clarifies the rules on **tiering**, and provides additional guidance on when a later project may be considered **within the scope** of a program EIR.

Fourth, the package enhances several **exemptions**. For example, consistent with Senate Bill 743 (Steinberg, 2013), it expands an existing exemption for projects implementing a specific plan to include not just residential, but also commercial and mixed-use projects near transit. It also clarifies the rules on the exemption for changes to existing facilities so that vacant buildings can more easily be redeveloped. Changes to that same exemption would also promote pedestrian, bicycle and streetscape improvements within an existing right of way.

Finally, the package includes a new section to assist agencies in complying with CEQA in response to a court's **remand**, and help the public and project proponents understand the effect of the remand on project implementation.

Substantive Improvements

The package also contains substantive improvements related to environmental protection.

First, the package would provide guidance regarding **energy** impacts analysis. Specifically, it would require an EIR to include an analysis of a project's energy impacts that addresses not just building design, but also transportation, equipment use, location, and other relevant factors.

Second, the package proposes guidance on the analysis of **water supply** impacts. The guidance is built on the holding in the California Supreme Court decision in *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal. 4th 412. It requires analysis of a proposed project's possible sources of water supply over the life of the project and the environmental impacts of supplying that water to the project. The analysis must consider any uncertainties in supply, as well as potential alternatives.

Technical Improvements

The package also includes many technical changes to conform to recent cases and statutory changes. For example, one of the changes clarifies when it may be appropriate to use projected future conditions as the **environmental baseline**. Another change addresses when agencies may defer specific details of **mitigation measures** until after project approval. The package also proposes a set of changes related to the duty of lead agencies to provide detailed **responses to comments** on a project. The changes would clarify that a general response may be appropriate when a comment submits voluminous data and information without explaining its relevance to the project. Other changes address a range of topics such as **selecting the lead agency**, **posting notices** with county clerks, clarifying the definition of "**discretionary**," and others.

What is Not in the Package?

This package does not contain several elements that have been discussed among stakeholders.

First, changes related to transportation analysis, required by SB 743, were released for public review in August 2014. OPR is still revising that proposal in response to stakeholder comments. The revised proposal will be released separately.

Second, OPR had originally included changes related to the analysis of greenhouse gas emissions among the topics that it might cover in a comprehensive update. Similarly, stakeholders suggested that the CEQA Guidelines should clarify whether CEQA requires analysis of impacts of the environment on a project. The California Supreme Court, however, is now considering those issues in several cases. OPR does not propose to address those topics while they are under consideration at the Supreme Court.

How Can I Provide Input?

This is a preliminary discussion draft, which we expect to change for the better through public input. We hope that you will share your thoughts and expertise in this effort.

When and Where to Submit Comments

Input may be submitted electronically to CEQA.Guidelines@resources.ca.gov. While electronic submission is preferred, suggestions may also be mailed or hand delivered to:

Christopher Calfee, Senior Counsel
Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

Please submit all suggestions before **October 12, 2015** at **5:00 p.m**. Once the comment period closes, OPR will review all written input and revise the proposal as appropriate. If substantial changes are made, OPR may seek additional public input. Once the draft has advanced to the point that most issues have been aired, it will submit the draft to the Natural Resources Agency, which will then commence a formal rulemaking process. Once the Natural Resources Agency adopts the changes, they undergo review by the Office of Administrative Law.

Tips for Providing Effective Input

OPR would like to encourage robust engagement in this update process. We expect that participants will bring a variety of perspectives. While opposing views may be strongly held, discourse can and should proceed in a civil and professional manner. To maximize the value of your input, please consider the following:

- In your comment(s), please clearly identify the specific issues on which you are commenting. If you are commenting on a particular word, phrase, or sentence, please provide the page number and paragraph citation.
- Explain why you agree or disagree with OPR's proposed changes. Where you disagree with a particular portion of the proposal, please suggest alternative language.

- Describe any assumptions and support assertions with legal authority and factual information, including any technical information and/or data. Where possible, provide specific examples to illustrate your concerns.
- When possible, consider trade-offs and potentially opposing views.
- Focus comments on the issues that are covered within the scope of the proposed changes. Avoid addressing rules or policies other than those contained in this proposal.
- Consider quality over quantity. One well-supported comment may be more influential than one hundred form letters.
- Please submit any comments within the timeframe provided.

Tips for Reviewing This Document

This document is lengthy, in part because it includes both existing and proposed changes to the CEQA Guidelines. The following pages contain an index of proposed changes grouped into categories. Each amendment listed in the index is hyperlinked to the full discussion of that amendment. You can jump directly to that discussion by pressing the "Ctrl" and clicking on the link. Each discussion contains background, detailed explanation of the proposed changes, and the text of the proposed amendments in **underline/~~strikeout~~** format.

Efficiency Improvements

The following pages describe proposed amendments intended to increase the efficiency of the environmental review process. Those potential efficiency improvements address:

- Using regulatory standards in the CEQA process
- Determining whether a project is "within the scope" of a program EIR
- Clarifying that restrictive tiering rules apply only to tiering, and not to other streamlining
- Using the new exemption for transit oriented developments
- Using the Existing Facilities Exemption
- Updates to the Sample Environmental Checklist in Appendix G
- Remand and Remedies

Using Regulatory Standards in CEQA

Proposed Amendments to Sections 15064 and 15064.7

Background

One purpose of the CEQA Guidelines is to provide "criteria for public agencies to follow in determining whether or not a proposed project may have a 'significant effect on the environment.'" (Pub. Resources Code, § 21083(b).) Courts have recognized that thresholds of significance may assist lead agencies in determining whether impacts are significant. (*Communities for a Better Environment v. Resources Agency* (2002) 103 Cal.App.4th 98, 111 ("a lead agency's use of existing environmental standards in determining the significance of a project's environmental impacts is an effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with other environmental program planning and regulation").)

CEQA also directs local agencies to "integrate the requirements of [CEQA] with planning and environmental review procedures otherwise required by law or by local practice…." (Pub. Resources Code § 21003(a).) The sample initial study checklist in Appendix G of the State CEQA Guidelines, for example, includes several questions asking about compliance with regulatory standards. (See, e.g., State CEQA Guidelines, App. G, IX(a) ("Would the project… [v]iolate any water quality standards or waste discharge requirements").) In practice, many local governments also treat regulatory standards as thresholds of significance. (*Oakland Heritage Alliance v. City of Oakland* (2011) 195 Cal. App. 4th 884, 904 ("compliance with the Building Code, and the other regulatory provisions, in conjunction with the detailed Geotechnical Investigation, provided substantial evidence that the mitigation measures would reduce seismic impacts to a less than significant level").)

In 1998, the Resources Agency adopted amendments to the CEQA Guidelines that would have, among other things, defined regulatory "standards" and codified the role of such standards in a CEQA analysis. Those amendments were later determined to be invalid because they failed to incorporate the fair argument standard. (*Comm. for a Better Env., et al., v. Resources Agency* (2002) 103 Cal.App.4th 98, 114 ("*CBE*").) The court in *CBE* did not, however, suggest that standards should not be used in a CEQA analysis. On the contrary, according to the Third District Court of Appeal "a lead agency's use of existing environmental standards in determining the significance of a project's environmental impacts is an effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with other environmental program planning and regulation." (*Comm. for a Better Env., supra,* 103 Cal.App.4th at 111; see also *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal. App. 4th 1099, 1108 ("invalidation of former Guidelines section 15064, subdivision (h), was not a repudiation of the use of thresholds of significance altogether").)

Explanation of Proposed Amendments

OPR proposes to update sections 15064 and 15064.7 to expressly provide that lead agencies may use thresholds of significance in determining significance, and that some regulatory standards may be appropriately used as thresholds of significance.

Explanation of Proposed Amendments to Section 15064

OPR proposes to amend Section 15064 to expressly provide that lead agencies may use thresholds of significance in determining whether the impacts of a project may be significant. Specifically, OPR proposes to add subdivision (b)(2) to Section 15064.

The first sentence of proposed subdivision (b)(2) states the rule that thresholds of significance may be used to determine significance. (See *CBE v. Resources Agency*, *supra*, 103 Cal.App.4th at 111; see also *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal. App. 4th 1099, 1111.) Importantly, that sentence provides a cross-reference to Section 15064.7, which defines a threshold of significance.

The second sentence provides that an agency that relies on a threshold to determine the significance of an impact should explain how application of the threshold indicates a less than significant effect. This sentence recognizes the court's caution in *Protect the Historic Amador Waterways* that "thresholds cannot be used to determine *automatically* whether a given effect will or will not be significant." (*Protect the Historic Amador Waterways, supra*, 116 Cal. App. 4th at pp. 1108-1109.) This sentence is also consistent with a similar provision in existing subdivision (h)(3), which states: "When relying on a plan, regulation or program [to evaluate cumulative impacts], the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable." (State CEQA Guidelines § 15064(h)(3).) Demonstrating that compliance with a threshold indicates that a project's impact is less than significant is impliedly already required by CEQA. For example, an initial study must include sufficient information to support its conclusions. (State CEQA Guidelines, § 15063(d)(3).) Similarly, section 15128 requires a lead agency to explain briefly the reasons that an impact is determined to be less than significant and therefore was not analyzed in an EIR.

Finally, the third sentence cautions that a lead agency must evaluate any substantial evidence supporting a fair argument that, despite compliance with thresholds, the project's impacts are nevertheless significant. (*Protect the Historic Amador Waterways, supra,* 116 Cal. App. 4th at pp. 1108-1109 ("thresholds cannot be used to determine automatically whether a given effect will or will not be significant[;]" rather, "thresholds of significance can be used only as a measure of whether a certain environmental effect 'will normally be determined to be significant' or 'normally will be determined to be less than significant' by the agency"); see also *CBE*, *supra*, 103 Cal.App.4th at 112-113.)

Explanation of Proposed Amendments to Section 15064.7

Because environmental standards, if used correctly, may promote efficiency in the environmental review process, OPR proposes to add subdivision (d) to Section 15064.7 on thresholds of significance. Consistent with the rulings in both *Communities for a Better Environment, supra*, and *Protect the Historic*

Amador Waterways, supra, the first sentence recognizes that lead agencies may treat environmental standards as thresholds of significance.

The second sentence provides that in adopting or applying an environmental standard as a threshold, the lead agency should explain how application of the environmental standard indicates a less than significant effect. This sentence recognizes the court's caution in *Protect the Historic Amador Waterways* that "thresholds cannot be used to determine *automatically* whether a given effect will or will not be significant." (*Protect the Historic Amador Waterways, supra*, 116 Cal. App. 4th at pp. 1108-1109.) This sentence is also consistent with a similar provision in existing subdivision (h)(3), which states: "When relying on a plan, regulation or program [to evaluate cumulative impacts], the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable." (State CEQA Guidelines § 15064(h)(3); see also §§ 15063(d)(3) (requiring an initial study to include sufficient information to support its conclusions); 15128 (requiring a lead agency to explain briefly the reasons that an impact is determined to be less than significant and therefore was not analyzed in an EIR).)

Finally, the third sentence provides criteria to assist a lead agency in determining whether a particular environmental standard is appropriate for use as a threshold of significance. The first criterion requires that the standard actually be adopted by some formal mechanism. This is necessary to prevent informal standards from being used that have never been subject to any decisionmaker's judgment or public scrutiny. The second criterion requires the standard to actually be adopted for the purpose of environmental protection. This is necessary to prevent reliance on market regulations, for example. The third criterion requires that the standard actually govern the impact at issue. This is necessary to prevent reliance on a standard that is not related to the impact of concern. (See, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16–20; *Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm*. (2001) 91 Cal.App.4th 1344, 1382 (requiring analysis of single event noise despite compliance with cumulative noise standard).) The last criterion is that the standard must actually govern the project type.

Notably, OPR also proposes to amend Section 15064 to clarify the appropriate use of thresholds of significance. Those provisions would also apply to environmental standards that are used as thresholds of significance.

Text of Proposed Amendments to Section 15064

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15064. Determining the Significance of the Environmental Effects Caused by a Project

(a) Determining whether a project may have a significant effect plays a critical role in the CEQA process.

(1) If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, the agency shall prepare a draft EIR.

(2) When a final EIR identifies one or more significant effects, the lead agency and each responsible agency shall make a finding under Section 15091 for each significant effect and may need to make a statement of overriding considerations under Section 15093 for the project.

(b) **(1)** The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting. For example, an activity which may not be significant in an urban area may be significant in a rural area.

(2) Thresholds of significance, as defined in Section 15064.7(a), may assist lead agencies in determining the significance of an impact. When relying on a threshold, the lead agency should explain how compliance with the threshold indicates that the project's impacts are less than significant. A lead agency shall not apply a threshold in a way that forecloses consideration of substantial evidence showing that, despite compliance with the threshold, there may still be a significant environmental effect from a project.

(c) In determining whether an effect will be adverse or beneficial, the lead agency shall consider the views held by members of the public in all areas affected as expressed in the whole record before the lead agency. Before requiring the preparation of an EIR, the lead agency must still determine whether environmental change itself might be substantial.

(d) In evaluating the significance of the environmental effect of a project, the lead agency shall consider direct physical changes in the environment which may be caused by the project and reasonably foreseeable indirect physical changes in the environment which may be caused by the project.

(1) A direct physical change in the environment is a physical change in the environment which is caused by and immediately related to the project. Examples of direct physical changes in the environment are the dust, noise, and traffic of heavy equipment that would result from construction of a sewage treatment plant and possible odors from operation of the plant.

(2) An indirect physical change in the environment is a physical change in the environment which is not immediately related to the project, but which is caused indirectly by the project. If a direct physical change in the environment in turn causes another change in the environment, then the other change is an indirect physical change in the environment. For example, the construction of a new sewage treatment plant may facilitate population growth in the service area due to the increase in sewage treatment capacity and may lead to an increase in air pollution.

(3) An indirect physical change is to be considered only if that change is a reasonably foreseeable impact which may be caused by the project. A change which is speculative or unlikely to occur is not reasonably foreseeable.

(e) Economic and social changes resulting from a project shall not be treated as significant effects on the environment. Economic or social changes may be used, however, to determine that a physical change shall be regarded as a significant effect on the environment. Where a physical change is caused by economic or social effects of a project, the physical change may be regarded as a significant effect in the same manner as any other physical change resulting from the project. Alternatively, economic and social effects of a physical change may be used to determine that the physical change is a significant effect on the environment. If the physical change causes adverse economic or social effects on people, those adverse effects may be used as a factor in determining whether the physical change is significant. For example, if a project would cause overcrowding of a public facility and the overcrowding causes an adverse effect on people, the overcrowding would be regarded as a significant effect.

(f) The decision as to whether a project may have one or more significant effects shall be based on substantial evidence in the record of the lead agency.

(1) If the lead agency determines there is substantial evidence in the record that the project may have a significant effect on the environment, the lead agency shall prepare an EIR (Friends of B Street v. City of Hayward (1980) 106 Cal. App. 3d 988). Said another way, if a lead agency is presented with a fair argument that a project may have a significant effect on the environment, the lead agency shall prepare an EIR even though it may also be presented with other substantial evidence that the project will not have a significant effect (No Oil, Inc. v. City of Los Angeles (1974) 13 Cal. 3d 68).

(2) If the lead agency determines there is substantial evidence in the record that the project may have a significant effect on the environment but the lead agency determines that revisions in the project plans or proposals made by, or agreed to by, the applicant would avoid the effects or mitigate the effects to a point where clearly no significant effect on the environment would occur and there is no substantial evidence in light of the whole record before the public agency that the project, as revised, may have a significant effect on the environment then a mitigated negative declaration shall be prepared.

(3) If the lead agency determines there is no substantial evidence that the project may have a significant effect on the environment, the lead agency shall prepare a negative declaration (Friends of B Street v. City of Hayward (1980) 106 Cal. App. 3d 988).

(4) The existence of public controversy over the environment effects of a project will not require preparation of an EIR if there is no substantial evidence before the agency that the project may have a significant effect on the environment.

(5) Argument, speculation, unsubstantiated opinion or narrative, or evidence that is clearly inaccurate or erroneous, or evidence that is not credible, shall not constitute substantial evidence. Substantial evidence shall include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts.

(6) Evidence of economic and social impacts that do not contribute to or are not caused by physical changes in the environment is not substantial evidence that the project may have a significant effect on the environment.

(7) The provisions of sections 15162, 15163, and 15164 apply when the project being analyzed is a change to, or further approval for, a project for which an EIR or negative declaration was previously certified or adopted (e.g. a tentative subdivision, conditional use permit). Under case law, the fair argument standard does not apply to determinations of significance pursuant to sections 15162, 15163, and 15164.

(g) After application of the principles set forth above in Section 15064(f), and in marginal cases where it is not clear whether there is substantial evidence that a project may have a significant effect on the environment, the lead agency shall be guided by the following principle: If there is disagreement among expert opinion supported by facts over the significance of an effect on the environment, the Lead Agency shall treat the effect as significant and shall prepare an EIR.

(h)(1) When assessing whether a cumulative effect requires an EIR, the lead agency shall consider whether the cumulative impact is significant and whether the effects of the project are cumulatively considerable. An EIR must be prepared if the cumulative impact may be significant and the project's incremental effect, though individually limited, is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

(2) A lead agency may determine in an initial study that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable and thus is not significant. When a project might contribute to a significant cumulative impact, but the contribution will be rendered less than cumulatively considerable through mitigation measures set forth in a mitigated negative declaration, the initial study shall briefly indicate and explain how the contribution has been rendered less than cumulatively considerable.

(3) A lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including, but not limited to, water quality control plan, air quality attainment or maintenance plan, integrated waste management plan, habitat conservation plan, natural community conservation plan, plans or regulations for the reduction of greenhouse gas emissions) that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources through a public review process to implement, interpret, or make specific the law enforced or administered by the public agency. When relying on a plan, regulation or program, the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding that the project complies with the specified plan or mitigation program addressing the cumulative problem, an EIR must be prepared for the project.

(4) The mere existence of significant cumulative impacts caused by other projects alone shall not constitute substantial evidence that the proposed project's incremental effects are cumulatively considerable.

AUTHORITY:

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Sections 21003, 21065, 21068, 21080, 21082, 21082.1, 21082.2, 21083, 21083.05 and 21100, Public Resources Code; No Oil, Inc. v. City of Los Angeles (1974) 13 Cal.3d 68; San Joaquin Raptor/Wildlife Center v. County of Stanislaus (1996) 42 Cal.App.4th 608; Gentry v. City of Murrieta (1995) 36 Cal.App.4th 1359; Laurel Heights Improvement Assn. v. Regents of the University of California (1993) 6 Cal.4th 1112; ~~**and**~~ Communities for a Better Environment v. California Resources Agency (2002) 103 Cal.App.4th 98**; Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal. App. 4th 1099**.

Text of Proposed Amendments to Section 15064.7

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15064.7. Thresholds of Significance

(a) Each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects. A threshold of significance is an identifiable quantitative, qualitative or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant.

(b) Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence.

(c) When adopting thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

(d) Any public agency may adopt or use an environmental standard as a threshold of significance. In adopting or using an environmental standard as a threshold of significance, a public agency shall explain how the particular requirements of that environmental standard will avoid or reduce project impacts, including cumulative impacts, to a less than significant level. For the purposes of this

subdivision, an "environmental standard" is a rule of general application that is adopted by a public agency through a public review process and that is all of the following:

(1) a quantitative, qualitative or performance requirement found in an ordinance, resolution, rule, regulation, order, or other environmental requirement of general application;

(2) adopted for the purpose of environmental protection;

(3) addresses the same environmental effect caused by the project; and,

(4) is designed to apply to the type of project under review.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21000, 21082 and 21083, Public Resources Code**; *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal. App. 4th 1099**.

"Within the Scope" of a Program EIR

Proposed Amendments to Section 15168

Background

Administrative efficiency has long been an explicit policy in CEQA. (See Pub. Resources Code § 21003(f) (statement of legislative intent that "[a]ll persons and public agencies involved in the environmental review process be responsible for carrying out the process in the most efficient, expeditious manner in order to conserve the available financial, governmental, physical, and social resources with the objective that those resources may be better applied toward the mitigation of actual significant effects on the environment").) The CEQA Guidelines encourage efficiency in several ways, including the provisions regarding program EIRs.

Program EIRs can be used to evaluate a series of connected actions, such as adoption and implementation of regulations or land use plans, in one environmental document. Section 15168 of the CEQA Guidelines governs the preparation and later use of program EIRs. It suggests that program EIRs are particularly useful in addressing big picture alternatives and cumulative impacts. When a program EIR is sufficiently detailed, later activities may be approved on the basis of that document without conducting further environmental review. The key question in determining whether additional review is required is whether the later activity falls "within the scope" of the project analyzed in the EIR. (State CEQA Guidelines § 15168(c)(2).)

Courts have treated the determination of whether an activity is within the scope of a program EIR to be a question of fact to be resolved by the lead agency. Several organizations representing CEQA practitioners have suggested that additional guidance should be provided to help lead agencies make that determination. (See, "Recommendations for Updating the State CEQA Guidelines," American Planning Association, California Chapter; Association of Environmental Professionals; and Enhanced CEQA Action Team (August 30, 2013).)

Proposed Amendments to Section 15168

OPR proposes to amend section 15168 to further assist lead agencies in determining whether later activities are within the scope of a prior program EIR. The additions appear primarily in subdivision (c).

First, the proposed additions to subdivision (c)(2) would clarify that the determination of whether a later activity falls within the scope of the program EIR is a question of fact to be resolved by the lead agency, and supported with substantial evidence in the record. This addition implements judicial opinions that have addressed the issue. (*See*, *e.g.*, *Citizens for Responsible Equitable Environmental Development v. City of San Diego Redevelopment Agency* (2005) 134 Cal. App. 4th 598, 610 ("*CREED*") ("the fair argument standard does not apply to judicial review of an agency's determination that a project is within the scope of a previously completed EIR"); *Sierra Club v. County of Sonoma* (1992) 6 Cal. App. 4th

1307, 1320-1321 ("evidence does not support a determination that [the] proposed site-specific project was either the same as or within the scope of the project, program, or plan described in the program EIR").)

Second, the proposed additions to subdivision (c)(2) provide a list of factors that may assist a lead agency in determining that a project is within the scope of a program EIR. Again, those factors have been recognized in judicial opinions as being instructive. Those factors include:

- Consistency with allowable land uses included in the project description (*compare Sierra Club*, *supra*, 6 Cal. App. 4th 1320-1321 (later activity could not have been within the scope of the prior EIR because it involved engaging "in terrace mining on land which was specifically designated in the Plan as an agricultural resource") *with CREED*, *supra*, 134 Cal. App. 4th at 616 ("the Community Plan designated the area where the hotel [project] is to be built as a "Commercial/Office District" in which "hotels and motels" would be emphasized as among the allowable land uses"));
- Consistency with densities and building intensities included in the project description (*see ibid* (the "MEIR forecast[ed] that a total of 5,880 additional hotel rooms would be constructed over a 35-year period within the Planning Area, and expressly contemplate[d] the completion of the Horton Plaza Redevelopment Project, which the hotel project will complete"));
- Being within the geographic area that the program EIR analyzed for potential impacts (*see*, *e.g.*, *Santa Teresa Citizen Action Group v. City of San Jose* (2003) 114 Cal. App. 4th 689, 704 (the project "will use recycled water in the same way and in the same general location evaluated by the previous studies"));
- Being included in the infrastructure described in the program EIR (*see ibid*).

Notably, this is not intended to be an exclusive list.

Third, OPR proposes to add a sentence to subdivision (c)(1) to clarify how to proceed with the analysis of a later activity that a lead agency determines is not "within the scope" of the program EIR. Specifically, the new sentence states that if additional analysis is needed, that analysis should follow the tiering process described in Section 15152. This addition is necessary to clarify that even if a project is not "within the scope" of a program EIR, the lead agency might still streamline the later analysis using the tiering process. This might allow a lead agency, for example, to focus the analysis of the later activity on effects that were not adequately analyzed in the program EIR. (See, State CEQA Guidelines § 15152(d).) This addition promotes administrative efficiency. (Pub. Resources Code § 21093(b) ("environmental impact reports shall be tiered whenever feasible").) This addition also follows the analysis in the *Sierra Club* decision, which addressed the relationship between program EIRs and tiering. (*Sierra Club*, *supra*, 6 Cal. App. 4th 1320-1321 (because the project was not within the scope of the program EIR, "section 21166 was inapplicable, and the [agency] was obligated by section 21094, subdivision (c), to consider whether [the] site- specific new project might cause significant effects on the environment that were not examined in the prior program EIR").)

Fourth, in subdivision (c)(5), OPR proposes to add that program EIRs will be most useful for evaluating later activities when those activities have been included in the program EIR's project description. (*CREED*, *supra*, 134 Cal. App. 4th at 616.)

Finally, OPR proposes a number of minor word changes throughout this section to improve clarity.

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in **~~strikeout~~**.

§ 15168. Program EIR

(a) General. A program EIR is an EIR which may be prepared on a series of actions that can be characterized as one large project and are related either:

(1) Geographically,

(2) As logical parts in the chain of contemplated actions,

(3) In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or

(4) As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.

(b) Advantages. Use of a program EIR can provide the following advantages. The program EIR can:

(1) Provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action,

(2) Ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis,

(3) Avoid duplicative reconsideration of basic policy considerations,

(4) Allow the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts,

(5) Allow reduction in paperwork.

(c) Use With Later Activities. **~~Subsequent~~** **Later** activities in the program must be examined in the light of the program EIR to determine whether an additional environmental document must be prepared.

(1) If a later activity would have effects that were not examined in the program EIR, a new initial study would need to be prepared leading to either an EIR or a negative declaration. **That later analysis may be tiered from the program EIR as provided in Section 15152.**

(2) If the agency finds that pursuant to Section 15162, no new **significant** effects could occur or no new mitigation measures would be required, the agency can approve the activity as being within the scope of the project covered by the program EIR, and no new environmental document would be required. **Determining that a later activity is within the scope of a program covered in the program EIR is a factual question that the lead agency determines based on substantial evidence in the record. Relevant factors that an agency may consider include, but are not limited to, consistency of the later activity with the type of allowable land use, overall planned density and building intensity, geographic area analyzed for environmental impacts, and description of covered infrastructure, as presented in the project description or elsewhere in the program EIR.**

(3) An agency shall incorporate feasible mitigation measures and alternatives developed in the program EIR into ~~**subsequent actions**~~ **later activities** in the program.

(4) Where the ~~**subsequent**~~ **later** activities involve site specific operations, the agency should use a written checklist or similar device to document the evaluation of the site and the activity to determine whether the environmental effects of the operation were ~~**covered in**~~ **within the scope of** the program EIR.

(5) A program EIR will be most helpful in dealing with ~~**subsequent**~~ **later** activities if it **provides a detailed description of planned activities that would implement the program and** deals with the effects of the program as specifically and comprehensively as possible. With a good and detailed **project description and** analysis of the program, many ~~**subsequent**~~ **later** activities could be found to be within the scope of the project described in the program EIR, and no further environmental documents would be required.

(d) Use With Subsequent EIRS and Negative Declarations. A program EIR can be used to simplify the task of preparing environmental documents on later ~~**parts of**~~ **activities in** the program. The program EIR can:

(1) Provide the basis in an initial study for determining whether the later activity may have any significant effects.

(2) Be incorporated by reference to deal with regional influences, secondary effects, cumulative impacts, broad alternatives, and other factors that apply to the program as a whole.

(3) Focus an EIR on a ~~**subsequent project**~~ **later activity** to permit discussion solely of new effects which had not been considered before.

(e) Notice With Later Activities. When a law other than CEQA requires public notice when the agency later proposes to carry out or approve an activity within the program and to rely on the program EIR for CEQA compliance, the notice for the activity shall include a statement that:

(1) This activity is within the scope of the program approved earlier, and

(2) The program EIR adequately describes the activity for the purposes of CEQA.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section 21003, Public Resources Code; ***Citizens for Responsible Equitable Environmental Development v. City of San Diego Redevelopment Agency*** **(2005) 134 Cal. App. 4th 598;** ***Santa Teresa Citizen Action Group v. City of San Jose*** **(2003) 114 Cal. App. 4th 689**; County of Inyo v. Yorty **(1973)** ~~,~~ 32 Cal. App. 3d 795 ~~**(1973)**~~.

Clarifying Rules on Tiering

Proposed Amendments to Section 15152

Background and Specific Purpose of Amendment

OPR proposes to amend Section 15152(h). As currently written, that section states that "[t]here are various types of EIRs that may be used in a tiering situation." OPR proposes to rewrite this section to clarify that tiering is only one of several streamlining mechanisms that can simplify the environmental review process. (*See, e.g.*, CEQA Guidelines, § 15006 (lists methods to reduce or eliminate duplication in the CEQA process).) Tiering is one such efficiency measure. (*See, e.g*., Pub. Resources Code, § 21093 (states that tiering may be appropriate "to exclude duplicative analysis" completed in previous EIRs), § 21094 (states that a lead agency may examine significant effects of a project by using a tiered EIR).) Public Resources Code Section 21094 is broadly worded to potentially be used for any number of programs, plans, policies, or ordinances, with a wide variety of content. (*Ibid.*) In adopting Section 21094, the legislature did not indicate that it intended to replace any other streamlining mechanisms. For example, the legislature did not override existing provisions including, but not limited to, Program EIRs (CEQA Guidelines, § 15168) and mitigation measures under a prior EIR (Pub. Resources Code, § 21083.3). In fact, the legislature created additional streamlining mechanisms after tiering was adopted. (*See, e.g*., Pub. Resources Code, § 21157 (Master EIR), § 21158 (Focused EIR).) Thus, this revision clarifies that tiering describes one mechanism for streamlining the environmental review process, but where other methods have more specific provisions, those provisions shall apply.

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15152. Tiering

(a) "Tiering" refers to using the analysis of general matters contained in a broader EIR (such as one prepared for a general plan or policy statement) with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR or negative declaration solely on the issues specific to the later project.

(b) Agencies are encouraged to tier the environmental analyses which they prepare for separate but related projects including general plans, zoning changes, and development projects. This approach can eliminate repetitive discussions of the same issues and focus the later EIR or negative declaration on the actual issues ripe for decision at each level of environmental review. Tiering is appropriate when the

sequence of analysis is from an EIR prepared for a general plan, policy, or program to an EIR or negative declaration for another plan, policy, or program of lesser scope, or to a site-specific EIR or negative declaration. Tiering does not excuse the lead agency from adequately analyzing reasonably foreseeable significant environmental effects of the project and does not justify deferring such analysis to a later tier EIR or negative declaration. However, the level of detail contained in a first tier EIR need not be greater than that of the program, plan, policy, or ordinance being analyzed.

(c) Where a lead agency is using the tiering process in connection with an EIR for a large-scale planning approval, such as a general plan or component thereof (e.g., an area plan or community plan), the development of detailed, site-specific information may not be feasible but can be deferred, in many instances, until such time as the lead agency prepares a future environmental document in connection with a project of a more limited geographical scale, as long as deferral does not prevent adequate identification of significant effects of the planning approval at hand.

(d) Where an EIR has been prepared and certified for a program, plan, policy, or ordinance consistent with the requirements of this section, any lead agency for a later project pursuant to or consistent with the program, plan, policy, or ordinance should limit the EIR or negative declaration on the later project to effects which:

(1) Were not examined as significant effects on the environment in the prior EIR; or

(2) Are susceptible to substantial reduction or avoidance by the choice of specific revisions in the project, by the imposition of conditions, or other means.

(e) Tiering under this section shall be limited to situations where the project is consistent with the general plan and zoning of the city or county in which the project is located, except that a project requiring a rezone to achieve or maintain conformity with a general plan may be subject to tiering.

(f) A later EIR shall be required when the initial study or other analysis finds that the later project may cause significant effects on the environment that were not adequately addressed in the prior EIR. A negative declaration shall be required when the provisions of Section 15070 are met.

(1) Where a lead agency determines that a cumulative effect has been adequately addressed in the prior EIR, that effect is not treated as significant for purposes of the later EIR or negative declaration, and need not be discussed in detail.

(2) When assessing whether there is a new significant cumulative effect, the lead agency shall consider whether the incremental effects of the project would be considerable when viewed in the context of past, present, and probable future projects. At this point, the question is not whether there is a significant cumulative impact, but whether the effects of the project are cumulatively considerable. For

a discussion on how to assess whether project impacts are cumulatively considerable, see Section 15064(i).

(3) Significant environmental effects have been "adequately addressed" if the lead agency determines that:

(A) they have been mitigated or avoided as a result of the prior environmental impact report and findings adopted in connection with that prior environmental report; or

(B) they have been examined at a sufficient level of detail in the prior environmental impact report to enable those effects to be mitigated or avoided by site specific revisions, the imposition of conditions, or by other means in connection with the approval of the later project.

(g) When tiering is used, the later EIRs or negative declarations shall refer to the prior EIR and state where a copy of the prior EIR may be examined. The later EIR or negative declaration should state that the lead agency is using the tiering concept and that it is being tiered with the earlier EIR.

(h) ~~**There are various types of EIRs that may be used in a tiering situation.**~~ **The rules in this section govern tiering generally. Several other methods to streamline the environmental review process exist, which are governed by the more specific rules of those provisions. Where other methods have more specific provisions, those provisions shall apply, rather than the provisions in this section.** These **other methods** include, but are not limited to, the following:

(1) General plan EIR (Section 15166).

(2) Staged EIR (Section 15167).

(3) Program EIR (Section 15168).

(4) Master EIR (Section 15175).

(5) Multiple-family residential development/residential and commercial or retail mixed-use development (Section 15179.5).

(6) Redevelopment project (Section 15180).

(7) Projects consistent with community plan, general plan, or zoning (Section 15183).

(8) Infill projects (Section 15183.3).

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21003, 21061, **21083.3,** 21093, 21094, 21100**, ~~and~~** 21151, **21157, and 21158** Public Resources Code; Stanislaus Natural Heritage Project, Sierra Club v. County of Stanislaus (1996) 48 Cal.App.4th 182; Al Larson Boat Shop, Inc. v. Board of Harbor Commissioners (1993) 18 Cal.App. 4th 729; and Sierra Club v. County of Sonoma (1992) 6 Cal.App. 4th 1307.

Transit Oriented Development Exemption

Proposed Amendments to Section 15182

Background

In 1978, the Governor adopted California's first Environmental Goals and Policy Report. Known as the Urban Strategy, it set forth key statewide environmental goals as well as an action plan to attain those goals. One of the recommendations in the action plan was to exempt certain types of projects that are consistent with a specific plan from further CEQA review. (An Urban Strategy for California (February 1978), at p. 14.) Shortly after adoption of the Urban Strategy, the legislature created an exemption for residential projects that are consistent with a specific plan. (See, Gov. Code § 65453 (added in 1979, later renumbered to section 65457).) That exemption is described in existing section 15182 of the CEQA Guidelines.

The exemption in the Government Code was much more limited than the Urban Strategy's original recommendation. First, its provisions were difficult to apply in practice. For example, if changed circumstances occurred, the exemption could not be used until a supplemental EIR was prepared to cover the entire specific plan, even if the analysis remained valid for the individual project. Second, rather than exempting a variety of uses, section 65457 exempts only purely residential development. Commercial projects, or even projects that included a commercial component, could not use the exemption. In the decades since the exemption was first enacted, planners have recognized that promoting mixed use developments may reduce land consumption, air pollution and other environmental ills.

In 2013, Governor Brown's administration proposed, and the Legislature enacted, a set of amendments to CEQA designed to better align the statute with other environmental goals, including the reduction of greenhouse gas emissions and promotion of infill development. (Senate Bill 743, Steinberg 2013.) One of those amendments included the addition of section 21155.4 to the Public Resources Code. That section resembles Government Code section 65457, but extends beyond purely residential projects to include commercial and mixed-use projects as well. The trigger for requiring additional review also is more closely tied to the project under consideration, instead of to the entire specific plan area. This expanded exemption is available to projects that are located near transit and that are consistent with regional plans for reducing greenhouse gas emissions.

Explanation of Proposed Amendments

OPR proposes to amend existing Guidelines section 15182 to reflect the new exemption in Public Resources Code section 21155.4. The specific amendments are explained in detail below.

Subdivision (a)

OPR proposes to reorganize section 15182 to describe both the exemption in Public Resources Code section 21155.4 as well as the exemption in Government Code section 65457. As amended, subdivision (a) would be a general section that points to the more specific provisions in subdivisions (b) and (c). Importantly, subdivision (a) clarifies that a specific plan is a plan that is adopted pursuant to the requirements set forth in Article 8, Chapter 3 of the Government Code. This clarification is necessary because cities and counties may give qualifying plans various titles, such as Master Plan or Downtown Plan. So long as the plan includes the contents described in the Government Code, it should enable use of the exemptions described in section 15182.

Subdivision (b)

As amended, subdivision (b) would contain the provisions applicable to projects within transit priority areas.

Subdivision (b)(1) describes the eligibility criteria for use of the exemption. Those eligibility criteria are drawn directly from Section 21155.4(a). Notably, while section 21155.4 uses the term "employment center project," proposed subdivision (b)(1) clarifies that term by referring to a commercial project with a floor area ratio of at least 0.75. (See Pub. Resources Code § 21099(a)(1) (defining "employment center project"). Further, subdivision (b)(1)(A) includes a cross reference to a new proposed section 15385.5 which defines "transit priority area".

Subdivision (b)(2) describes the limitation to the exemption. Specifically, it clarifies that additional review may be required if the project triggers one of the requirements for further review described in section 15162. New review may be required if, for example, the project requires changes in the specific plan that would result in new or worse significant impacts, or if circumstances have changed since adoption of the specific plan that would lead to new or worse significant impacts.

Subdivision (b)(3) includes a cross reference to the statute of limitation periods described in section 15112. This subdivision is necessary to alert planners that, unlike the exemption in section 65457 which provides for a 30 day statute of limitations regardless of whether a notice of exemption is filed, the exemption in section 21155.4 is subject to CEQA's normal statute of limitations.

Subdivision (c)

As amended, subdivision (c) would contain the provisions that apply to purely residential projects. The content in subdivision (c) largely mirrors the text in existing section 15182. OPR does propose several clarifications, however. For example, section 15182 currently states that no further environmental impact report or negative declaration is required for residential projects that are consistent with a

specific plan. Section 65457 actually states that such projects are exempt from any of CEQA requirements, not just preparation of a new environmental document. Therefore, OPR proposes to clarify in subdivision (c) that such projects are exempt.

Also, OPR proposes to pull the existing description of the special statute of limitations into subdivision (c)(3).

Subdivision (d)

Subdivision (d) in existing section 15182 allows local governments to collect fees to cover the cost of preparing a specific plan. This authority is found in Government Code section 65456. Since fees may be collected to cover the preparation of specific plans, regardless of whether the plans cover residential, commercial or other uses, OPR proposes to leave subdivision (d) as currently written.

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15182. ~~**Residential**~~ Projects Pursuant to a Specific Plan

(a) **General. Certain residential, commercial and mixed-use projects that are consistent with a specific plan adopted pursuant to Article 8, Chapter 3 of the Government Code may be exempt from further environmental review, as described in subdivisions (b) and (c) of this section.**

(b) Projects Proximate to Transit.

(1) Eligibility. A residential or mixed-use project, or a commercial project with a floor area ratio of at least 0.75, including any required subdivision or zoning approvals, is exempt if the project satisfies the following criteria:

(A) It is located within one-half mile of an existing or planned rail transit station, ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods. For the purposes of this subdivision, within the boundaries of a metropolitan planning organization, a "planned" station, terminal or stop includes a facility that is scheduled to be completed within the planning horizon included in the regional transportation plan. Outside of the boundaries of a metropolitan planning organization, a "planned" station, terminal or stop includes a facility that is scheduled to be completed within the planning horizon included in the regional transportation improvement program;

(B) It is consistent with a specific plan for which an environmental impact report was certified; and

(C) It is consistent with the general use designation, density, building intensity, and applicable policies specified for the project area in either a sustainable communities strategy or an alternative planning strategy for which the State Air Resources Board has accepted the determination that the sustainable communities strategy or the alternative planning strategy would achieve the applicable greenhouse gas emissions reduction targets.

(2) Limitation. Additional environmental review may be required for a project described in this subdivision if one of the events in section 15162 occurs with respect to that project.

(3) Statute of Limitations. A challenge to a project described in this subdivision is subject to the statute of limitations periods described in section 15112.

(c) ~~**Exemption**~~ **Residential Projects within Specific Plans**.

(1) Eligibility. Where a public agency has prepared an EIR on a specific plan after January 1, 1980, ~~**no EIR or negative declaration need be prepared for**~~ a residential project undertaken pursuant to and in conformity to that specific plan **is exempt** if the project meets the requirements of this section.

~~**(b) Scope.**~~ Residential projects covered by this section include but are not limited to land subdivisions, zoning changes, and residential planned unit developments.

~~**(c)**~~ **(2)** Limitation. ~~**This section is subject to the limitation that i I**~~f after the adoption of the specific plan, an event described in Section 15162 ~~**should**~~ occur**s**, ~~**this**~~ **the** exemption **in this subdivision** shall not apply until the city or county which adopted the specific plan completes a subsequent EIR or a supplement to an EIR on the specific plan. The exemption provided by this section shall again be available to residential projects after the lead agency has filed a Notice of Determination on the specific plan as reconsidered by the subsequent EIR or supplement to the EIR.

(3) Statute of Limitations. A court action challenging the approval of a project under this subdivision for failure to prepare a supplemental EIR shall be commenced within 30 days after the lead agency's decision to carry out or approve the project in accordance with the specific plan.

(d) Fees. The lead agency has authority to charge fees to applicants for projects which benefit from this section. The fees shall be calculated in the aggregate to defray but not to exceed the cost of developing and adopting the specific plan including the cost of preparing the EIR.

~~**(e) Statute of Limitations. A court action challenging the approval of a project under this section for failure to pre-pare a supplemental EIR shall be commenced within 30 days after the lead agency's decision to carry out or approve the project in accordance with the specific plan.**~~

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section **21155.4, Public Resources Code; Sections ~~65453~~ 65456 and 65457**, Government Code**; *Concerned Dublin Citizens v. City of Dublin* (2013) 214 Cal. App. 4th 1301**.

Using the Existing Facilities Exemption

Proposed Amendments to Section 15301

Background

Section 15301 of the CEQA Guidelines exempts operations and minor alterations of existing facilities from CEQA. The key in determining whether the exemption applies is whether the project involves an *expansion* to an existing use. Projects that involve no or only a negligible expansion may be exempt. This exemption plays an important role in implementing the state's goal of prioritizing infill development.

Explanation of Proposed Amendments

OPR proposes to make two changes to Section 15301.

The first change appears in the first sentence of the exemption. It would delete the phrase "beyond that existing at the time of the lead agency's determination." Stakeholders have noted that this phrase could be interpreted to preclude use of this exemption if a facility were vacant "at the time of the lead agency's determination," even if it had a history of productive use, because compared to an empty building *any* use would be an expansion of use. (See, Comments of the Building Industry Association, August 30, 2013.) Such an interpretation is inconsistent with California's policy goals of promoting infill development.

It would also not reflect recent case law regarding "baseline." Those cases have found that a lead agency may look back to historic conditions to establish a baseline where existing conditions fluctuate, again provided that it can document such historic conditions with substantial evidence. (See, *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 327-328 ("Environmental conditions may vary from year to year and in some cases it is necessary to consider conditions over a range of time periods") (quoting *Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 125); see also *Cherry Valley Pass Acres & Neighbors v. City of Beaumont* (2010) 190 Cal.App.4th 316.)

This phrase at issue was apparently added in response to *Bloom v. McGurk* (1994) 26 Cal. App. 4th 1307. The court in that case was asked to decide whether the fact that the facility in question had never undergone CEQA review triggered an exception to the exemption. In analyzing that question, the court in *Bloom* relied on the analysis of a prior Supreme Court decision. It explained:

> Under *Wine Train's* analysis, the term "existing facility" in the class 1 exemption would mean a facility as it exists at the time of the agency's determination, *rather than a*

> *facility existing at the time CEQA was enacted*. For purposes of the exception to the categorical exemptions, "significant effect on the environment" would mean a change in the environment existing at the time of the agency's determination, rather than a change in the environment that existed when CEQA was enacted.

(*Id*. at 1315 (citing *Napa Valley Wine Train, Inc. v. Public Utilities Com*. (1990) 50 Cal.3d 370, 378, fn 12) (*emphasis added*).) Nothing in that decision indicates, however, that a lead agency could not consider actual historic use in deciding whether the project would expand beyond that use.

The second change appears in subdivision (c). The purpose of this change is to clarify that improvements within a public right of way that enable use by multiple modes (i.e., bicycles, pedestrians, transit, etc.) would normally not cause significant environmental impacts. This is an important clarification because it would allow other modes to be served within existing road-space. It also is consistent with the Complete Streets Act of 2008, which requires cities and counties to plan for the needs of all users of their streets. In this regard, because such improvements involve operation of public rights of way, they may be similar to the imposition of water conservation requirements for existing water facilities (*see*, *Turlock Irrigation Dist. v. Zanker* (2006) 140 Cal. App. 4th 1047,1065), or the regulation of the right of way for parking (*see*, *Santa Monica Chamber of Commerce v. City of Santa Monica* (2002) 101 Cal.App.4th 786, 793 ("it is clear that the Class 1 exemption applies to the legislation/project here[; it] involves adjusting the particular group of persons permitted to use 'existing facilities,' in other words, the existing, unmetered, curbside parking on residential streets")). Improvements to the existing right of way have long been understood to fall within the category of activities in subdivision (c), provided that the activity does not involve roadway widening. (*See*, *Erven v. Board of Supervisors* (1975) 53 Cal. App. 3d 1004.)

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15301. Existing Facilities

Class 1 consists of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of **historic** use ~~**beyond that existing at the time of the lead agency's determination**~~. The types of "existing facilities" itemized below are not intended to be all-inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.

Examples include but are not limited to:

(a) Interior or exterior alterations involving such things as interior partitions, plumbing, and electrical conveyances;

(b) Existing facilities of both investor and publicly-owned utilities used to provide electric power, natural gas, sewerage, or other public utility services;

(c) Existing highways and streets, sidewalks, gutters, bicycle and pedestrian trails, and similar facilities (this includes road grading for the purpose of public safety**, and other alterations such as the addition of bicycle facilities, including but not limited to bicycle parking, bicycle-share facilities and bicycle lanes, pedestrian crossings, and street trees, and other similar improvements that do not create additional automobile lanes**).

(d) Restoration or rehabilitation of deteriorated or damaged structures, facilities, or mechanical equipment to meet current standards of public health and safety, unless it is determined that the damage was substantial and resulted from an environmental hazard such as earthquake, landslide, or flood;

(e) Additions to existing structures provided that the addition will not result in an increase of more than:

(1) 50 percent of the floor area of the structures before the addition, or 2,500 square feet, whichever is less; or

(2) 10,000 square feet if:

(A) The project is in an area where all public services and facilities are available to allow for maximum development permissible in the General Plan and

(B) The area in which the project is located is not environmentally sensitive.

(f) Addition of safety or health protection devices for use during construction of or in conjunction with existing structures, facilities, or mechanical equipment, or topographical features including navigational devices;

(g) New copy on existing on and off-premise signs;

(h) Maintenance of existing landscaping, native growth, and water supply reservoirs (excluding the use of pesticides, as defined in Section 12753, Division 7, Chapter 2, Food and Agricultural Code);

(i) Maintenance of fish screens, fish ladders, wildlife habitat areas, artificial wildlife waterway devices, streamflows, springs and waterholes, and stream channels (clearing of debris) to protect fish and wildlife resources;

(j) Fish stocking by the California Department of Fish and Game;

(k) Division of existing multiple family or single-family residences into common-interest ownership and subdivision of existing commercial or industrial buildings, where no physical changes occur which are not otherwise exempt;

(l) Demolition and removal of individual small structures listed in this subdivision;

(1) One single-family residence. In urbanized areas, up to three single-family residences may be demolished under this exemption.

(2) A duplex or similar multifamily residential structure. In urbanized areas, this exemption applies to duplexes and similar structures where not more than six dwelling units will be demolished.

(3) A store, motel, office, restaurant, and similar small commercial structure if designed for an occupant load of 30 persons or less. In urbanized areas, the exemption also applies to the demolition of up to three such commercial buildings on sites zoned for such use.

(4) Accessory (appurtenant) structures including garages, carports, patios, swimming pools, and fences.

(m) Minor repairs and alterations to existing dams and appurtenant structures under the supervision of the Department of Water Resources.

(n) Conversion of a single family residence to office use.

(o) Installation, in an existing facility occupied by a medical waste generator, of a steam sterilization unit for the treatment of medical waste generated by that facility provided that the unit is installed and operated in accordance with the Medical Waste Management Act (Section 117600, et seq., of the Health and Safety Code) and accepts no offsite waste.

(p) Use of a single-family residence as a small family day care home, as defined in Section 1596.78 of the Health and Safety Code.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section 21084, Public Resources Code; ***Communities for a Better Environment v. South Coast Air Quality Management Dist*.** **(2010) 48 Cal.4th 310;** Bloom v. McGurk (1994) 26 Cal.App.4th 1307.

Updating the Environmental Checklist

Proposed Amendments to Appendix G

Background

Appendix G in the CEQA Guidelines contains a sample initial study format. The purpose of an initial study is to assist lead agencies in determining whether a project may cause a significant impact on the environment. (State CEQA Guidelines, § 15063.) To help guide that determination, Appendix G asks a series of questions regarding a range of environmental resources and potential impacts. Appendix G's questions are not an exhaustive list of all potential impacts. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal. App. 4th 1099, 1109-1112 (seasonal reduction of surface flow in local streams may be an impact on the environment, even though that particular impact is not specifically listed in Appendix G).) For that reason, Appendix G advises that "[s]ubstantial evidence of potential impacts that are not listed on this form must also be considered." Appendix G further advises that its environmental checklist is only a *sample* form that can be tailored to address local conditions and project characteristics.

When the checklist was originally developed, it contained only a handful of questions. Over time, the list of questions has grown in response to increasing awareness of the effects of development on the environment. Currently, the sample checklist contains 89 questions divided into 18 categories of potential impacts. Depending on the project's location and circumstances, the sample checklist questions may be both under- and over-inclusive. Because the purpose of an initial study is to provoke thought and investigation, and because the checklist cannot contain an exhaustive list, the sample in Appendix G should, in OPR's view, contain questions that are (1) broadly worded, (2) highlight environmental issues *commonly* associated with *most* types of new development, and (3) alert lead agencies to environmental issues that might otherwise be overlooked in the project planning and approval process.

As part of this comprehensive update to the CEQA Guidelines, OPR is investigating ways to enhance both the efficiency and efficacy of the environmental review process. To that end, OPR proposes to revise the sample environmental checklist in several ways. First, it proposes to consolidate certain categories of questions to eliminate redundancy and ease data collection. Second, it proposes to reframe or delete certain questions that should be addressed in the planning process to focus attention on those issues must be addressed in the CEQA process. Third, it proposes to add questions that, although required by current law, tend to be overlooked in the environmental review process. Finally, it proposes to revise the questions related to tribal cultural resources, transportation impacts and wildfire risk as required by AB 52, SB 743 and SB 1241, respectively. If finalized, these proposed changes would substantially change Appendix G, shortening its length by approximately 30 percent.

These proposed revisions, described in greater detail below, are intended to provoke further thought and discussion among stakeholders. They represent a first step in this update process. We anticipate that stakeholders will have other ideas about ways to improve Appendix G and we expect that this proposal will change for the better in response to that input.

A narrative description of the changes, and the intent behind those changes, is provided below, followed by the actual text of the changes in underline/strikeout format.

Reorganized and Consolidated Questions

The largest consolidation occurs in a category of resources identified as "Open Space, Managed Resources and Working Landscapes." This category includes subcategories such as natural resources, managed resources, areas used for recreation, and areas requiring special treatment due to hazards. These subcategories roughly correspond to the categories of open space that must be inventoried in a city or county's open space element. (Gov. Code § 65560.) Linking the organization of the questions to the content of an open space element may enable practitioners to more quickly identify relevant information about a proposed project's surroundings and potential impacts. This reorganization should also enable lead agencies, particularly cities and counties, to better tailor their own initial study checklists to resources that are identified in that element.

Categories in the existing Appendix G that would be consolidated into this new category include:

- Agriculture and Forest Resources
- Geology and Soils
- Mineral Resources
- Recreation

In addition to moving some questions into the consolidated open space category, questions within many of the existing categories have been consolidated. For example, the section on Hazards contains separate questions related to hazards from airports and private airstrips. Because the hazards and subject matter in both questions is similar, OPR proposes to consolidate them into a single question.

Deleted or Consolidated Questions

OPR proposes to delete or consolidate numerous questions from the Appendix G checklist. Those questions, and the reason that they are proposed for deletion, are discussed below.

Soils Incapable of Supporting Septic Systems

In Section VI (Geology and Soils), Appendix G currently asks whether a project would "[h]ave soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water." According to the U.S. Environmental

Protection Agency, inappropriately placed or operated septic systems may be a source of significant groundwater contamination.

OPR proposes to revise the questions in Appendix G related to water quality. Specifically, among other revisions, OPR proposes to clarify that the question asking whether a project would "substantially degrade water quality" refers to both surface and ground water quality. Thus, as revised, the broader question about groundwater quality would capture not just impacts from inappropriately placed septic tanks, but also any other possible sources of uncontrolled leachate.

Conflicts with a Habitat Conservation Plan

Existing Appendix G asks whether a project would conflict with a habitat conservation plan and other related plans in two separate sections: biological resources and land use planning. OPR proposes to delete the question from the land use planning section. The question in the biological resources section would remain unchanged.

Wastewater Treatment Requirements

In the section on utilities, Appendix G currently asks whether a project would exceed wastewater treatment requirements of an applicable regional water quality control board. Similarly, in the water quality section, Appendix G asks whether a project would violate any waste discharge requirements. Since the question in the water quality section would encompass wastewater treatment requirements as well as other water quality standards, OPR proposes to delete the question from the utilities section.

Updated Considerations

As part of the reorganization of Appendix G, OPR also proposes to update some considerations or questions to the checklist. Those considerations, and the reason that they are proposed to be revised, are discussed below.

Aesthetics

Existing Appendix G asks whether a project would degrade the existing visual character of a site. Visual character is a particularly difficult issue to address in the context of environmental review, in large part because it could call for exceedingly subjective judgments. Both federal and state courts have struggled with the issue of precisely what questions related to aesthetics are relevant to an analysis of environmental impact. (*See*, *e.g.*, *Maryland-National Cap. Pk. & Pl. Com'n. v. U.S. Postal Serv*. (D.C. Cir. 1973) 159 U.S. App. D.C. 158; *see also Bowman v. City of Berkeley* (2006) 122 Cal. App. 4th 572.) As a practical matter, infill projects are often challenged on the grounds of aesthetics. (See, e.g., Pub. Resources Code § 21099(d) (exempting certain types of infill projects from the requirement to analyze aesthetics).)

For these reasons, OPR proposes to recast the existing question on "visual character" to ask whether the project is consistent with zoning or other regulations governing visual character. This change is intended to align with the analysis of the aesthetics issue in the *Bowman* case, *supra*. The court in that case, which involved a challenge to a multifamily residential project in an urban area, noted:

> "Virtually every city in this state has enacted zoning ordinances for the purpose of improving the appearance of the urban environment" …, and architectural or design review ordinances, adopted "solely to protect aesthetics," are increasingly common…. While those local laws obviously do not preempt CEQA, we agree with the Developer and the amicus curiae brief of the Sierra Club in support of the Project that aesthetic issues like the one raised here are ordinarily the province of local design review, not CEQA.

(*Bowman*, *supra*, 122 Cal. App. 4th at p. 593 (citations omitted).) This revision is also consistent with the proposed changes in sections 15064 and 15064.7 that recognize the appropriate role of environmental standards in a CEQA analysis.

Air Quality

Existing Appendix G asks whether the project would create objectionable odors. OPR proposes to update this question in several ways. First, the term "objectionable" is subjective. Sensitivities to odors may vary widely. Therefore, OPR proposes to recast the question to focus on the project's potential to cause adverse impacts to substantial numbers of people. (*See Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477, 492–493 ("Under CEQA, the question is whether a project will affect the environment of persons in general, not whether a project will affect particular persons"); *see also Banker's Hill, Hillcrest, Park West Community Preservation Group v. City of San Diego* (2006) 139 Cal. App. 4th 249, 279.) Similarly, OPR proposes to include odor as one of several examples of potential localized air quality impacts.

Biological Resources and State Wetlands

Appendix G currently asks whether a project would substantially adversely affect a federally protected wetland. California law protects all waters of the state, while the federal Clean Water Act governs only "navigable waters". Since nothing in CEQA's definition of environment limits consideration to federally regulated resources, OPR proposes to clarify in Appendix G that lead agencies should consider impacts to wetlands that are protected by either the state or the federal government.

Cultural Resources

AB 52 requires an update to Appendix G to separate the consideration of paleontological resources from tribal cultural resources and update the relevant sample questions and add consideration of tribal cultural resources with relevant sample questions. OPR continues to conduct outreach regarding AB 52. As a placeholder, the question regarding tribal cultural resources that was circulated in OPR's Discussion Draft AB 52 Technical Advisory is included in this package for additional input.

Energy

As explained in the discussion of proposed amendments to section 15126.2, CEQA has long required analysis of energy impacts. (Pub. Resources Code § 21100(b)(3) (added in 1974, requiring EIRs to include measures to avoid wasteful and inefficient uses of energy); *California Clean Energy Committee v.*

City of Woodland (2014) 225 Cal. App. 4th 173.) However, the description of the required analysis sits largely unnoticed in a stand-alone Appendix F in the CEQA Guidelines. To better integrate the energy analysis with the rest of CEQA, OPR proposed to add relevant questions regarding potential energy impacts to the sample environmental checklist in Appendix G.

Impervious Surfaces

Appendix G currently asks a series of questions about hydrology, one of which asks whether the project will alter the drainage patterns of the site through alteration of the course of a stream or river. Another relevant factor in determining the effect of a project on existing drainage systems, however, is how much impervious surfaces a project might add. (See State Water Resources Control Board, Non-Point Source Encyclopedia, § 3.1 (Impervious Surfaces).) OPR's Technical Advisory on "low impact design" identifies the development of new impervious surfaces as a contributor to non-point source pollution and hydromodification. (Office of Planning and Research, "CEQA and Low Impact Development Stormwater Design: Preserving Stormwater Quality and Stream Integrity Through California Environmental Quality Act (CEQA) Review" (August 2009).) Therefore, OPR proposes to add "impervious surfaces" to the considerations in the hydrology portion of the checklist.

Notably, the proposed addition of impervious surfaces as a consideration is not intended to imply that *any* addition of impervious material will necessarily lead to a significant impact. Rather, the modified question asks whether the addition of impervious surface would lead to substantial erosion, exceed the capacity of stormwater drainage systems, etc. Also, some water quality permits do already address the addition of impervious surfaces, and, as provided in updated sections 15064 and 15064.7, a project's compliance with those requirements will be relevant in determining whether the added surfaces create a significant impact.

Groundwater

OPR proposes to make two changes to the existing question in Appendix G asking about a project's impacts to groundwater. First, the existing question asks whether a project will "substantially *deplete*" groundwater supplies. The word "deplete" could be interpreted to mean "empty". Therefore, OPR proposes to revise the question to ask whether the project would "substantially *decrease* groundwater supplies." Second, the existing question asks whether the project would lower groundwater table level and provides the following example: "e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted." There are many other potential impacts that could result from lowering groundwater levels, including subsidence, altering surface stream hydrology, causing migration of contaminants, etc. Therefore, OPR proposes to delete the example from the question. These proposed changes are consistent with the new regime governing groundwater passed in 2014.

Land Use Plans

Appendix G currently asks whether a project conflicts with certain land use plans. The question largely mirrors Section 15125(d), which requires an EIR to analyze any inconsistencies with any applicable plans. OPR proposes to revise that question in two ways in order to better focus the analysis.

First, OPR proposes to clarify that the focus of the analysis should not be on the "conflict" with the plan, but instead, on any adverse environmental impact that might result from a conflict. For example, destruction of habitat that results from development in conflict with a habitat conservation plan might lead to a significant environmental impact. The focus, however, should be on the impact on the environment, not on the conflict with the plan. (*See*, *e.g.*, *Marin Mun. Water Dist. v. Kg Land Cal. Corp*. (1991) 235 Cal. App. 3d 1652, 1668 ("A local agency engaged in EIR analysis may not ignore regional needs and the cumulative impacts of a proposed project. … Thus the Guidelines require an EIR to discuss any inconsistencies between the proposed project and applicable general and regional plans"); see also Pub. Resources Code § 21100(e) ("Previously approved land use documents, including, but not limited to, general plans, specific plans, and local coastal plans, *may be used in cumulative impact analysis*") (emphasis added).) Application of a density bonus to exceed limits in a general plan or zoning, on the other hand, might not lead to any environmental impact. (*See*, *e.g.*, *Wollmer v. City of Berkeley* (2009) 179 Cal. App. 4th 933.)

Second, OPR proposes to delete the phrase "with jurisdiction over the project" from the question, again for the purpose of focusing the analysis on any *actual environmental impacts* that might result from the project. Finally, OPR proposes to delete the list of examples of plans from the question. Section 15125(d) contains numerous examples of potentially relevant land use plans, and so repetition in the question in Appendix G is not necessary.

Population Growth

Appendix G currently asks whether a project will cause substantial population growth. OPR proposes to clarify that the question should focus on whether such growth is *unplanned*. Growth that is planned, and the environmental effects of which have been analyzed in connection with a land use plan or a regional plan, should not by itself be considered an impact.

Jobs/Housing Fit

Planners and scholars have long recognized the impact that an imbalance of jobs and housing has on commute lengths, and therefore on air pollution, health and other effects associated with driving. (See, e.g., California Planning Roundtable, "Deconstructing Jobs-Housing Balance" (2008); Cervero and Duncan, "Which Reduced Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?" Journal of the American Planning Association, Autumn 2006, Vol. 72, No. 4, pp. 475-490.) The balance of jobs and housing is also something that has been studied in environmental documents prepared pursuant to CEQA. (See, e.g., *Defend the Bay v. City of Irvine* (2004) 119 Cal. App. 4th 1261.) In recent years, more attention is being paid to "jobs-housing fit," which includes not just the overall number of jobs and housing in a community, but also accounts for wages and housing cost. (See Brenner and Tithi, "Jobs-Housing Fit in the Sacramento Region," Center for Regional Change, UC Davis (2012) ("attention to this jobs-housing fit for low-income earners might have a particularly large impact on GHG reduction, since low-income households on average drive older and less fuel efficient cars").) Because these factors affect, among other things, travel behavior that has implications for air quality, energy and greenhouse gas emissions, a lead agency might appropriately consider jobs/housing fit in Appendix G's questions on population.

Transportation

OPR is currently updating the analysis of transportation impacts in CEQA. To that end, OPR proposes several changes to the questions related to transportation in Appendix G. First, OPR proposes to revise the question related to "measures of effectiveness" so that the focus is more on the circulation element and other plans governing transportation. Second, OPR proposes to revise the question that currently refers to "level of service" to focus instead on a project's vehicle miles traveled. Third, OPR proposes to recast the question related to design features so that it focuses instead on whether a roadway project would tend to induce additional travel. Please note, these changes in Appendix G are placeholders while OPR continues outreach on its proposal implementing SB 743.

Water Supply

Appendix G currently asks whether the project has adequate water supplies. OPR proposes to update the question to better reflect the factors identified by the Supreme Court in *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal. 4th 412, as well as the water supply assessment and verification statutes. (Wat. Code § 10910; Gov. Code § 66473.7.)

Wildfire

Senate Bill 2141 (Kehoe, 2012) requires the Office of Planning and Research, the Natural Resources Agency and CalFire to develop "amendments to the initial study checklist of the [CEQA Guidelines] for the inclusion of questions related to fire hazard impacts for projects located on lands classified as state responsibility areas, as defined in Section 4102, and on lands classified as very high fire hazard severity zones, as defined in subdivision (i) of Section 51177 of the Government Code." (Pub. Resources Code § 21083.01 (emphasis added).) Proposed additions implementing SB 1241 are included in this package.

Questions for Reviewers

As indicated above, OPR sees these proposed changes to Appendix G as a conversation starter. To that end, OPR asks that reviewers consider several questions regarding the proposal, including:

1. Do any of the proposed revisions conflict with CEQA or cases interpreting CEQA?
2. Will any of the proposed revisions raise any concerns about practical application?
3. Are there revisions (that are consistent with CEQA and the cases interpreting it) that you think would lead to a more efficient process? Or better substantive outcomes?
4. Could the format of Appendix G be improved to be more user-friendly (i.e., by adding internet links to data resources)?

We look forward to your thoughts.

Proposed Revisions

Changes to the existing guideline are shown in **bold** type, with additions **<u>underlined</u>** and deletions shown in ~~**strikeout**~~. [*Please note: some of formatting in the following table may be off*.]

Appendix G

Environmental Checklist Form

NOTE: The following is a sample form ~~**and**~~ **<u>that</u>** may be tailored to satisfy individual agencies' needs and project circumstances. It may be used to meet the requirements for an initial study when the criteria set forth in CEQA Guidelines have been met. Substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in this form are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance.

1. Project title:_____

2. Lead agency name and address:

   _____
   _____
   _____

3. Contact person and phone number: _____

4. Project location: _____

5. Project sponsor's name and address:

   _____
   _____
   _____

6. General plan designation: _____ 7. Zoning: _____

8. Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

_____
_____
_____
_____

9. Surrounding land uses and setting: Briefly describe the project's surroundings:

_____
_____
_____
_____

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

_____
_____
_____
_____

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ ~~**Agriculture and Forestry Resources**~~	☐ Air Quality
Biological Resources	Cultural Resources	**Energy**

☐		☐		☐	~~**Geology /Soils**~~
☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials	☐	Hydrology / Water Quality
☐	Land Use / Planning	☐	~~**Mineral Resources**~~	☐	Noise
					Open Space, Managed Resources And Working Landscapes
☐	Population / Housing	☐	Public Services	☐	~~**Recreation**~~
☐	Transportation~~/Traffic~~	☐	Utilities / Service Systems	☐	**Wildfire**
				___	Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Signature	Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

    a) Earlier Analysis Used. Identify and state where they are available for review.

    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

    c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and

   b) the mitigation measure identified, if any, to reduce the impact to less than significance

10) Other checklist forms may be appropriate in certain circumstances. For example:

   a. When the project under consideration is a subsequent approval for a previously approved project, the checklist should ask whether a potential impact is a new significant impact or a substantial increase in the severity of previously identified significant impact. (See CEQA Guidelines § 15162.) If the project would not cause new or more severe impacts, the lead agency may adopt an addendum. (See CEQA Guidelines § 15164.)
   b. When the project is an infill project that satisfies the performance standards in Appendix M, the agency should use the checklist in Appendix N. (See CEQA Guidelines § 15183.3.)
   c. When the project is a residential, mixed use or employment center project, and is located within a transit priority area, the project's aesthetic or parking impacts shall not be considered to be significant impacts on the environment. (See Public Resources Code § 21099.)

SAMPLE QUESTION

Issues:

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on **either** a scenic vista **or scenic resources within a designated scenic highway**?	☐	☐	☐	☐
b) ~~**Substantially damage scenic resources, including, but not limited to, trees, rock**~~	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~outeroppings, and historic buildings within a state scenic highway?~~				
~~e)~~ ~~Substantially degrade the existing~~ **Substantially degrade the existing** visual character or quality of **public views of** the site and its surroundings **in conflict with applicable zoning and other regulations**?	☐	☐	☐	☐
c) ~~d)~~ Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☐

~~**II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. -- Would the project:**~~

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?~~	☐	☐	☐	☐
~~b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?~~	☐	☐	☐	☐
~~c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?~~	☐	☐	☐	☐
~~d) Result in the loss of forest land or conversion of forest land to non-forest use?~~	☐	☐	☐	☐
~~e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?~~	☐	☐	☐	☐
III. AIR QUALITY -- ~~Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied~~				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~upon to make the following determinations.~~ Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan **or exceed significance criteria established by the applicable air quality management or air pollution control district**?	☐	☐	☐	☐
b) Violate any air quality standard or ~~contribute substantially to~~ **result in a cumulatively considerable net increase in** an existing or projected air quality violation?	☐	☐	☐	☐
c) ~~Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?~~	☐	☐	☐	☐
~~d)~~ Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☐
e) ~~Create objectionable~~ **Result in frequent and substantial emissions (such as** odors**, dust or haze) for a substantial duration that adversely** affect~~ing~~ a substantial number of people?	☐	☐	☐	☐
IV. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☐
c) Have a substantial adverse effect on **state or** federally protected wetlands ~~**as defined by Section 404 of the Clean Water Act**~~ (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
conservation plan?				
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource **or of a unique archeological resource pursuant to ~~as defined in~~** § 15064.5?	☐	☐	☐	☐
b) **~~Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?~~**	☐	☐	☐	☐
~~c)~~ Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code Section 21074?~~Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?~~	☐	☐	☐	☐
~~d)~~ c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☐
~~VI. GEOLOGY AND SOILS -- Would the project:~~				
~~a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:~~	☐	☐	☐	☐
~~i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a~~	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~known fault? Refer to Division of Mines and Geology Special Publication 42.~~				
~~ii) Strong seismic ground shaking?~~	☐	☐	☐	☐
~~iii) Seismic-related ground failure, including liquefaction?~~	☐	☐	☐	☐
~~iv) Landslides?~~	☐	☐	☐	☐
~~b) Result in substantial soil erosion or the loss of topsoil?~~	☐	☐	☐	☐
~~c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?~~	☐	☐	☐	☐
~~d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?~~	☐	☐	☐	☐
~~e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?~~	☐	☐	☐	☐
V. ENERGY – Would the project:				
a) Result in wasteful, inefficient, or unnecessary consumption of energy, during project construction or operation?				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation or other project features?				
VII. GREENHOUSE GAS EMISSIONS -- Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☐
VIII. HAZARDS AND HAZARDOUS MATERIALS - Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, **or within the vicinity of a private airstrip,** would the project result in a safety hazard **or excessive noise** for people residing or working in the project area?	☐	☐	☐	☐
~~**f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?**~~	☐	☐	☐	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, **flooding or other inundation, unstable soils and other potential hazards** ~~**including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands**~~?	☐	☐	☐	☐

IX. HYDROLOGY AND WATER

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
QUALITY -- Would the project:				
a) Violate any water quality standards or waste discharge requirements **or otherwise substantially degrade surface or ground water quality**?	☐	☐	☐	☐
b) Substantially ~~**deplete**~~ **decrease** groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level ~~**(e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)**~~?	☐	☐	☐	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river **or through the addition of impervious surfaces**, in a manner which would**:** **(i)** result in substantial erosion or siltation on- or off-site**;** **(ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;** **(iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or**	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(iv) impede or redirect flood flows?				
~~d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?~~	☐	☐	☐	☐
~~e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?~~	☐	☐	☐	☐
~~f) Otherwise substantially degrade water quality?~~	☐	☐	☐	☐
~~g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?~~	☐	☐	☐	☐
~~h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?~~	☐	☐	☐	☐
~~i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?~~	☐	☐	☐	☐
~~j) Inundation by seiche, tsunami, or mudflow?~~	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~I~~X. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☐
b) **~~Conflict~~ Cause a significant environmental impact due to a conflict** with any **~~applicable~~** land use plan, policy, or regulation **~~of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance)~~** adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☐
~~c) Conflict with any applicable habitat conservation plan or natural community conservation plan?~~	☐	☐	☐	☐
~~XI. MINERAL RESOURCES -- Would the project:~~				
~~a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?~~	☐	☐	☐	☐
~~b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?~~	☐	☐	☐	☐
XII. NOISE -- Would the project result in:				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of **a substantial temporary or permanent increase in ambient** noise levels **in the vicinity of the project** in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☐
~~**c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?**~~	☐	☐	☐	☐
~~**d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?**~~	☐	☐	☐	☐
~~**e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?**~~	☐	☐	☐	☐
~~**f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?**~~	☐	☐	☐	☐

XI. OPEN SPACE, MANAGED RESOURCES AND WORKING

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

LANDSCAPES – Would the project adversely affect open spaces containing natural resources and working landscapes? Considerations may include, among others, whether the project would:

a) **Adversely impact open space for the preservation of natural resources, including, but not limited to:**

   (i) **habitat required for the preservation of fish and wildlife species, including habitat corridors;**

   (ii) **waters of the state; or**

   (iii) **unique paleontological resource or site or unique geologic feature?**

b) **Adversely impact open space used for production of resources by, among other things:**

   (i) **converting farmland to non-agricultural use;**

   (ii) **changing existing zoning or plan designations for agricultural uses to non-agricultural use;**

   (iii) **conflicting with a Williamson Act contract;**

   (iv) **converting forest land to non-forest use;**

   (v) **changing existing zoning or plan designations for forest land (as defined in Public Resources Code**

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)), to non-forest land uses;

(vi) converting oak woodlands;

(vii) substantially impeding groundwater recharge;

(viii) causing substantial soil erosion or the loss of topsoil; or

(ix) causing the loss of availability of a known mineral resource.

c) Adversely affect open spaces used for outdoor recreation, including parks, trails and similar resources through conversion to non-recreation uses or by increasing demand to a degree that substantial physical deterioration would occur?

d) Place new structures in or otherwise adversely affect areas requiring special management due to hazards, including, but not limited to:

(i) areas subject to periodic inundation, including

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
coasts, wetlands, and riparian areas and flood zones; **(ii) wildfire hazard areas;** **(iii) unstable soil areas, including fault zones, liquefaction zones, areas subject to landslides and expansive soil areas; or** **(iv) areas required for the protection of water quality and water supply?**				
XIII. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial **unplanned** population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☐
b) Displace substantial numbers of existing **people or** housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐
c) **Result in a substantial imbalance in regional jobs / housing fit? ~~Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?~~**	☐	☐	☐	☐
~~XIII~~XIV. PUBLIC SERVICES				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☐
Fire protection?	☐	☐	☐	☐
Police protection?	☐	☐	☐	☐
Schools?	☐	☐	☐	☐
Parks?	☐	☐	☐	☐
Other public facilities?	☐	☐	☐	☐
~~**XIV**~~**XV. RECREATION –**				
~~**a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?**~~	☐	☐	☐	☐
~~**b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?**~~	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XV**I**. TRANSPORTATION**/~~TRAFFIC~~** -- Would the project:				
a) Conflict with a**~~n applicable~~** plan, ordinance or policy **~~establishing measures of effectiveness for the~~** **addressing the safety or** performance of the circulation system**, including transit, roadways, bicycle lanes and pedestrian paths? ~~,~~ ~~taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit~~**?	☐	☐	☐	☐
b) **~~Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?~~** **Cause substantial additional vehicle miles traveled (per capita, per service population, or other appropriate measure)?**	☐	☐	☐	☐
c) **~~Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks~~**?	☐	☐	☐	☐
Substantially **induce additional automobile**	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network? ~~**increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)**~~?				
d) Result in inadequate emergency access?	☐	☐	☐	☐
~~—~~	~~☐~~	~~☐~~	~~☐~~	~~☐~~
~~**f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?**~~	☐	☐	☐	☐
XVI<u>I</u>. UTILITIES AND SERVICE SYSTEMS -- Would the project:				
a) ~~**Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?**~~	☐	☐	☐	☐
~~**b)**~~ Require or result in the construction of new **or expanded** water**,** ~~**or**~~ wastewater treatment **or storm water drainage** facilities ~~**or expansion of existing facilities**~~, the construction of which could cause significant environmental effects?	☐	☐	☐	☐
~~**c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the**~~	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
~~**construction of which could cause significant environmental effects?**~~				
d) Have sufficient water supplies available to serve the project **and reasonably foreseeable future development during normal, dry and multiple dry years** ~~**from existing entitlements and resources, or are new or expanded entitlements needed**~~?	☐	☐	☐	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☐
XVIII. WILDFIRE -- If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a) Impair an adopted emergency response plan or emergency evacuation plan?				
b) Due to slope, prevailing winds, and other factors, expose project occupants to, or exacerbate risks from, pollutant				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
concentrations from a wildfire or the uncontrolled spread of a wildfire?				
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?				
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE --				
a) Does the project have the potential to **substantially** degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, **substantially** reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐

Note: Authority cited: Sections 21083, 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080, 21083.05, 21095, Pub. Resources Code; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

Remedies and Remand

Proposed New Section 15234

Background

CEQA is in most instances enforced through a form of judicial review known as a writ of mandate proceeding.[1] In reviewing a petition for writ of mandate, the court examines an agency's administrative record to determine whether it properly implemented CEQA in connection with a project approval. If the court concludes that the agency did not comply with CEQA, it may order the agency to take further action before proceeding with the project. At that point, questions may arise regarding what further environmental review is needed, and what project activities, if any, may continue while the agency takes further action. Proposed new Section 15234 will assist agencies in complying with CEQA in response to a court's remand, and help the public and project proponents understand the effect of the remand on project implementation. Specifically, proposed new Section 15234 reflects the language of the statutory provision governing remedies in CEQA cases, Public Resources Code section 21168.9, as well as case law interpreting that statute.

Explanation of Proposed Section 15234

Proposed subdivision (a) is necessary to explain to public agencies how CEQA litigation may affect project implementation. First, it clarifies that not every violation of CEQA will compel a court to set aside project approvals. Public Resources Code Section 21005 provides that "courts shall continue to follow the established principle that there is no presumption that error is prejudicial." The California Supreme Court recently reiterated that "[i]nsubstantial or merely technical omissions are not grounds for relief." (*Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (2013) 57 Cal. 4th 439, 463.) In order to justify setting aside a project approval, a violation must "preclude relevant information from being presented to the public agency." (Pub. Resources Code, § 21005, subd. (a).)

Second, subdivision (a) states that, except as provided in Public Resources Code section 21168.9 itself, CEQA does not limit the traditional equitable powers of the judicial branch and that remedies may be tailored based on the circumstances of the project. It further explains that the court may order the agency to set aside all or a portion of the project approvals, and may require the agency to conduct additional environmental review.

[1] Exceptions apply where challenges to certain types of agency actions specifically require a different procedure. For example, Government Code section 56103 requires that any challenge to any change of organization, reorganization, or sphere of influence determination approved by a local agency formation commission be accomplished through a validating action pursuant to Code of Civil Procedure section 860 et seq. (*See Protect Agricultural Land v. Stanislaus County Local Agency Formation Commission* (2014) 223 Cal. App. 4th 550.)

Next, subdivision (b) clarifies that in certain circumstances, portions of the project approvals or the project itself may proceed while the agency conducts further review. Specifically, Section 21168.9 of the Public Resources Code provides that a court may allow certain project approvals or activities to proceed as long as continued implementation of the project would not prevent the agency from fully complying with CEQA. In 1993, the legislature amended that section "to expand the authority of courts to fashion a remedy that permits a part of the project to continue while the agency seeks to correct its CEQA violations." (*Poet, LLC v. State Air Resources Bd*. (2013) 218 Cal.App. 4th 681, 756.)

Next, subdivision (c) codifies the outcome in *Poet, LLC v. State Air Resources Bd*. (2013) 218 Cal. App. 4th 681, in which the Court of Appeal found that the California Air Resources Board had failed to fully comply with CEQA in enacting Low Carbon Fuel Standards regulations, but nevertheless exercised its equitable discretion to leave the challenged regulations in place during the remand period. The court reasoned that a remedy that left the regulations in place would achieve a higher level of environmental protection than would a remedy that left them inoperative.

Finally, subdivision (d) addresses how an agency should proceed with additional environmental review if required by a court. Specifically, it indicates that where a court upholds portions of an agency's environmental document, additional review of topics covered in the upheld portions is only required if the project or circumstances surrounding the project have changed in a way that results in new or worse environmental impacts. To illustrate, assume that a court concludes that an agency's analysis of noise impacts is inadequate, but that the remainder of its environmental impact report complies with CEQA. The agency may prepare a revised environmental impact report that focuses solely on noise. It would only need to revise the air quality analysis, for example, if the agency concluded that changes in the circumstances surrounding the project would result in substantially more severe air quality impacts.

Text of Proposed Section 15234

***New* Section 15234. Remand**

(a) Not every violation of CEQA is prejudicial requiring rescission of project approvals. Courts may fashion equitable remedies in CEQA litigation. If a court determines that a public agency has not complied with CEQA, and that noncompliance was a prejudicial abuse of discretion, the court shall issue a peremptory writ of mandate requiring the agency to:

(1) void the project approval, in whole or in part;

(2) suspend any project activities that preclude consideration and implementation of mitigation measures and alternatives necessary to comply with CEQA; or

(3) take specific action necessary to bring the agency's consideration of the project into compliance with CEQA.

(b) Following a determination described in subdivision (a), an agency may proceed with those portions of the challenged determinations, findings, or decisions for the project or those project activities that the court finds:

(1) are severable;

(2) will not prejudice the agency's compliance with CEQA as described in the court's peremptory writ of mandate; and

(3) complied with CEQA.

(c) An agency may also proceed with a project, or individual project activities, during the remand period where the court has exercised its equitable discretion to leave project approvals in place or in practical effect during that period because the environment will be given a greater level of protection if the project is allowed to remain operative than if it were inoperative during that period.

(d) As to those portions of an environmental document that a court finds to comply with CEQA, additional environmental review shall only be required as required by the court consistent with principles of res judicata. In general, where a court has required an agency to void its approval of the project, the agency need not expand the scope of analysis on remand beyond that specified by the court, except under the circumstances described in section 15088.5. In general, where a court has not required an agency to void its approval of the project, the agency need not expand the scope of analysis on remand beyond that specified by the court, except under the circumstances described in Section 15162.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21005, 21168.9; *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (2013) 57 Cal. 4th 439; *Preserve Wild Santee v. City of Santee* (2012) 210 Cal. App. 4th 260; *Golden Gate Land Holdings, LLC v. East Bay Regional Park Dist*. (2013) 215 Cal. App. 4th 353; *POET, LLC v. State Air Resources Board* (2013) 218 Cal. App. 4th 681; *Silverado Modjeska Recreation and Parks Dist. v. County of Orange* (2011) 197 Cal. App. 4th 282.

Substance Improvements

The following pages describe substantive improvements to the CEQA Guidelines. These improvements address:

- Energy Impacts Analysis
- Water Supply Analysis

Analysis of Energy Impacts

Proposed Amendments to Section 15126.2

Background

In 1974, the Legislature adopted the Warren-Alquist State Energy Resources Conservation and Development Act. (Pub. Resources Code, § 25000 et seq.) That act created what is now known as the California Energy Commission, and enabled it to adopt building energy standards. (See, e.g., id. at 25402.) At that time, the Legislature found the "rapid rate of growth in demand for electric energy is in part due to wasteful, uneconomic, inefficient, and unnecessary uses of power and a continuation of this trend will result in serious depletion or irreversible commitment of energy, land and water resources, and potential threats to the state's environmental quality." (*Id*. at § 25002; see also § 25007 ("It is further the policy of the state and the intent of the Legislature to employ a range of measures to reduce wasteful, uneconomical, and unnecessary uses of energy, thereby reducing the rate of growth of energy consumption, prudently conserve energy resources, and assure statewide environmental, public safety, and land use goals").)

The same year that the Legislature adopted Warren-Alquist, it also added section 21100(b)(3) to CEQA, requiring environmental impact reports to include "measures to reduce the wasteful, inefficient, and unnecessary consumption of energy." As explained by a court shortly after it was enacted, the "energy mitigation amendment is *substantive* and not procedural in nature and was enacted for the purpose of requiring the lead agencies to focus upon the energy problem in the preparation of the final EIR." (*People v. County of Kern* (1976) 62 Cal. App. 3d 761, 774 (emphasis added).) It compels an affirmative investigation of the project's potential energy use and feasible ways to reduce that use.

Though Appendix F of the CEQA Guidelines has contained guidance on energy analysis for decades, implementation among lead agencies has not been consistent. (*See*, *e.g.*, *California Clean Energy Committee v. City of Woodland* (2014) 225 Cal. App. 4th 173, 209.) While California is a leader in energy conservation, the importance of addressing energy impacts has not diminished since 1974. On the contrary, given the need to take action to avoid the effects of climate change, energy use is an issue that we cannot afford to ignore. As explained in the Discussion Draft of the Environmental Goals and Policy Report (2014),

> As the largest sources of both GHG and air pollution emissions, the state's energy and transportation systems are key to achieving long-term GHG emission reductions. Significant technological improvements are needed in electricity generation and storage, vehicles, and fuels, along with reductions in demand through energy efficiency programs, smart land use, and investments in better infrastructure. Cleaning up the state's energy and transportation systems is a critical element of not only meeting the state's climate change goals, but also meeting federal air quality standards.

(Draft EGPR, at p. 14.) Appendix F was revised in 2009 to clarify that analysis of energy impacts is mandatory. OPR today proposes to add a subdivision in section 15126.2 on energy impacts to further elevate the issue, and remove any question about whether such an analysis is required.

Explanation of Proposed Amendments

OPR proposes to add a new subdivision (b) to Section 15126.2 discussing the required contents of an environmental impact report. The new subdivision would specifically address the analysis of a project's potential energy impacts. This addition is necessary for several reasons explained in detail below.

The first sentence clarifies that an EIR must analyze whether a project will result in significant environmental effects due to "wasteful, inefficient, or unnecessary consumption of energy." This clarification is necessary to implement Public Resources Code section 21100(b)(3). Since the duty to impose mitigation measures arises when a lead agency determines that the project may have a significant effect, section 21100(b)(3) necessarily requires both analysis and a determination of significance in addition to energy efficiency measures. (Pub. Resources Code § 21002.)

The second sentence further clarifies that all aspects of the project must be considered in the analysis. This clarification is consistent with the rule that lead agencies must consider the "whole of the project" in considering impacts. It is also necessary to ensure that lead agencies consider issues beyond just building design. (*See*, *e.g.*, *California Clean Energy Committee*, *supra*, at pp. 210-212.) The analysis of vehicle miles traveled provided in proposed section 15064.3 (implementing Public Resources Code Section 21099 (SB 743)) on transportation impacts may be relevant to this analysis.

The third sentence signals that the analysis of energy impacts may need to extend beyond building code compliance. (*Ibid*.) The requirement to determine whether a project's use of energy is "wasteful, inefficient, and unnecessary" compels consideration of the project in its context. (Pub. Resources Code, § 21100(b)(3).) While building code compliance is a relevant factor, the generalized rules in the building code will not necessarily indicate whether a particular project's energy use could be improved. (*Tracy First v. City of Tracy* (2009) 177 Cal. App. 4th 912, 933 (after analysis, lead agency concludes that project proposed to be *at least 25% more energy efficient than the building code requires* would have a less than significant impact); see also State CEQA Guidelines, Appendix F, § II.C.4 (describing building code compliance as one of several different considerations in determining the significance of a project's energy impacts).) That the Legislature added the energy analysis requirement in CEQA at the same time that it created an Energy Commission authorized to impose building energy standards indicates that compliance with the building code is a necessary but not exclusive means of satisfying CEQA's independent requirement to analyze energy impacts broadly.

The new proposed subdivision (b) also provides a cross-reference to Appendix F. This cross-reference is necessary to direct lead agencies to the more detailed provisions contained in that appendix.

Finally, new proposed subdivision (b) cautions that the analysis of energy impacts is subject to the rule of reason, and must focus on energy demand actually caused by the project. This sentence is necessary

to place reasonable limits on the analysis. Specifically, it signals that a full "lifecycle" analysis that would account for energy used in building materials and consumer products will generally not be required. (See also Cal. Natural Resources Agency, Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97 (Dec. 2009) at pp. 71-72.)

Question for Stakeholders

Neither the statute nor the Guidelines currently define the phrase "wasteful, inefficient, and unnecessary consumption of energy." Should the Guidelines define that phrase? If so, how should it be defined?

Text of Proposed Amendments to Section 15126.2

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15126.2. Consideration and Discussion of Significant Environmental Impacts

(a) The Significant Environmental Effects of the Proposed Project. An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected. For example, an EIR on a subdivision astride an active fault line should identify as a significant effect the seismic hazard to future occupants of the subdivision. The subdivision would have the effect of attracting people to the location and exposing them to the hazards found there. Similarly, the EIR should evaluate any potentially significant impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans, addressing such hazards areas.

(b) **Energy Impacts. The EIR shall include an analysis of whether the project will result in significant environmental effects due to wasteful, inefficient, or unnecessary consumption of energy. This**

analysis should include the project's energy use for all project phases and components, including transportation-related energy, during construction and operation. In addition to project design, other relevant considerations may include, among others, the project's size, location, orientation, equipment use and any renewable energy features that could be incorporated into the project. (Guidance on information that may be included in such an analysis is presented in Appendix F.) This analysis is subject to the rule of reason and shall focus on energy demand that is caused by the project.

(c) Significant Environmental Effects Which Cannot be Avoided if the Proposed Project is Implemented. Describe any significant impacts, including those which can be mitigated but not reduced to a level of insignificance. Where there are impacts that cannot be alleviated without imposing an alternative design, their implications and the reasons why the project is being proposed, notwithstanding their effect, should be described.

~~**(c)**~~**(d)** Significant Irreversible Environmental Changes Which Would be Caused by the Proposed Project Should it be Implemented. Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified. (See Public Resources Code section 21100.1 and Title 14, California Code of Regulations, section 15127 for limitations to applicability of this requirement.)

~~**(d)**~~**(e)** Growth-Inducing Impact of the Proposed Project. Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a waste water treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

AUTHORITY:

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Sections 21002, 21003 and 21100, Public Resources Code; ***California Clean Energy Committee v. City of Woodland*** **(2014) 225 Cal. App. 4th 173 ; North Coast Rivers Alliance v. Marin Municipal Water District (2013) 216 Cal. App. 4th 614 ;** Citizens of Goleta Valley v. Board of Supervisors, (1990) 52 Cal.3d 553; Laurel Heights Improvement Association v. Regents of the University of California, (1988) 47 Cal.3d 376; Gentry v.

Cityof Murrieta (1995) 36 Cal.App.4th 1359; Laurel Heights Improvement Association v. Regents of the University of California (1993) 6 Cal.4th 1112; and Goleta Union School Dist. v. Regents of the Univ. Of Calif (1995) 37 Cal. App.4th 1025.

Water Supply Analysis in CEQA

Proposed Amendments to Section 15155

Background

California is experiencing the worst water crisis in our state's modern history. We are currently in the fourth consecutive year of extremely dry conditions. Precipitation and snowpack are a small fraction of their normal averages, reservoirs are at extremely low levels and rivers have severely diminished flows. In response to the growing crisis, Governor Brown proclaimed a state of emergency in January 2014. and call on all Californians to reduce their water consumption by 20%. In April 2014, the Department of Water Resources announced a 5 percent allocation of the State Water Project – the lowest ever. (DWR, Water Conditions.) Allocations remain low in 2015. The State Water Resources Control Board has begun to notify water rights holders that they must curtail their diversions in certain watersheds. (See, State Water Resources Control Board, "Notices of Water Availability (Curtailment and Emergency Regulations)" .) In September 2014, Governor Brown signed into law the Sustainable Groundwater Management Act, historic legislation to strengthen local management and monitoring of groundwater basins most critical to the state's water needs. Responding to continuing dry conditions, in April 2015, the Governor issued Executive Order B-29-15 calling on Californians to redouble their water conservation efforts. Specifically, urban water agencies are required to reduce water use by a combined 25%.

Climate change is expected to increase long-term variability in California's water supplies. (Esther Conrad, "Preparing for New Risks: Addressing Climate Change in California's Urban Water Management Plans" (June 2013).)

The Department of Water Resources has identified several climate change effects that could affect water supplies, including:

- Water Demand — Hotter days and nights, as well as a longer irrigation season, will increase landscaping water needs, and power plants and industrial processes will have increased cooling water needs.
- Water Supply and Quality — Reduced snowpack, shifting spring runoff to earlier in the year …, increased potential for algal bloom, and increased potential for seawater intrusion—each has the potential to impact water supply and water quality.
- Sea Level Rise — It is expected that sea level will continue to rise, resulting in near shore ocean changes such as stronger storm surges, more forceful wave energy, and more extreme tides. This will also affect levee stability in low-lying areas and increase flooding.
- Disaster — Disasters are expected to become more frequent as climate change brings increased climate variability, resulting in more extreme droughts and floods. This will challenge water

> supplier operations in several ways as wildfires are expected to become larger and hotter, droughts will become deeper and longer, and floods can become larger and more frequent.

(Department of Water Resources, "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan," (March 2011), at G-3.) These risks are now being incorporated into long-term water supply planning.

California courts have long recognized CEQA's requirement to analyze the adequacy of water supplies needed to serve a proposed project. (*See*, *e.g.*, *Santiago County Water Dist. v. County of Orange* (1981) 118 Cal. App. 3d 818.) Accordingly, the sample initial study checklist in Appendix G asks whether the project would have "sufficient water supplies available to serve the project…." (State CEQA Guidelines, App. G., § XVII(d).)

In recent years, the California Legislature added water supply assessment and verification requirements for certain types of projects. (See Wat. Code §§ 10910 et seq. (water supply assessments); Gov. Code § 66473.7 (water supply verifications).) Shortly after those statutory requirements were enacted, the California Supreme Court articulated several principles describing the content requirements for an adequate water supply evaluation in CEQA. (*Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal. 4th 412.) The Natural Resources Agency added section 15155 to the CEQA Guidelines to describe the consultation and documentation that must be occur between water suppliers and lead agencies. (State CEQA Guidelines § 15155.) Because that section was developed before the Supreme Court's decision in *Vineyard*, it focuses on compliance with the consultation requirements in SB 610, and does not discuss the issue of adequacy of a water supply analysis in CEQA more broadly.

Description of the Proposed Amendments to Section 15155

Because water is such a critical resource in California, and because California courts have required specific content in environmental documents regarding water supply, OPR proposes to revise section 15155 to incorporate the adequacy principles described in the Supreme Court's *Vineyard* decision. Doing so should ensure that lead agencies consistently develop the information needed to evaluate the impacts associated with providing water to their projects. The specific additions to section 15155 are described below.

New Subdivision (f) – Water Supply Analysis and Degree of Specificity

OPR proposes to add a new subdivision (f) to section 15155 to set forth the content requirements for a water supply analysis in CEQA. While subdivision (f) describes these content requirements, it is important to note that OPR is not creating *new* requirements. Rather, it is merely stating explicitly in the Guidelines what CEQA already requires. (See, Pub. Resources Code § 21060.5 ("environment" defined as "the physical conditions that exist within the area which will be affected by a proposed project, including … water …"); *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal. 4th 412 (setting forth the required elements of a water supply analysis).)

The first two sentences in subdivision (f) state the rule that the level of certainty regarding water supplies will increase as the analysis moves from general to specific. (*Vineyard*, *supra*, 40 Cal. 4th at 434 ("we emphasize that the burden of identifying likely water sources for a project varies with the stage of project approval involved; the necessary degree of confidence involved for approval of a conceptual plan is much lower than for issuance of building permits").) This rule is consistent with other portions of the CEQA Guidelines governing forecasting and the degree of specificity required in environmental documents. (State CEQA Guidelines §§ 15144 ("[w]hile foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can"), 15146 ("degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity which is described in the EIR").)

Subdivision (f)(1) – Purpose

Subdivision (f)(1) states the requirement that a water supply analysis provide enough information to the lead agency to evaluate the pros and cons of providing water to the project. (*Vineyard*, *supra*, 40 Cal. 4th at 431; *Santiago*, *supra*, 118 Cal. App. 3d at pp. 829-831.) This will necessarily require information regarding the project's water demand as well as the quantity of water that is available to serve the project.

Subdivision (f)(2) – Environmental Impacts of Supplying the Water

Subdivision (f)(2) states the requirement to analyze the environmental effects of supplying water to the project. This sentence further specifies that the analysis must account for all phases of the project, over the life of the project. (*Vineyard*, *supra*, 40 Cal. 4th at 431 ("an adequate environmental impact analysis for a large project, to be built and occupied over a number of years, cannot be limited to the water supply for the first stage or the first few years").) This is an important clarification because the water supply assessment and verification statutes only require looking twenty years into the future. Some projects may have a lifespan of fifty or more years. In that circumstance, some degree of forecasting may be required. (State CEQA Guidelines § 15144.) Pure speculation, however, is not required. (*Id*. at § 15145.)

Additionally, the focus of this subdivision should be on the *environmental impacts* associated with a particular water supply. (*Vineyard*, *supra*, 40 Cal. 4th at 434 (the "ultimate question under CEQA … is not whether an EIR establishes a likely source of water, but whether it adequately addresses the reasonably foreseeable *impacts* of supplying water to the project") (emphasis in original).) For example, after establishing the amount of water a project will need, the analysis might examine whether supplying that amount from groundwater might lead to subsidence or unsafe yield, or whether diverting that amount from surface flow might adversely affect fish and wildlife.

Subdivision (f)(3) – Circumstances Affecting the Likelihood of Supplies

Since water supply availability is variable in California, subdivision (f)(3) requires acknowledging any circumstances that might affect the availability of water supplies identified for a project. (*Vineyard*, *supra*, 40 Cal. 4th at 432 (an environmental document "must address the impacts of likely future water sources, and the EIR's discussion must include a reasoned analysis of the circumstances affecting the

likelihood of the water's availability").) The magnitude of variability should also be disclosed. (*Id*. at p. 434 ("an EIR may satisfy CEQA if it acknowledges the degree of uncertainty involved").) Subdivision (f)(3) also provides a list of circumstances that might potentially affect water supplies, including but not limited to: "drought, salt-water intrusion, regulatory or contractual curtailments, and other reasonably foreseeable demands on the water supply."

Subdivision (f)(4) – Alternatives and Mitigation

Subdivision (f)(4) provides that when supplies for the project are not certain, the analysis should address alternatives. (*Vineyard*, *supra*, 40 Cal. 4th at 432.) Again, the focus of the analysis should be on the *environmental impacts* that would flow from using those alternative sources of supply. (*Ibid*.) However, the level of detail of that analysis need not be as great as that provided for the project itself. (See, State CEQA Guidelines § 15126.6(d) ("If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed").) Thus, subdivision (f)(4) states that the analysis of impacts from alternative sources should be stated "at least in general terms." (*Napa Citizens for Honest Government v. Napa County Bd. of Sup*. (2001) 91 Cal. App. 4th 342, 373.) Further, subdivision (f)(4) provides that in addition to analyzing alternative water supplies when identified supplies are uncertain, a lead agency may also consider project alternatives that require less water. For example, if supplies are certain up to a certain amount, a lead agency should be able to consider alternative project designs that would use less water and that could be confidently served.

Finally, subdivision (f)(4) provides that if water supplies are not certain, and if the agency has fully analyzed water supply availability as described above, curtailing later project phases may be an appropriate mitigation measure.

Question for stakeholders

OPR proposes to add the discussion of water supply analysis requirements, which apply to all project types, to existing Section 15155, which governs consultation requirements with public water systems for certain types of projects. Is this the right place to include this new discussion? Would it be better to add this discussion to Section 15064, on determining significance? Or to section 15126.2, on contents of an EIR? Or to create a separate section?

Text of the Proposed Amendments to Section 15155

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in **~~strikeout~~**.

§ 15155. **Water Supply Analysis;** City or County Consultation with Water Agencies

(a) The following definitions are applicable to this section.

(1) A "water-demand project" means:

(A) A residential development of more than 500 dwelling units.

(B) A shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(C) A commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(D) A hotel or motel, or both, having more than 500 rooms.

(E) An industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(F) A mixed-use project that includes one or more of the projects specified in subdivisions (a)(1)(A), (a)(1)(B), (a)(1)(C), (a)(1)(D), (a)(1)(E), and (a)(1)(G) of this section.

(G) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

(H) For public water systems with fewer than 5,000 service connections, a project that meets the following criteria:

1. A proposed residential, business, commercial, hotel or motel, or industrial development that would account for an increase of 10 percent or more in the number of a public water system's existing service connections; or

2. A mixed-use project that would demand an amount of water equivalent to, or greater than, the amount of water required by residential development that would represent an increase of 10 percent or more in the number of the public water system's existing service connections.

(2) "Public water system" means a system for the provision of piped water to the public for human consumption that has 3000 or more service connections. A public water system includes all of the following:

(A) Any collection, treatment, storage, and distribution facility under control of the operator of the system which is used primarily in connection with the system.

(B) Any collection or pretreatment storage facility not under the control of the operator that is used primarily in connection with the system.

(C) Any person who treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

(3) "Water acquisition plans" means any plans for acquiring additional water supplies prepared by the public water system or a city or county lead agency pursuant to subdivision (a) of section 10911 of the Water Code.

(4) "Water assessment" means the water supply assessment that must be prepared by the governing body of a public water system, or the city or county lead agency, pursuant to and in compliance with sections 10910 to 10915 of the Water Code, and that includes, without limitation, the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g) of section 10910 of the Water Code.

(5) "City or county lead agency" means a city or county, acting as lead agency, for purposes of certifying or ap-proving an environmental impact report, a negative declaration, or a mitigated negative declaration for a water-demand project.

(b) Subject to section 15155, subdivision (d) below, at the time a city or county lead agency determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration, or any supplement thereto, is required for the water-demand project, the city or county lead agency shall take the following steps:

(1) The city or county lead agency shall identify any water system that either: (A) is a public water system that may supply water to the water-demand project, or (B) that may become such a public water system as a result of supplying water to the water-demand project. The city or county lead agency shall request the governing body of each such public water system to determine whether the projected water demand associated with a water-demand project was included in the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with section 10610) of the Water Code, and to prepare a water assessment approved at a regular or special meeting of that governing body.

(2) If the city or county lead agency is not able to identify any public water system that may supply water for the water-demand project, the city or county lead agency shall prepare a water assessment after consulting with any entity serving domestic water supplies whose service area includes the site of the water-demand project, the local agency formation commission, and the governing body of any public water system adjacent to the site of the water-demand project. The governing body of the city or county lead agency must approve the water assessment prepared pursuant to this section at a regular or special meeting.

(c) The city or county lead agency shall grant any reasonable request for an extension of time that is made by the governing body of a public water system preparing the water assessment, provided that the request for an extension of time is made within 90 days after the date on which the governing body of the public water system received the request to prepare a water assessment. If the governing body of the public water system fails to request and receive an extension of time, or fails to submit the water assessment notwithstanding the 30-day extension, the city or county lead agency may seek a writ of mandamus to compel the governing body of the public water system to comply with the requirements

of Part 2.10 of Division 6 (commencing with section 10910) of the Water Code relating to the submission of the water assessment.

(d) If a water-demand project has been the subject of a water assessment, no additional water assessment shall be required for subsequent water-demand projects that were included in such larger water-demand project if all of the following criteria are met:

(1) The entity completing the water assessment had concluded that its water supplies are sufficient to meet the projected water demand associated with the larger water-demand project, in addition to the existing and planned future uses, including, but not limited to, agricultural and industrial uses; and

(2) None of the following changes has occurred since the completion of the water assessment for the larger water-demand project:

(A) Changes in the larger water-demand project that result in a substantial increase in water demand for the water-demand project.

(B) Changes in the circumstances or conditions substantially affecting the ability of the public water system or the water supplying city or county identified in the water assessment to provide a sufficient supply of water for the water demand project.

(C) Significant new information becomes available which was not known and could not have been known at the time when the entity had reached the conclusion in subdivision (d)(1).

(e) The city or county lead agency shall include the water assessment, and any water acquisition plan in the EIR, negative declaration, or mitigated negative declaration, or any supplement thereto, prepared for the water-demand project, and may include an evaluation of the water assessment and water acquisition plan information within such environmental document. The city or county lead agency shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and planned future uses. If a city or county lead agency determines that water supplies will not be sufficient, the city or county lead agency shall include that determination in its findings for the water-demand project.

(f) The degree of certainty regarding the availability of water supplies will vary depending on the stage of project approval. A lead agency should have greater confidence in the availability of water supplies for a specific project than might be required for a conceptual plan. An analysis of water supply in an environmental document shall include the following:

(1) Sufficient information regarding the project's proposed water demand and proposed water supplies to permit the lead agency to evaluate the pros and cons of supplying the amount of water that the project will need.

(2) An analysis of the long-term environmental impacts of supplying water throughout the life of all phases of the project.

(3) An analysis of circumstances affecting the likelihood of the water's availability, as well as the degree of uncertainty involved. Relevant factors may include but are not limited to, drought, salt-water intrusion, regulatory or contractual curtailments, and other reasonably foreseeable demands on the water supply.

(4) If the lead agency cannot confidently predict the availability of a particular water supply, it shall conduct an analysis of alternative sources, including at least in general terms the environmental consequences of using those alternative sources, or alternatives to the project that could be served with available water.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section 21151.9, Public Resources Code; and Sections 10910-10915, Water Code**; *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal. 4th 412**.

Technical Improvements

The following pages describe technical improvements to the CEQA Guidelines. These improvements address:

- Baseline
- Mitigation details
- Responses to Comments

Baseline

Proposed Amendments to Section 15125

Background

The description of the environmental setting plays a key role in the CEQA process by providing the baseline against which the project's potential impacts are measured. Section 15125 of the CEQA Guidelines has for years described the general rule: "normally," the baseline consists of physical environmental conditions "as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced." In recent years, several cases in the courts of appeal and in the California Supreme Court have focused on exceptions to this general rule. OPR's proposed amendments to Section 15125 are intended to reflect those decisions, as described in greater detail below.

Explanation of Proposed Amendments

OPR proposes to amend subdivision (a) of Section 15125 regarding the environmental setting. Specifically, OPR proposes to add a statement of purpose and three subdivisions to subdivision (a).

Subdivision (a) - Purpose

In the body of subdivision (a), OPR proposes to add a sentence stating that the purpose of defining the environmental setting is to give decision-makers and the public an accurate picture of the project's likely impacts, both near-term and long-term. This sentence paraphrases the Supreme Court's description of the requirement in *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (2013) 57 Cal. 4th 439. (See id. at 455 ("Even when a project is intended and expected to improve conditions in the long term--20 or 30 years after an EIR is prepared--decision makers and members of the public are entitled under CEQA to know the short- and medium-term environmental costs of achieving that desirable improvement. … [¶] … The public and decision makers are entitled to the most accurate information on project impacts practically possible, and the choice of a baseline must reflect that goal"); see also *Communities for a Better Environment v. South Coast Air Quality Management Dist*. (2010) 48 Cal.4th 310).) The purpose of adding this sentence to subdivision (a) is to guide lead agencies in the choice between potential alternative baselines. When in doubt, lead agencies should choose the baseline that most meaningfully informs decision-makers and the public of the project's possible impacts.

Subdivision (a)(1) – General Rule

Proposed subdivision (a)(1) sets forth the general rule: normally, conditions existing at the time of the environmental review should be considered the baseline. The first sentence largely consists of language that was moved from the body of existing subdivision (a) and that states this general rule. The second

sentence provides that a lead agency may look back to historic conditions to establish a baseline where existing conditions fluctuate, provided that it can document such historic conditions with substantial evidence. (See, *Communities for a Better Environment, supra,* 48 Cal.4th at pp. 327-328 ("Environmental conditions may vary from year to year and in some cases it is necessary to consider conditions over a range of time periods") (quoting *Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 125); see also *Cherry Valley Pass Acres & Neighbors v. City of Beaumont* (2010) 190 Cal.App.4th 316.)

The third sentence provides that a lead agency may describe both existing conditions as well as future conditions. (*Neighbors*, *supra*, 57 Cal. 4th at p. 454 ("nothing in CEQA law precludes an agency… from considering both types of baseline--existing and future conditions--in its primary analysis of the project's significant adverse effects").) The court in the *Neighbors* decision described examples of when it might be appropriate to focus on conditions existing at the time the project commences operations:

> For example, in an EIR for a new office building, the analysis of impacts on sunlight and views in the surrounding neighborhood might reasonably take account of a larger tower already under construction on an adjacent site at the time of EIR preparation. For a large-scale transportation project …, to the extent changing background conditions during the project's lengthy approval and construction period are expected to affect the project's likely impacts, the agency has discretion to consider those changing background conditions in formulating its analytical baseline.

(*Id*. at 453.)

Subdivision (a)(2) – Exceptions to the General Rule

Proposed subdivision (a)(2) sets forth the exception to the general rule, and conditions allowing lead agencies to use an alternative baseline. The first sentence explains that existing conditions may be omitted in favor of an alternate baseline where "use of existing conditions would be either misleading or without informative value to decision-makers and the public." (*See*, *Neighbors*, *supra*, 57 Cal.4th at p. 453 ("To the extent a departure from the 'norm[]' of an existing conditions baseline (Guidelines, § 15125(a)) promotes public participation and more informed decisionmaking by providing a more accurate picture of a proposed project's likely impacts, CEQA permits the departure. Thus an agency may forego analysis of a project's impacts on existing environmental conditions if such an analysis would be uninformative or misleading to decision makers and the public").) Notably, the Court in the *Neighbors* case highlighted a useful example of when future conditions might provide a more useful analysis:

> In this illustration, an existing industrial facility currently emits an air pollutant in the amount of 1,000 pounds per day. By the year 2020, if no new project is undertaken at the facility, emissions of the pollutant are projected to fall to 500 pounds per day due to enforcement of regulations already adopted and to turnover in the facility's vehicle

> fleet. The operator proposes to use the facility for a new project that will emit 750 pounds per day of the pollutant upon implementation and through at least 2020. An analysis comparing the project's emissions to existing emissions would conclude the project would reduce pollution and thus have no significant adverse impact, while an analysis using a baseline of projected year 2020 conditions would show the project is likely to increase emissions by 250 pounds per day, a (presumably significant) 50 percent increase over baseline conditions.

(*Neighbors*, *supra*, 57 Cal. 4th at 453, n 5.)

The first sentence in subdivision (a)(2) also describes the procedural requirement that the lead agency must expressly justify its decision not to use existing conditions as the baseline for environmental analysis, and that justification must be supported with substantial evidence in the record. (*See id*. at 457.) The second sentence provides that if ***future*** conditions are to be used, they must be based on reliable projections grounded in substantial evidence. This provision reflects the court's concern regarding gamesmanship and manipulation as stated in the *Neighbors* decision, as well as the concern that predictive modeling may not be readily understood by the public. (*Id*. at pp. 455-456[2]; see also Pub. Resources Code, §§ 21003(b) (CEQA documents shall "be organized and written in a manner that will be meaningful and useful to decision makers and to the public"), 21080(e)(2) ("Substantial evidence" does not include "speculation … or … evidence that is clearly inaccurate or erroneous").)

[2] The Supreme Court explained in some detail the potential drawbacks of using a future conditions baseline:

> In addition, existing environmental conditions have the advantage that they can generally be directly measured and need not be projected through a predictive model. However sophisticated and well designed a model is, its product carries the inherent uncertainty of every long-term prediction, uncertainty that tends to increase with the period of projection. For example, if future population in the project area is projected using an annual growth multiplier, a small error in that multiplier will itself be multiplied and compounded as the projection is pushed further into the future. The public and decision makers are entitled to the most accurate information on project impacts practically possible, and the choice of a baseline must reflect that goal.
>
> Finally, use of existing conditions as a baseline makes the analysis more accessible to decision makers and especially to members of the public, who may be familiar with the existing environment but not technically equipped to assess a projection into the distant future. As an amicus curiae observes, "[a]nyone can review an EIR's discussion of current environmental conditions and determine whether [it] comports with that person's knowledge and experience of the world." But "[i]n a hypothetical future world, the environment is what the statisticians say it is." Quantitative and technical descriptions of environmental conditions have a place in CEQA analysis, but an agency must not create unwarranted barriers to public understanding of the EIR by unnecessarily substituting a baseline of projected future conditions for one based on actual existing conditions. (See Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 392 [253 Cal.Rptr. 426, 764 P.2d 278] [EIR allows the public to "know the basis on which its responsible officials either approve or reject environmentally significant action," thereby promoting "informed self-government"].)

(*Neighbors*, *supra*, 57 Cal. 4th at 455-456.)

Subdivision (a)(3) – Hypothetical Conditions

Subdivision (a)(3) specifies that hypothetical conditions may not be used as a baseline. Specifically, this proposed subdivision states that lead agencies may not measure project impacts against conditions that are neither existing nor historic, such as those that might be allowed under existing permits or plans. As the Supreme Court explained in its *CBE* decision: "[a]n approach using hypothetical allowable conditions as the baseline results in 'illusory' comparisons that 'can only mislead the public as to the reality of the impacts and subvert full consideration of the actual environmental impacts,' a result at direct odds with CEQA's intent." (*Communities for a Better Environment*, *supra*, 48 Cal. 4th at 322 (quoting *Environmental Planning & Information Council v. County of El Dorado* (1982) 131 Cal. App. 3d 350, 358).)

OPR's proposal reflects in large part suggestions submitted by the Association of Environmental Professionals and American Planning Association, and, to a degree, those submitted by the California Building Industry Association. (See "Recommendations for Updating the State CEQA Guidelines American Planning Association, California Chapter; Association of Environmental Professionals; and Enhanced CEQA Action Team (August 30, 2013), at pp. 1-2; see also Letter from the California Building Industry Association, February 14, 2014.) OPR's proposal, however, breaks the new guidance into subdivisions to more clearly identify (1) the general rule, (2) acceptable exceptions to the general rule and conditions for using alternative baselines, and (3) prohibited alternative baselines.

What is Not Included?

OPR declines to include the "examples of future conditions that may appropriately be included in an adjusted baseline" as identified in the BIA letter. The CEQA Guidelines do occasionally include factual examples to help illustrate a principle of law. However, because the Supreme Court has cautioned that the selection of a baseline is "a primarily factual assessment" that depends on whether a certain set of conditions would tend to inform or mislead decision-makers and the public (*Neighbors*, *supra*, at p. 457), the examples cited in BIA's letter may or may not be appropriate alternative baselines depending on the circumstances of a given project.

OPR also declines the suggestion of several commenters to require baselines to exclude the effects of illegal activities. The Supreme Court has identified a line of cases upholding a lead agency's use of existing conditions as the baseline, even when those conditions were not legal or permitted. (See, *Communities for a Better Environment*, *supra*, 48 Cal. 4th at p. 321 fn 7 (citing *Eureka Citizens for Responsible Government v. City of Eureka* (2007) 147 Cal.App.4th 357, 370-371; *Fat v. County of Sacramento* (2002) 97 Cal.App.4th 1270, 1278-1280; *Riverwatch v. County of San Diego* (1999) 76 Cal.App.4th 1428, 1452-1453).)

Text of Proposed Amendments to Section 15125

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15125. Environmental Setting

(a) An EIR must include a description of the physical environmental conditions in the vicinity of the project**.** ~~**, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environ-mental analysis is commenced, from both a local and regional perspective.**~~ This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant. The description of the environmental setting shall be no longer than is necessary to an understanding of the significant effects of the proposed project and its alternatives. **The purpose of this requirement is to give the public and decision makers the most accurate and understandable picture practically possible of the project's likely near-term and long-term impacts.**

(1) Generally, the lead agency should describe physical environmental conditions as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. Where existing conditions change or fluctuate over time, a lead agency may define existing conditions by referencing historic conditions that are supported with substantial evidence. In addition to existing conditions, a lead agency may also use a second baseline consisting of projected future conditions that are supported by reliable projections based on substantial evidence in the record.

(2) If a lead agency demonstrates with substantial evidence that use of existing conditions would be either misleading or without informative value to decision-makers and the public, it may use a different baseline. Use of projected future conditions must be supported by reliable projections based on substantial evidence in the record.

(3) A lead agency may not rely on hypothetical conditions, such as those that might be allowed, but have never actually occurred, under existing permits or plans, as the baseline.

(b) When preparing an EIR for a plan for the reuse of a military base, lead agencies should refer to the special application of the principle of baseline conditions for determining significant impacts contained in Section 15229.

(c) Knowledge of the regional setting is critical to the assessment of environmental impacts. Special emphasis should be placed on environmental resources that are rare or unique to that region and would be affected by the project. The EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated and discussed and it must permit the significant effects of the project to be considered in the full environmental context.

(d) The EIR shall discuss any inconsistencies between the proposed project and applicable general plans, specific plans and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, regional

blueprint plans, plans for the reduction of greenhouse gas emissions, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the coastal zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains.

(e) Where a proposed project is compared with an adopted plan, the analysis shall examine the existing physical conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced as well as the potential future conditions discussed in the plan.

AUTHORITY:

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Sections 21060.5, 21061 and 21100, Public Resources Code; ***Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (2013) 57 Cal. 4th 439; *Communities for a Better Environment v. South Coast Air Quality Management Dist*. (2010) 48 Cal.4th 310; *Cherry Valley Pass Acres & Neighbors v. City of Beaumont* (2010) 190 Cal.App.4th 316;** E.P.I.C. v. County of El Dorado (1982) 131 Cal. App. 3d 350; San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus (1994) 27 Cal.App.4th 713; Bloom v. McGurk (1994) 26 Cal.App.4th 1307.

Deferral of Mitigation Details

Proposed Amendments to Section 15126.4

Background

When a lead agency identifies a potentially significant environmental impact, it must propose feasible mitigation measures in the environmental document for a project. (Pub. Resources Code §§ 21002 (duty to mitigate); 21080(c)(2) (mitigated negative declaration); 21100(b)(3) (EIR must include mitigation measures).) The formulation of mitigation measures cannot be deferred until after project approval. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal. App. 4th 70, 92 ("reliance on tentative plans for future mitigation after completion of the CEQA process significantly undermines CEQA's goals of full disclosure and informed decisionmaking; and consequently, these mitigation plans have been overturned on judicial review as constituting improper deferral of environmental assessment").)

Practical considerations, however, sometimes preclude development of detailed mitigation plans. In such cases, courts have permitted lead agencies to defer some of the *details* of mitigation measures provided that the agency commits itself to mitigation and analyzes the different mitigation alternatives that might ultimately be incorporated into the project. (See, e.g., *Sacramento Old City Assn. v. City Council* (1991) 229 Cal. App. 3d 1011, 1028–1030.)

A line of recent cases have addressed more specific rules on what details may or may not be deferred. (See, e.g., *Preserve Wild Santee v. City of Santee* (2012) 210 Cal.App.4th 260; *Rialto Citizens for Responsible Growth v. City of Rialto* (2012) 208 Cal.App.4th 899; *City of Maywood v. Los Angeles Unified School District* (2012) 208 Cal.App.4th 362; *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70; *Sheryl Gray v. County of Madera* (2008) 167 Cal.App.4th 1099; *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645; *Endangered Habitats League, Inc. v. County of Orange* (2005) 131 Cal.App.4th 777; *Defend the Bay v. City of Irvine* (2004) 119 Cal.App.4th 1261.)

In response to stakeholder suggestions for additional guidance in the CEQA Guidelines, OPR proposes changes, as outlined below, to further clarify when deferral of mitigation details may be permissible.

Explanation of Proposed Amendments

First, the proposed amendments would clarify in section 15126.4, subdivision (a)(1)(B), that the lead agency 'shall' not defer identification of mitigation measures. This binding requirement is clearly stated in a number of cases. (See, e.g., *Preserve Wild Santee, supra*, 210 Cal.App.4th 260; *Rialto Citizens for Responsible Growth, supra*, 208 Cal.App.4th 899; *City of Maywood, supra*, 208 Cal.App.4th 362; *CBE*, *supra*, 184 Cal.App.4th 70; *Gray*, *supra*, 167 Cal.App.4th 1099; *San Joaquin Raptor Rescue Center*, *supra*, 149 Cal.App.4th 645; *Endangered Habitats League*, *supra*, 131 Cal.App.4th 777; *Defend the Bay*, *supra*,

119 Cal.App.4th 1261.) Therefore, replacing the word 'should' with 'shall' will conform the Guidelines to case law. (State CEQA Guidelines § 15005.)

Second, the proposed amendments would describe situations when deferral of the *specific details* of mitigation may be allowable under CEQA, including what commitments the agency should make in the environmental document. Specifically, the proposed amendments would explain that deferral may be permissible when it is impractical or infeasible to fully formulate the details of a mitigation measure at the time of project approval and the agency commits to mitigation. (See, e.g., *Oakland Heritage Alliance v. City of Oakland* (2011) 195 Cal.App.4th 884 (deferral of mitigation was proper where practical considerations prohibited devising mitigation measures early in the planning process, and the agency committed to performance criteria); *Defend the Bay*, *supra*, 119 Cal.App.4th 1261 (deferral of specifics of mitigation measures was permissible where practical considerations prohibited devising such measures for a general plan amendment and zoning change); and *Preserve Wild Santee, supra*, 210 Cal.App.4th 260 (deferral of mitigation details was improper where performance standards were not specified and lead agency did not provide an explanation for why such standards were impractical or infeasible to provide at the time of certification of the EIR).)

Further, OPR proposes to clarify that when deferring the specifics of mitigation, the lead agency should either provide a list of possible mitigation measures, or adopt specific performance standards. The first option is summarized in *Defend the Bay v. City of Irvine, supra*. In that case, the court stated that deferral may be appropriate where the lead agency "lists the alternatives to be considered, analyzed and possibly incorporated into the mitigation plan." (*Defend the Bay, supra*, at p. 1275; see also *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376; *Rialto Citizens for Responsible Growth, supra*, 208 Cal.App.4th 899; *Gray*, *supra*, 167 Cal.App.4th 1099; *San Joaquin Raptor Rescue Center*, *supra*, 149 Cal.App.4th 645; *Endangered Habitats League*, *supra*, 131 Cal.App.4th 777.)

Alternatively, the lead agency may adopt performance standards in the environmental document, as described by the court in *Rialto Citizens for Responsible Growth v. City of Rialto, supra*. There, the court ruled that where mitigation measures incorporated specific performance criteria and were not so open-ended that they allowed potential impacts to remain significant, deferral was proper. (*Rialto Citizens for Responsible Growth, supra*, 208 Cal.App.4th 899; see also *Laurel Heights*, *supra*, 47 Cal.3d 376; *Preserve Wild Santee, supra*, 210 Cal.App.4th 260; *City of Maywood, supra*, 208 Cal.App.4th 362; *CBE*, *supra*, 184 Cal.App.4th 70; *Gray*, *supra*, 167 Cal.App.4th 1099; *San Joaquin Raptor Rescue Center*, *supra*, 149 Cal.App.4th 645; *Endangered Habitats League*, *supra*, 131 Cal.App.4th 777.)

Finally, the proposed amendments would explain that such deferral may be appropriate "where another regulatory agency will issue a permit for the project and is expected to impose mitigation requirements independent of the CEQA process so long as the EIR included performance criteria and the lead agency committed itself to mitigation." (*Clover Valley Foundation v. City of Rocklin* (2011) 197 Cal.App.4th 200, 237; see also *Oakland Heritage Alliance*, *supra*, 195 Cal.App.4th 884; *Defend the Bay*, *supra*, 119 Cal.App.4th 1261.)

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15126.4. Consideration and Discussion of Mitigation Measures proposed to Minimize Significant Effects.

(a) Mitigation Measures in General.

(1) An EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy.

(A) The discussion of mitigation measures shall distinguish between the measures which are proposed by project proponents to be included in the project and other measures proposed by the lead, responsible or trustee agency or other persons which are not included but the lead agency determines could reasonably be expected to reduce adverse impacts if required as conditions of approving the project. This discussion shall identify mitigation measures for each significant environmental effect identified in the EIR.

(B) Where several measures are available to mitigate an impact, each should be discussed and the basis for selecting a particular measure should be identified. Formulation of mitigation measures **~~should~~ shall** not be deferred until some future time. **~~However, measures may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way.~~ Deferral of the specific details of mitigation measures may be permissible when it is impractical or infeasible to fully formulate the details of such measures at the time of project approval, or where a regulatory agency other than the lead agency will issue a permit for a project that will impose mitigation requirements, provided that the lead agency has:**

1. fully evaluated the significance of the environmental impact and explained why it is not feasible or practical to formulate specific mitigation at the time of project approval;

2. commits to mitigation,

3. lists the mitigation options to be considered, analyzed and possibly incorporated in the mitigation plan; and

4. adopts specific performance standards that will be achieved by the mitigation measure.

(C) Energy conservation measures, as well as other appropriate mitigation measures, shall be discussed when relevant. Examples of energy conservation measures are provided in Appendix F.

(D) If a mitigation measure would cause one or more significant effects in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed. (*Stevens v. City of Glendale* (1981) 125 Cal.App.3d 986.)

(2) Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

(3) Mitigation measures are not required for effects which are not found to be significant.

(4) Mitigation measures must be consistent with all applicable constitutional requirements, including the following:

(A) There must be an essential nexus (i.e. connection) between the mitigation measure and a legitimate governmental interest. *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987); and

(B) The mitigation measure must be "roughly proportional" to the impacts of the project. *Dolan v. City of Tigard*, 512 U.S. 374 (1994). Where the mitigation measure is an ad hoc exaction, it must be "roughly proportional" to the impacts of the project. *Ehrlich v. City of Culver City* (1996) 12 Cal.4th 854.

(5) If the lead agency determines that a mitigation measure cannot be legally imposed, the measure need not be proposed or analyzed. Instead, the EIR may simply reference that fact and briefly explain the reasons underlying the lead agency's determination.

(b) Mitigation Measures Related to Impacts on Historical Resources.

(1) Where maintenance, repair, stabilization, rehabilitation, restoration, preservation, conservation or reconstruction of the historical resource will be conducted in a manner consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties with **Guidelines** for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (1995), Weeks and Grimmer, the project's impact on the historical resource shall generally be considered mitigated below a level of significance and thus is not significant.

(2) In some circumstances, documentation of an historical resource, by way of historic narrative, photographs or architectural drawings, as mitigation for the effects of demolition of the resource will not mitigate the effects to a point where clearly no significant effect on the environment would occur.

(3) Public agencies should, whenever feasible, seek to avoid damaging effects on any historical resource of an archaeological nature. The following factors shall be considered and discussed in an EIR for a project involving such an archaeological site:

(A) Preservation in place is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.

(B) Preservation in place may be accomplished by, but is not limited to, the following:

1. Planning construction to avoid archaeological sites;

2. Incorporation of sites within parks, greenspace, or other open space;

3. Covering the archaeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site.

4. Deeding the site into a permanent conservation easement.

(C) When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provision for adequately recovering the scientifically consequential information from and about the historical resource, shall be prepared and adopted prior to any excavation being undertaken. Such studies shall be deposited with the California Historical Resources Regional Information Center. Archaeological sites known to contain human remains shall be treated in accordance with the provisions of Section 7050.5 Health and Safety Code. If an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation.

(D) Data recovery shall not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archaeological or historical resource, provided that the determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center.

(c) Mitigation Measures Related to Greenhouse Gas Emissions.
Consistent with section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions. Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:

(1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;

(2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures, such as those described in Appendix F;

(3) Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions;

(4) Measures that sequester greenhouse gases;

(5) In the case of the adoption of a plan, such as a general plan, long range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Sections 5020.5, 21002, 21003, 21083.05, 21084.1 and 21100, Public Resources Code; Citizens of Goleta Valley v. Board of Supervisors, (1990) 52 Cal.3d 553; Laurel Heights Improvement Association v. Regents of the University of California, (1988) 47 Cal.3d 376; Gentry v. City of Murrieta (1995) 36 Cal.App.4th 1359; Laurel Heights Improvement Association v. Regents of the University of California (1993) 6 Cal.4th 1112; Sacramento Old City Assn. v. City Council of Sacramento (1991) 229 Cal.App.3d 1011; San Franciscans Upholding the Downtown Plan v. City & Co. of San Francisco (2002) 102 Cal.App.4th 656; Ass'n of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383; ~~and~~ Environmental Council of Sacramento v. City of Sacramento (2006) 142 Cal.App.4th 1018**; Clover Valley Foundation v. City of Rocklin (2011) 197 Cal.App.4th 200; Preserve Wild Santee v. City of Santee (2012) 210 Cal.App.4th 260; and Rialto Citizens for Responsible Growth v. City of Rialto (2012) 208 Cal.App.4th 899.**

Responses to Comments

Proposed Amendments to Sections 15087 and 15088

Background

Public review and comment plays an important role in the CEQA process. In brief, the statute requires a lead agency to "consider" and "evaluate" timely comments, and to prepare written responses to comments on an environmental impact report. (Pub. Resources Code § 21091(d).) A lead agency may, but is not required to, respond to comments submitted after the close of the comment period. Section 21082.1(b) provides that "comments may be submitted in any format[.]"

Case law has further clarified the scope of a lead agency's duty to respond:

> 'The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.' … Thus, a lead agency need not respond to each comment made during the review process, however, it must specifically respond to the most significant environmental questions presented. … Further, the determination of the sufficiency of the agency's responses to comments on the draft EIR turns upon the detail required in the responses. … Where a general comment is made, a general response is sufficient.

(*Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859, 878 (citations omitted).)

Advances in technology have altered the nature of the public's interactions with government agencies. Many public agencies now incorporate the internet and social media into their outreach and public participation strategies. (See, e.g., Office of Planning and Research, Book of Lists (2003), pp. 94-99 (listing local governments that use the internet and e-mail as forms of public engagement); see also Institute for Local Government, "A Local Official's Guide to Online Public Engagement" (2012).) Similarly, the public has expanded its use of the internet and digital storage to provide increasing amounts of data and information to decision-makers.

In recent years, several court cases have grappled with a related set of questions in the context of litigation. For example, one court considered whether a citizens group fairly raised an issue by submitting voluminous data, without explanation, on a digital video disk ("DVD"). (*Citizens for Responsible Equitable Environmental Development v. City of San Diego* (2011) 196 Cal.App.4th 515 ("*CREED*").) Specifically, the group submitted a "cursory" letter, on the night of the hearing on the project, accompanied by a DVD containing more than 4,000 pages of documents and data without any particular organization. The DVD did not contain a table of contents or any summary of the information contained on the disk. Neither the disk nor the comment letter explained how the information might

relate to the project. (*Id*. at p. 521.) Discussing the way that this information was presented to the lead agency, the court explained:

> Evidence must be presented in a manner that gives the agency the opportunity to respond with countervailing evidence. [Citations omitted.] The City cannot be expected to pore through thousands of documents to find something that arguably supports [a project opponent's] belief the project should not go forward.

(*Id*. at p. 528.) The court thus held that simply submitting information on a DVD, without in any way explaining its contents or how they relate to the project, did not fairly present the information in a way that the lead agency could respond. (*Ibid*.) Therefore, in that case, the petitioner had not exhausted its administrative remedies.

Another case addressed how to treat citations to websites within written comments for the purposes of determining what documents should be considered part of an administrative record. (*Consolidated Irrigation Dist. v. Superior Court* (2012) 205 Cal. App. 4th 697, 720-725.) In that case, various letters cited to other documents as evidence. Some of the citations included specific URLs that link directly to the cited document. Other websites cited in the letters, on the other hand, were more general and would require searching to locate the specific document referenced in the letters. The court held that, for the purposes of determining the contents of the administrative record, citing general websites is insufficient to "submit" documents or evidence to a lead agency. In reaching its conclusion, the court observed:

> In allocating the burden between lead agency personnel and the commenter, we conclude that lead agency personnel should not be required to spend time searching for documents that the commenter asserts can be found through a general Web site. Presumably when the commenter is reviewing the document on the World Wide Web, it would take little effort to note the URL of the specific Web page where the document is located and include that URL in the comment letter. We do not doubt that some documents can be found easily if a general Web site is given. Conversely, other documents will be difficult to locate. In view of the potential variation from document to document, it is best to adopt a rule that will avoid subjecting lead agency personnel to potentially time-consuming efforts.

Thus, in order for a document from the internet to be considered "submitted to" a lead agency, a commenter must specifically direct the agency to that document. (*Id*. at p. 724.)

Together, though they relate to litigation, these cases tell us something about the duty of lead agencies to respond to information that is presented to them. First, if a lead agency is to develop a detailed written response to information presented to it, a comment must explain in some way how the information is relevant to the project and to any potential environmental impacts. Second, a lead agency should not be expected to search out, let alone develop a detailed written response to, information that is only vaguely referenced in a comment. In other words, if a comment is not detailed

enough to exhaust or to include in the administrative record, it is not enough to compel a detailed response. (*Consolidated Irrigation Dist. v. Superior Court* (2012) 205 Cal. App. 4th 697, 720-725; *Citizens for Responsible Equitable Environmental Development v. City of San Diego* (2011) 196 Cal.App.4th 515, 528.)

Explanation of Proposed Amendments

In light of the increasing use of the internet in public engagement, as well as the cases described above, OPR proposes to clarify the scope of a lead agency's duty to respond to comments as described in Section 15088. Specifically, OPR proposes to clarify that responses to general comments may be general. Further, OPR proposes to clarify that general responses may be appropriate when a comment does not explain the relevance of information submitted with the comment, and when a comment refers to information that is not included or is not readily available to the agency.

Additionally, OPR proposes to clarify in Section 15088(b) that a lead agency may provide proposed responses to public agency comments in electronic form.

Finally, OPR proposes to clarify in Section 15087(c)(2) that the lead agency may specify the manner in which it will receive written comments. This clarification is necessary to accommodate those agencies that wish to publicize the availability a draft environmental impact report on the internet or social media, and to make clear that responses will not be prepared for comments made in internet chat-rooms or via social media like Facebook and Twitter.

Text of Proposed Amendments to Sections 15087 and 15088

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15087. Public Review of Draft EIR

(a) The lead agency shall provide public notice of the availability of a draft EIR at the same time as it sends a notice of completion to the Office of Planning and Research. If the United States Department of Defense or any branch of the United States Armed Forces has given the lead agency written notification of the specific boundaries of a low-level flight path, military impact zone, or special use airspace and provided the lead agency with written notification of the contact office and address for the military service pursuant to subdivision (b) of Section 15190.5, then the lead agency shall include the specified military contact office in the list of organizations and individuals receiving a notice of availability of a draft EIR pursuant to this section for projects that meet the criteria set forth in subdivision (c) of Section 15190.5. The public notice shall be given as provided under Section 15105 (a sample form is provided in Appendix L). Notice shall be mailed to the last known name and address of all organizations and individuals who have previously requested such notice in writing, and shall also be given by at least one of the following procedures:

(1) Publication at least one time by the public agency in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be published in the newspaper of largest circulation from among the newspapers of general circulation in those areas.

(2) Posting of notice by the public agency on and off the site in the area where the project is to be located.

(3) Direct mailing to the owners and occupants of property contiguous to the parcel or parcels on which the project is located. Owners of such property shall be identified as shown on the latest equalized assessment roll.

(b) The alternatives for providing notice specified in subdivision (a) shall not preclude a public agency from providing additional notice by other means if such agency so desires, nor shall the requirements of this section preclude a public agency from providing the public notice required by this section at the same time and in the same manner as public notice otherwise required by law for the project.

(c) The notice shall disclose the following:

(1) A brief description of the proposed project and its location.

(2) The starting and ending dates for the review period during which the lead agency will receive comments**, and the manner in which the lead agency will receive those comments**. If the review period is shortened, the notice shall disclose that fact.

(3) The date, time, and place of any scheduled public meetings or hearings to be held by the lead agency on the proposed project when known to the lead agency at the time of notice.

(4) A list of the significant environmental effects anticipated as a result of the project, to the extent which such effects are known to the lead agency at the time of the notice.

(5) The address where copies of the EIR and all documents referenced in the EIR will be available for public review. This location shall be readily accessible to the public during the lead agency's normal working hours.

(6) The presence of the site on any of the lists of sites enumerated under Section 65962.5 of the Government Code including, but not limited to lists of hazardous waste facilities, land designated as hazardous waste property, hazardous waste disposal sites and others, and the information in the Hazardous Waste and Substances Statement required under subdivision (f) of that Section.

(d) The notice required under this section shall be posted in the office of the county clerk of each county in which the project will be located for a period of at least 30 days. The county clerk shall post such notices within 24 hours of receipt.

(e) In order to provide sufficient time for public review, the review period for a draft EIR shall be as provided in Section 15105. The review period shall be combined with the consultation required under Section 15086. When a draft EIR has been submitted to the State Clearinghouse, the public review

period shall be at least as long as the review period established by the State Clearinghouse. The public review period and the state agency review period may, but are not required to, begin and end at the same time. Day one of the state review period shall be the date that the State Clearing-house distributes the document to state agencies.

(f) Public agencies shall use the State Clearinghouse to distribute draft EIRs to state agencies for review and should use areawide clearinghouses to distribute the documents to regional and local agencies.

(g) To make copies of EIRs available to the public, lead agencies should furnish copies of draft EIRs to public library systems serving the area involved. Copies should also be available in offices of the lead agency.

(h) Public agencies should compile listings of other agencies, particularly local agencies, which have jurisdiction by law and/or special expertise with respect to various projects and project locations. Such listings should be a guide in determining which agencies should be consulted with regard to a particular project.

(i) Public hearings may be conducted on the environmental documents, either in separate proceedings or in con-junction with other proceedings of the public agency. Public hearings are encouraged, but not required as an element of the CEQA process.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21091, 21092, 21092.2, 21092.3, 21092.6, 21098, 21104, 21152, 21153 and 21161, Public Resources Code.

§ 15088. Evaluation of and Response to Comments

(a) The lead agency shall evaluate comments on environmental issues received from persons who reviewed the draft EIR and shall prepare a written response. The lead agency shall respond to comments received during the noticed comment period and any extensions and may respond to late comments.

(b) The lead agency shall provide a written proposed response**, either in a printed copy or in an electronic format,** to a public agency on comments made by that public agency at least 10 days prior to certifying an environmental impact report.

(c) The written response shall describe the disposition of significant environmental issues raised (e.g., revisions to the proposed project to mitigate anticipated impacts or objections). In particular, the major environmental issues raised when the lead agency's position is at variance with recommendations and objections raised in the comments must be addressed in detail giving reasons why specific comments and suggestions were not accepted. There must be good faith, reasoned analysis in response. Conclusory statements unsupported by factual information will not suffice. **The level of detail contained in the response, however, may correspond to the level of detail provided in the comment**

(i.e., responses to general comments may be general). A general response may be appropriate when a comment does not contain or specifically refer to readily available information, or does not explain the relevance of evidence submitted with the comment.

(d) The response to comments may take the form of a revision to the draft EIR or may be a separate section in the final EIR. Where the response to comments makes important changes in the information contained in the text of the draft EIR, the lead agency should either:

(1) Revise the text in the body of the EIR, or

(2) Include marginal notes showing that the information is revised in the response to comments.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections **21091;** 21092.5, 21104 and 21153, Public Resources Code; People v. County of Kern, (1974) 39 Cal. App. 3d 830; Cleary v. County of Stanislaus, (1981) 118 Cal. App. 3d 348**; Friends of the Eel River v. Sonoma County Water Agency (2003) 108 Cal. App. 4th 859; Citizens for Responsible Equitable Environmental Development v. City of San Diego (2011) 196 Cal.App.4th 515, 528; Consolidated Irrigation Dist. v. Superior Court (2012) 205 Cal. App. 4th 697, 720-725.**

Minor Technical Improvements

The following pages describe minor technical improvements to the CEQA Guidelines. These improvements address:

- Pre-Approval Agreements
- Lead Agency by Agreement
- Common Sense Exemption
- Preparing the Initial Study
- Consultation with Transit Agencies
- Citations in Environmental Documents
- Posting with the County Clerk
- Time Limits for Negative Declarations
- Project Benefits
- Using the Emergency Exemption
- When is a Project Discretionary?
- Defining Mitigation

Pre-Approval Agreements

Proposed Amendments to Section 15004

Background

If environmental review is to play a meaningful role in shaping a project, review must occur "as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment." (State CEQA Guidelines § 15004(b).) While it is clear that environmental review must occur prior to project approval, determining what project-related activities may proceed prior to project approval is sometimes less clear. For example, the League of Cities explained in briefing on a Supreme Court case that:

> [C]ities often reach purchase option agreements, memoranda of understanding, exclusive negotiating agreements, or other arrangements with potential developers, especially for projects on public land, before deciding on the specifics of a project. Such preliminary or tentative agreements may be needed in order for the project proponent to gather financial resources for environmental and technical studies, to seek needed grants or permits from other government agencies, or to test interest among prospective commercial tenants.

(*Save Tara v. City of West Hollywood* (2008) 45 Cal. 4th 116, 137.) Such pre-approval activities are not unique to cities. In fact, public agencies throughout the state confront the question of which project-related activities may occur prior to environmental review and project approval.

Explanation of the Proposed Amendments

While the Supreme Court has addressed the issue of when CEQA applies to pre-approval activities, it declined to set forth a bright-line rule. (*Save Tara*, *supra*, 45 Cal. 4th at 138.) Instead, it concluded that several factors are relevant to that determination. (*Id*. at 139 ("courts should look not only to the terms of the agreement but to the surrounding circumstances to determine whether, as a practical matter, the agency has committed itself to the project as a whole or to any particular features, so as to effectively preclude any alternatives or mitigation measures that CEQA would otherwise require to be considered, including the alternative of not going forward with the project").) OPR proposes to add a new subdivision (b)(4) to Section 15004 to assist lead agencies in applying the principles identified by the Supreme Court in the *Save Tara* decision.

The first sentence in subdivision (b)(4) acknowledges that pre-approval agreements may fall on a spectrum between mere interest in a project and a commitment to a definite course of action. That sentence also reflects the Supreme Court's holding that circumstances surrounding the activity are

relevant to the determination of whether an agency has, as a practical matter, committed to a project. (*Save Tara*, *supra*, 45 Cal. 4th at 139.)

The second sentence provides an example of an agreement that likely could not precede CEQA review (i.e., a development agreement that would grant vested rights). (*Id*. at 138; *see also Citizens for Responsible Government v. City of Albany* (1997) 56 Cal.App.4th 1199.)

The third sentence provides examples of characteristics of agreements that may be executed prior to CEQA review. These characteristics include:

- a commitment to compliance with CEQA (*see Save Tara*, *supra*, 45 Cal. 4th at 139 (a "contract's conditioning of final approval on CEQA compliance is relevant but not determinative" in determining whether an agency has approved a project));
- an absence of terms that bind the agency to a definite course of action (*Ibid* ("If, as a practical matter, the agency has foreclosed any meaningful options to going forward with the project, then for purposes of CEQA the agency has 'approved' the project") (*citing* Remy et al., GUIDE TO THE CAL. ENVIRONMENTAL QUALITY ACT (CEQA) (11th ed. 2006), at p. 71)); and
- an absence of restrictions on the consideration of the full range of mitigation measures and alternatives (*ibid* ("whether the agency has nevertheless effectively circumscribed or limited its discretion with respect to that environmental review").

Finally, the last clause of subdivision (b)(2)(A) would be deleted because the circumstances it describes would be encompassed in the new subdivision (b)(4).

Text of the Proposed Amendments to Section 15004

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15004. Time of Preparation

(a) Before granting any approval of a project subject to CEQA, every lead agency or responsible agency shall consider a final EIR or negative declaration or another document authorized by these guidelines to be used in the place of an EIR or negative declaration. See the definition of "approval" in Section 15352.

(b) Choosing the precise time for CEQA compliance involves a balancing of competing factors. EIRs and negative declarations should be prepared as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment.

(1) With public projects, at the earliest feasible time, project sponsors shall incorporate environmental considerations into project conceptualization, design, and planning. CEQA compliance should be completed prior to acquisition of a site for a public project.

(2) To implement the above principles, public agencies shall not undertake actions concerning the proposed public project that would have a significant adverse effect or limit the choice of alternatives or mitigation measures, before completion of CEQA compliance. For example, agencies shall not:

(A) Formally make a decision to proceed with the use of a site for facilities which would require CEQA review, regardless of whether the agency has made any final purchase of the site for these facilities~~, except that agencies may designate a preferred site for CEQA review and may enter into land acquisition agreements when the agency has conditioned the agency's future use of the site on CEQA compliance~~.

(B) Otherwise take any action which gives impetus to a planned or foreseeable project in a manner that forecloses alternatives or mitigation measures that would ordinarily be part of CEQA review of that public project.

(3) With private projects, the Lead Agency shall encourage the project proponent to incorporate environmental considerations into project conceptualization, design, and planning at the earliest feasible time.

(4) While mere interest in, or inclination to support, a project does not constitute approval, a public agency entering into preliminary agreements regarding a project prior to approval shall not, as a practical matter, commit the agency to the project. For example, it shall not grant any vested rights prior to compliance with CEQA. Further, any such agreement should:

(A) Condition the agreement on compliance with CEQA;

(B) Not bind any party, or commit to any definite course of action, prior to CEQA compliance; and

(C) Not restrict the lead agency from considering any feasible mitigation measures and alternatives, including the "no project" alternative.

(c) The environmental document preparation and review should be coordinated in a timely fashion with the existing planning, review, and project approval processes being used by each public agency. These procedures, to the maximum extent feasible, are to run concurrently, not consecutively. When the lead agency is a state agency, the environmental document shall be included as part of the regular project report if such a report is used in its existing review and budgetary process.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21003, 21061 and 21105, Public Resources Code; Friends of Mammoth v. Board of Supervisors, (1972) 8 Cal. 3d 247; Mount Sutro Defense Committee v. Regents of the University of California, (1978) 77 Cal. App. 3d 20**; and *Save Tara v. City of West Hollywood* (2008) 45 Cal.4th 116**.

Lead Agency by Agreement

Proposed Amendments to Section 15051

Background and Explanation of the Proposed Amendments

CEQA defines "lead agency" in Public Resources Code section 21067 as, "the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment." Similarly, the CEQA Guidelines define the lead agency as "the public agency which has the principal responsibility for carrying out or approving a project…. Criteria for determining which agency will be the lead agency for a project are contained in section 15051." (Guidelines § 15367.) Guidelines section 15051, subdivisions (a) and (b), explain which entity will act as lead agency under usual circumstances, and subdivisions (c) and (d) describe circumstances when there may be some discrepancy over who should act as the lead on a project. Stakeholders point out that subdivisions (c) and (d), when read together, are contradictory and essentially render subdivision (d) moot with respect to subdivisions (b) and (c). Thus, OPR proposes to amend section 15051, subdivision (c), to address the existing contradiction and to allow for necessary flexibility in determining the lead agency when two or more agencies have a substantial claim to that role.

Section 15051, subdivision (c), states that, "[w]here more than one public agency equally meet the criteria in subdivision (b), the agency which will act first on the project in question *shall* be the lead agency." (Italics added.) However, subdivision (d) states that "[w]here the provisions of subdivisions (a), (b), and (c) leave two or more public agencies with a substantial claim to be the lead agency, the public agencies may by agreement designate an agency as the lead agency…."

As these sections are currently written, where two public agencies equally meet the criteria for lead agency, the agency which will act first must be the lead under subdivision (c), which effectually renders subdivision (d) inapplicable other than with respect to subdivision (a). The existing language prevents two potential lead agencies which meet the criteria in subdivision (b), each with a substantial claim to be the lead, from agreeing to designate one as the lead unless both happen to act at the exact same moment on the project. Changing the word "shall" to "will normally" will clarify that where more than one public agency meets the criteria in subdivision (b), the agencies may agree pursuant to subdivision (d) to designate one entity as the lead.

Text of Proposed Amendments to Section 15051

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in **~~strikeout~~**.

§ 15051. Criteria for Identifying the Lead Agency.

Where two or more public agencies will be involved with a project, the determination of which agency will be the lead agency shall be governed by the following criteria:

(a) If the project will be carried out by a public agency, that agency shall be the lead agency even if the project would be located within the jurisdiction of another public agency.

(b) If the project is to be carried out by a nongovernmental person or entity, the lead agency shall be the public agency with the greatest responsibility for supervising or approving the project as a whole.

(1) The lead agency will normally be the agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose such as an air pollution control district or a district which will provide a public service or public utility to the project.

(2) Where a city prezones an area, the city will be the appropriate lead agency for any subsequent annexation of the area and should prepare the appropriate environmental document at the time of the prezoning. The local agency formation commission shall act as a responsible agency.

(c) Where more than one public agency equally meet the criteria in subdivision (b), the agency which will act first on the project in question **will normally** ~~**shall**~~ be the lead agency.

(d) Where the provisions of subdivisions (a), (b), and (c) leave two or more public agencies with a substantial claim to be the lead agency, the public agencies may by agreement designate an agency as the lead agency. An agreement may also provide for cooperative efforts by two or more agencies by contract, joint exercise of powers, or similar devices.

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section 21165, Public Resources Code.

Common Sense Exemption

Proposed Amendments to Section 15061

Background and Explanation of Proposed Amendments

OPR proposes to amend subdivision (b)(3) of Section 15061. Currently, subdivision (b)(3) states that an activity is covered by the "general rule" and exempt from CEQA if there is no possibility that activity may have a significant effect on the environment. OPR proposes to replace the phrase "general rule" with the phrase "common sense exception" in order to match the language used by the California Supreme Court when evaluating the application of this CEQA exemption (See, *Muzzy Ranch Co. v. Solano County Airport Land Use Com.* (2007) 41 Cal. 4th 372, 389 (used the term "common sense exception" to apply Section 15061).) This clarification is needed to match practitioners' customary use of the term "common sense exception" and to prevent possible confusion for others who see or hear references to the term but cannot find it in the text of the CEQA Guidelines.

Text of Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15061. Review for Exemption

(b) A project is exempt from CEQA if:

(1) The project is exempt by statute (see, e.g. Article 18, commencing with Section 15260).
(2) The project is exempt pursuant to a categorical exemption (see Article 19, commencing with Section 15300) and the application of that categorical exemption is not barred by one of the exceptions set forth in Section 15300.2.
(3) The activity is covered by the ~~**general rule**~~ **common sense exception** that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.
(4) The project will be rejected or disapproved by a public agency. (See Section 15270(b)).
(5) The project is exempt pursuant to the provisions of Article 12.5 of this Chapter.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections

21080(c), 21080.1,21080.3, 21082.1, 21100 and 21151, Public Resources Code; **Muzzy Ranch Co. v. Solano County Airport Land Use Commission (2007) 41 Cal. 4th 372**; Gentry v. City of Murrieta (1995) 36 Cal.App.4th 1359; San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus (1994) 27 Cal.App.4th 713; Leonoff v. Monterey County Board of Supervisors (1990) 222 Cal.App.3d 1337.

Preparing an Initial Study

Proposed Amendments to Section 15063

Background and Explanation of Proposed Amendments

OPR proposes to add a new subsection (4) to Section 15063, subdivision (a), to specify the arrangements a lead agency may use to prepare an initial study. The Public Resources Code states that a public agency may prepare a draft environmental impact report or negative declaration directly or under contract to that public agency. (Pub. Resources Code § 21082.1.) Section 15084 implements the Public Resources Code by allowing lead agencies to prepare a draft environmental impact report directly or under contract. (See, State CEQA Guidelines § 15084(d).) The Guidelines do not currently, however, contain a parallel provision for negative declarations or mitigated declarations.

A draft or mitigated negative declaration must include a copy of an initial study. (See, State CEQA Guidelines § 15071(d) (stating that a negative declaration circulated for public review must include a copy of the initial study).) Therefore, OPR proposes to add the new subsection to Section 15063(a) to match the methods and arrangement used to prepare a draft environmental impact report and increase consistency in report preparation. This addition is necessary to provide consistent guidance for lead agencies preparing environmental documents. (See, Pub. Resources Code, § 21082.1 (stating that any draft environmental impact report, negative declaration, etc. "shall be prepared directly by, or under contract to, a public agency"); CEQA Guidelines, § 15084(d) (lists available arrangements for completing a draft environmental impact report).)

Text of Proposed Amendments to Section 15063

Changes to the existing guideline are shown in **bold** type, with additions **<u>underlined</u>** and deletions shown in ~~**strikeout**~~.

§ 15063. Initial Study

(a) Following preliminary review, the lead agency shall conduct an initial study determine if the project may have a significant effect on the environment. If the lead agency can determine that an EIR will clearly be required for the project, an initial study is not required but may still be desirable.

(1) All phases of project planning, implementation, and operation must be considered in the initial study of the project.

(2) To meet the requirements of this section, the lead agency may use an environmental assessment or a similar analysis prepared pursuant to the National Environmental Policy Act.

(3) An initial study may rely upon expert opinion supported by facts, technical studies or other substantial evidence to document its findings. However, an initial study is neither intended nor required to include the level of detail included in an EIR.

(4) The lead agency may use any of the arrangements or combination of arrangements described in Section 15084(d) to prepare an initial study.

(b) Results.

(1) If the agency determines that there is substantial evidence that any aspect of the project, either individually or cumulatively, may cause a significant effect on the environment, regardless of whether the overall effect of the project is adverse or beneficial, the lead agency shall do one of the following:

(A) Prepare an EIR or

(B) Use a previously prepared EIR which the lead agency determines would adequately analyze the project at hand, or

(C) Determine, pursuant to a program EIR, tiering, or another appropriate process, which of a project's effects were adequately examined by an earlier EIR or negative declaration. Another appropriate process may include, for example, a master EIR, a master environmental assessment, approval of housing and neighborhood commercial facilities in urban areas, approval of residential projects pursuant to a specific plan as described in section 15182, approval of residential projects consistent with a community plan, general plan or zoning as described in section 15183, or an environmental document prepared under a State certified regulatory program. The lead agency shall then ascertain which effects, if any, should be analyzed in a later EIR or negative declaration.

(2) The lead agency shall prepare a negative declaration if there is no substantial evidence that the project or any of its aspects may cause a significant effect on the environment.

(c) Purposes. The purposes of an initial study are to:

(1) Provide the lead agency with information to use as the basis for deciding whether to prepare an EIR or negative declaration;

(2) Enable an applicant or lead agency to modify a project, mitigating adverse impacts before an EIR is prepared, thereby enabling the project to qualify for a negative declaration;

(3) Assist the preparation of an EIR, if one is required, by:

(A) Focusing the EIR on the effects determined to be significant,

(B) Identifying the effects determined not to be significant,

(C) Explaining the reasons for determining that potentially significant effects would not be significant, and

(D) Identifying whether a program EIR, tiering, or another appropriate process can be used for analysis of the project's environmental effects.

(4) Facilitate environmental assessment early in the design of a project;

(5) Provide documentation of the factual basis for the finding in a negative declaration that a project will not have a significant effect on the environment;

(6) Eliminate unnecessary EIRs;

(7) Determine whether a previously prepared EIR could be used with the project.

(d) Contents. An initial study shall contain in brief form:

(1) A description of the project including the location of the project;

(2) An identification of the environmental setting;

(3) An identification of environmental effects by use of a checklist, matrix, or other method, provided that entries on a checklist or other form are briefly explained to indicate that there is some evidence to support the entries. The brief explanation may be either through a narrative or a reference to another information source such as an attached map, photographs, or an earlier EIR or negative declaration. A reference to another document should include, where appropriate, a citation to the page or pages where the information is found.

(4) A discussion of ways to mitigate the significant effects identified, if any;

(5) An examination of whether the project would be consistent with existing zoning, plans, and other applicable land use controls;

(6) The name of the person or persons who prepared or participated in the initial study.

(e) Submission of Data. If the project is to be carried out by a private person or private organization, the lead agency may require such person or organization to submit data and information which will enable the lead agency to prepare the initial study. Any person may submit any information in any form to assist a lead agency in preparing an initial study.

(f) Format. Sample forms for an applicant's project description and a review form for use by the lead agency are contained in Appendices G and H. When used together, these forms would meet the requirements for an initial study, provided that the entries on the checklist are briefly explained pursuant to subdivision (d)(3). These forms are only suggested, and public agencies are free to devise their own format for an initial study. A previously prepared EIR may also be used as the initial study for a later project.

(g) Consultation. As soon as a lead agency has determined that an initial study will be required for the project, the lead agency shall consult informally with all responsible agencies and all trustee agencies responsible for resources affected by the project to obtain the recommendations of those agencies as to whether an EIR or a negative declaration should be prepared. During or immediately after preparation of an initial study for a private project, the lead agency may consult with the applicant to determine if the applicant is willing to modify the project to reduce or avoid the significant effects identified in the initial study.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21080(c), 21080.1,21080.3, 21082.1, 21100 and 21151, Public Resources Code; Gentry v. City of Murrieta (1995) 36 Cal.App.4th 1359, San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus (1994) 27 Cal.App.4th 713, Leonoff v. Monterey County Board of Supervisors (1990) 222 Cal.App.3d 1337.

Consultation with Transit Agencies

Proposed Amendments to Sections 15072 and 15086

Background and Explanation of the Proposed Amendments

OPR proposes to add a sentence subdivision (e) of Section 15072 and subdivision (a)(5) of Section 15086. The purpose of those subdivisions is to list the agencies and entities in which a lead agency shall or may consult prior to completing an environmental impact report. (See, Pub. Resources Code, § 21104 (stating that the lead agency shall consult with, and obtain comments from each responsible, trustee, or public agency that has jurisdiction over the project).) OPR proposes to clarify in those subdivisions that lead agencies should also consult public transit agencies facilities within one-half mile of the proposed project. This addition is necessary to improve noticing standards by involving affected public transit agencies in the preparation of an environmental impact report and to ensure environmental transportation impacts are fully considered in accordance to the general statutory mandate under CEQA. (See, Pub. Resources Code, § 21092.4 ("Consultation shall be …for the purpose of the lead agency obtaining information concerning the project's effect … within the jurisdiction of a transportation planning agency…); CEQA Guidelines, § 15003(f) ("CEQA was intended … to afford the fullest possible protection to the environment…).)

Text of the Proposed Amendments to Sections 15072 and 15086

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in **~~strikeout~~**.

§ 15072. Notice of Intent to Adopt a Negative Declaration or Mitigated Negative Declaration

(a) A lead agency shall provide a notice of intent to adopt a negative declaration or mitigated negative declaration to the public, responsible agencies, trustee agencies, and the county clerk of each county within which the proposed project is located, sufficiently prior to adoption by the lead agency of the negative declaration or mitigated negative declaration to allow the public and agencies the review period provided under Section 15105.

(b) The lead agency shall mail a notice of intent to adopt a negative declaration or mitigated negative declaration to the last known name and address of all organizations and individuals who have previously requested such notice in writing and shall also give notice of intent to adopt a negative declaration or mitigated negative declaration by at least one of the following procedures to allow the public the review period provided under Section 15105:

(1) Publication at least one time by the lead agency in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be published in the newspaper of largest circulation from among the newspapers of general circulation in those areas.

(2) Posting of notice by the lead agency on and off site in the area where the project is to be located.

(3) Direct mailing to the owners and occupants of property contiguous to the project. Owners of such property shall be identified as shown on the latest equalized assessment roll.

(c) The alternatives for providing notice specified in subdivision (b) shall not preclude a lead agency from providing additional notice by other means if the agency so desires, nor shall the requirements of this section preclude a lead agency from providing the public notice at the same time and in the same manner as public notice required by any other laws for the project.

(d) The county clerk of each county within which the proposed project is located shall post such notices in the office of the county clerk within 24 hours of receipt for a period of at least 20 days.

(e) For a project of statewide, regional, or areawide significance, the lead agency shall also provide notice to transportation planning agencies and public agencies which have transportation facilities within their jurisdictions which could be affected by the project as specified in Section 21092.4(a) of the Public Resources Code. "Transportation facilities" includes: major local arterials and public transit within five miles of the project site and freeways, highways and rail transit service within 10 miles of the project site. **The lead agency should also consult with public transit agencies with facilities within one-half mile of the proposed project.**

(f) If the United States Department of Defense or any branch of the United States Armed Forces has given a lead agency written notification of the specific boundaries of a low-level flight path, military impact zone, or special use airspace and provided the lead agency with written notification of the military contact office and address for the military service pursuant to subdivision (b) of Section 15190.5, then the lead agency shall include the specified military contact office in the list of organizations and individuals receiving a notice of intent to adopt a negative declaration or a mitigated negative declaration pursuant to this section for projects that meet the criteria set forth in subdivision (c) of Section 15190.5. The lead agency shall send the specified military contact office such notice of intent sufficiently prior to adoption by the lead agency of the negative declaration or mitigated negative declaration to allow the military service the review period provided under Section 15105.

(g) A notice of intent to adopt a negative declaration or mitigated negative declaration shall specify the following:

(1) A brief description of the proposed project and its location.

(2) The starting and ending dates for the review period during which the lead agency will receive comments on the proposed negative declaration or mitigated negative declaration. This shall include starting and ending dates for the review period. If the review period has been is shortened pursuant to Section 15105, the notice shall include a statement to that effect.

(3) The date, time, and place of any scheduled public meetings or hearings to be held by the lead agency on the proposed project, when known to the lead agency at the time of notice.

(4) The address or addresses where copies of the proposed negative declaration or mitigated negative declaration including the revisions developed under Section 15070(b) and all documents referenced in the proposed negative declaration or mitigated negative declaration are available for review. This location or locations shall be readily accessible to the public during the lead agency's normal working hours.

(5) The presence of the site on any of the lists enumerated under Section 65962.5 of the Government Code including, but not limited to lists of hazardous waste facilities, land designated as hazardous waste property, and hazardous waste disposal sites, and the information in the Hazardous Waste and Substances Statement required under subdivision (f) of that section.

(6) Other information specifically required by statute or regulation for a particular project or type of project.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21091, 21092, 21092.2, 21092.4, 21092.3, 21092.6, 21098 and 21151.8, Public Resources Code.

§ 15086.Consultation Concerning Draft EIR

(a) The lead agency shall consult with and request comments on the draft EIR from:

(1) Responsible agencies,

(2) Trustee agencies with resources affected by the project, and

(3) Any other state, federal, and local agencies which have jurisdiction by law with respect to the project or which exercise authority over resources which may be affected by the project, including water

agencies consulted pursuant to section 15083.5.

(4) Any city or county which borders on a city or county within which the project is located.

(5) For a project of statewide, regional, or areawide significance, the transportation planning agencies and public agencies which have transportation facilities within their jurisdictions which could be affected by the project. "Transportation facilities" includes: major local arterials and public transit within five miles of the project site, and freeways, highways and rail transit service within 10 miles of the project site. **The lead agency should also consult with public transit agencies with facilities within one-half mile of the proposed project.**

(6) For a state lead agency when the EIR is being prepared for a highway or freeway project, the California Air Resources Board as to the air pollution impact of the potential vehicular use of the highway or freeway and if a non-attainment area, the local air quality management district for a determination of conformity with the air quality management plan.

(7) For a subdivision project located within one mile of a facility of the State Water Resources Development System, the California Department of Water Resources.

(b) The lead agency may consult directly with:

(1) Any person who has special expertise with respect to any environmental impact involved,

(2) Any member of the public who has filed a written request for notice with the lead agency or the clerk of the governing body.

(3) Any person identified by the applicant whom the applicant believes will be concerned with the environmental effects of the project.

(c) A responsible agency or other public agency shall only make substantive comments regarding those activities involved in the project that are within an area of expertise of the agency or which are required to be carried out or approved by the responsible agency. Those comments shall be supported by specific documentation.

(d) Prior to the close of the public review period, a responsible agency or trustee agency which has identified what that agency considers to be significant environmental effects shall advise the lead agency of those effects. As to those effects relevant to its decision, if any, on the project, the responsible or trustee agency shall either submit to the lead agency complete and detailed performance objectives for mitigation measures addressing those effects or refer the lead agency to appropriate, readily available guidelines or reference documents concerning mitigation measures. If the responsible or

trustee agency is not aware of mitigation measures that address identified effects, the responsible or trustee agency shall so state.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21081.6, 21092.4, 21092.5, 21104 and 21153, Public Resources Code.

Citations in Environmental Documents

Proposed Amendments to Sections 15072 and 15087

Background and Explanation of the Proposed Amendments

CEQA requires a lead agency to provide notice that it is preparing an EIR or a negative declaration, and such notice "shall specify … the address where copies of the draft environmental impact report or negative declaration, and all documents referenced in the draft environmental impact report or negative declaration, are available for review …." (Pub. Resources Code § 21092, subds. (a) and (b).) Stakeholders have noted that there is some confusion about the word "referenced" as used in that section and in the CEQA Guidelines. (CEQA Guidelines §§ 15072, 15087.) Some agencies interpret "referenced" to mean every document that is cited in the environmental document, where others interpret it to mean every document that is incorporated by reference into the document pursuant to Section 15150.

For purposes of comparison, while section 21092 requires that the lead agency provide the address where the public can review copies of all documents *referenced* in an environmental document, CEQA section 21061 requires that sources that are *cited* in an EIR must simply be available for inspection at a public place or building. Thus, the Legislature appears to have made a distinction between those documents that are merely cited and those that are more fully referenced in an EIR or negative declaration. However, the statute does not make this distinction clear.

The CEQA Guidelines discuss "incorporation by reference" in section 15150. There, subdivision (a) states that, "[a]n EIR or negative declaration may incorporate by reference all or portions of another document which is a matter of public record or is generally available to the public. Where all or part of another document is incorporated by reference, the incorporated language shall be considered to be set forth in full as part of the text of the EIR or negative declaration." Subdivision (b) of the same section requires that, " [w]here part of another document is incorporated by reference, such other document shall be made available to the public for inspection at a public place or public building. The EIR or negative declaration shall state where the incorporated documents will be available for inspection. At a minimum, the incorporated documents shall be made available to the public in an office of the lead agency in the county where the project would be carried out or in one or more public buildings such as county offices or public libraries if the lead agency does not have an office in the county." This section only calls out documents that are incorporated by reference to be made available to the public for inspection.

On the other hand, Guidelines sections 15072 and 15087 as they are currently written, do *not* specifically call out either those documents that are incorporated by reference or those that are simply cited, and instead describe documents that are "referenced" generally. OPR proposes to clarify the requirement in these sections by changing the term "referenced" to "incorporated by reference." This

change would make clear that a lead agency is not required to make every document that is merely cited in an EIR or a negative declaration available in its entirety for public review, and instead must only include all documents that are incorporated by reference as described in section 15150 of the Guidelines.

In enacting CEQA, the Legislature declared that "it is the policy of the state that … [a]ll persons and public agencies involved in the environmental review process be responsible for carrying out the process in the most efficient, expeditious manner …." (Pub. Resources Code § 21003, subd. (f).) In an EIR or a negative declaration, a lead agency will often cite to a number of documents, including books, maps, and other potentially voluminous and/or obscure references. If the requirement for the lead agency to make documents available for public inspection were to include all documents simply referenced or cited in an EIR or negative declaration, the requirement would be burdensome, unnecessary and unreasonable on lead agencies.

Furthermore, this change would provide internal consistency between sections 15072, 15082 and 15150 of the Guidelines and would clarify that CEQA itself does not mandate that a lead agency include every document cited in an EIR for public review.

Text of Proposed Amendments to Sections 15072 and 15087

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in **~~strikeout~~**.

§ 15072**. Notice of Intent to Adopt a Negative Declaration or Mitigated Negative Declaration**

(a) A lead agency shall provide a notice of intent to adopt a negative declaration or mitigated negative declaration to the public, responsible agencies, trustee agencies, and the county clerk of each county within which the proposed project is located, sufficiently prior to adoption by the lead agency of the negative declaration or mitigated negative declaration to allow the public and agencies the review period provided under Section 15105.

(b) The lead agency shall mail a notice of intent to adopt a negative declaration or mitigated negative declaration to the last known name and address of all organizations and individuals who have previously requested such notice in writing and shall also give notice of intent to adopt a negative declaration or mitigated negative declaration by at least one of the following procedures to allow the public the review period provided under Section 15105:

(1) Publication at least one time by the lead agency in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be published in the newspaper of largest circulation from among the newspapers of general circulation in those areas.

(2) Posting of notice by the lead agency on and off site in the area where the project is to be located.

(3) Direct mailing to the owners and occupants of property contiguous to the project. Owners of such property shall be identified as shown on the latest equalized assessment roll.

(c) The alternatives for providing notice specified in subdivision (b) shall not preclude a lead agency from providing additional notice by other means if the agency so desires, nor shall the requirements of this section preclude a lead agency from providing the public notice at the same time and in the same manner as public notice required by any other laws for the project.

(d) The county clerk of each county within which the proposed project is located shall post such notices in the office of the county clerk within 24 hours of receipt for a period of at least 20 days.

(e) For a project of statewide, regional, or areawide significance, the lead agency shall also provide notice to transportation planning agencies and public agencies which have transportation facilities within their jurisdictions which could be affected by the project as specified in Section 21092.4(a) of the Public Resources Code. “Transportation facilities” includes: major local arterials and public transit within five miles of the project site and freeways, highways and rail transit service within 10 miles of the project site.

(f) If the United States Department of Defense or any branch of the United States Armed Forces has given a lead agency written notification of the specific boundaries of a low-level flight path, military impact zone, or special use airspace and provided the lead agency with written notification of the military contact office and address for the military service pursuant to subdivision (b) of Section 15190.5, then the lead agency shall include the specified military contact office in the list of organizations and individuals receiving a notice of intent to adopt a negative declaration or a mitigated negative declaration pursuant to this section for projects that meet the criteria set forth in subdivision (c) of Section 15190.5. The lead agency shall send the specified military contact office such notice of intent sufficiently prior to adoption by the lead agency of the negative declaration or mitigated negative declaration to allow the military service the review period provided under Section 15105.

(g) A notice of intent to adopt a negative declaration or mitigated negative declaration shall specify the following:

(1) A brief description of the proposed project and its location.

(2) The starting and ending dates for the review period during which the lead agency will receive comments on the proposed negative declaration or mitigated negative declaration. This shall include starting and ending dates for the review period. If the review period has been is shortened pursuant to Section 15105, the notice shall include a statement to that effect.

(3) The date, time, and place of any scheduled public meetings or hearings to be held by the lead agency on the proposed project, when known to the lead agency at the time of notice.

(4) The address or addresses where copies of the proposed negative declaration or mitigated negative declaration including the revisions developed under Section 15070(b) and all documents **incorporated by reference** ~~**referenced**~~ in the proposed negative declaration or mitigated negative declaration are available for review. This location or locations shall be readily accessible to the public during the lead agency's normal working hours.

(5) The presence of the site on any of the lists enumerated under Section 65962.5 of the Government Code including, but not limited to lists of hazardous waste facilities, land designated as hazardous waste property, and hazardous waste disposal sites, and the information in the Hazardous Waste and Substances Statement required under subdivision (f) of that section.

(6) Other information specifically required by statute or regulation for a particular project or type of project.

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21091, 21092, 21092.2, 21092.4, 21092.3, 21092.6, 21098 and 21151.8, Public Resources Code.

§ 15087. Public Review of Draft EIR

(a) The lead agency shall provide public notice of the availability of a draft EIR at the same time as it sends a notice of completion to the Office of Planning and Research. If the United States Department of Defense or any branch of the United States Armed Forces has given the lead agency written notification of the specific boundaries of a low-level flight path, military impact zone, or special use airspace and provided the lead agency with written notification of the contact office and address for the military service pursuant to subdivision (b) of Section 15190.5, then the lead agency shall include the specified military contact office in the list of organizations and individuals receiving a notice of availability of a draft EIR pursuant to this section for projects that meet the criteria set forth in subdivision (c) of Section 15190.5. The public notice shall be given as provided under Section 15105 (a sample form is provided in Appendix L). Notice shall be mailed to the last known name and address of all organizations and individuals who have previously requested such notice in writing, and shall also be given by at least one of the following procedures:

(1) Publication at least one time by the public agency in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be published in the newspaper of largest circulation from among the newspapers of general circulation in those areas.

(2) Posting of notice by the public agency on and off the site in the area where the project is to be located.

(3) Direct mailing to the owners and occupants of property contiguous to the parcel or parcels on which the project is located. Owners of such property shall be identified as shown on the latest equalized assessment roll.

(b) The alternatives for providing notice specified in subdivision (a) shall not preclude a public agency from providing additional notice by other means if such agency so desires, nor shall the requirements of this section preclude a public agency from providing the public notice required by this section at the same time and in the same manner as public notice otherwise required by law for the project.

(c) The notice shall disclose the following:

(1) A brief description of the proposed project and its location.

(2) The starting and ending dates for the review period during which the lead agency will receive comments. If the review period is shortened, the notice shall disclose that fact.

(3) The date, time, and place of any scheduled public meetings or hearings to be held by the lead agency on the proposed project when known to the lead agency at the time of notice.

(4) A list of the significant environmental effects anticipated as a result of the project, to the extent which such effects are known to the lead agency at the time of the notice.

(5) The address where copies of the EIR and all documents **incorporated by reference** ~~**referenced**~~ in the EIR will be available for public review. This location shall be readily accessible to the public during the lead agency's normal working hours.

(6) The presence of the site on any of the lists of sites enumerated under Section 65962.5 of the Government Code including, but not limited to lists of hazardous waste facilities, land designated as hazardous waste property, hazardous waste disposal sites and others, and the information in the Hazardous Waste and Substances Statement required under subdivision (f) of that Section.

(d) The notice required under this section shall be posted in the office of the county clerk of each county in which the project will be located for a period of at least 30 days. The county clerk shall post such notices within 24 hours of receipt.

(e) In order to provide sufficient time for public review, the review period for a draft EIR shall be as provided in Section 15105. The review period shall be combined with the consultation required under Section 15086. When a draft EIR has been submitted to the State Clearinghouse, the public review period shall be at least as long as the review period established by the State Clearinghouse. The public review period and the state agency review period may, but are not required to, begin and end at the same time. Day one of the state review period shall be the date that the State Clearinghouse distributes the document to state agencies.

(f) Public agencies shall use the State Clearinghouse to distribute draft EIRs to state agencies for review and should use areawide clearinghouses to distribute the documents to regional and local agencies.

(g) To make copies of EIRs available to the public, lead agencies should furnish copies of draft EIRs to public library systems serving the area involved. Copies should also be available in offices of the lead agency.

(h) Public agencies should compile listings of other agencies, particularly local agencies, which have jurisdiction by law and/or special expertise with respect to various projects and project locations. Such listings should be a guide in determining which agencies should be consulted with regard to a particular project.

(i) Public hearings may be conducted on the environmental documents, either in separate proceedings or in conjunction with other proceedings of the public agency. Public hearings are encouraged, but not required as an element of the CEQA process.

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21091, 21092, 21092.2, 21092.3, 21092.6, 21098, 21104, 21152, 21153 and 21161, Public Resources Code.

Posting Notices with the County Clerk

Proposed Amendments to Section 15082

Background and Explanation of the Proposed Amendments

OPR proposes to amend subdivision (a) of Section 15082. Currently, subdivision (a) of Section 15082 states that a lead agency must send a notice of preparation stating that an environmental impact report will be prepared to the Office of Planning and Research and each responsible and trustee agency involved in the project. OPR proposes to include a statement that the notice must also be filed with the county clerk of each county within which the project is located. This addition is necessary to accurately reflect the procedural requirement stated in the Public Resources Code, which also requires posting with the county clerk. (Pub. Resources Code, § 21092.3 ("The notices … for an environmental impact report shall be posted in the office of the county clerk of each county in which the project will be located…").)

Text of Proposed Amendments to Section 15082

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15082. Notice of Preparation and Determination of Scope of EIR

(a) Notice of Preparation. Immediately after deciding that an environmental impact report is required for a project, the lead agency shall send **a notice of preparation stating that an environmental impact report will be prepared** to the Office of Planning and Research and each responsible and trustee agency ~~**a notice of preparation stating that an environmental impact report will be prepared**~~ **and file with the county clerk of each county in which the project will be located**. This notice shall also be sent to every federal agency involved in approving or funding the project. If the United States Department of Defense or any branch of the United States Armed Forces has given the lead agency written notification of the specific boundaries of a low-level flight path, military impact zone, or special use airspace and provided the lead agency with written notification of the military contact office and address for the military service pursuant to subdivision (b) of Section 15190.5, then the lead agency shall include the specified military contact office in the list of organizations and individuals receiving a notice of preparation of an EIR pursuant to this section for projects that meet the criteria set forth in subdivision (c) of Section 15190.5.

(1) The notice of preparation shall provide the responsible and trustee agencies**,** ~~**and**~~ the Office of Planning and Research **and county clerk** with sufficient information describing the project and the

potential environmental effects to enable the responsible agencies to make a meaningful response. At a minimum, the information shall include:

(A) Description of the project,

(B) Location of the project (either by street address and cross street, for a project in an urbanized area, or by attaching a specific map, preferably a copy of a U.S.G.S. 15'or 7 1/2'topographical map identified by quadrangle name), and

(C) Probable environmental effects of the project.

(2) A sample notice of preparation is shown in Appendix I. Public agencies are free to devise their own formats for this notice. A copy of the initial study may be sent with the notice to supply the necessary information.

(3) To send copies of the notice of preparation, the lead agency shall use either certified mail or any other method of transmittal that provides it with a record that the notice was received.

(4) The lead agency may begin work on the draft EIR immediately without awaiting responses to the notice of preparation. The draft EIR in preparation may need to be revised or expanded to conform to responses to the notice of preparation. A lead agency shall not circulate a draft EIR for public review before the time period for responses to the notice of preparation has expired.

(b) Response to Notice of Preparation. Within 30 days after receiving the notice of preparation under subdivision (a), each responsible and trustee agency and the Office of Planning and Research shall provide the lead agency with specific detail about the scope and content of the environmental information related to the responsible or trustee agency's area of statutory responsibility that must be included in the draft EIR.

(1) The response at a minimum shall identify:

(A) The significant environmental issues and reasonable alternatives and mitigation measures that the responsible or trustee agency, or the Office of Planning and Research will need to have explored in the draft EIR; and

(B) Whether the agency will be a responsible agency or trustee agency for the project.

(2) If a responsible or trustee agency, or the Office of Planning and Research fails by the end of the 30-day period to provide the lead agency with either a response to the notice or a well-justified request for

additional time, the lead agency may presume that none of those entities have a response to make.

(3) A generalized list of concerns not related to the specific project shall not meet the requirements of this section for a response.

(c) Meetings. In order to expedite the consultation, the lead agency, a responsible agency, a trustee agency, the Office of Planning and Research, or a project applicant may request one or more meetings between representatives of the agencies involved to assist the lead agency in determining the scope and content of the environmental information that the responsible or trustee agency may require. Such meetings shall be convened by the lead agency as soon as possible, but no later than 30 days after the meetings were requested. On request, the Office of Planning and Research will assist in convening meetings that involve state agencies.

(1) For projects of statewide, regional or areawide significance pursuant to Section 15206, the lead agency shall conduct at least one scoping meeting. A scoping meeting held pursuant to the National Environmental Policy Act, 42 USC 4321 et seq.(NEPA) in the city or county within which the project is located satisfies this requirement if the lead agency meets the notice requirements of subsection (c)(2) below.

(2) The lead agency shall provide notice of the scoping meeting to all of the following:

(A) any county or city that borders on a county or city within which the project is located, unless otherwise designated annually by agreement between the lead agency and the county or city;

(B) any responsible agency

(C) any public agency that has jurisdiction by law with respect to the project;

(D) any organization or individual who has filed a written request for the notice.

(3) A lead agency shall call at least one scoping meeting for a proposed project that may affect highways or other facilities under the jurisdiction of the Department of Transportation if the meeting is requested by the department. The lead agency shall call the scoping meeting as soon as possible but not later than 30 days after receiving the request from the Department of Transportation.

(d) The Office of Planning and Research. The Office of Planning and Research will ensure that the state responsible and trustee agencies reply to the lead agency within 30 days of receipt of the notice of preparation by the state responsible and trustee agencies.

(e) Identification Number. When the notice of preparation is submitted to the State Clearinghouse, the state identification number issued by the Clearinghouse shall be the identification number for all subsequent environmental documents on the project. The identification number should be referenced on all subsequent correspondence regarding the project, specifically on the title page of the draft and final EIR and on the notice of determination.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21083.9, 21080.4**, 21092.3** and 21098, Public Resources Code.

Time Limits for Negative Declarations

Proposed Amendments to Section 15107

Background and Explanation of the Proposed Amendments

OPR proposes to amend Section 15107. That section currently states that a negative declaration must be completed and approved within 180 days from the date in which the lead agency accepted the application for a private project involving one or more public agencies. OPR proposes to add a sentence clarifying that a lead agency may extend the 180-day time limit once for a period of no more than 90 days upon the consent of both the lead agency and the applicant. This addition allows the lead agency the same flexibility to extend the deadline for the completion of a negative declaration as is allotted for the completion of an environmental impact report. (CEQA Guidelines, § 15108 (lead agency may extend the deadline for the completion of an environmental impact report "…[O]nce for a period of not more than 90 days upon consent of the lead agency and the applicant").)

Text of the Proposed Amendments to Section 15107

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15107. Completion of Negative Declaration for Certain Private Projects

With private projects involving the issuance of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies, the negative declaration must be completed and approved within 180 days from the date when the lead agency accepted the application as complete. **Lead agency procedures may provide that the 180-day time limit may be extended once for a period of not more than 90 days upon consent of the lead agency and the applicant.**

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21100.2 and 21151.5, Public Resources Code.

Project Benefits

Proposed Amendments to Section 15124

Background and Explanation of the Proposed Amendments

OPR proposes to amend subdivision (b) of Section 15124. Currently, subdivision (b) states that a project description shall include a statement of objectives sought by the project. OPR proposes to clarify that the general description may also discuss the proposed project's benefits to ensure the project description allows decision makers to balance, if needed, a project's benefit against its environmental cost. (See *County of Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 192 (determined an accurate project description allows decision makers to balance the proposal's benefit against its environmental cost).)

Text of the Proposed Amendments to Section 15124

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15124. Project Description

The description of the project shall contain the following information but should not supply extensive detail beyond that needed for evaluation and review of the environmental impact.

(a) The precise location and boundaries of the proposed project shall be shown on a detailed map, preferably topographic. The location of the project shall also appear on a regional map.

(b) A statement of the objectives sought by the proposed project. A clearly written statement of objectives will help the lead agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision makers in preparing findings or a statement of overriding considerations, if necessary. The statement of objectives should include the underlying purpose of the project **and may discuss the project benefits.**

(c) A general description of the project's technical, economic, and environmental characteristics, considering the principal engineering proposals if any and supporting public service facilities.

(d) A statement briefly describing the intended uses of the EIR.

(1) This statement shall include, to the extent that the information is known to the lead agency,

(A) A list of the agencies that are expected to use the EIR in their decision-making, and

(B) A list of permits and other approvals required to implement the project.

(C) A list of related environmental review and consultation requirements required by federal, state, or local laws, regulations, or policies. To the fullest extent possible, the lead agency should integrate CEQA review with these related environmental review and consultation requirements.

(2) If a public agency must make more than one decision on a project, all its decisions subject to CEQA should be listed, preferably in the order in which they will occur. On request, the Office of Planning and Research will provide assistance in identifying state permits for a project.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21080.3, 21080.4, 21165, 21166 and 21167.2, Public Resources Code; County of Inyo v. City of Los Angeles (1977) 71 Cal. App. 3d 185.

Joint NEPA/CEQA Documents

Proposed Amendments to Section 15222

Background and Explanation of the Proposed Amendments

OPR proposes to amend Section 15222. That section currently addresses the preparation of joint documents between the Federal and state lead agencies the state lead agency will act on the project first. OPR proposes to add a sentence encouraging a lead agency to enter into a Memorandum of Understanding with appropriate Federal agencies. This addition will encourage increased cooperation between the state and Federal agencies to coordinate project requirements, timelines, and reduce duplication under CEQA and NEPA provisions. (See, CEQA Guidelines, 15220; 40 C.F.R. Section 1506.2 ("Agencies shall cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and comparable State and local requirements…").) OPR and the White House Council on Environmental Quality prepared a sample Memorandum of Understanding to assist state and Federal agencies in this process.

Text of the Proposed Amendments

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15222. Preparation of Joint Documents

If a lead agency finds that an EIS or finding of no significant impact for a project would not be prepared by the federal agency by the time when the lead agency will need to consider an EIR or negative declaration, the lead agency should try to prepare a combined EIR-EIS or negative declaration-finding of no significant impact. To avoid the need for the federal agency to prepare a separate document for the same project, the lead agency must involve the federal agency in the preparation of the joint document. **The lead agency may also enter into a Memorandum of Understanding with the federal agency to ensure that both federal and state requirements are met.** This involvement is necessary because federal law generally prohibits a federal agency from using an EIR prepared by a state agency unless the federal agency was involved in the preparation of the document.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21083.5 and 21083.7, Public Resources Code; Section 102(2)(D) of NEPA, 43 U.S.C.A. 4322 (2)(D); 40 C.F.R. Part 1506.2.

Using the Emergency Exemption

Proposed Amendments to Section 15269

Background and Explanation of the Proposed Amendments

OPR proposes to amend subdivisions (b) and (c) of Section 15269. Currently, subdivisions (b) and (c) state that emergency repairs may be exempt under CEQA and that this exemption does not apply to long-term projects undertaken for the purpose of preventing or mitigating an emergency. OPR proposes to add a sentence to subdivision (b) clarifying that emergency repairs may require planning and qualify under this exemption. Further, OPR proposes to add two subsections under subdivision (c) clarifying how imminent an emergency must be to fall within the statutory exemption. These additions are necessary to clarify the application of this emergency exemption and to maintain consistency with a court of appeal decision stating that an emergency repair may be anticipated. (See, *CalBeach Advocates v. City of Solana Beach* (2002) 103 Cal. App. 4th 529, 537 (emergency repairs need not be "unexpected" and "in order to design a project to prevent an emergency, the designer must anticipate the emergency").

Text of the Proposed Amendments to Section 15269

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15269. Emergency Projects

The following emergency projects are exempt from the requirements of CEQA.

(a) Projects to maintain, repair, restore, demolish, or replace property or facilities damaged or destroyed as a result of a disaster in a disaster stricken area in which a state of emergency has been proclaimed by the Governor pursuant to the California Emergency Services Act, commencing with Section 8550 of the Government Code. This includes projects that will remove, destroy, or significantly alter an historical resource when that resource represents an imminent threat to the public of bodily harm or of damage to adjacent property or when the project has received a determination by the State Office of Historic Preservation pursuant to Section 5028(b) of Public Resources Code.

(b) Emergency repairs to publicly or privately owned service facilities necessary to maintain service essential to the public health, safety or welfare. **Emergency repairs include those that require a**

reasonable amount of planning.

(c) Specific actions necessary to prevent or mitigate an emergency. This does not include long-term projects undertaken for the purpose of preventing or mitigating a situation that has a low probability of occurrence in the short-term**, but this exclusion does not apply (i) if the anticipated period of time to conduct an environmental review of such a long-term project would create a risk to public health, safety or welfare, or (ii) if activities (such as fire or catastrophic risk mitigation or modifications to improve facility integrity) are proposed for existing facilities in response to an emergency at a similar existing facility.**

(d) Projects undertaken, carried out, or approved by a public agency to maintain, repair, or restore an existing highway damaged by fire, flood, storm, earthquake, land subsidence, gradual earth movement, or landslide, provided that the project is within the existing right of way of that highway and is initiated within one year of the damage occurring. This exemption does not apply to highways designated as official state scenic highways, nor any project undertaken, carried out, or approved by a public agency to expand or widen a highway damaged by fire, flood, storm, earthquake, land subsidence, gradual earth movement, or landslide.

(e) Seismic work on highways and bridges pursuant to Section180.2 of the Streets and Highways Code, Section 180 et seq.

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Sections 21080(b)(2), (3), and (4), 21080.33 and 21172, Public Resources Code; ***CalBeach Advocates v. City of Solana Beach* (2002) 103 Cal. App. 4th 529**; Castaic Lake Water Agency v. City of Santa Clarita (1995) 41 Cal.App.4th 1257; and Western Municipal Water District of Riverside County v. Superior Court of San Bernardino County (1987) 187 Cal.App.3d 1104.

When is a Project Discretionary?

Proposed Amendments to Section 15357

Background and Explanation of Proposed Amendments

OPR proposes to amend Section 15357. That section currently defines a discretionary project as a project involving the exercise of judgment or deliberation by a public agency. Discretionary projects require environmental review under CEQA. (See, Pub. Resources Code, § 21080(a).) OPR proposes to add a sentence clarifying that a discretionary project is one in which a public agency can shape the project in any way to respond to concerns raised in an environmental impact report. This addition reflects various cases distinguishing the term "discretionary" and the term "ministerial." (*See, e.g., Friends of Westwood, Inc. v. City of Los Angeles* (1987) 191 Cal. App. 3d 259, 267 ("[T]he touchstone is whether the approval process involved allows the government to shape the project in any way that could respond to any of the concerns … in an environmental impact report").) The California Supreme Court and Fourth District Court of Appeal have consistently followed this interpretation. (*See, e.g., Mountain Lion Foundation v. Fish & Game Comm*. (1997) 16 Cal. 4th 105, 177; *San Diego Navy Broadway Complex Coalition v. City of San Diego* (2010) 185 Cal. App. 4th 924, 933*; Friends of Juana Briones House v. City of Palo Alto* (2010) 190 Cal. App. 4th 286, 299.) This clarification is necessary to maintain consistency in determining "discretionary" projects and to improve practitioners' ability identify when a project is required to complete environmental review under CEQA.

OPR also proposes to add the words "fixed standards" to the end of the first sentence in the definition. This addition is consistent with the holding in *Health First v. March Joint Powers Authority* (2009) 174 Cal. App. 4th 1135. Notably, the definition of "discretionary" in these Guidelines may need to be read in context with other statutes. For example, Government Code Sections 65583(a)(4) and 65583.2(h) require that local governments zone specified areas for specified uses for "use by right." In those circumstances, local government review cannot be considered discretionary pursuant to CEQA.

Text of Proposed Amendments to Section 15357

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15357.Discretionary Project

"Discretionary project" means a project which requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular activity, as distinguished from situations where the public agency or body merely has to determine whether there has been conformity with applicable statutes, ordinances, ~~**or**~~ regulations**, or other fixed standards**. **The key question is**

whether the approval process involved allows the public agency to shape the project in any way that could materially respond to any of the concerns which might be raised in an environmental impact report. A timber harvesting plan submitted to the State Forester for approval under the requirements of the Z'berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code Sections 4511 et seq.) constitutes a discretionary project within the meaning of the California Environmental Quality Act. Section 21065(c).

AUTHORITY:

Note: Authority cited: Section 21083, Public Resources Code. Reference: Section 21080(a), Public Resources Code; Johnson v. State of California (1968) 69 Cal. 2d 782; People v. Department of Housing and Community Development (1975) 45 Cal. App. 3d 185; Day v. City of Glendale (1975) 51 Cal. App. 3d 817; N.R.D.C. v. Arcata National Corp. (1976) 59 Cal. App. 3d 959**; Friends of Westwood, Inc. v. City of Los Angeles (1987) 191 Cal. App. 3d 259; Mountain Lion Foundation v. Fish & Game Comm. (1997) 16 Cal. 4th 105; Friends of Juana Briones House v. City of Palo Alto (2010) 190 Cal. App. 4th 286; San Diego Navy Broadway Complex Coalition v. City of San Diego (2010) 185 Cal. App. 4th 924.**

Conservation Easements as Mitigation

Proposed Amendments to Section 15370

Background and Explanation of Proposed Amendments

OPR proposes to revise Section 15370 to incorporate the First District Court of Appeal holding in *Masonite Corporation v. County of Mendocino* (2013) 218 Cal.App.4th 230. In that case, the court ruled that off-site agricultural conservation easements constitute a potential means to mitigate for direct, in addition to cumulative and indirect, impacts to farmland. The court stated that although such easements do not replace lost onsite resources, they "may appropriately mitigate for the direct loss of farmland when a project converts agricultural land to a nonagricultural use…." (*Masonite Corporation v. County of Mendocino, supra,* 218 Cal.App.4th at p. 238.) Furthermore, the court stated that this preservation of substitute resources fits within the definition of mitigation in section 15370, subdivision (e) of the Guidelines. Therefore, OPR proposes to clarify in the Guidelines that permanent protection of off-site resources through conservation easements constitutes mitigation.

Text of Proposed Amendments to Section 15370

Changes to the existing guideline are shown in **bold** type, with additions **underlined** and deletions shown in ~~**strikeout**~~.

§ 15370. Mitigation.

"Mitigation" includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments**, including through permanent protection of such resources in the form of conservation easements**.

Note: Authority cited: Section 21083, Public Resources Code.
Reference: Sections 21002,21002.1, 21081 and 21100(c), Public Resources Code**; *Masonite Corporation v. County of Mendocino* (2013) 218 Cal.App.4th 230**.

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Comprehensive Land Use and Regional Growth Projects

Smart Growth Trip Generation and Parking Study

Smart growth developments are generally perceived to generate fewer auto trips and less demand for parking as compared to conventional developments due to an increased number of trips via transit, walking, or bicycling. Current trip generation and parking supply guidelines are based on conventional suburban development, perhaps imposing a burden on developers and jurisdictions to provide more roadway and parking capacity than is necessary. Application of identified trip generation and parking demand rates appropriate for smart growth development could result in cost savings for jurisdictions, developers, homebuyers, and renters.

SANDAG prepared Trip Generation for Smart Growth: Planning Tools for the San Diego Region and Parking Strategies for Smart Growth: Planning Tools for the San Diego Region to identify trip generation rates and parking demand associated with smart growth developments.

The trip generation and parking demand guidelines update the SANDAG San Diego Traffic Generators Manual, a guide to trip generation rates in the San Diego region, and Designing for Smart Growth: Planning Tools for the San Diego region, smart growth design guidelines published by SANDAG in 2009. The guidelines are available for jurisdictions to use in local planning efforts.

The guidelines address the following questions:

1. Does smart growth development result in lower trip generation rates and decreased parking demand as compared to traditional development? If so, what rates have been observed?
2. What are the characteristics of smart growth development that account for identified reductions in trip generation and parking demand?
3. Can identified trip generation rates and reductions in parking demand associated with smart growth development in other regions be applied in the San Diego region?

Trip Generation for Smart Growth is accompanied by an interactive Excel spreadsheet tool designed to assist users in calculating trip reduction rates for individual smart growth developments or smart growth planning areas. The spreadsheet can be completed by the user on his or her own, or data can be provided by SANDAG Service Bureau for a fee.

Trip Generation for Smart Growth
Parking Strategies for Smart Growth
Smart Growth Trip Generation Spreadsheet Tool

Project Manager

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Related Resources

Publications

- Parking Strategies for Smart Growth [PDF: 879KB]
- Trip Generation for Smart Growth [PDF: 1MB]

SANDAG, 401 B Street, Suite
(619) 699-1900, fax: (619) 699-1905, we

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Research Report – UCD-ITS-RR-11-12

Evaluation of the Operation and Accuracy of Five Available Smart Growth Trip Generation Methodologies

September 2011

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DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

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Appendix A: Summary of Findings and Recommendations Regarding Key Definitions

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Evaluation of the Operation and Accuracy of Five Available Smart Growth Trip Generation Methodologies

Richard Lee, Josh Miller, Rachel Maiss, Mary Campbell, Kevan Shafizadeh, Deb Niemeier, and Susan Handy
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Revised 9/18/12

Executive Summary

No standard methodology exists in the U.S. for estimating trip generation that takes into account the smart growth characteristics of a land use development project. As a first step toward developing such a methodology, this report assesses the available alternatives to the traditional ITE *Trip Generation* methodology. We identified eight available methods. For five of these methods, we completed a two-part assessment. The first part was to evaluate the methods against a variety of operational criteria developed through discussions with a panel of transportation practitioners. The second part was to test the accuracy of the methods by comparing the predictions of the various methods against available traffic counts and other data at 22 California sites that have at least some characteristics of smart growth

Existing Methodologies
We searched for existing tools that provide trip generation estimates for projects located within urban environments where transit and non-motorized transportation is more common. Most of the identified tools adjust the ITE trip generation rates to better reflect the effects of location, density, mixed land uses, and other design characteristics on trip generation. In addition, we identified two other types: tools that provide rates based on trip generation data collected at sites with smart growth characteristics, and one tool that uses person-trip data from a travel survey. Of these eight, we determined that five were candidate methodologies:

1. The current ITE *Handbook* Chapter 7 method for Multi-use development (referred to as **ITE Multi-use method**).
2. The EPA/SANDAG MXD Multi-use analysis method developed for the US EPA and subsequently adapted for use in the SANDAG region (**EPA MXD**).
3. The NCHRP 8-51 method, based on a recently completed research project. It is an enhancement of the current ITE Handbook Chapter 7 method (**NCHRP 8-51**).
4. A prototype method that adjusts ITE trip generation rates using travel survey with factors derived from data compiled by the Metropolitan Transportation Commission in the San Francisco Bay Area (**MTC Survey**).
5. URBEMIS 2007, the most recent version of a tool developed for analysis of emissions from land development projects, including mobile source emissions (**URBEMIS**).

Evaluation of Candidate Methods on Operational Criteria

We evaluated each of the five candidate methods with respect to key operational criteria identified and rated on their importance by a panel of transportation practitioners with experience in traffic impact analysis. The operational criteria are grouped into the following categories: 1) Ease of use; 2) Sensitivity to key smart growth elements; 3) Input requirements; 4) Output features; and 5) Usability of a methodology or tool in helping to define smart growth projects based on their performance.

No clear "winner" emerges among currently available methods based on the operational criteria; the methods all both meet and fall short of desired goals. However, criteria highly rated by the panel could be focal points in considering the merits of both existing methods and a final preferred methodology (Table ES-1).

Table ES-1: Top-Rated Criteria

Criterion	Criteria Type	Average Rating from 1-6 (6=Highest Rating)
1. Sensitivity of output to inputs	Input Data Mechanics	6.0
2. Results replicable by other analysts	Output	5.8
3. Results should not fluctuate excessively.	Additional Criteria	5.6
4. Method measures the performance of different kinds of land use projects	Additional Criteria	5.6
5. AM / PM / daily / Other time frames reported	Output	5.4
6. Auto vs. "other" trip generation rates	Output	5.3
7. LU context variables	Sensitivity	5.1
8. "Internal capture" shown	Output	5.0
9. Project-level Variables	Sensitivity	5.0
10. Transport Variables	Sensitivity	4.9
11. Project description by land use(s) and size	Output	4.9

Evaluation of the Accuracy of Candidate Methods

Panel members unanimously ranked accuracy as the highest priority criterion for trip generation estimation methodologies. To assess the relative accuracy of each of the five candidate methods, we compared available cordon counts at ten multi-use sites and twelve infill sites in California against estimates produced by the methodologies. These methods were also compared to the industry standard ITE trip generation rates for single land uses. The summary tables in the report show the error for each method, calculated as the percentage deviation between the actual traffic count and the estimate. Two summary statistics were also computed for each method: the average error, calculated as the sum of the errors for all sites divided by the number of sites; and the average absolute error, calculated as the sum of the absolute values of the errors for all sites divided by the number of sites.

Table ES-2 (below) indicates *for each site* the method that most accurately matches the observed traffic counts for the two sets of land use sites. For sites where the raw ITE rate is the best match, the candidate method that mostly closely matches the observed count is also shown. For the multi-use sites, all of which are large-scale projects not located in a central business district, the EPA MXD method produces the most accurate estimate in the greatest number of sites. It is not surprising that the EPA MXD method is most accurate for the multi-use sites, given that these sites were chosen based on their similarity to the sites used to calibrate the method. For the single-use urban infill sites, a clearly best method does not emerge.

Conclusions

This report provides an assessment of five candidate smart growth trip generation methodologies with respect to their performance regarding operational criteria and their accuracy. The results show that all of the candidate methodologies performed better than the ITE rates, but they do not point to a clear "winner" – one methodology that is clearly superior to the others. Nevertheless, this assessment generated many insights that could guide the selection or development of a recommended methodology.

These initial results also point to the critical need for further collection of trip generation data at smart growth sites. Based on only 22 sites, the evaluation presented here is not adequate to fully assess the performance of available methods. In addition, the validation sites do not reflect the full spectrum of smart growth development projects but instead cluster around two extremes – large multi-use suburban sites, and individual urban infill projects. Data from more sites of more types are needed to better understand the performance of the available methods.

Table ES-2. Most Accurate Method for Each Evaluation Site (Showing Method with Lowest Error Rate)

Multi-Use Site and Location	Daily	% Error	AM Peak Hour	% Error	PM Peak Hour	% Error	Notes on Site
Gateway Oaks, Sacramento	ITE Multi-Use	0%	na		na		Large site, little use mix
Jamboree Center, Irvine	EPA MXD	-3%	MTC survey	9%	MTC survey	5%	Large site, little use mix
	ITE Rate	*1%*					
Park Place, Irvine	EPA MXD	15%	EPA MXD	23%	EPA MXD	20%	Mulit-use, low-density
	MTC Survey	15%					
The Villages, Irvine	URBEMIS	-7%	MTC survey	0%	URBEMIS	8%	Higher density, lowest WalkScore (40)
Rio Vista Station Village, San Diego	EPA MXD	4%	MTC survey	28%	URBEMIS	2%	Multi-use suburban, LRT
La Mesa Village Plaza,	EPA MXD	-5%	EPA MXD	10%	EPA MXD	-12%	Multi-use suburban,
San Diego	*ITE Rate*	*-3%*	NCHRP 8-51	-10%	URBEMIS	-12%	LRT
Uptown Center, San Diego	EPA MXD	1%	URBEMIS	3%	EPA MXD	10%	Multi-use urban; no rail
The Village @Morena Linda Vista, San Diego	EPA MXD	11%	MTC survey	22%	MTC survey	19%	Multi-use suburban, LRT
Hazard Center, San Diego	URBEMIS	2%	NCHRP 8-51	11%	MTC survey	7%	Office+retail, LRT no res'l
Heritage Center @ Otay	EPA MXD	-20%	URBEMIS	10%	ITE Multi-	-3%	Suburban, no LRT
Ranch, Chula Vista	*ITE Rate*	*-13%*					
Infill Study Site and Location							
Retail,	na		EPA MXD	-92%	EPA MXD	-18%	Retail only, Oakland
Oakland			*ITE Rate*	*-92%*	*ITE Rate*	*-7%*	
Office, San Francisco	na		EPA MXD	-17%	NCHRP 8-51	-2%	Office Only, CBD
Office, Los Angeles	na		URBEMIS	-23%	URBEMIS	-3%	Office Only, CBD
Residential, San Diego	na		MTC Survey	101%	EPA MXD	31%	High–rise res'l, CBD
Residential, San Diego	na		MTC Survey	-6%	MTC Survey	4%	Res'l + coffee shop, CBD
Office, Los Angeles	na		URBEMIS	79%	URBEMIS	-3%	Office Only, CBD
Office, Los Angeles	na		URBEMIS	-25%	MTC Survey	-3%	Office Only, CBD
Residential, San Diego	na		NCHRP 8-51	-7%	URBEMIS	2%	Mid–rise res'l Only, CBD
Residential,	na		NCHRP 8-51	-25%	NCHRP 8-51	1%	High–rise res'l Only,
Pasadena			URBEMIS	-25%			
			ITE Rate	*-12%*			
Residential, San Francisco	na		NCHRP 8-51	-14%	NCHRP 8-51	-15%	High–rise res'l Only, CBD
Restaurant,	na		EPA MXD	12%	NCHRP 8-51	3%	Quality restaurant only
San Francisco					MTC Survey	3%	
Restaurant,	na		NCHRP 8-51	24%	EPA MXD	-20%	Quality restaurant only
San Francisco					*ITE Rate*	*-10%*	

Evaluation of the Operation and Accuracy of Five Available Smart Growth Trip Generation Methodologies

1. Introduction

Many communities are encouraging development that follows “smart growth” principles – higher densities, mixed land uses, infill locations – as a strategy for reducing vehicle travel. A substantial body of evidence suggests that vehicle use is generally lower in such developments (Ewing and Cervero 2010). However, forecasting the effects of any single smart growth development on traffic is difficult. In compliance with the California Environmental Quality Act (CEQA), developers in California must estimate the transportation impacts of their proposed developments in the form of a Traffic Impact Analysis (TIA). Often developers are required to mitigate these traffic impacts by paying impact fees or providing facility improvements. The basis for such mitigation is the project's TIA. Accuracy in TIAs is thus important to ensure that mitigations are adequate but not excessive.

Estimating the number and type of trips that a development project will produce is the first step of a TIA, a step known as “trip generation.” The guidance used most often for estimating trip generation is the Institute of Transportation Engineers' (ITE) *Trip Generation.* This manual provides average vehicle trip generation rates (daily and peak-hours) for a variety of land use categories. However, the data used in *Trip Generation* are mostly collected at isolated developments that lack public transit and good bicycle and pedestrian infrastructure. Thus, the manual specifies that while these rates are appropriate for conventional suburban developments, they should not be used in downtowns or other areas served by transit, where the ITE rates tend to overestimate the vehicle trips.

Despite an awareness of this limitation, no standard methodology exists in the U.S. for estimating trip generation that takes into account the smart growth characteristics of a development project. Because of the lack of a standard methodology, analysts sometimes improvise. But improvised methods often produce more controversial results than the standard technique using the ITE’s *Trip Generation* rates, if only because the latter is the standard. To avoid this controversy and its potential legal ramifications, many analysts revert to using the ITE rates, even when they recognize their limitations. Applying the ITE rates to smart growth projects is likely to produce over-estimates of vehicle trips and may lead to mitigation measures that over-emphasize vehicle needs while under-supplying appropriate transit, bicycle, and pedestrian facilities.

As a first step toward the development of a standard trip generation methodology for smart growth projects, this report assesses the available alternatives to the ITE rates. We identified eight available methods, as described in Section 2. For five of these methods, we completed a two-part assessment. The first part was to evaluate the methods against a variety of operational criteria developed through discussions with a panel of transportation practitioners (described in Section 3). The second part was to test the accuracy of the methods by comparing the predictions of the various methods against available traffic counts and other data at 22 California sites that have at least some characteristics of smart growth (described in Section 4). As summarized in Section 5, the results of this assessment do not point to a clear “winner” but provide important insights for the effort to develop a smart growth trip generation methodology.

2. Available Methods

2.1 Background

Many studies have illuminated the drawbacks of the ITE *Trip Generation* methodology, especially when this method is used to estimate trip generation rates for development projects with smart growth characteristics. For instance, one study concluded that "...traffic impact studies for mixed use developments are little more than exercise in speculation" (Ewing et al. 2001). Similar findings have been made at transit-oriented developments (TODs) as well as infill developments. One infill development study using traffic counts and intercept surveys found that, with the exception of a few sites, observed trips were an average of 26 to 40 percent lower during peak periods than those indicated by the ITE method (Kimley Horn & Associates 2009).

In another study, traffic counts at TODs found that residential TODs averaged 44 percent fewer vehicle trips than those estimated by ITE (Arrington and Cervero 2008). Based on a multivariate regression analysis, this study also found that residential density within one-half mile of the transit station is the variable most correlated with trip generation rates. Thus, the risks of overestimating trip generation rates for TODs are significant. Typically, higher trip generation estimates lead to increased parking provisions, which in turn can lead to lower development density. In effect, inaccurate ITE data can create a feedback cycle in which developers decide to decrease density and increase parking provision at a TOD in order to get the development approved, which in turn leads to less transit use than originally anticipated, and which ultimately reaffirms initial concerns regarding the traffic impacts of the development. This study concluded that more accurate predictions of TOD-generated traffic are essential for TODs to reach their full potential.

Overestimation of trips using ITE rates is not limited to TODs. In one analysis, case studies at actual developments showed that ITE peak-hour trip generation rates often overestimated traffic impacts, regardless of development type (Muldoon and Bloomberg 2008). Researchers in that study attributed the overestimation to improper ITE land-use code selection, inadequate assessment of pass-by trip reductions, failure to consider seasonal variations in traffic counts, and lack of multi-modal evaluation. Such studies indicate that planners need a more flexible, context-sensitive, and accurate trip generation tool to produce traffic impact analyses.

2.2 Existing Methodologies

We searched for existing tools that provide trip generation estimates for projects located within urban environments where transit and non-motorized transportation is more common. A key consideration was the tool's ability to respond to location, density, mixed land uses, and other design characteristics that have been found to facilitate non-motorized travel. In general, the search emphasized tools that are more context-sensitive than the traditional ITE *Trip Generation* methodology.

A majority of the identified tools adjust the ITE trip generation rates (or an alternative set of rates compiled by the San Diego Association of Governments (SANDAG)) to better reflect the effects of location, density, mixed land uses, and other design characteristics on trip generation. In addition to this type of tool, we identified two other types: tools that provide rates based on trip generation data collected at sites with smart growth characteristics, and one tool that uses person-trip data from a travel survey. All of these tools are potentially better than the traditional ITE *Trip Generation* method, though none is without flaws. This section describes each identified tool.

2.1.1 Adjustments to ITE/SANDAG Rates

- **ITE Trip Generation**

The ITE *Trip Generation Handbook* (*Handbook*) guides practitioners on the proper use of the data provided in *Trip Generation*, and includes supplemental material regarding the trip generation estimation process. Chapter Seven of the *Handbook* provides a methodology for estimating trip generation rates at mixed-use sites, using a worksheet in the document. However, the analyst is instructed to "exercise caution" when using this methodology to estimate reductions, as the data on which the method is based come from a very small sample of sites, and all sites are located in a single state. According to the *Handbook*, this methodology is only applicable to multi-use developments and does not account for other factors known to affect trip rates, such as density, transit availability, street design, etc. In fact, the *Handbook* specifically cautions against using ITE trip rates data in downtowns or locations served by transit.[1] Also, because trip generation rates calculated using this worksheet are expressed as reductions from the ITE vehicle trip generation rates, there is no modal split information. Though *Trip Generation* is widely used and is the most cited authority on trip generation estimates in the United States, it has serious drawbacks, as listed above.

- **EPA MXD Model/SANDAG Mixed-Use Model**

These two tools are assessed together because they adjust trip estimates using the same elasticities for any given set of land use and transportation variables. The elasticities were derived from travel survey data collected at 239 multi-use developments[2] in six metropolitan regions around the United States. These models reduce the vehicle trip estimates in ITE's *Trip Generation* or San Diego's *Traffic Generators* (a tool similar to *Trip Generation*, but specific to the San Diego area). These reductions to vehicle trips are categorized as internally-captured trips within multi-use developments, walking/biking external trips, or transit external trips ("external" refers to trips outside of a multi-use site or neighborhood). The EPA tool is in spreadsheet format, with some basic data input requirements. These tools take into account the "D-factors" in land use known to affect travel (i.e. density, diversity (land use mix), design (usually measured as street connectivity), distance to transit, "destination accessibility," and others). The EPA MXD tool has been validated at 16 sites in the U.S. for which vehicle trip counts were collected; six of these sites are in California. The SANDAG tool has been validated at six sites in the San Diego region for which vehicle trips counts were collected, as well as 20 areas in that region for which an adequate number of records were available from the SANDAG 2006 Regional Household Travel Behavior Survey.

- **Eakland's Model**

Peter Eakland, an independent transportation planner, developed a tool that provides an input module for analysts to estimate trip generation using the numbers in the City of San Diego's *Traffic Generators* (a somewhat more detailed version of SANDAG's *Traffic Generators*). This tool puts rates and equations into a spreadsheet format, which makes the trip generation estimation process more user-friendly and transparent. Other attractive features of this tool include its ability to estimate city center

[1] ITE *Trip Generation Handbook, Second Edition*. June 2004. Page 15: "If the site is located in a downtown setting, served by significant public transportation, or is the site of an extensive transportation demand management program, the site is **not consistent with the ITE data** and the analyst should collect local data and establish a local rate." [*Emphasis added.*]

[2] Although the method is labeled "MXD" for "mixed-use development," we reserve the use of this term for areas where land uses are mixed at a finer grain, as is typically found in a downtown or town center. The 239 sites used in the cited study are more appropriately labeled "multi-use" in that they tend to have larger blocks of single land uses separated by arterial streets and are thus less walkable.

vehicle trip rates, and its ability to take into account vehicle trips generated by existing developments. One drawback is that it provides no distinction between non-motorized and pass-by trips (these are all grouped under "pass-by"). Further, it does not account for land use characteristics such as density and mix of uses as it is based purely on the information provided in *Traffic Generators*.

- **URBEMIS**

This tool, which stands for "urban emissions," was originally created by the California Air Resources Board to facilitate the assessment of criteria pollutant emissions from light-duty vehicle travel related to land use projects in California. During the late 1990s, it was upgraded and a "mobile source mitigation component" added under the direction of a consortium of air quality management districts in California, which continued to update and disseminate URBEMIS via the Internet until recently. Among other things, URBEMIS is capable of estimating trip generation for smart growth developments based on various land use, locational, and transportation characteristics. It is a user-friendly tool and has withstood several legal challenges for use in air quality impacts analyses of land use projects in California. However, because it was developed as an air quality analysis tool, it does not provide peak-hour trip generation rates which are of significant importance in traffic impact analyses. Further, the interface of this software provides the user with little insight into the calculations being performed, so its transparency is somewhat limited. However, the analyst can find descriptions of most of the module's calculations in the user guide. This limitation could potentially be viewed as an advantage as the calculations cannot be inappropriately manipulated by the user.

- **NCHRP 8-51 Method and Spreadsheet Tool**

The National Cooperative Highway Research Program (NCHRP) is in the midst of finalizing a project (*Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*) aimed at outlining a methodology for analysts to collect appropriate data in order to estimate internal capture rates for multi-use developments,[3] and to apply these rates as reductions to trip generation rates. This tool is in spreadsheet format, which enhances its user-transparency. In addition to internal capture rates, it provides mode split estimates, which is ideal for the analysis of smart growth projects. However, since this tool is meant to assist analysts in collecting their own trip generation rates data, it is extremely data-intensive and thus unlikely to be used as a primary trip generation estimation tool.

2.1.2 Organized Empirical Database Tools

- **UK's TRICS**

The Trip Rate Information Computer System (TRICS) is a trip generation rates tool that has been used in the United Kingdom (UK) since 1989. It is a comprehensive and dynamic database consisting of trip generation estimates based on actual vehicle counts and multi-modal survey data for a variety of different land use types at numerous locations (in England, Scotland, Wales, and Ireland). The system is based on multi-modal data and provides trip generation estimates for multiple travel modes for proposed development projects. Further, the estimates are sensitive to urban versus suburban locational factors. Users have access to all of the available survey data from existing development to estimate trip generation, as well as detailed information regarding the survey sites and collection dates. The database is updated with new survey data regularly, and data older than ten years is removed. The

[3] Although the title of the project used the term "mixed-use development," we label the sites "multi-use development" for reasons noted in Footnote 2.

TRICS system is an exemplary tool for calculating multi-modal trip generation rates of proposed development projects of various types, locations and designs. However, it is based solely on UK data.

- **New Zealand Trips and Parking Database**

This tool is similar to TRICS in that it is a comprehensive database of trip generation rates data. It provides users with information on trip generation rates based on land use groups and activity subgroups. The Trips and Parking Database, like TRICS, provides multi-modal estimates, and seems to be context-sensitive to an even higher degree than the TRICS database, utilizing even more of the factors found to affect trip generation. However, this database is only directly applicable to developments in New Zealand.

2.1.3 Person-Trip Based Tools

- **San Francisco Method**

The *Transportation Impact Analysis Guidelines for Environmental Review,* published by the Planning Department of the City and County of San Francisco in 2002, provides a trip generation methodology used in analyzing developments proposed in the City and County of San Francisco. This tool is in the form of a look-up table with trip rates (per square feet) for various land use types. Unique to this tool is its ability to estimate person trips in place of vehicle trips, and to estimate mode split based on local travel survey data. The tool itself is based on a combination of ITE's *Trip Generation*, data from the San Francisco Citywide Travel Behavior Survey, and traffic analyses from various environmental impact reports. However, the accuracy of using travel survey data to estimate trip generation rates for individual sites is uncertain. Further, as this tool is based on San Francisco survey data, its applicability outside San Francisco is questionable.

2.3 Candidate Methods

In the remainder of this report, we assess five available "candidate" methods as to: 1) which, if any, of the methods best meet operational requirements (Section 3), and 2) which may be the most accurate for what types/locations of land use projects (Section 4). We omitted three methods from this assessment: the UK's TRICs and the New Zealand Trips and Parking Database, because the data are not applicable to California; and Ekland's model, because it is based solely on San Diego data. In place of the San Francisco method, we tested a survey-based approach based on analysis of travel survey data for the San Francisco Bay Area provided by the Metropolitan Transportation Commission. The five available candidate methods examined were:

6. The current ITE *Handbook* Chapter 7 method for Multi-use development (referred to as **ITE Multi-use method**).
7. The EPA/SANDAG MXD Multi-use analysis method developed for the US EPA and subsequently adapted for use in the SANDAG region (**EPA MXD**).
8. The NCHRP 8-51 method, based on a recently-completed research project; it is an enhancement of the current ITE Handbook Chapter 7 method (**NCHRP 8-51**).
9. A prototype method that adjusts ITE trip generation rates using travel survey with factors derived from data compiled by the Metropolitan Transportation Commission in the San Francisco Bay Area (**MTC Survey**).

10. URBEMIS 2007, the most recent version of a tool developed for analysis of emissions from land development projects, including mobile source emissions (**URBEMIS**).

Summaries of key features of each of these methods are listed in Table 1. Appendix A provides detailed information about each of these methodologies (including detailed references). It also lists the key data sources and assumptions used to test the accuracy of each method in estimating traffic generation at 22 multi-use and infill sites in California for which traffic cordon count data is available (the results of which are described in Section 4 of this report).

Table 1: Brief Overview of Five "Candidate" Methodologies

ITE Handbook Multi-use Methodology*

- Available and in use since 2001.
- Calculates internalization of trips due to multiple land uses only.
- Daily and PM peak hour – no AM.
- Based on only three cases studies – all in Florida.
- Does not predict the mode of internalized trips (e.g., driving, walk/bike, shuttle or transit).
- Does not account for other on-site or context variables (such as density, location, design, etc.).

* Source: *ITE Trip Generation Handbook, 2nd Edition. June 2004*

EPA MXD Method

- Developed for US EPA based on analysis of travel survey data at multi-use sites in six metro areas in the U.S.* The San Diego Association of Governments (SANDAG) adopted it for use in June 2010.
- Key Inputs (in addition to land uses):
  - Area (in acres); number of intersections within project.
  - Employment within one mile of the multi-use development.
  - Employment that can be reached from project within a 30-minute transit trip.
- Outputs: reductions for internal capture, and external transit and pedestrian/bicycle trips.

* See: "EPA Mixed Use Trip Gen Research 05 09.pdf" on the Project website; and *Trip Generation for Smart Growth: Planning Tools for the San Diego Region*, SANDAG, June 2010. http://www.sandag.org/tripgeneration

NCHRP 8-51 Method

- Enhanced version of ITE Handbook Multi-use methodology.
- Based on data collected at six sites.
- Provides PM peak hour rates, plus AM peak hour (Current ITE Method lacks AM estimate).
- Method operationalized in a spreadsheet.
- Tested at two sites in Texas & one in Georgia.
- Requires data on mode split and vehicle occupancy, ideally in peak hours and by inbound/outbound.
- For this report, mode split data from the 2000 MTC Travel Survey was used for all the Multi-use sites (the only daily, two-way modal data available). For the Infill sites, intercept survey data was used (that was collected for the California Infill Trip Generation Rates study*).

*Kimley-Horn & Associates, et.al., *Trip-Generation Rates for Urban Infill Land Uses in California, Final Report*, June, 2009.

MTC Survey-based method

- A travel survey-based method was suggested by a panel member. Based on detailed analysis of the Metropolitan Transportation Commission's (MTC) 2000 Travel Survey of the SF Bay Area*
- Adjusts ITE vehicle trip rates based on urban environment (density) and proximity to rail/ferry transit.

* Station Area Residents Survey (StaRS), 2006: http://www.mtc.ca.gov/planning/smart_growth/stars/

URBEMIS* ("Urban Emissions")

- Air quality analysis tool for estimating daily vehicle trips and emissions of land use projects in CA.
- Uses ITE trip rates (7th Edition of Trip Generation; not yet updated to the 8th).
- "Mobile Source Mitigation Component" includes some context variables (density, mixed-use, transit, street connectivity, bicycle and pedestrian facilities, transportation-demand management).
- Does not predict peak hour trips; some consultants estimate for peak hours based on ITE Trip Generation data (this method was also used for this report).

* URBEMIS 2007 (version 9.2.4) http://urbemis.com/

3. Evaluation of Candidate Methods on Operational Criteria using Survey Rankings

This section evaluates each of the five candidate methods using a number of key operational criteria identified by a panel of transportation practitioners with experience in traffic impact analysis (Practitioners Panel). During several conference calls, the panelists discussed the qualities – in addition to accuracy – that they most require in a smart growth trip generation rates estimation methodology. From these discussions, we compiled a list of operational criteria and reviewed them with the panelists. Based on our experience in applying each method (as described in Section 4 and Appendix A), we rated the methods regarding each criterion.

We then invited panelists to rate the criteria regarding their relative importance via an on-line survey. Eight members of the Practitioners Panel responded to the on-line survey (see full results in Appendix C). Respondents were asked to rate each criterion from one to six with one being "least important" and six being "most important." The average of all responses for each criterion is shown in the right column of Tables 3 through 7. The criteria are arranged according to the average ratings from highest-rated to lowest-rated in each category.

The Practitioners Panel's operational criteria are grouped into the following categories: 1) Ease of use; 2) Sensitivity to key smart growth elements; 3) Input requirements; 4) Output features; and 5) Usability of a methodology or tool in helping to define smart growth projects based on their performance. Definitions of subjective criteria (terms such as "Low," "Moderate," "High," and "User-friendliness") that are used in the evaluations of operational criteria are shown in Table 2.

Table 2: Subjective Criteria Definitions

Criteria	Low	Moderate	High
User-friendliness	Basic understanding of the method requires more than a day	Basic understanding of the method requires more than an hour but under a day	Basic understanding of the method requires under an hour
Transparency	Source and magnitude of effects of adjustments to trip rate not readily apparent	Source and magnitude of effects of adjustments to trip rate somewhat apparent	Source and magnitude of effects of adjustments to trip rate readily apparent
Data needs	Little or no data needed beyond that required to use ITE trip rates	Some data needed beyond that required to use ITE trip rates	Substantial data needed beyond that required to use ITE trip rates
Difficulty of obtaining required data	All relevant data readily obtainable from public sources	Most relevant data readily obtainable from public sources	Unpublished data needed, or extensive data collection by analyst required
Effort to use available data	Little interpretation or judgments about data required	Up to three interpretations or judgments about data required	More than three interpretations or judgments about data required
Sensitivity of output to inputs	Many inputs reduce the effect of any single factor	Several inputs have a moderate effect on outputs	One or two inputs greatly affect output

3.1 Evaluation Results

The first set of criteria identified by the Practitioners Panel addresses the relative difficulty or ease of using each of the methods. Table 3 compares each of the candidate methods against specific components of ease of use. (Note that for the last criterion - "time to analyze a project composed of three land uses" - it was assumed that the user starts with a site plan with land uses, quantities, and site area.)

Table 3: Ease of Use Criteria*

Criterion	ITE Multi-use	EPA MXD	NCHRP 8-51	MTC Survey	URBEMIS	Average Survey Rating
1. User-friendliness	Moderate	Moderate	Moderate	High	Moderate	4.8
2. Difficulty of obtaining required data	Low	High	High	Low	Low	4.8
3. Transparency	High	Moderate	High	High	Low	4.1
4. Data needs	Low	Moderate	High	Low	High	4.1
5. Time to analyze a Project (with three land uses)	<30 minutes	30-60 min. *(if required data is readily available)*	30 min. *(note: including land use interchange distance data & mode split survey adds one day)*	<30 minutes	2 hours	3.4
6. Use voluntary	Yes	Yes	Yes	Yes	Yes	2.3

Elaboration of Criteria in Table 3 (based on Practitioners Panel input):

1. Is the tool user-friendly? (i.e., Can architects, planners, and junior engineers with little/no experience use it?)
2. Is needed input data readily available?
3. Is the methodology transparent?
4. How much data needs to be input to use the methodology?
5. How much time is required to run the methodology (using available data)?
6. Will use of the methodology be voluntary?

Based on all the criteria in Table 3, the ITE Multi-use and MTC Survey methods emerge as the easiest to use, while URBEMIS, the EPA MXD, and NCHRP 8-51 methods are more challenging, each for slightly different reasons. URBEMIS' data needs are high in terms of the number of items an analyst must enter; however sources for this data are easily found. The number of data items required for the EPA MXD method is fewer, but one required item – the number of jobs accessible within 30 minutes by transit – is difficult to calculate manually without a regional model, and analysts in some regions may not have easy access to such regional modeling data. The NCHRP 8-51 method has fewer inputs than either URBEMIS or MXD, but detailed data on mode of access to a project site is not readily available, and collecting such data at sites comparable to the project site would be labor intensive.

Responding practitioners rated user-friendliness and ease in obtaining data as their most important criteria regarding ease of use, reaffirming the favorable status of the ITE Multi-use and MTC Survey

methods in this category. Respondents did not consider the voluntary use of the methodology to be an important criterion, and the time required to analyze a project did not rate highly.

The second set of criteria identified by the Practitioners Panel addresses how sensitive each method or tool is to important factors that affect project trip generation, especially factors that define projects as smart growth. Table 4 compares the methods against specific sensitivities that practitioners identified as important. As in Table 3, the criteria are shown as rated by the respondents to the on-line survey, with the highest-rated criteria listed first.

Table 4: Method Sensitivities Criteria*

Criterion	ITE Multi-use	EPA MXD	NCHRP 8-51	MTC Survey	URBEMIS	Average Survey Rating
1. LU context variables	No	Yes	No, except via mode split	Yes	Yes	5.1
2. Project-level Variables	Yes (land use mix only)	Yes	Yes (land use mix only)	No	Yes	5.0
3. Transport Variables	No	Yes	Via mode split	Yes	Yes	4.9
4. Transit headways/ Change in service	No	Indirectly, via employment within 30 minutes	No, except via mode split	No	Yes	4.3
5. Urban design variables	No	Intersection density	No, except via mode split	No	Yes – several	4.0
6. Parking supply/pricing	No	No	No	No	Yes	3.9
7. Pedestrian/ Bicycle Connectivity	No	Indirectly, via number of intersections and employment within 1 mile	Yes	No	Yes	3.7
8. Use of 7Ds	1 D	6 Ds	2 Ds	2 Ds	5 Ds	3.4
9. Starts with person trips, then allocates to modes	No	No	No; estimates person trips	No	No	2.4
10. Gas Prices	No	No	No	No	No	2.0

Elaboration of Criteria in Table 4 (based on Practitioner Panel input):

- Is the method or tool sensitive to:
    1. Land use/context-sensitive variables? Density and mix of surrounding uses.
    2. Project level variables? (Especially spatial distribution) – e.g. density and mixed use.
    3. Transportation variables? e.g., proximity to transit, nearby pedestrian & bike facilities.
    4. Transit headways/Changes in Transit service?
    5. Urban design variables? Pedestrian friendliness, traffic calming.
    6. Parking supply and pricing?
    7. Pedestrian connectivity? e.g. density of walkways.
    8. Does it use the 7Ds methodology? Can it prioritize Ds by estimated sensitivity?
    9. Does it start with person trips, then allocate to modes? (Considered ideal).
    10. Gas prices?

Examination of all Table 4 criteria indicates that URBEMIS and the EPA MXD method are the most sensitive to key smart growth variables regarding this category. The NCHRP 8-51 method is sensitive to some of these variables, while the ITE Multi-use and MTC Survey method are the least sensitive.

In reviewing the highest-rated sensitivity criteria (over 4.0), URBEMIS and EPA MXD are again the preferred methods, along with NCHRP 8-51 with mode split applied. Respondents favored sensitivity to the surrounding land-use variables as the most important criterion, followed closely by project-specific and multi-modal sensitivity. It is interesting to see that based on this rating, sensitivity regarding the surrounding environment scored slightly higher than sensitivity to the actual project and mode data. It is also interesting to note that "sensitivity to gas prices" and "starting with person trips" were rated as not important in this context.

The third set of criteria identified by the Practitioners Panel concerns the mechanics of preparing the input data. Table 5 compares each of the candidate methods against specific criteria regarding input data requirements and characteristics. The average rating from panelists via the on-line survey is shown in the column on the right.

Table 5: Input Data Mechanics Criteria*

Criterion	ITE Multi-use	EPA MXD	NCHRP 8-51	MTC Survey	URBEMIS	Average Survey Ratings
1. Sensitivity of output to inputs	High, since few inputs	Moderate, several inputs	High, since few inputs	High, since few inputs	Moderate, several inputs	6.0
2. Uses local information	No	Yes	Via mode split	Yes	Yes	4.6
3. Difficulty of obtaining required data	Low	High	High	Low	Low	4.6
4. Amount of data needed about the proposed project	Land use quantities (LUQ)	LUQ plus HH size & Vehicle Ownership	LUQ plus mode split data	LUQ	LUQ plus mitigation data	4.6
5. Can it work without regional or local travel models?	Yes	Yes; more effort if no model	Yes	Yes	Yes	4.5
6. 2-tiered data inputs for data-poor/-rich areas	No	No	No	No	No	4.5
7. Borrowed data OK	No	No	No	To be determined	No	4.3
8. Amount of data needed about the project's context &/or area nearby	None	Two data items	None	One item	Several data items	4.3
9. Relates Smart Growth indicators to inputs	No	Yes Intersection density	No, except via mode split data	No	Yes	4.1
10. Effort to use available data	Low	Moderate	Moderate	Low	High	3.6

Elaboration of Criteria in Table 5 (based on Practitioner Panel input):

1. How sensitive is the final result to the data input?
2. Does method require some local information?
3. How easy is it to access/find input data? (Ideally method uses data that is available.)
4. How much input data is project-level?
5. Can method work without regional or local travel models?
6. Is it two-tiered for more and less sophisticated data environments? (Is there a process for areas without good data or models? e.g., possibly "lookup" tables in lieu of regional or modeling data.)
7. If input data is lacking, does method allow for borrowing from other, similar sources?
8. How much input data is larger contextual data?
9. Does a tool relate smart growth indicators to inputs?
10. How difficult is it to operate the methodology using available data?

The evaluation summarized in Table 5 indicates that the EPA MXD method and the NCHRP 8-51 method are the most demanding with respect to input data availability. URBEMIS is the most demanding in terms of the amount data that needs to be input. The ITE Multi-use and MTC survey-based methods are the least demanding in terms of data availability and input.

Overall, survey respondents gave input mechanics criteria high importance ratings, with sensitivity of outputs to inputs receiving the highest possible score (6) from every respondent. Respondents' ratings show that input mechanics are a priority and that the availability of local data is of high importance in evaluating a preferred methodology. URBEMIS scores well in the prioritized criteria for its use of local data and the ease of acquiring these data; it also has the most demanding data requirements, but respondents gave relatively low importance to this criterion.

The fourth set of criteria identified by the Practitioners Panel concerns the outputs that are calculated and reported by each of the methods. Table 6 compares the methods against specific criteria related to outputs and shows the on-line Panel survey results.

Table 6: Method Output Criteria*

Criterion	ITE Multi-use	EPA MXD	NCHRP 8-51	MTC Survey	URBEMIS	Average Survey Ratings
1. **Results replicable by other analysts?**	Yes	Yes	Yes	Yes	Yes	5.8
2. **AM / PM / daily / other time frames reported?**	PM / Daily	AM/PM/ Daily	AM/PM	AM/PM/ Daily	Daily only	5.4
3. **Auto vs. "other" trip generation rates**	Auto only	Auto, Transit, Non-motor	Auto, Transit, Non-motor	Auto, Transit, Non-motor	Auto only	5.3
4. **"Internal capture" shown?**	Yes	Yes	Yes	No	Yes	5.0
5. **Project description by land use(s) and size?**	Yes	Yes	Yes	Yes	Yes	4.9
6. **Input assumption?**	Yes	Yes	Yes	Yes	Yes	4.6
7. **Analyst can adjust model?**	No	Yes	Yes	No	Yes	4.5
8. **Include and distinguish between future traffic volumes and a project's trip generation rate?**	No non-project trips	No non-project trips	No non-project trips	No non-project trips	No non-project trips	4.0
9. **Effect of bike and pedestrian facilities on travel?**	No	Yes	No	No	Yes	3.9
10. **Graphical representation of raw vs. final trip gen. data?**	No	No	No	No	No	3.8
11. **Link reduced trips to a reduction in vehicle-miles traveled (VMT)?**	No	Possible with more data	No	No	Yes	3.4

12. **Effect of transit service on travel?**	No	Yes	Yes	Yes	Yes	3.3

The data in Table 6 indicate that most methods produce and report a significant number of the outputs desired by practitioners. None of the methods produce all desired outputs. In particular, all the methods lack graphical display of outputs.

URBEMIS stands out as the one method that does not produce peak hour results because it was designed to estimate air quality effects, not for traffic impact studies. While this shortcoming has been addressed by practitioners and in our assessment (through the application of peak hour factors from ITE Trip Generation data, as described in Appendix A), it adds another layer of complexity to this method.

Survey respondents gave high ratings to many of the output criteria, as they did for the input criteria. Most importantly, results need to be replicable, a criterion satisfied by all methodologies. Respondents also wanted multi-modal reports on multiple time frames. This criterion favors the EPA MXD, NCHRP 8-51 and MTC Survey methods, although the latter does not show internal capture, another highly-rated criterion. Consistent with ratings in Tables 4 and 5, respondents favor local, project-specific information both as an input and an output. Respondents were only somewhat concerned with linking reduced trips to a reduction in vehicle-miles traveled or knowing how transit availability affected travel.

The Practitioners Panel also identified several other criteria and topics, shown in Table 7 in the order of importance as rated by respondents in the survey.

Table 7: Additional Criteria

Criterion	ITE Multi-use	EPA MXD	NCHRP 8-51	MTC Survey	URBEMIS	Average Survey Ratings
1. **Results should not fluctuate excessively**	See Section 4 (Evaluation of Accuracy)					5.6
2. **Can the method measure the performance of different kinds of land use projects?**	Theoretically, each method could potentially be used to do this, if it is sufficiently accurate based on adequate traffic count data for a sufficiently broad range of sites					5.6
3. **Can the method be used to define a range of reductions in ITE rates?**	Theoretically, each method could potentially be used to do this, if it is sufficiently accurate based on adequate traffic count data for a sufficiently broad range of sites					4.3
4. **Does the method identify a context for a development that qualifies it as smart growth?**	Theoretically, each method could potentially be used to do this, if it is sufficiently accurate based on adequate traffic count data for a sufficiently broad range of sites					3.6

5. **Can the method define different categories of smart growth based on size, urban area, etc?**	Theoretically, each method could potentially be used to do this, if it is sufficiently accurate based on adequate traffic count data for a sufficiently broad range of sites	3.6
6. **Complex equations should be converted to simpler graphs and/or tables**	Although this analysis has not been done for any of the methods, converting equations to graphs or tables would appear to be a straightforward procedure, especially for methods implemented as spreadsheets.	3.6
7. **Can the method group certain types of smart growth within parameters to comprehend complex development mixes?**	Theoretically, each method could potentially be used to do this, if it is sufficiently accurate based on adequate traffic count data for a sufficiently broad range of sites	3.4

Many of these additional criteria relate to whether the method can be used to measure and define different types and levels of smart growth based on performance as estimated by the method. As noted, any of the methodologies should be able to meet these objectives, depending on the data and the range of sites. Section 4 of this report presents evidence regarding the fluctuation of results, a highly-rated criterion in this category. The emphasis practitioners placed on repeatability and flexibility in general over specific relationships to "smart growth" is particularly interesting.

In addition to the above listed criteria, the Practitioners Panel highlighted the ability to encourage and facilitate the use of a preferred method as important for any chosen methodology.

3.3 Conclusions

No clear "winner" emerges among currently available methodologies based on the Practitioners Panel operational criteria. However, survey respondents prioritized a number of criteria that could be focal points in considering the merits of both existing methodologies and a final preferred methodology. However, survey results should be considered in light of the small initial respondent pool. It could be useful to survey a broader sample of practitioners as well as additional constituencies such as policymakers and regulators.

With respect to the operational criteria described above, the methods all both meet and fall short of desired goals:

- The current ITE Multi-use method has modest data needs, but does not consider any land use and transportation contextual factors beyond the project boundaries. It also does not predict AM peak hour trip generation, which is necessary for most traffic impact analyses.

- The EPA MXD method is fairly sensitive to smart growth characteristics and has moderate data needs. However, the availability of required input data can be challenging, particularly regarding employment within a 30-minute transit trip. This data need can be met by a fairly simple exercise of a regional travel demand model, if one is available, accessible, and models transit. However, such models are not universally accessible in California at this time.

- The NCHRP 8-51 method is less data intensive than either URBEMIS or the EPA MXD methods. However, one data requirement – directional mode split information for comparable

projects in the AM and PM peak periods – is not readily available and has proved challenging to collect via surveys. The method does not make explicit consideration of land use and transportation contextual factors beyond the project boundaries, although if accurate mode split data can be obtained, such data would be reflective of the project's context.

- The MTC Survey method has very modest data needs, but it does not consider on-site characteristics (e.g. the mix of land uses, density, connectivity, etc.). The method's basis (the MTC 2000 Bay Area Travel Survey) may not be applicable to other regions in California, although it would potentially be possible to analyze travel survey data from other regions to produce more localized adjustment factors.

- URBEMIS is very comprehensive with respect to its sensitivity to smart growth factors. Required input data is readily available for URBEMIS, but it takes the most time to operate due to the need to analyze census and other available input data. Also, URBEMIS does not currently provide peak hour estimations, which must therefore be obtained from other sources for use in traffic impact analyses (if available).

The results of the initial Practitioners Panel survey on operational criteria provide guidance for the selection of an existing methodology or development of new methodologies. The top-rated criteria across all categories, as shown in Table 8, suggest that respondents favored specific output criteria (five of the 11 highest-rated) followed by method sensitivity (three of the 11) as most important. Interestingly, no "ease of use" criterion scored higher than a 4.8, suggesting that the practitioners who responded to our on-line survey favor results from an input-sensitive methodology over one that is easier to use. They also prefer a method that works for various land types, not only smart growth development, and has results that are not analyst-dependent. Respondents consistently noted the importance of a method using local context-sensitive data from both the project as well as the surrounding environment.

Table 8: Top-Rated Criteria

Criterion	Criteria Type	Average Rating
12. Sensitivity of output to inputs	Input Data Mechanics	6.0
13. Results replicable by other analysts	Output	5.8
14. Results should not fluctuate excessively.	Additional Criteria	5.6
15. Method measures the performance of different kinds of land use projects	Additional Criteria	5.6
16. AM / PM / daily / Other time frames reported	Output	5.4
17. Auto vs. "other" trip generation rates	Output	5.3
18. LU context variables	Sensitivity	5.1
19. "Internal capture" shown?	Output	5.0
20. Project-level Variables	Sensitivity	5.0
21. Transport Variables	Sensitivity	4.9
22. Project description by land use(s) and size?	Output	4.9

Because the survey results are based on a limited number of responses (8) and a select group of respondents (Practitioners Panel members), they may not be generalizable. Other practitioners, city council members, agency regulators, or interest-based policy groups could have different perspectives on desired sensitivities, outputs, and other "operational criteria" for trip generation methodologies. It is important to consider what different user groups would prefer in a new trip generation methodology, both to ensure its wide acceptance and broad usefulness.

4. Evaluation of the Accuracy of Candidate Methodologies

The Practitioners Panel identified the ability to accurately predict trip generation for projects as the most important criterion against which each method should be measured. To assess the relative accuracy of each of the five candidate methods, we compared available cordon counts at ten multi-use sites and twelve infill sites in California against estimates from the five candidate methodologies. These methods were also compared to the industry standard ITE trip generation rates for single land uses (referred to as **ITE rates**).[4]

Traffic count data used to evaluate the accuracy of the candidate methodologies come from two sources: 1) daily and peak-hour traffic counts at 10 sites in California originally collected for validation of the EPA/SANDAG MXD method[5] (referred to hereafter as the "**Multi-Use sites**"); and 2) peak hours cordon count and intercept survey data for 12 infill sites that was gathered for Caltrans' *Trip-Generation Rates for Urban Infill Land Uses in California* study[6] (referred to hereafter as the "**Infill sites**"). Most of the Multi-Use sites are medium to large-scale developments (5 to 200+ acres) located outside urban cores. By contrast, the Infill sites are single uses located in urban cores close to high-quality transit. Appendix B provides information about each of the sites.

Three summary tables present the results of the evaluation of the five candidate methodologies. Table 9 summarizes results for daily counts, for the multi-use sites only (daily counts were not available for the infill sites). Table 10 summarizes results for AM peak hour counts, for both multi-use and infill sites. Table 11 summarizes results for PM peak hour counts, for both multi-use and infill sites. Figures associated with each table help to illuminate the comparisons.

The summary tables show the error for each method, calculated as the percentage deviation between the actual traffic count and the estimate.[7] Two summary statistics were also computed for each method: the average error, calculated as the sum of the errors for all sites divided by the number of sites; and the average absolute error, calculated as the sum of the absolute values of the errors for all sites divided by

[4] Institute of Transportation Engineers, *Trip Generation*, 8th Edition.

[5] Although 12 of the validation sites are in California, we chose to exclude two sites, South Davis and Moraga because these areas are too large for appropriate use of trip-generation rates. See the draft documentation (EPA Mixed Use Trip Gen Research 05 09.pdf); and *Trip Generation for Smart Growth: Planning Tools for the San Diego Region*, SANDAG, June 2010 (*http://www.sandag.org/tripgeneration).*

[6] Kimley-Horn & Associates, et.al, *Trip-Generation Rates for Urban Infill Land Uses in California, Final Report* for Caltrans, June, 2009. *http://www.dot.ca.gov/research/researchreports/reports/2009/final_summary_report-calif._infill_trip-generation_rates_study_july_2009.pdf*

[7] Several entries in the tables are missing, for various reasons. The NCHRP method does not produce daily estimates. The EPA/SANDAG method estimates are missing for five infill sites because of the unavailability of a key input, employment accessible within 30 minutes by transit. The ITE Multi-use method does not produce AM peak hour estimates and is not applicable to infill sites. AM and PM peak hour counts were not available for Gateway Oaks, a multi-use site in Sacramento.

the number of sites. A positive average error indicates that the method, on average, overestimates vehicle trips, while a negative average error indicates that the method underestimates vehicle trips. The absolute average error corrects for the fact that a method that overestimates in half the cases and underestimates by the same amount in the other half would have a misleading average error of 0%.

It is important to note that the results presented here depend on the assumptions used in applying the methods, as described in Table 1 and in Appendix A, and on the assumptions used in preparing the input data. Repeating the analysis with different assumptions could produce different results and lead to different conclusions about the performance of each methodology with respect to accuracy.

4.1 Daily Counts

Estimated daily counts and error rates are shown in Table 9. Note that the NCHRP 8-51 method does not produce estimates of daily counts. As shown in the table, the ITE Multi-use method and the EPA MXD method tied for the lowest average error (6%) for the Multi-use sites, while the EPA MXD method had the lowest average absolute error (11%). This result is perhaps not surprising, given that the multi-use sites were chosen because they are similar in scale and composition to the sites used to calibrate the EPA MXD method. Average and absolute errors for the other methods are generally comparable to or greater than those for ITE rates (average error of 9% and average absolute error of 19%). The fact that ITE rates are as accurate as most of the methods may suggest that the multi-use sites in the EPA study are not all full-fledged examples of smart growth regarding location, density, and site design. In particular, the Gateway Oaks site (in Sacramento) and the three Irvine sites are larger (and hence more spread out) than the others and do not appear particularly walkable (see site descriptions in Appendix B).

Figure 1a shows estimated counts plotted against observed counts for each method for each site. The points mostly cluster around the diagonal line representing estimated counts equal to observed counts. Estimates for the three largest sites for the SANDAG trip rates stand out as significantly higher than the observed counts. Error rates, calculated as the difference between estimated and observed counts divided by observed counts, for the SANDAG Rates method are substantially higher than for other methods, as seen in Figure 1b, particularly for the Park Place site in Irvine. As shown in Table 9, all of the methods are more accurate than using unadjusted SANDAG trip generation rates at these sites. On average, SANDAG rates overestimate vehicle trip generation at the 10 multi-use sites by 40%.

4.2 AM Peak Hour

Estimated counts and error rates for the AM peak hour are shown in Table 10, first for the multi-use sites, then for the infill sites. Note that the ITE Multi-use method does not produce estimates for the AM peak hour, and key input data were missing for the EPA MXD method for several of the sites. Again, the EPA MXD method produced the lowest average error and absolute average error for the multi-use sites, at 14% and 27%, respectively. All methods, however, had significantly lower errors than the ITE rate. Note that the errors were generally greater for the AM peak than for daily counts, as can be seen in Figures 2a and 2b.

For the infill sites, URBEMIS produced the lowest average error, at 8%, and the lowest average absolute error, at 51%. Again, all methods had significantly lower errors than the ITE rate. However, the errors for the infill sites were generally much higher than for the multi-use sites, as can be seen in

Figures 3a and 3b. The error rates, shown in Figure 3b, are higher for the smaller infill sites, and mostly reflect over-estimates of AM counts.

4.3 PM Peak Hour

Estimated counts and error rates for the PM peak hour are shown in Table 11, first for the multi-use sites, then for the infill sites. Note that input data were missing for the EPA MXD method for several of the sites and that the ITE Multi-use method cannot (without modification) be applied to the infill sites. PM peak hour counts were also not available for one MXD site.

For the PM peak hour, the MTC Survey method produces the lowest average error, at 5%, but the EPA MXD method produces the lowest average absolute error, at 22%. As before, this result is not surprising, given that the multi-use sites were selected to resemble the multi-use sites used in calibrating the EPA MXD method. All methods but the ITE Multi-use method produce lower average errors than the ITE rates. As shown in Figures 4a and 4b, the methods tend to err in the same direction and to similar degrees for each site. For example, the errors are all quite high for Park Place and for Jamboree, both in Irvine.

For the infill sites, URBEMIS produced the lowest average error, at -4%, and the second lowest average absolute error, at 29%. Again, all methods had significantly lower errors than the ITE rate. The ITE rate error was especially high for one of the residential sites in San Francisco. In contrast to the AM peak hour errors, the PM peak hour errors were generally about the same for the infill sites and for the multi-use sites. However, as can be seen in 5a, 5b, and 5c, the variation in errors for any particular site was much greater than for the multi-use sites. As was the case for AM peak hour estimates, the error rates for the smaller infill sites tend to reflect over-estimates of PM counts. Errors for some of the larger sites are comparable to the errors for the smaller sites. The MTC survey method and the NCHRP 8-51 method produce errors over 100% for some sites.

Table 9. Daily Trip Estimates vs Counts

Mixed-Use Site and Location	Daily Count	Trip Generation Rates				Candidate Methods							
		ITE Rate Estimate	ITE Rate Error	SANDAG Rates Estimate	SANDAG Rates Error	ITE Multi-Use Estimate	ITE Multi-Use Error	EPA MXD Estimate	EPA MXD Error	MTC Survey Estimate	MTC Survey Error	URBEMIS Estimate	URBEMIS Error
Gateway Oaks, Sacramento	**23,280**	23,984	3%	33,593	44%	23,333	0%	21,274	-9%	20,960	-10%	19,897	-15%
Jamboree Center, Irvine	**36,569**	36,918	1%	54,133	48%	35,529	-3%	31,996	-13%	32,263	-12%	33,142	-9%
Park Place, Irvine	**19,064**	25,157	32%	41,356	117%	24,501	29%	22,008	15%	21,985	15%	23,334	22%
The Villages, Irvine	**7,128**	8,808	24%	8,435	18%	8,790	23%	7,886	11%	7,697	8%	6,623	-7%
Rio Vista Station Village, San Diego*	**5,307**	7,216	36%	6,689	26%	7,101	34%	5,538	4%	3,991	-25%	4,324	-19%
La Mesa Village Plaza, San Diego*	**4,280**	4,146	-3%	5,681	33%	4,057	-5%	4,539	6%	2,293	-46%	3,024	-29%
Uptown Center, San Diego*	**16,886**	11,376	-33%	20,214	20%	10,786	-36%	17,097	1%	9,942	-41%	8,487	-50%
The Village at Morena Linda Vista, San Diego*	**4,712**	5,438	15%	6,375	35%	5,367	14%	5,251	11%	3,007	-36%	3,909	-17%
Hazard Center, San Diego*	**11,644**	14,703	26%	15,051	29%	14,427	24%	13,214	13%	8,131	-30%	11,890	2%
Heritage Center at Otay Ranch, Chula Vista*	**7,935**	6,870	-13%	10,505	32%	6,383	-20%	9,730	23%	6,004	-24%	11,007	39%
Average error			**9%**		**40%**		**6%**		**6%**		**-20%**		**-8%**
Average absolute error			**19%**		**40%**		**19%**		**11%**		**25%**		**21%**

*San Diego and Chula Vista sites use SANDAG rates in their MXD estimates

Note: NCHRP method does not produce daily estimates.

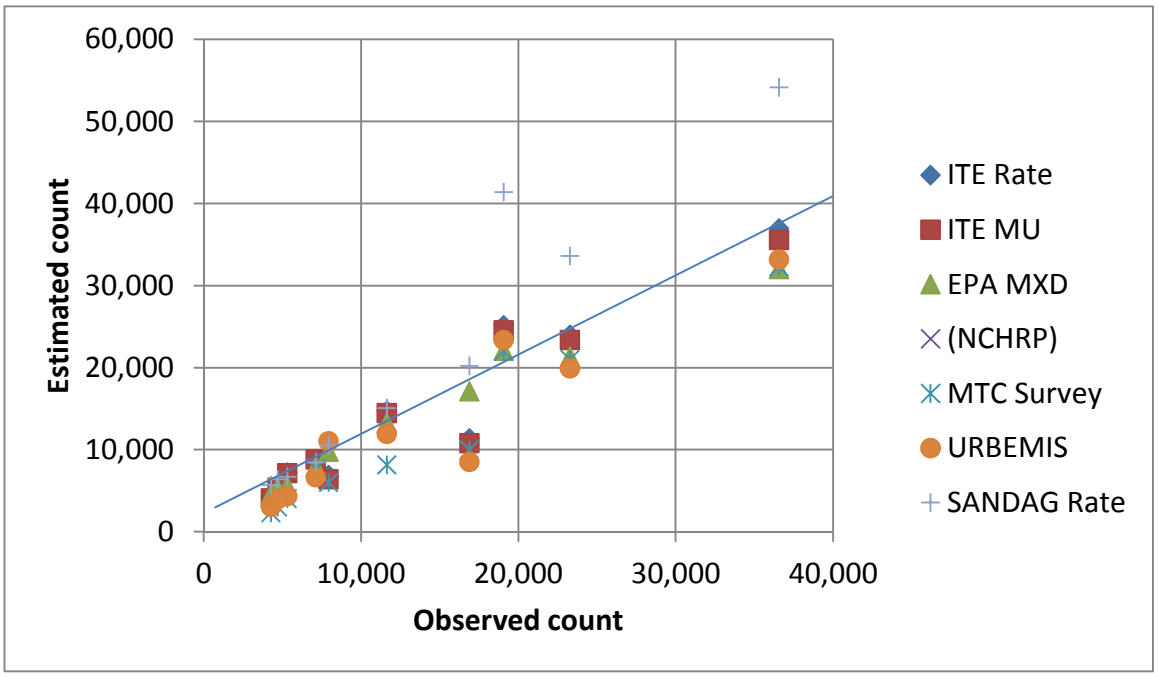


Figure 1a. Estimated versus Observed Count – **Daily for Multi-Use Sites**

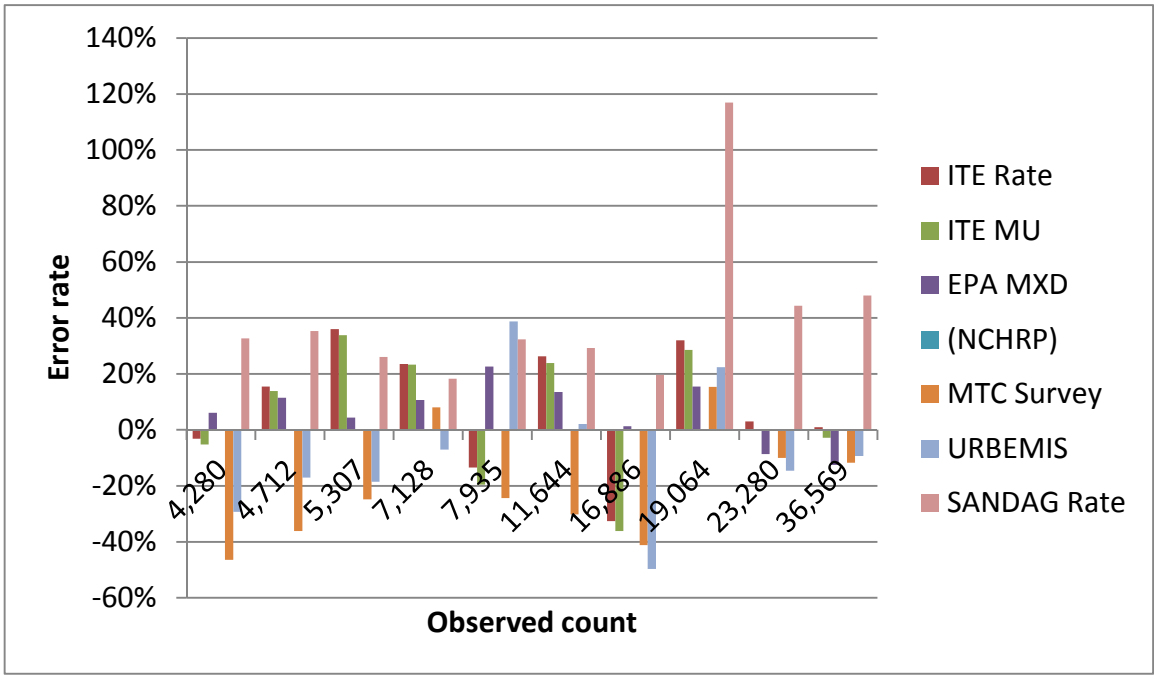


Figure 1b. Error Rate versus Observed Count – **Daily for Multi-Use Sites**

Table 10. AM Peak Hour Trip Estimates vs Counts

Mixed-Use Site and Location	AM Peak Hour Count	Trip Gen Rates		Candidate Methods									
		ITE Rate Estimate	ITE Rate Error	ITE Multi-Use Estimate	ITE Multi-Use Error	EPA MXD Estimate	EPA MXD Error	NCHRP 8-51 Estimate	NCHRP 8-51 Error	MTC Survey Estimate	MTC Survey Error	URBEMIS Estimate	URBEMIS Error
Gateway Oaks, Sacramento	missing	2,684	**na**	**A**	**na**	1,555	**na**	2,185	**na**	2,346	**na**	2,235	**na**
Jamboree Center, Irvine	3,125	3,893	25%	**A**	**na**	2,393	-23%	3,847	23%	3,402	9%	3,512	12%
Park Place, Irvine	1,295	3,068	137%	**A**	**na**	1,594	23%	2,454	89%	2,681	107%	2,841	119%
The Villages, Irvine	664	757	14%	**A**	**na**	565	-15%	652	-2%	662	0%	584	-12%
Rio Vista Station Village, San Diego	280	650	132%	**A**	**na**	431	54%	391	40%	359	28%	400	43%
La Mesa Village Plaza, San Diego	302	456	51%	**A**	**na**	331	9.8%	273	-9.6%	252	-16%	333	10.3%
Uptown Center, San Diego	638	882	38%	**A**	**na**	770	21%	776	22%	771	21%	658	3%
The Village at Morena Linda Vista, San Diego	315	693	120%	**A**	**na**	391	24%	419	33%	383	22%	511	62%
Hazard Center, San Diego	614	1,575	157%	**A**	**na**	938	53%	679	11%	871	42%	1,273	107%
Heritage Center at Otay Ranch, Chula Vista	667	485	-27%	**A**	**na**	553	-17%	882	32%	424	-36%	737	10%
Average error			**72%**				**14%**		**26%**		**19%**		**40%**
Average absolute error			**78%**				**27%**		**29%**		**31%**		**42%**

A = Method does not produce AM peak hour estimates and is not applicable to infill sites

B = Missing input data (Employment within 30 min. by transit)

Table 10 AM Peak Hour Trip Estimates vs Counts - continued

Infill Site and Location	AM Peak Hour Count	Trip Gen Rates		Candidate Methods									
		ITE Rate Estimate	ITE Rate Error	ITE Multi-Use Estimate	ITE Multi-Use Error	EPA MXD Estimate	EPA MXD Error	NCHRP 8-51 Estimate	NCHRP 8-51 Error	MTC Survey Estimate	MTC Survey Error	URBEMIS Estimate	URBEMIS Error
Retail, Oakland	133	11	-92%	A	na	10	-92%	6	-95%	6	-95%	4	-97%
Office, San Francisco	145	186	28%	A	na	120	-17%	114	-21%	109	-25%	92	-37%
Office, Los Angeles	110	210	92%	A	na	B	na	200	82%	160	46%	84	-23%
Residential, San Diego	21	72	241%	A	na	45	113%	56	165%	42	101%	45	113%
Residential, San Diego	132	212	61%	A	na	75	-43%	113	-14%	125	-6%	145	10%
Office, Los Angeles	28	140	393%	A	na	B	na	128	350%	82	190%	51	79%
Office, Los Angeles	63	131	110%	A	na	B	na	123	97%	100	59%	47	-25%
Residential, San Diego	33	37	11%	A	na	B	na	31	-7%	28	-15%	29	-13%
Residential, Pasadena	39	34	-12%	A	na	B	na	29	-25%	26	-33%	29	-25%
Residential, San Francisco	21	126	499%	A	na	42	100%	18	-14%	74	252%	40	90%
Restaurant, San Francisco	14	17	24%	A	na	15	12%	6	-56%	10	-27%	8	-42%
Restaurant, San Francisco	11	33	214%	A	na	30	186%	13	24%	19	85%	17	62%
Average error			**131%**				**37%**		**40%**		**44%**		**8%**
Average absolute error			**148%**				**80%**		**79%**		**78%**		**51%**

A = Method does not produce AM peak hour estimates and is not applicable to infill sites

B = Missing input data (Employment within 30 min. by transit)

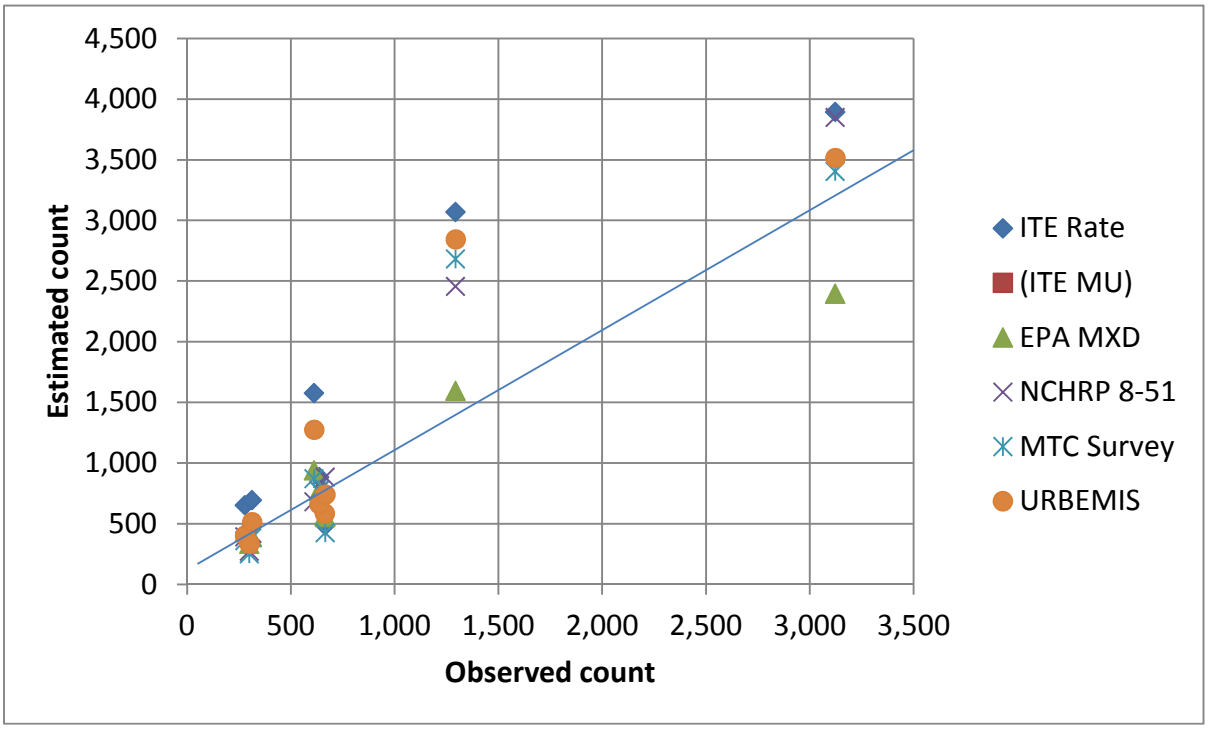


Figure 2a. Estimated versus Observed Count – **AM Peak Hour for Multi-Use Sites**

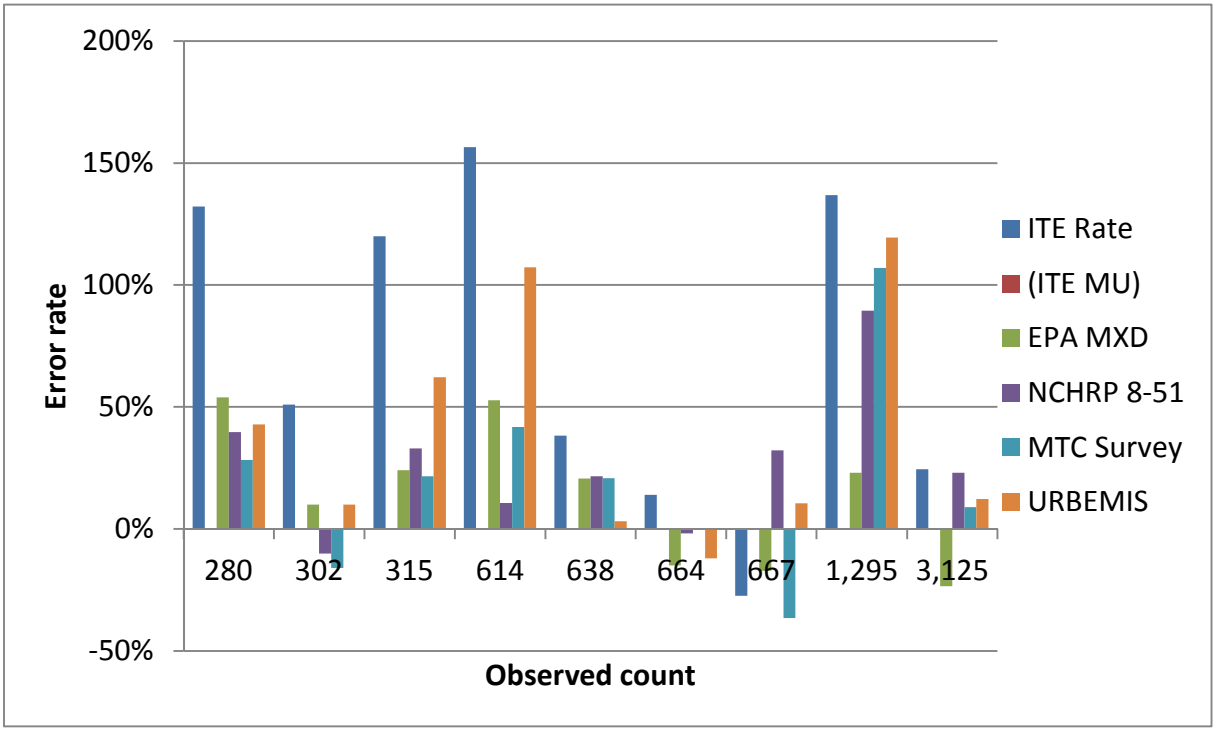


Figure 2b. Error Rate versus Observed Count – **AM Peak Hour for Multi-Use Sites**

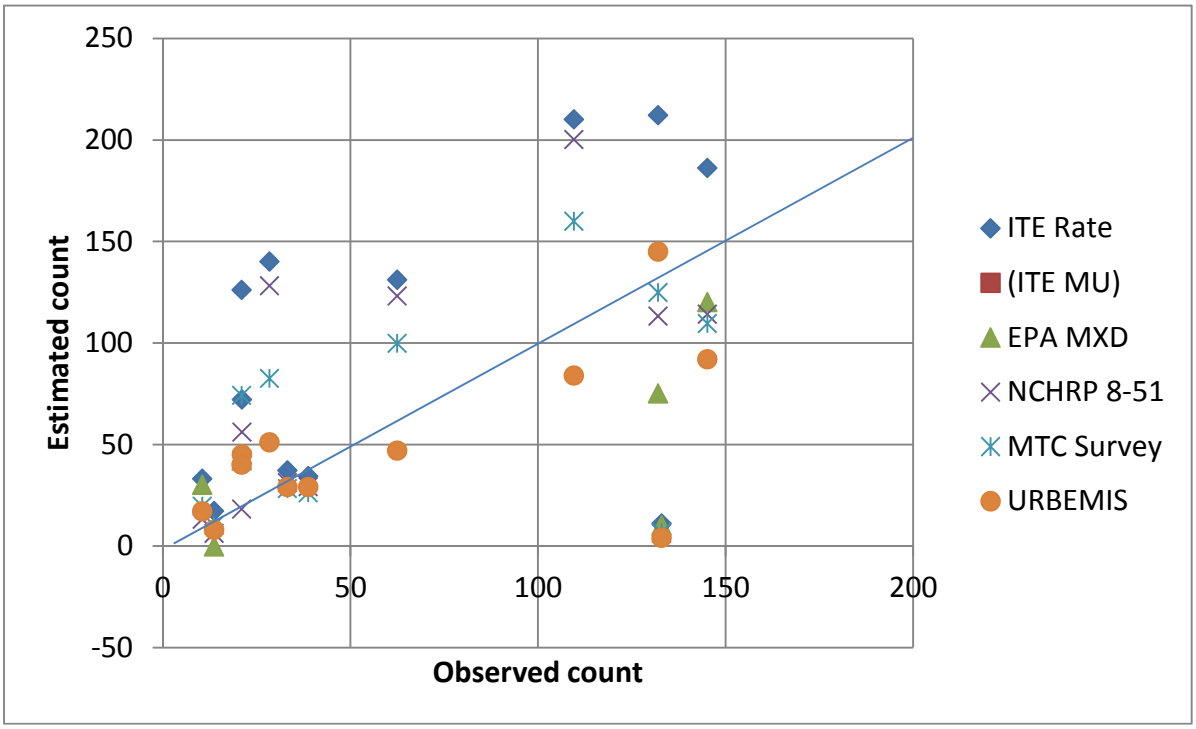


Figure 3a. Estimated versus Observed Count – **AM Peak Hour for Infill Sites**

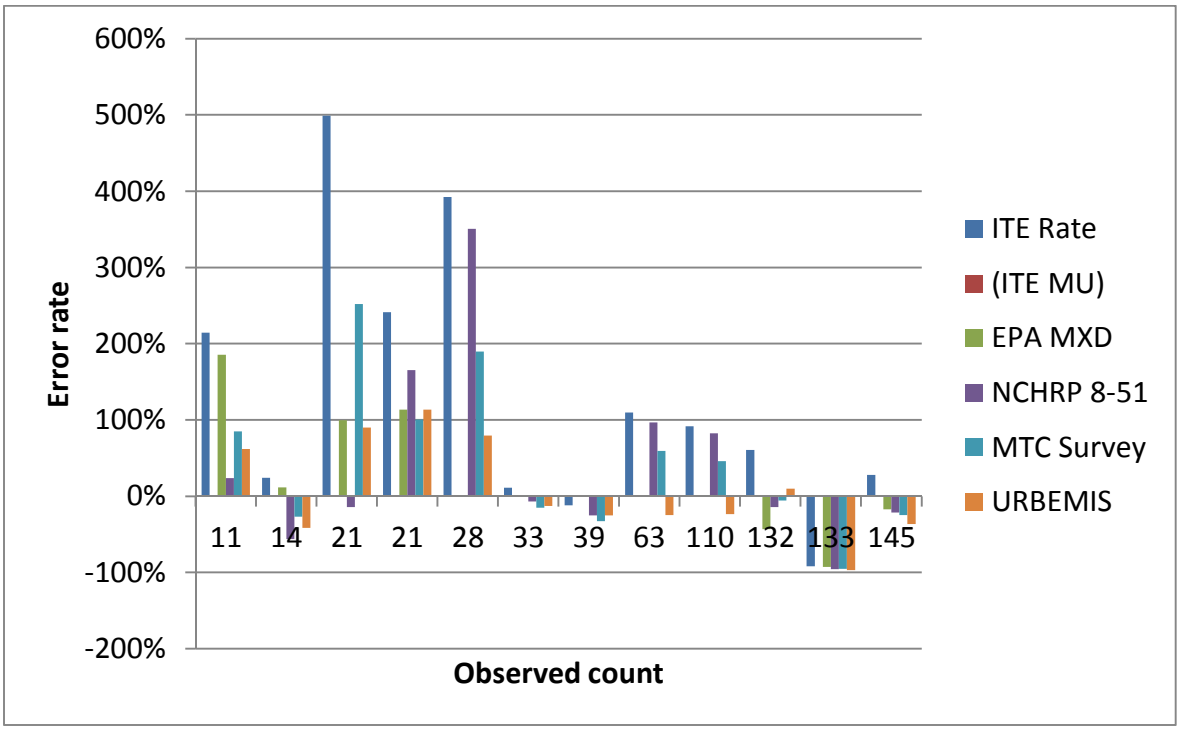


Figure 3b. Error Rate versus Observed Count – **AM Peak Hour for Infill Sites**

Table 11. PM Peak Hour Trip Estimates vs Counts

Mixed-Use Site and Location	PM Peak Hour Count	Trip Gen Rates		Candidate Methods									
		ITE Rate Estimate	ITE Rate Error	ITE Multi-Use Estimate	ITE Multi-Use Error	EPA MXD Estimate	EPA MXD Error	NCHRP 8-51 Estimate	NCHRP 8-51 Error	MTC Survey Estimate	MTC Survey Error	URBEMIS Estimate	URBEMIS Error
Gateway Oaks, Sacramento	missing	2,858	na	2,779	na	1,891	na	2,379	na	2,498	na	2,377	na
Jamboree Center, Irvine	3,513	4,212	20%	4,096	17%	2,329	-34%	4,283	22%	3,681	5%	3,775	7%
Park Place, Irvine	1,676	3,289	96%	3,230	93%	2,016	20%	2,659	59%	2,874	71%	3,046	82%
The Villages, Irvine	605	877	45%	875	45%	665	10%	750	24%	766	27%	655	8%
Rio Vista Station Village, San Diego	452	757	67%	744	65%	500	11%	432	-4%	419	-7%	459	2%
La Mesa Village Plaza, San Diego	434	518	19%	508	17%	381	-12%	294	-32%	286	-34%	380	-12%
Uptown Center, San Diego	1,560	1,203	-23%	1,148	-26%	1,722	10%	968	-38%	1,051	-33%	899	-42%
The Village at Morena Linda Vista, San Diego	361	774	114%	766	112%	456	26%	445	23%	428	19%	568	57%
Hazard Center, San Diego	978	1,891	93%	1,869	91%	1,231	26%	819	-16%	1,046	7%	1,530	56%
Heritage Center at Otay Ranch, Chula Vista	673	697	4%	656	-3%	980	46%	1,136	69%	609	-9%	1,024	5%
Average error			48%		46%		11%		12%		5%		18%
Average absolute error			54%		54%		22%		32%		24%		30%

Table 11. PM Peak Hour Trip Estimates vs Counts - continued

Infill Site and Location	PM Peak Hour Count	Trip Gen Rates		Candidate Methods									
		ITE Rate Estimate	ITE Rate Error	ITE Multi-Use Estimate	ITE Multi-Use Error	EPA MXD Estimate	EPA MXD Error	NCHRP 8-51 Estimate	NCHRP 8-51 Error	MTC Survey Estimate	MTC Survey Error	URBEMIS Estimate	URBEMIS Error
Retail, Oakland	44	41	-7%	A	na	36	-18%	26	-41%	24	-45%	16	-64%
Office, San Francisco	110	178	61%	A	na	104	-6%	108	-2%	105	-5%	88	-20%
Office, Los Angeles	84	201	140%	A	na	B	na	201	140%	153	82%	81	-3%
Residential, San Diego	36	81	126%	A	na	47	31%	59	64%	48	33%	50	39%
Residential, San Diego	72	127	76%	A	na	68	-6%	53	-26%	75	4%	98	36%
Office, Los Angeles	51	135	166%	A	na	B	na	127	150%	79	56%	49	-3%
Office, Los Angeles	99	126	28%	A	na	B	na	118	20%	96	-3%	45	-54%
Residential, San Diego	33	49	47%	A	na	B	na	30	-10%	37	12%	34	2%
Residential, Pasadena	36	44	22%	A	na	B	na	37	1%	34	-7%	34	-7%
Residential, San Francisco	29	147	399%	A	na	47	60%	25	-15%	86	193%	47	60%
Restaurant, San Francisco	13	22	75%	A	na	20	55%	13	3%	13	3%	14	11%
Restaurant, San Francisco	50	45	-10%	A	na	40	-20%	26	-47%	26	-47%	27	-46%
Average error			94%				14%		20%		23%		-4%
Average absolute error			96%				28%		43%		41%		29%

A = Method is not applicable to infill sites

B = Missing input data (Employment within 30 min. by transit)

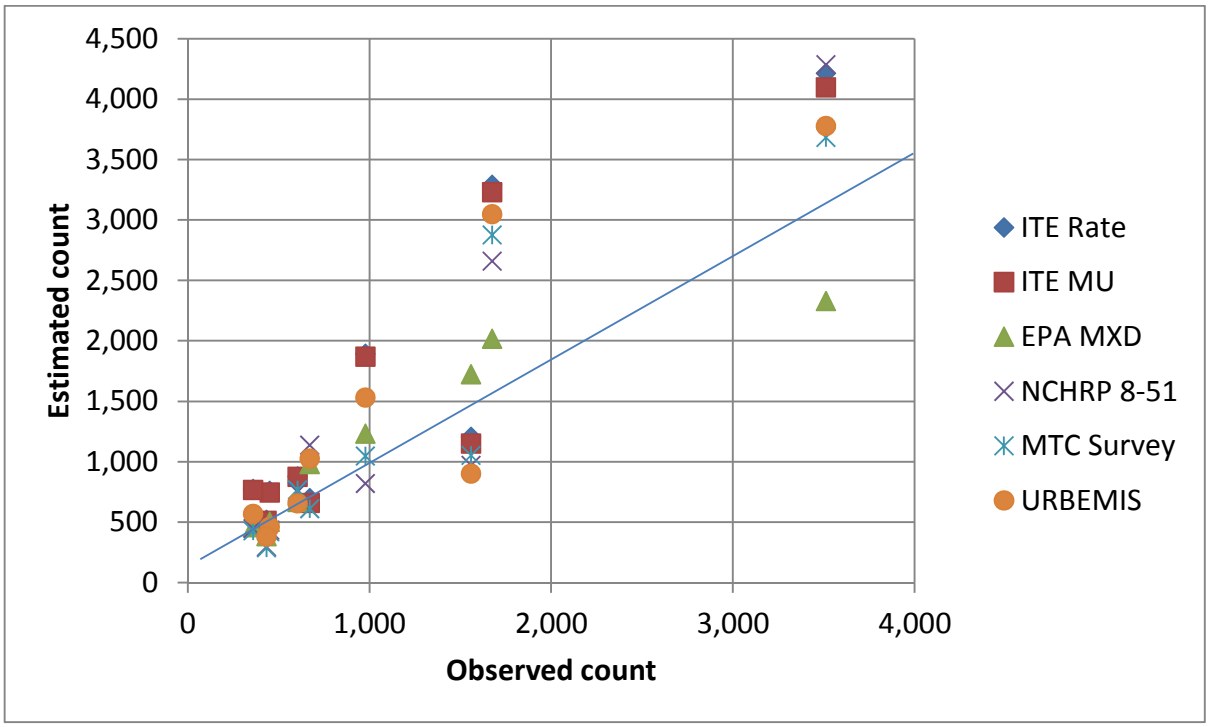


Figure 4a. Estimated versus Observed Count – **PM Peak Hour for Multi-Use Sites**

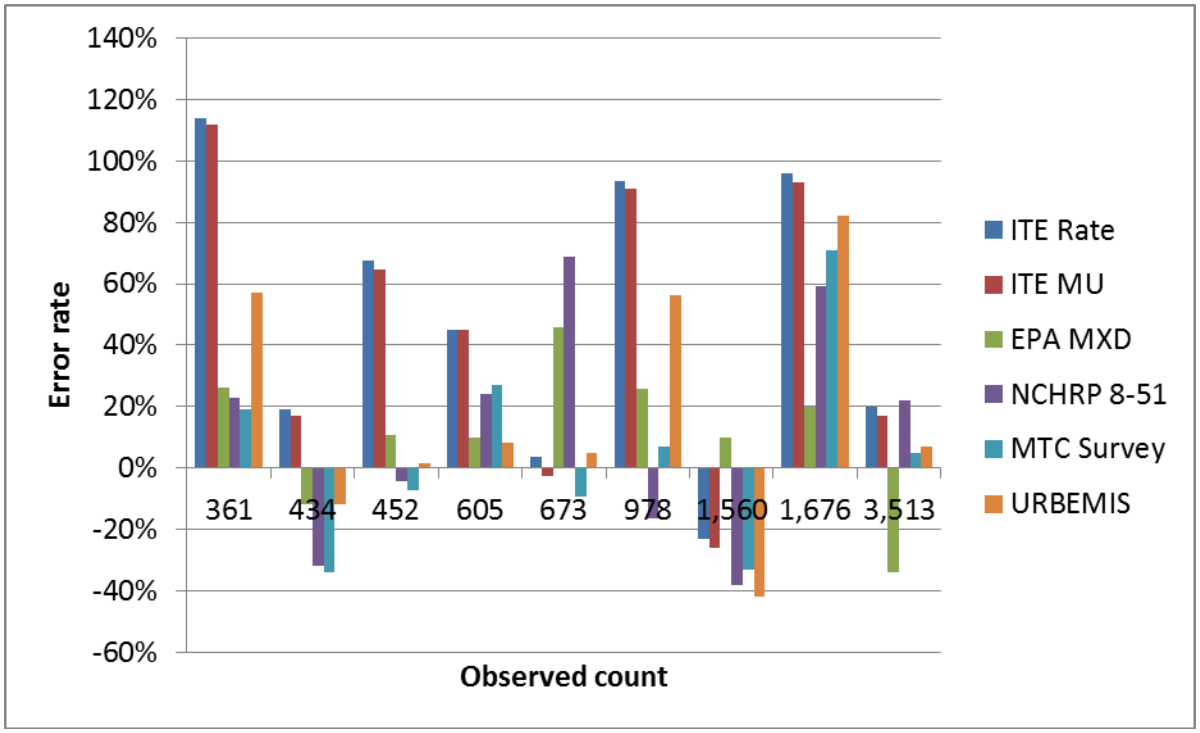


Figure 4b. Error Rate versus Observed Count – **PM Peak Hour for Multi-Use Sites**

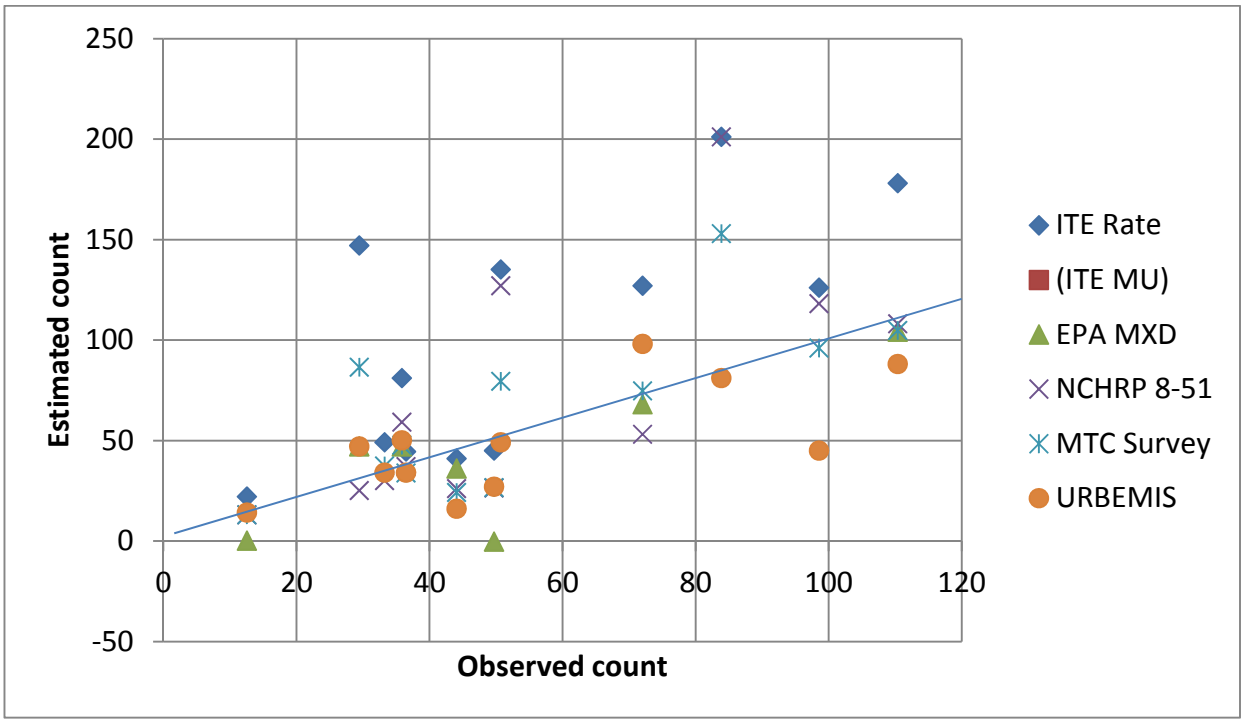


Figure 5a. Estimated versus Observed Count – **PM Peak Hour for Infill Sites**

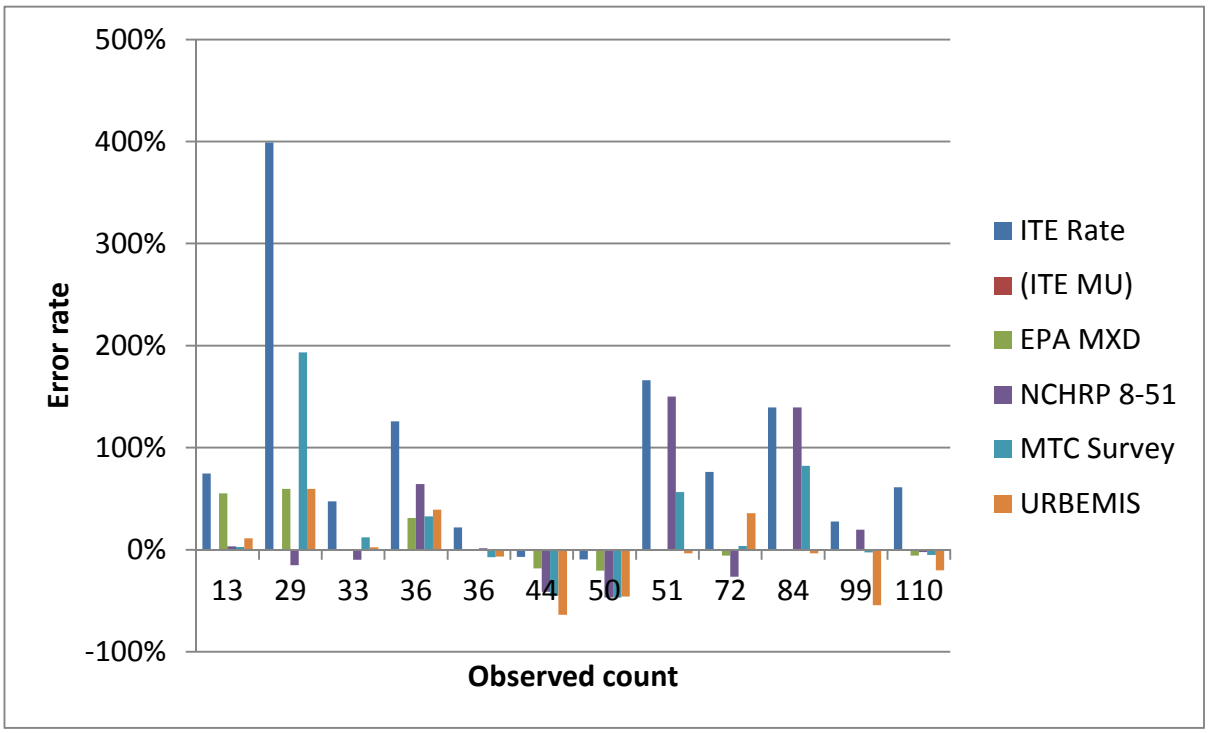


Figure 5b. Error Rate versus Observed Count – **PM Peak Hour for Infill Sites**

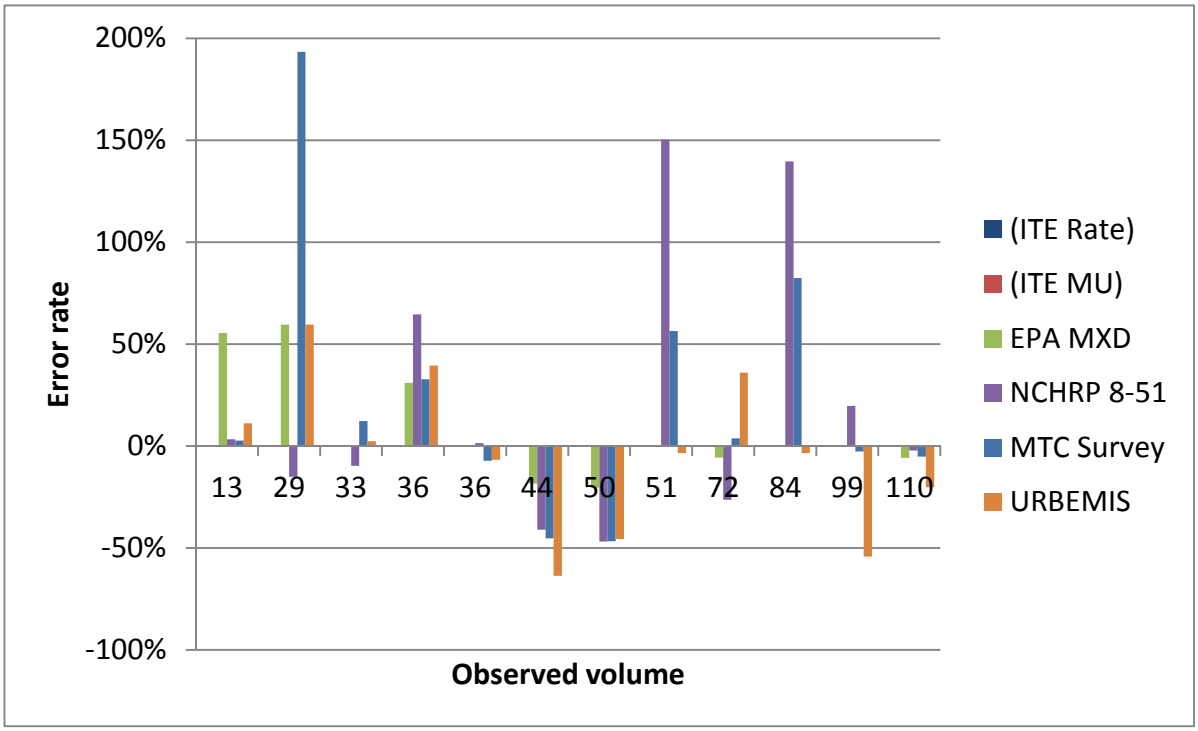


Figure 5c. Error Rate versus Observed Count – **PM Peak Hour for Infill Sites – without ITE Rate Estimates**

4.4 Summary

Table 12 indicates *for each site* the method that most accurately matches the observed traffic counts for the two sets of land use sites. For sites where the raw ITE rate is the best match, the candidate method that mostly closely matches the observed count is also shown.

For the multi-use sites, all of which are large-scale projects not located in the central business district, the EPA MXD method produces the most accurate estimate in the greatest number of sites. For daily counts, the EPA MXD method is most accurate for seven of the sites. Its performance drops to two sites for AM peak hour and four sites for PM peak hour. As noted earlier, it is not surprising that the EPA MXD method is most accurate for the multi-use sites, given that these sites were chosen based on their similarity to the sites used to calibrate the method. The MTC Survey method is most accurate for four multi-use sites for the AM peak hour and three sites for the PM peak hour. URBEMIS is most accurate for two sites for daily counts, two for AM peak hour, and three for PM peak hour. The ITE Multi-use method was most accurate for daily counts for one site and for PM peak hour for one site. The NCHRP 8-51 method was the most accurate for two sites in the AM peak hour (note that this method does not produce estimates of daily counts). ITE trip rates were more accurate than the candidate methods for daily counts for three of the sites.

For the single-use urban infill sites, a clearly best method does not emerge. For the AM peak hour, the methods were most accurate for relatively equal numbers of sites: the EPA/MXD method was most

accurate for three sites, the MTC Survey method for two, URBEMIS for four, and the NCHRP method for four. For the PM peak hour, the numbers are roughly equal: the EPA/MXD method was most accurate for three sites, the MTC Survey method for three, URBEMIS for three, and the NCHRP method for four. Across both the AM and PM peak hours, the NCHRP method is most accurate for the greatest number of sites, followed by URBEMIS, the EPA/MXD method, and the MTC Survey method. Note that the ITE Multi-use method was not applied to the infill sites because it requires at least two land uses. ITE trip rates were as or more accurate than the candidate methods in three cases, but were much higher for the other sites.

Table 12. Most Accurate Method for Each Evaluation Site (Showing Method with Lowest Error Rate)

Multi-Use Site and Location	Daily	% Error	AM Peak Hour	% Error	PM Peak Hour	% Error	Notes on Site
Gateway Oaks, Sacramento	ITE Multi-Use	0%	na		na		Large site, little use mix
Jamboree Center, Irvine	EPA MXD	-3%	MTC survey	9%	MTC survey	5%	Large site, little use mix
	ITE Rate	*1%*					
Park Place, Irvine	EPA MXD	15%	EPA MXD	23%	EPA MXD	20%	Mulit-use, low-density
	MTC Survey	15%					
The Villages, Irvine	URBEMIS	-7%	MTC survey	0%	URBEMIS	8%	Higher density, lowest WalkScore (40)
Rio Vista Station Village, San Diego	EPA MXD	4%	MTC survey	28%	URBEMIS	2%	Multi-use suburban, LRT
La Mesa Village Plaza,	EPA MXD	-5%	EPA MXD	10%	EPA MXD	-12%	Multi-use suburban,
San Diego	*ITE Rate*	*-3%*	NCHRP 8-51	-10%	URBEMIS	-12%	LRT
Uptown Center, San Diego	EPA MXD	1%	URBEMIS	3%	EPA MXD	10%	Multi-use urban; no rail
The Village @Morena Linda Vista, San Diego	EPA MXD	11%	MTC survey	22%	MTC survey	19%	Multi-use suburban, LRT
Hazard Center, San Diego	URBEMIS	2%	NCHRP 8-51	11%	MTC survey	7%	Office+retail, LRT no res'l
Heritage Center @ Otay	EPA MXD	-20%	URBEMIS	10%	ITE Multi-	-3%	Suburban, no LRT
Ranch, Chula Vista	*ITE Rate*	*-13%*					
Infill Study Site and Location							
Retail,	na		EPA MXD	-92%	EPA MXD	-18%	Retail only, Oakland
Oakland			*ITE Rate*	*-92%*	*ITE Rate*	*-7%*	
Office, San Francisco	na		EPA MXD	-17%	NCHRP 8-51	-2%	Office Only, CBD
Office, Los Angeles	na		URBEMIS	-23%	URBEMIS	-3%	Office Only, CBD
Residential, San Diego	na		MTC Survey	101%	EPA MXD	31%	High–rise res'l, CBD
Residential, San Diego	na		MTC Survey	-6%	MTC Survey	4%	Res'l + coffee shop, CBD
Office, Los Angeles	na		URBEMIS	79%	URBEMIS	-3%	Office Only, CBD
Office, Los Angeles	na		URBEMIS	-25%	MTC Survey	-3%	Office Only, CBD
Residential, San Diego	na		NCHRP 8-51	-7%	URBEMIS	2%	Mid–rise res'l Only, CBD
Residential,	na		NCHRP 8-51	-25%	NCHRP 8-51	1%	High–rise res'l Only,
Pasadena			URBEMIS	-25%			
			ITE Rate	*-12%*			
Residential, San Francisco	na		NCHRP 8-51	-14%	NCHRP 8-51	-15%	High–rise res'l Only, CBD
Restaurant,	na		EPA MXD	12%	NCHRP 8-51	3%	Quality restaurant only
San Francisco					MTC Survey	3%	
Restaurant,	na		NCHRP 8-51	24%	EPA MXD	-20%	Quality restaurant only
San Francisco					*ITE Rate*	*-10%*	

Finally, a summary of the average percent error across all sites for each method is shown in Table 13 below. This table represents the percent error for each site averaged across all sites and indicates that all five methods are more accurate than ITE rates. At the 10 multi-use sites, EPA MXD was most accurate but it was developed for this purpose (i.e. multi-use sites). At the 12 infill sites, no clear winner exists, but URBEMIS and EPA MXD methods are the most accurate of the five. At the 12 infill sites, the percent standard error is significantly higher compared to the 10 multi-use sites, which were more suburban.

Table 13. Summary Table of Average Percent Error Averaged Across All Sites by Method

Method	10 Multi-Use Sites			12 Infill Sites	
	Daily	AM	PM	AM	PM
ITE Rate	19%	78%	54%	148%	96%
ITE Multi-Use	19%	NA	54%	NA	NA
EPA MXD	11%	27%	22%	80%	28%
NCHRP 8-51	?	29%	32%	79%	43%
MTC Survey	25%	31%	24%	78%	41%
URBEMIS	21%	42%	30%	51%	29%

5. Conclusions

This report provides an assessment of five candidate smart growth trip generation methodologies with respect to their performance regarding operational criteria and their accuracy. The results show that all of the candidate methodologies performed better than the ITE rates, but they do not point to a clear "winner" – one methodology that is clearly superior to the others. Nevertheless, this assessment generated many insights that could guide the selection or development of a recommended methodology. Four options seem feasible:

1. The selection of one of the candidate methods as the recommended method, despite its limitations.
2. The development of a "decision-tree" that would guide the analyst as to what method is most appropriately used for what kinds of development projects in what situations.
3. The modification of one or more of the candidate methods to increase its sensitivity to smart growth qualities and to the California context.
4. The development of an entirely new method using available data sources.

A combination of the second and third options might also be considered. The fourth option is limited by the quantity and quality of available data; given the limited trip generation data collected for smart growth development projects, travel survey data offer the most promise but are generally too sparse spatially to be of much use for this purpose. It would be unfeasible in the near term to develop a method for the U.S. comparable to the UK's TRICs or the New Zealand Trips and Parking Database. These methods require a substantial investment in data collection and considerable time to build a sufficient database of multimodal trip generation data from a large and diverse set of development sites. In the long-term, such an approach would be desirable.

These initial results also point to the critical need for further collection of trip generation data at smart growth sites. Based on only 22 sites, the evaluation presented here is not adequate to fully assess the performance of the available methods. In addition, the validation sites do not reflect the full spectrum of smart growth development projects but instead cluster around two extremes – large multi-use suburban sites, and individual urban infill projects. Data from more sites of more types are needed to better understand the performance of the available methods. Such data, if sufficient in quantity and quality, could be used to modify one of the existing methods or calibrate an entirely new method. In addition, development of an acceptable methodology for obtaining such data potentially could form the basis for a long-term effort to build a multimodal trip generation database for the U.S., similar to those in the U.K. and New Zealand.

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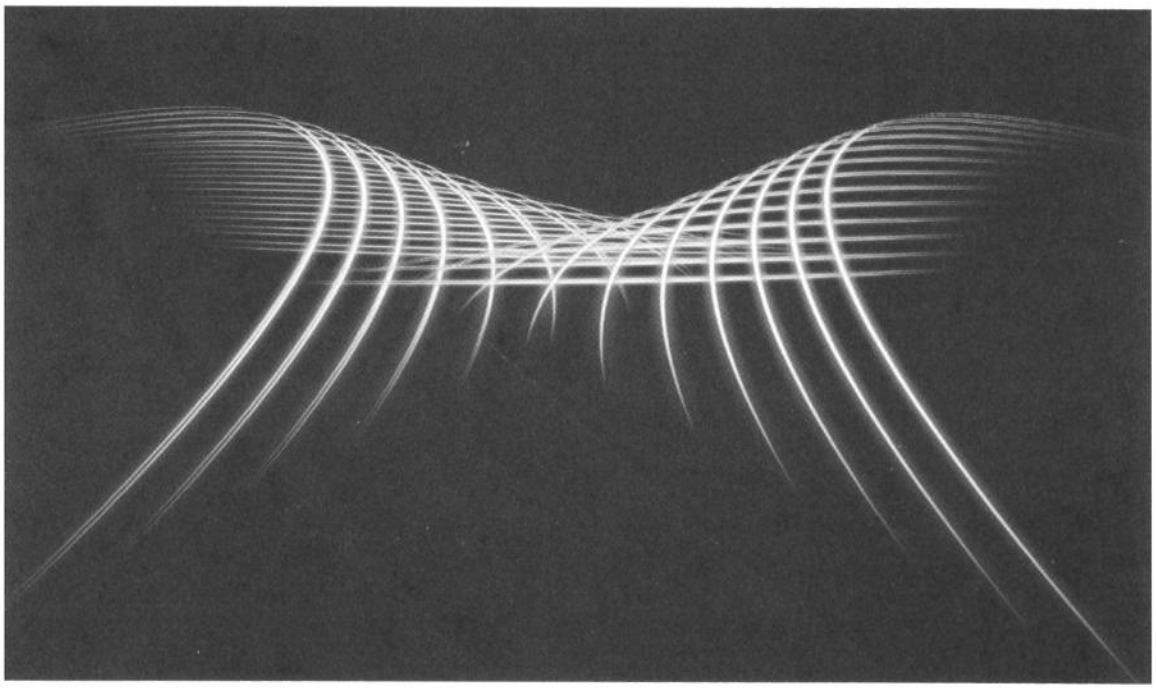
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HIGHWAY CAPACITY MANUAL



VOLUME 1: CONCEPTS

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MIXED USE TRIP GENERATION MODEL V4 - INPUT

All shaded cells are inputs
Project / Scenario Specific Inputs
Default National Factors - Can be changed for project based on site specific data, or regional values from census data, travel demand model, etc…

Section 1 - General Site Information

Site Name	Example Project	
Geographic		**Notes / Instructions**
Developed Area (in acres)	0	Include streets, ROW, parking lots, pocket parks. Do not include open space, vacant lots.
Number of Intersections		Count intersections either within or on the perimeter of the MXD. Do not count most unsignalized driveways or alleys, but DO count major entrances to shopping areas or resid
Is Transit (bus or rail) present within the site or across the street?	Yes	Note: This is only used as a way to zero out the probability of external trips if no transit is present.
Land Use - Surrounding Area		
Is the site in a Central Business District or TOD?	Yes	Answering "Yes" will reduce the HBO and NHB purpose splits for retail use to those found in smaller stores. The nature of the stores (large vs. small) should be the primary factor in the selection here.
Employment within one mile of the MXD	0	Do not include employment within the MXD itself
Employment within a 30 minute Transit Trip (Door-to-door)	0	Include employment within the MXD itself This can be a difficult number to get - some suggestions are in the instructions tab in "Instructions."
Site Demographics		
Enter Population Directly?		If "No", will apply average HH size factors (in section 2) to dwelling units below
Population		You do not need to enter population here. It will be calculated based on dwelling units below and average HH sizes in section 2.
Average Vehicles Owned per Dwelling Unit	1.85	The U.S. Census American Community Survey is likely a good source. Go to the link at right, and search "Community Facts" for your community. The vehicles per household data is within the housing statistics of the ACS. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

Section 2 - Variable Modeling Parameters

Conversion Factors

			Source:	What does this input affect?
Average Household Size				
	Single Family	3.2		Directly affects trip internalization and mode splits. Also used to compute site population if population isn't entered directly.
	Multi-Family	2.5		
	High Rise Condo	2.5		
Jobs per ksf				
	Retail	2.0	ITE Trip Generation Manual	Used to compute site employment for any land uses which are entered in ksf rather than jobs. For retail, if land uses are entered in jobs, it's used to convert back to ksf for trip generation calculations.
	Office	3.0	ITE Trip Generation Manual	
	Light Industrial	1.0	ITE Trip Generation Manual	
	Manufacturing	0.5	ITE Trip Generation Manual	
	Warehousing	2.0	ITE Trip Generation Manual	
	Misc. Uses	2.0	ITE Trip Generation Manual	
Jobs from ITE rates per other unit				

		Source	
Jobs per Hotel Room	0.50	ITE Trip Generation Manual	
Jobs per Movie Screen	4.00	ITE Trip Generation Manual	
Grade School Jobs per student	0.10	ITE Trip Generation Manual	Used to compute site employment for these
High School / Middle School Jobs per Student	0.10	ITE Trip Generation Manual	land uses which are typically expressed in other
College Jobs per student	0.25	ITE Trip Generation Manual	units

Trip Purpose Splits by Land Use Type

This will affect the final results significantly. Keep "Use NCHRP" on "Yes" unless you have reliable splits which have been QA/QCd

For each land use type, choose whether to use NCHRP 365 splits as outlined on the Mode Parameters tab.
If "Yes" is chosen, the percentages will not affect the results. If "No," then enter the splits.

NOTE: For residences, the NHB Attractions are automatically calculated as the remainder to ensure the total is 100%
NOTE: For all other purposes, the NHB attractions are automatically set equal to the NHB productions, and the HBO attractions are automatically calculated as the remainder to ensure the total is 100%
NOTE: There is no NCHRP split defined for schools, so the split has to be entered below.

		Productions			Attractions			
DAILY	**Use NCHRP?**	**HBW**	**HBO**	**NHB**	**HBW**	**HBO**	**NHB**	**Source (if not using NCHRP):**
Residences	Yes	15%	50%	10%	7%	8%	10%	
Retail	Yes	0%	0%	15%	10%	60%	15%	
Office	Yes	0%	0%	15%	35%	35%	15%	
Other non-residential (excluding schools)	Yes	0%	0%	10%	60%	20%	10%	
Schools	No	0%	0%	2.5%	35%	60%	3%	
AM PEAK HOUR								
Residences	Yes	15%	50%	10%	7%	8%	10%	
Retail	Yes	0%	0%	15%	10%	60%	15%	
Office	Yes	0%	0%	15%	35%	35%	15%	
Other non-residential (excluding schools)	Yes	0%	0%	10%	60%	20%	10%	
Schools	No	0%	0%	2.5%	35%	60%	3%	
PM PEAK HOUR								
Residences	Yes	15%	50%	10%	7%	8%	10%	
Retail	Yes	0%	0%	15%	10%	60%	15%	
Office	Yes	0%	0%	15%	35%	35%	15%	
Other non-residential (excluding schools)	Yes	0%	0%	10%	60%	20%	10%	
Schools	No	0%	0%	2.5%	35%	60%	3%	

NON-HOME BASED TRIPS GENERATED BY PROJECT HOUSEHOLDS

Enter the percent of these that occur…		Source for this information:	
Completely Within the Project Site	25%		
With one trip end external to the Project Site	15%		This only affects VMT
Completely outside the Project Site	60%	Calculated from other two percentages	calculations

SITE-SPECIFIC INTERNALIZATION

This should only be used in unique situations such as if the project is isolated from surrounding communities or contains a school that primarily serves local residents

This section of input is for when you have specific trips you want to EXCLUDE from the MXD process. These trips will be counted as internal, and subtracted

from the "baseline" trips before applying the model. The overall trip reduction percentage will still take these trips into account, and thus be a higher reduction than if you were just letting the model work on all the "baseline" trips. An experienced transportation engineer or planner should be consulted to determine the appropriate assumptions and calculations.

Section 3 - Land Use Inputs

			Trip Equation Method			Trips				ITE Daily Parameters				
	Quantity	Units	Daily	AM Peak Hour	PM Peak Hour	Daily	AM Peak Hour	PM Peak Hour		Code	Average Rate	Linear Multiplier	Linear Constant	Log Multipler
Number of Dwelling Units														
Single Family	0	DU	Log Equation	Linear Equatior	Log Equation	0	0	0		210	9.57			0.92
Multi-Family	0	DU	Linear Equatior	Linear Equatior	Linear Equati	0	0	0		220	6.65	6.06	123.56	
High Rise Condo	0	DU	Linear Equatior	Linear Equatior	Linear Equati	0	0	0		232	4.18	3.77	223.66	
Retail (note: if you use job units for retail, the spreadsheet will convert before applying trip rates, using the rate in section 2 which you can change)														
General Retail other than those listed below	0	ksf	Log Equation	Log Equation	Log Equation	0	0	0	Note the	820	42.94			0.65
Supermarket	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	formulas	850	102.24	66.95	1391.56	
Bank	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	are	912	148.15			
Health Club	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	slightly	492	32.93			
Restaurant (non-fast food)	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	different in	932	127.15			
Fast-Food Restaurant	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	this	934	496.12			
Gas Station	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	section	945	1181.07			
Auto Repair	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0	<====	942	31.6			
Office														
Non-Medical	0	jobs	Log Equation	Log Equation	Linear Equati	0	0	0		710	3.32			0.84
Medical	0	jobs	Average Rate	Average Rate	Average Rate	0	0	0		720	8.91			0.67
Industrial														
Light Industrial	0	jobs	Average Rate	Average Rate	Average Rate	0	0	0		110	3.02	2.95	30.57	
Manufacturing	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0		140	3.82	3.88	-20.7	
Warehousing / Self-Storage	0	ksf	Average Rate	Average Rate	Average Rate	0	0	0		151	2.5			1.01
Hotel (including restaurant, facilities, etc…)	0	Rooms	Average Rate	Average Rate	Average Rate	0	0	0		310	8.17	8.95	-373.16	
Motel	0	Rooms	Average Rate	Average Rate	Average Rate	0	0	0		320	5.63			0.92
Movie Theater	0	Screens	Average Rate	Average Rate	Average Rate	0	0	0		445	175.29			
School														
University	0	Students	Average Rate	Average Rate	Average Rate	0	0	0		550	2.38	2.23	440	
High School	0	Students	Average Rate	Average Rate	Average Rate	0	0	0		530	1.71			0.81
Middle School	0	Students	Average Rate	Average Rate	Average Rate	0	0	0		522	1.62			
Elementary	0	Students	Average Rate	Average Rate	Average Rate	0	0	0		520	1.29			

	Daily	AM Peak Hour	PM Peak Hour
Trips from Land uses not covered above ==>	0	0	0
Jobs in those Land Uses	0		

Daily	AM Peak Hour	PM Peak Hour

Total "Baseline" ITE Trips	**0**	**0**	**0**

Section 4 - VMT Inputs

	HBW	HBO	NHB
Average Trip Length in the Region	0	0	0
Average Trip Length in the Traffic Analysis Zone	0	0	0

Source:

region's Metropolitan Planning Organization

ential developments.

	AM PEAK HOUR TRIP RATES					PM PEAK HOUR TRIP RATES					Valid Trip Gen Calc Choice?			
Log Constant	**Average Rate**	**Linear Multiplier**	**Linear Constant**	**Log Multipler**	**Log Constant**	**Average Rate**	**Linear Multiplier**	**Linear Constant**	**Log Multipler**	**Log Constant**	**Jobs Per Input Unit (if Applicable)**	**Daily**	**AM Peak Hour**	**PM Peak Hour**
[redacted]														
2.71	0.75	0.7	9.74			1.01			0.9	0.51		Yes	Yes	Yes
	0.51	0.49	3.73			0.62	0.55	17.65				Yes	Yes	Yes
	0.34	0.29	28.86			0.38	0.34	15.47				Yes	Yes	Yes
[redacted]														
5.83	1			0.59	2.32	3.73			0.67	3.37	2.0	Yes	Yes	Yes
	3.59					10.5			0.61	3.95	2.0	Yes	Yes	Yes
	12.35					25.82					2.0	Yes	Yes	Yes
	1.38					3.53			0.95	1.43	2.0	Yes	Yes	Yes
	11.52					11.15					2.0	Yes	Yes	Yes
	49.35					33.84					2.0	Yes	Yes	Yes
	79.3					97.08					2.0	Yes	Yes	Yes
	2.94					3.38			0.94	1.33	2.0	Yes	Yes	Yes
[redacted]														
2.23	0.48			0.86	0.24	0.46	0.37	60.08			1.0	Yes	Yes	Yes
3.76	0.53					1.06			1.06	-0.32	1.0	Yes	Yes	Yes
[redacted]														
	0.44	0.27	70.47			0.42	0.29	58.03			1.0	Yes	Yes	Yes
	0.73	0.83	-29.52			0.73	0.78	-15.97			0.5	Yes	Yes	Yes
0.82	0.15					0.26			1.02	1.49	2.0	Yes	Yes	Yes
[redacted]														
	0.56			1.24	-2	0.59					0.50	Yes	Yes	Yes
2.11	0.45			0.92	-0.46	0.47			0.94	-0.51	0.50	Yes	Yes	Yes
	0					13.64					4.00	Yes	Yes	Yes
[redacted]														
	0.21	0.21	-69.14			0.21	0.19	118.58			0.25	Yes	Yes	Yes
1.86	0.42					0.13					0.10	Yes	Yes	Yes
	0.54					0.16					0.10	Yes	Yes	Yes
	0.45			1.14	-1.86	0.15					0.10	Yes	Yes	Yes

MIXED USE TRIP GENERATION MODEL v 4.0

FEHR

MODEL UPDATES

As is the case with all scientific and engineering methods, this MXD tool will continue to underg
It is the user's responsibility to verify that the version in use is suitably up to date for his/her pu
For updates to the MXD tool spreadsheet, including versions that account for transit and

USAGE STATEMENT AND DISCLAIMER

The MXD spreadsheet tool is a functional implementation of the research and mathematical equaitons for the MXD
as a public service, for use by professional transportation planners and traffic engineers, experienced in the use of
We make no representation or warranty concerning the tool's use by inexperienced individuals, nor concerning the
no responsibility for the conclusions or opinions inexperienced users may draw from the results produced.

While the research underlying the spreadsheet has been reviewed for general usefulness, it is the responsibility of
It is also the user's responsibility to exercise professional judgment on appropriateness to the specific details of the
with respect to local data and to test the method's sensitivities to the particular combination of factors under study.

In cases that vary significantly from those used to develop and validate the method (as described in the accompan
as to the method's relevance and performance.

Although the method has been validated with respect to its ability to predict daily traffic generation for a variety of n

1. The accuracies of the model's predictions of travel by transit, walking, and bicycle modes have not been mather

2. The accuracy of prediction of proportions of daily travel occurring during specific times of day has not been fully

3. The method was developed primarily to address the effects of mixed-use development and, though it does acco
to transit-oriented developments (particularly adjacent to premium bus or rail service) and to development within th

4. The method does not account for the effects of changing the spatial separation among uses within the developn

5. The spreadsheet has not been tested for all possible project descriptions, and the user assumes responsibility f
results expected based on the documented equations and against the professional judgment of an expert in the tra

To ensure fully-informed use of the results produced by this method, the user is advised to present them alongside
and *Trip Generation* Handbook) and to explain the professional judgment that leads to a conclusion that the MXD

As is the case with all scientific and engineering methods, MXD will continue to undergo enhancement and update
the version in use is suitably up to date for his/her purposes. **For updates to the MXD spreadsheet, including ve**

1. "Traffic Generation by Mixed-Use Developments - A Six-Region Study Using Consistent Built Environment Meas
2. Ibid.

INSTRUCTIONS

This spreadsheet allows one to input data from a project site and estimate vehicle trip reduction
by determining:

1. The percent of trips internally captured
2. The percent of external trips which are made by walking
3. The percent of external trips which are made by transit

All user inputs are on the "Input" tab and the results are on the "Results" tab

The spreadsheet uses regression model cofficients to calculate trip reduction percentages by trip purpose. ITE Trip
The results are combined to produce "adjusted" external vehicle trips.

Most Input cells are shaded this color of yellow. All other cells are protected and should not be changed.

Always check your results for reasonability and compare them to sites of similar nature with actual counts available

Off-site variables
The spreadsheet takes some off-site variables into account. So the results may be different for different planning y
could change. Please keep this in mind if doing an analysis that involves "existing plus project" and "cumulative pl

AM and PM peak hour models
The AM and PM peak hour results are not based on a validated peak hour model. The site trip reduction data was
the "predicted probabilities" (internal capture, walk, and transit) are the same in the peak hours as for daily for a giv
The overall trip reduction percentages will differ in the peak hours only to the extent that the trip purpose distributio
use NCHRP factors to account for this or to input trip purpose splits manually.

Site-Specific Internalization
In some cases one may wish to manually define site specific internalization due to unique situations. These include
or contain schools that mostly serve local residents. An experienced traffic engineer or planner will need to be cons

Project Site Size Limitations
Please be aware that the site ought to fall within the range of the data used to develop the model, namely:

1. The site should be between 5 and 2000 acres
2. There should be less than 5000 dwelling units and less than 3 million square feet of commercial use

If the site does not meet the above criteria, please use an alternate method, as described in the ITE Handbook wri

Employment within a 30 minute transit trip input variable
Note: the 30 minutes is door-to-door, so should include estimations for home-to-transit and transit-to-work travel tir
as well as average waiting time for the transit vehicle.
If local data is unavailable:

1. Estimate the geographic area accessible by a 30-minute transit trip.
2. Compare that geographic area to the Census' Longitudinal Employer-Household Dynamics data.
   The Census LEHD program's "On the Map" allows users draw a geographic area within which the map
   calculate employment. See http://onthemap.ces.census.gov/

PEERS

go enhancement and updates in the future, and the current version may become out-of-date or
urposes.
d peak hour validation please visit: www.coolconnections.org

D method described in the accompanying documentation [1]. Fehr & Peers offers the spreadsheet
the Institute of Transportation Engineers *Trip Generation* report and *Trip Generation Handbook* .
e tool's functionality or accuracy beyond the scope of the underlying research. We also bear

the user to assess whether the research is relevant to and credible for his/her intended application.
eir subject case. In cases where this is in doubt, the user is advised to either apply alternate methods or to validate

ying documentation) [2], the user is advised to consult with an expert in the transportation planning/engineering fiel

nixed-use development projects, the following qualifiers apply:

natically validated, and the model does not predict the amount of automobile travel occurring entirely within the MX

validated.

unt for some effects of transit availability and regional accessibility, special care should be used when applying the
ıe regional core (downtown).

nent site, nor with changing the mix of specific types of retail and services uses such as entertainment, restaurant,

or checking and judging the reasonableness of the spreadsheet results for the specific case under study both agair
ansportation planning or engineering.

e the results produced by the conventional methods (such as those in the Institute of Transportaiton Engineers *Trip*
results as reasonable. Ideally, traffic counts at sites comparable to the proposed project should be performed.

s in the future, and the current version may become out-of-date or superseded. It is the user's responsibility to verif
ersions that account for transit and peak hour validation please visit: www.coolconnections.

sures", Ewing et al., *ASCE Journal of Urban Planning and Development* , September 2011.

p Generation and NCHRP 365 factors are used to calculate "Baseline" project site trips by purpose.

e

years, because the surrounding area
us project" scenarios.

s only captured on a daily basis, and thus
ven trip purpose.
n differs. The user is given the option to

e project sites that are isolated from surrounding communities
sulted to determine the appropriate assumptions and calculations.

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Generation report

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Acronym	Definition
ACS	American Community Survey
ASCE	American Society of Civil Engineers
DU	dwelling unit
HBO	home-based other trips
HBW	home-based work trips
HH	household
ITE	Institute of Transportation Engineers
ksf	thousand square feet
MXD	mixed use development
MXD tool	EPA's Mixed-Use Development Trip Generation Tool
NCHRP	National Cooperative Highway Research Program
NHB	non-home-based trips
ROW	right-of-way
TOD	transit-oriented development
VMT	vehicle-miles traveled

MIXED USE TRIP GENERATION MODEL V4 - INPUT

F

All shaded cells are inputs
Project / Scenario Specific Inputs
Default National Factors - Can be changed for project based on site specific data, or regional values fro

Section 1 - General Site Information

Site Name	Example Project	
Geographic		**Notes / Instructions**
Developed Area (in acres)	0	Include streets, ROW, parking lots, pocl
Number of Intersections		Count intersections either within or on th
Is Transit (bus or rail) present within the site or across the street?	Yes	Note: This is only used as a way to zero
Land Use - Surrounding Area		
Is the site in a Central Business District or TOD?	Yes	Answering "Yes" will reduce the HBO ar the stores (large vs. small) should be th
Employment within one mile of the MXD	0	Do not include employment within the M
Employment within a 30 minute Transit Trip (Door-to-door)	0	Include employment within the MXD itse
		This can be a difficult number to get - sc
Site Demographics		
Enter Population Directly?		If "No", will apply average HH size factor
Population		You do not need to enter population her
		The U.S. Census American Community right, and search "Community Facts" for
Average Vehicles Owned per Dwelling Unit	1.85	is within the housing statistics of the AC

Section 2 - Variable Modeling Parameters

Conversion Factors

		Source:
Average Household Size		
Single Family	3.2	
Multi-Family	2.5	
High Rise Condo	2.5	
Jobs per ksf		
Retail	2.0	ITE Trip Genera
Office	3.0	ITE Trip Genera
Light Industrial	1.0	ITE Trip Genera
Manufacturing	0.5	ITE Trip Genera
Warehousing	2.0	ITE Trip Genera
Misc. Uses	2.0	ITE Trip Genera
Jobs from ITE rates per other unit		
		Source

Jobs per Hotel Room	0.50	ITE Trip Genera
Jobs per Movie Screen	4.00	ITE Trip Genera
Grade School Jobs per student	0.10	ITE Trip Genera
High School / Middle School Jobs per Student	0.10	ITE Trip Genera
College Jobs per student	0.25	ITE Trip Genera

Trip Purpose Splits by Land Use Type

This will affect the final results significantly. Keep "Use NCHRP" on "Yes" unless you have reliable split

For each land use type, choose whether to use NCHRP 365 splits as outlined on the Mode Parameters tab.
If "Yes" is chosen, the percentages will not affect the results. If "No," then enter the splits.

NOTE: For residences, the NHB Attractions are automatically calculated as the remainder to ensure the total is 1
NOTE: For all other purposes, the NHB attractions are automatically set equal to the NHB productions, and the H
total is 100%
NOTE: There is no NCHRP split defined for schools, so the split has to be entered below.

		Productions	
DAILY	**Use NCHRP?**	**HBW**	**HBO**
Residences	Yes	15%	50%
Retail	Yes	0%	0%
Office	Yes	0%	0%
Other non-residential (excluding schools)	Yes	0%	0%
Schools	No	0%	0%
AM PEAK HOUR			
Residences	Yes	15%	50%
Retail	Yes	0%	0%
Office	Yes	0%	0%
Other non-residential (excluding schools)	Yes	0%	0%
Schools	No	0%	0%
PM PEAK HOUR			
Residences	Yes	15%	50%
Retail	Yes	0%	0%
Office	Yes	0%	0%
Other non-residential (excluding schools)	Yes	0%	0%
Schools	No	0%	0%

NON-HOME BASED TRIPS GENERATED BY PROJECT HOUSEHOLDS

Enter the percent of these that occur…		Source for this information:
Completely Within the Project Site	25%	
With one trip end external to the Project Site	15%	
Completely outside the Project Site	60%	Calculated from other two percentages

SITE-SPECIFIC INTERNALIZATION

This should only be used in unique situations such as if the project is isolated from surrounding communities or c

This section of input is for when you have specific trips you want to EXCLUDE from the MXD process. These tri
from the "baseline" trips before applying the model. The overall trip reduction percentage will still take these trips

if you were just letting the model work on all the "baseline" trips. An experienced transportation engineer or planr
assumptions and calculations.

Section 3 - Land Use Inputs

	Quantity	Units	Trip Equation
Number of Dwelling Units			Daily
Single Family	0	DU	Log Equation
Multi-Family	0	DU	Linear Equatior
High Rise Condo	0	DU	Linear Equatior
Retail (note: if you use job units for retail, the spreadsheet will convert before applying trip rates, using the rate in section 2 which you can change)			
General Retail other than those listed below	0	ksf	Log Equation
Supermarket	0	ksf	Average Rate
Bank	0	ksf	Average Rate
Health Club	0	ksf	Average Rate
Restaurant (non-fast food)	0	ksf	Average Rate
Fast-Food Restaurant	0	ksf	Average Rate
Gas Station	0	ksf	Average Rate
Auto Repair	0	ksf	Average Rate
Office			
Non-Medical	0	jobs	Log Equation
Medical	0	jobs	Average Rate
Industrial			
Light Industrial	0	jobs	Average Rate
Manufacturing	0	ksf	Average Rate
Warehousing / Self-Storage	0	ksf	Average Rate
Hotel (including restaurant, facilities, etc…)	0	Rooms	Average Rate
Motel	0	Rooms	Average Rate
Movie Theater	0	Screens	Average Rate
School			
University	0	Students	Average Rate
High School	0	Students	Average Rate
Middle School	0	Students	Average Rate
Elementary	0	Students	Average Rate

	Daily	AM Peak Hour	PM Peak Hour
Trips from Land uses not covered above ==>	0	0	0
Jobs in those Land Uses	0		

	Daily	AM Peak Hour	PM Peak Hour
Total "Baseline" ITE Trips	**0**	**0**	**0**

Section 4 - VMT Inputs

	HBW	HBO	NHB
Average Trip Length in the Region	0	0	0
Average Trip Length in the Traffic Analysis Zone	0	0	0

EHR PEERS

n census data, travel demand model, etc…

‹et parks. Do not include open space, vacant lots.
ıe perimeter of the MXD. Do not count most unsignalized driveways or alleys, but DO count major entrances t

out the probability of external trips if no transit is present.

ıd NHB purpose splits for retail use to those found in smaller stores. The nature of
e primary factor in the selection here.
IXD itself
ɛlf
ɔme suggestions are in the instructions tab in "Instructions."

rs (in section 2) to dwelling units below
e. It will be calculated based on dwelling units below and average HH sizes in section 2.

Survey is likely a good source. Go to the link at
· your community. The vehicles per household data
S. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xh

What does this input affect?

Directly affects trip internalization and mode splits. Also used to compute site population if population isn't entered directly.

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Used to compute site employment for any land uses which are entered in ksf rather than jobs. For retail, if land uses are entered in jobs, it's used to convert back to ksf for trip generation calculations.

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ation Manual

Used to compute site employment for these land uses which are typically expressed in other units

ts which have been QA/QCd

100%
HBO attractions are automatically calculated as the remainder to ensure the

		Attractions			
NHB	**HBW**	**HBO**	**NHB**		**Source (if not using NCHRP):**
10%	7%	8%	10%		
15%	10%	60%	15%		
15%	35%	35%	15%		
10%	60%	20%	10%		
2.5%	35%	60%	3%		
10%	7%	8%	10%		
15%	10%	60%	15%		
15%	35%	35%	15%		
10%	60%	20%	10%		
2.5%	35%	60%	3%		
10%	7%	8%	10%		
15%	10%	60%	15%		
15%	35%	35%	15%		
10%	60%	20%	10%		
2.5%	35%	60%	3%		

This only affects VMT calculations

contains a school that primarily serves local residents

ips will be counted as internal, and subtracted
s into account, and thus be a higher reduction than

ner should be consulted to determine the appropriate

Method		Trips				ITE Daily Parameters		
AM Peak Hour	PM Peak Hour	Daily	AM Peak Hour	PM Peak Hour		**Code**	**Average Rate**	**Linear Multiplier**
Linear Equatior	Log Equation	0	0	0		210	9.57	
Linear Equatior	Linear Equatic	0	0	0		220	6.65	6.06
Linear Equatior	Linear Equatic	0	0	0		232	4.18	3.77
Log Equation	Log Equation	0	0	0	Note the	820	42.94	
Average Rate	Average Rate	0	0	0	formulas	850	102.24	66.95
Average Rate	Average Rate	0	0	0	are	912	148.15	
Average Rate	Average Rate	0	0	0	slightly	492	32.93	
Average Rate	Average Rate	0	0	0	different	932	127.15	
Average Rate	Average Rate	0	0	0	in this	934	496.12	
Average Rate	Average Rate	0	0	0	section	945	1181.07	
Average Rate	Average Rate	0	0	0	<====	942	31.6	
Log Equation	Linear Equatic	0	0	0		710	3.32	
Average Rate	Average Rate	0	0	0		720	8.91	
Average Rate	Average Rate	0	0	0		110	3.02	2.95
Average Rate	Average Rate	0	0	0		140	3.82	3.88
Average Rate	Average Rate	0	0	0		151	2.5	
Average Rate	Average Rate	0	0	0		310	8.17	8.95
Average Rate	Average Rate	0	0	0		320	5.63	
Average Rate	Average Rate	0	0	0		445	175.29	
Average Rate	Average Rate	0	0	0		550	2.38	2.23
Average Rate	Average Rate	0	0	0		530	1.71	
Average Rate	Average Rate	0	0	0		522	1.62	
Average Rate	Average Rate	0	0	0		520	1.29	

Source:

region's Metropolitan Planning Organization

to shopping areas or residential developments.

ıtml

AM PEAK HOUR TRIP RATES

Linear Constant	Log Multipler	Log Constant	Average Rate	Linear Multiplier	Linear Constant	Log Multipler	Log Constant
	0.92	2.71	0.75	0.7	9.74		
123.56			0.51	0.49	3.73		
223.66			0.34	0.29	28.86		
	0.65	5.83	1			0.59	2.32
1391.56			3.59				
			12.35				
			1.38				
			11.52				
			49.35				
			79.3				
			2.94				
	0.84	2.23	0.48			0.86	0.24
	0.67	3.76	0.53				
30.57			0.44	0.27	70.47		
-20.7			0.73	0.83	-29.52		
	1.01	0.82	0.15				
-373.16			0.56			1.24	-2
	0.92	2.11	0.45			0.92	-0.46
			0				
440			0.21	0.21	-69.14		
	0.81	1.86	0.42				
			0.54				
			0.45			1.14	-1.86

PM PEAK HOUR TRIP RATES

Valid Trip G

Average Rate	Linear Multiplier	Linear Constant	Log Multipler	Log Constant	Jobs Per Input Unit (if Applicable)	Daily
1.01			0.9	0.51		Yes
0.62	0.55	17.65				Yes
0.38	0.34	15.47				Yes
3.73			0.67	3.37	2.0	Yes
10.5			0.61	3.95	2.0	Yes
25.82					2.0	Yes
3.53			0.95	1.43	2.0	Yes
11.15					2.0	Yes
33.84					2.0	Yes
97.08					2.0	Yes
3.38			0.94	1.33	2.0	Yes
0.46	0.37	60.08			1.0	Yes
1.06			1.06	-0.32	1.0	Yes
0.42	0.29	58.03			1.0	Yes
0.73	0.78	-15.97			0.5	Yes
0.26			1.02	1.49	2.0	Yes
0.59					0.50	Yes
0.47			0.94	-0.51	0.50	Yes
13.64					4.00	Yes
0.21	0.19	118.58			0.25	Yes
0.13					0.10	Yes
0.16					0.10	Yes
0.15					0.10	Yes

Gen Calc Choice?

AM Peak Hour	PM Peak Hour
[redacted]	
Yes	Yes
Yes	Yes
Yes	Yes
[redacted]	
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
[redacted]	
Yes	Yes
Yes	Yes
[redacted]	
Yes	Yes
Yes	Yes
Yes	Yes
[redacted]	
Yes	Yes
Yes	Yes
Yes	Yes
[redacted]	
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes

MIXED USE TRIP GENERATION MODEL V4 - RESULTS

MODEL APPLICATION - ALL TRIPS

	Daily				
	HBW	HBO	NHB	Total	HBW
Baseline # of External Trips (ITE Model)	0	0	0	0	0
% External Trip Reduction (predicted by MXD Model)					
Internal Capture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Walking External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Transit External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
# of Trips Reduced (predicted by MXD Model)					
Internal Capture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Walking External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Transit External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
MXD Model # of Vehicle Trips	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

Results	**External Vehicle Trips**		
	Baseline	Adjusted	Reduction %
Daily	0	#DIV/0!	#DIV/0!
AM Peak Hour	0	#DIV/0!	#DIV/0!
PM Peak Hour	0	#DIV/0!	#DIV/0!

MODEL APPLICATION - TRIP ENDS ASSOCIATED WITH HOUSES IN THE PROJECT ONLY

	Daily				
	HBW	HBO	NHB	Total	HBW
Baseline # of External Trips (ITE Model)	0	0	0	0	0
% External Trip Reduction (predicted by MXD Model)					
Internal Capture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Walking External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Transit External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
# of Trips Reduced (predicted by MXD Model)					
Internal Capture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Walking External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Transit External	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Adjusted # (MXD Model) of Vehicle Trips generated by Project Residences	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

	External Vehicle Trips		
Results	Baseline	Adjusted	Reduction %

Daily	0	#DIV/0!	#DIV/0!
AM Peak Hour	0	#DIV/0!	#DIV/0!
PM Peak Hour	0	#DIV/0!	#DIV/0!

FEHR PEERS

Daily V

AM Peak Hour				PM Peak Hour		
HBO	NHB	Total	HBW	HBO	NHB	Total
0	0	0	0	0	0	0
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

ITE Daily V
MXD Daily
MXD Redu
(VMT Redu
as a perce

VMT Redu
VMT Redu
Total Daily

Total Trips Reduced

	HBW	HBO	NHB	Total
Daily	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
AM Peak Hour	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
PM Peak Hour	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

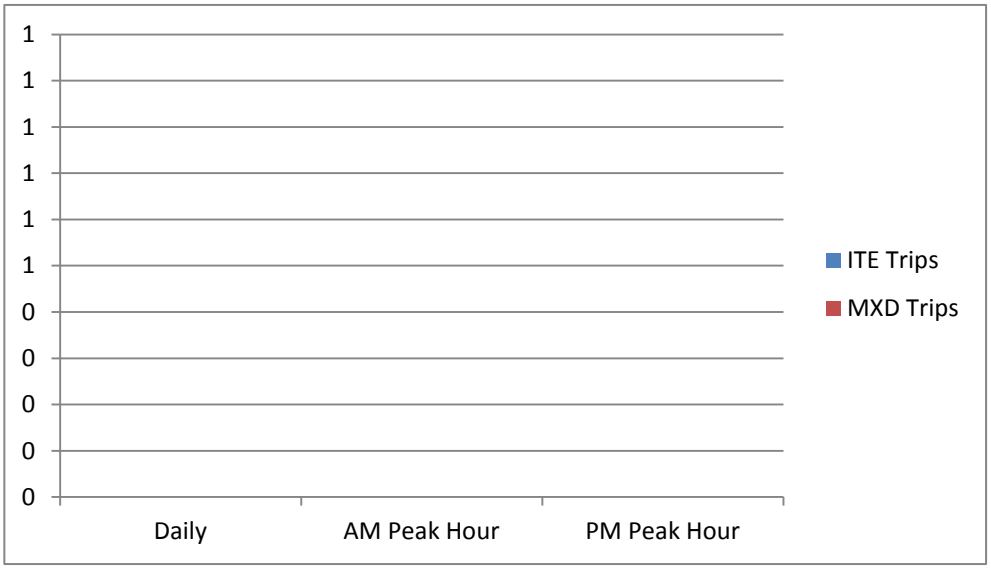
AM Peak Hour				PM Peak Hour		
HBO	NHB	Total	HBW	HBO	NHB	Total
0	0	0	0	0	0	0
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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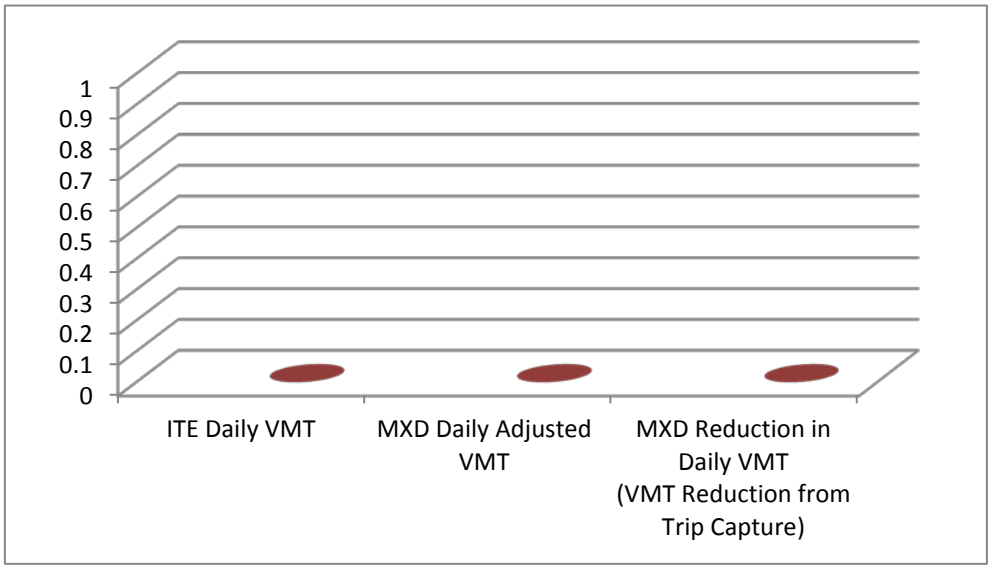
/MT Reduced

	HBW	HBO	NHB	Total
/MT	0	0	0	0
/ Adjusted VMT	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
uction in Daily VMT				
uction from Trip Capture)				#DIV/0!
ntage				#DIV/0!

	HBW	HBO	NHB	Total
uction from Trip Capture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
uction from Shorter Trips	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
/ VMT Avoided				#DIV/0!

Comparison of MXD forecasted daily trips to ITE forecasted daily trips





AC Transit Bus Line Descriptions

Effective August 23, 2015

About Bus Line Numbers and Letters

AC Transit's numbered lines serve the East Bay.

Lines 1–299 operate normal hours. Normal hours are, at a minimum, the commute periods, 6 a.m.–9 a.m. and 4 p.m.–6 p.m., weekdays. Almost all operate all day on weekdays and many operate weekday evenings and weekends as well. Lines 200–299 serve the areas of Fremont and Newark, while other lines serve other parts of the East Bay from Richmond to Hayward.

Lines 300–399 do not operate during the commute period. They operate at other times of the day: for example, mid-days only, weekends only, or evenings only. Some lines operate only a few days per week (for example, Tuesdays and Thursdays).

Lines 600–699 are timed to match the instruction hours of local schools, and operate only when schools are in session. They may have altered schedules when local schools have minimum day or alternative schedules. These lines are open to all passengers at regular fares.

Lines 800–899 are All Nighter lines, operating from 1 a.m.–5 a.m. daily. Some may operate somewhat earlier or later (especially on weekends).

Lettered lines (A–Z) are Transbay routes, connecting the East Bay to San Francisco or the Peninsula.

Go to the Maps & Schedules page.

Local Lines
Transbay Lines
All Nighter Lines
Supplementary Lines

Local Lines

Line	Description	Links
1	Berkeley BART to Bay Fair BART via Telegraph Ave., International Blvd., and E. 14th St.	Map Schedule
1R	International Rapid: U.C. Berkeley campus to Bay Fair BART via Berkeley BART, Telegraph Ave., International Blvd., and E. 14th St.	Map Schedule
7	El Cerrito del Norte BART to Berkeley BART via Arlington Ave. and Shattuck Ave.	Map Schedule
11	Dimond District, Oakland to Estates Dr. & Inverleith Terr., Piedmont, via Highland Hospital, 14th Ave., 10th St., Broadway, Harrison St., Oakland Ave., and Highland Ave.	Map Schedule
12	Berkeley BART to Downtown Oakland via Martin Luther King Jr. Way, 55th St., Temescal District, Piedmont Ave. and Grand Ave.	Map Schedule
14	Downtown Oakland to Fruitvale BART via E. 18th St., E. 21st St., School St., MacArthur Blvd., and High St.	Map Schedule
18	University Village, Albany, to Montclair via Solano Ave., Shattuck Ave., Children's Hospital, Martin Luther King Jr. Way, downtown Oakland, and Park Blvd.	Map Schedule
20	Dimond District, Oakland, to downtown Oakland via Fruitvale Ave., Fruitvale BART, Park St., Alameda Towne Centre, Shoreline Dr., Grand St., Otis Dr., Westline Dr., Central Ave. and Webster St.	Map Schedule
21	Dimond District, Oakland, to Oakland Airport via Fruitvale Ave., Fruitvale BART, Park St., Alameda Towne Centre, and Bay Farm Island.	Map Schedule
22	Two-way loop: Hayward BART, Mission Blvd., South Hayward BART, Tennyson Rd., Hesperian Blvd., Chabot College, Southland Mall, W. Winton Ave., and D St.	Map Schedule
25	Two-way loop: El Cerrito Plaza BART, Central Ave, Pierce St., University Village, Gilman St., Hopkins St., Martin Luther King Jr. Way, Berkeley BART, Martin Luther King Jr. Way, Solano Ave., Colusa Ave., Fairmount Ave.	Map Schedule
26	Emery Bay Public Market to Lakeshore Ave. & Wala Vista Ave., Oakland, via Shellmound St., 40th St., Adeline St., 7th St., West Oakland BART, Wood St., 14th St. and Lakeshore Ave.	Map Schedule
31	Alameda Point to MacArthur BART via Midway Ave., Lincoln Ave., Marina Village Pkwy., Webster/Posey tubes, 12th St., 10th St., West Oakland BART, Peralta St., Hollis St. and 40th St.	Map Schedule
32	Two-way loop: Hayward BART, Western Blvd., Meekland Ave., Ashland Ave., Bay Fair BART, E. 14th St., 164th Ave., Miramar Ave., Stanton Ave., Lake Chabot Rd., Castro Valley BART, Center St., and B St.	Map Schedule
37	Two-way loop: Hayward BART, West A St., Santa Clara St., Amador St., Santa Clara St., Underwood Ave., Patrick Ave., Tennyson Rd., South Hayward BART, Whitman St., Silva Ave., and Meek Ave.	Map Schedule
39	Fruitvale BART to Skyline High School via Fruitvale Ave., Lincoln Ave., and Joaquin Miller Rd.	Map Schedule
40	Downtown Oakland to Bay Fair BART via Foothill Blvd., Eastmont Transit Center and Bancroft Ave.	Map Schedule
45	Eastmont Transit Center to Foothill Square, Oakland, via Hillmont Ave., Seminary Ave., Coliseum BART, Edes Ave., Sobrante Park, 105th Ave. and 104th Ave.	Map Schedule

46	Coliseum BART to Oakland Zoo via 81st Ave., 82nd Ave. Fontaine St., Keller Ave., and Mountain Blvd.	Map Schedule
46L	Coliseum BART to Grass Valley via 81st Ave., 82nd Ave. Fontaine St., Mountain Blvd., and Golf Links Rd. Limited stops between Coliseum BART and Mountain Blvd. & Golf Links Rd.	Map Schedule
47	Fruitvale BART to Trask St. & 55th Ave., Oakland, via Maxwell Park: Monticello Ave. and Birdsall Ave.	Map Schedule
48	From Hayward BART to Bay Fair BART via Foothill Blvd., City Center Dr., Grove St., Redwood Rd., Castro Valley BART, Center St., Seven Hills Rd., Redwood Rd., Somerset Ave., Lake Chabot Rd.,Foothill Blvd., and 159th Ave.	Map Schedule
49	Two-way loop: Rockridge BART, College Ave., Ashby Ave., 7th St., Dwight Way, Shattuck Ave., Berkeley BART, Bancroft Wy. / Durant Ave., Piedmont Ave., Warring St., Derby St., Claremont Blvd., Claremont Ave. and College Ave.	Map Schedule
51A	Rockridge BART to Fruitvale BART via College Ave., Broadway (Oakland), Webster St., Santa Clara Ave., and Broadway (Alameda).	Map Schedule
51B	Rockridge BART to Berkeley Amtrak or Berkeley Marina via College Ave., Bancroft Way / Durant Ave., Shattuck Ave., Berkeley BART, and University Ave.	Map Schedule
52	University Village to UC Campus via University Village, Cedar St., Sacramento St., and University Ave., looping the UC Campus via Hearst Ave., Gayley St., Bancroft Way, and Shattuck Ave. (Berkeley BART).	Map Schedule
54	Fruitvale BART to Merritt College via 35th Ave. and Redwood Rd.	Map Schedule
57	40th St. & San Pablo Ave., Emeryville, to Foothill Square, Oakland, via 40th St. and MacArthur Blvd.	Map Schedule
58L	Oakland Amtrak to Eastmont Transit Center via Jack London Square, Broadway, downtown Oakland, Grand Ave., and MacArthur Blvd. Limited stop service.	Map Schedule
60	Hayward BART to Cal State East Bay via downtown Hayward and 2nd St.	Map Schedule
62	West Oakland BART to Fruitvale BART via 7th St., E. 10th St., 8th Ave., Highland Hospital and 23rd Ave.	Map Schedule
65	Berkeley BART to Lawrence Hall of Science or Senior Ave. and Grizzly Peak Blvd. via Hearst Ave., Euclid Ave. and Grizzly Peak Blvd.	Map Schedule
67	Berkeley BART to Grizzly Peak Blvd. and Spruce St. via Oxford St. and Spruce St. Weekends serves Tilden Park.	Map Schedule
70	Richmond BART to Richmond Pkwy. Transit Center via 18th St., Rheem Ave., Doctor’s Medical Center, San Pablo Dam Rd., Appian Way and Fitzgerald Dr.	Map Schedule
71	El Cerrito Plaza BART to Richmond Parkway Transit Center via Carlson Blvd., Richmond BART, Rumrill Blvd., Contra Costa College, Parchester Village, Giant Highway, Atlas Rd., and Richmond Parkway.	Map Schedule
72	Hilltop Mall to Oakland Amtrak via Moyers Rd., Contra Costa College, San Pablo Ave., El Cerrito del Norte BART, downtown Oakland, and Jack London Square.	Map Schedule
72M	Point Richmond to Oakland Amtrak via Garrard Blvd., Macdonald Ave., El Cerrito del Norte BART, San Pablo Ave., downtown Oakland, and Jack London Square.	Map Schedule
72R	San Pablo Rapid — Contra Costa College to Jack London Square via El Cerrito del Norte BART, San Pablo Ave. and downtown Oakland.	Map Schedule
73	Eastmont Transit Center to Oakland Airport via 73rd Ave., Coliseum BART and Hegenberger Rd.	Map Schedule
74	Marina Bay, Richmond to Castro Ranch Rd. & San Pablo Dam Rd., El Sobrante, via Richmond BART, 23rd St., Contra Costa College and San Pablo Dam Rd. Weekends, some trips travel from Contra Costa College to Hilltop Mall.	Map Schedule
75	Two-way loop: San Leandro BART, Dutton Av., MacArthur Bl., Foothill Sq., Grand Ave., Bayfair Ctr., Bay Fair BART, Hesperian Bl., Lewelling Bl., Farnsworth St., Wiley St., Merced St., and Williams St.	Map Schedule
76	El Cerrito del Norte BART to Hilltop Mall via Cutting Blvd., Richmond BART, North Richmond, Market St., Church Lane, Road 20, Contra Costa College, Birmingham Dr. and Shane Rd.	Map Schedule
83	Hayward BART to South Hayward BART via A St., Hesperian Blvd., Clawiter Blvd., Investment Blvd., Arden Rd. and Tennyson Rd.	Map Schedule
85	San Leandro BART to South Hayward BART via Washington Ave., Paseo Grande, Hesperian Blvd., A St., Hayward BART, Soto Rd. and Gading Rd.. Extended weekdays to Union Landing Transit Ctr. via Tampa Ave.,Industrial Parkway W., and Huntwood Ave.	Map Schedule
86	Hayward BART to South Hayward BART via Winton Ave., Mack St. (AC Transit Hayward Division), Cabot Blvd., Industrial Blvd. and Tennyson Rd.	Map Schedule
88	From Berkeley BART to Lake Merritt BART via University Ave., Sacramento St., Market St. and downtown Oakland.	Map Schedule
89	Two-way loop: San Leandro BART, Davis St., West Gate Pkwy., Williams St., S. L. Marina, Wicks Bl., Lewelling Bl., Farnsworth St., Halcyon Dr., Bayfair Ctr., Bay Fair BART, Bancroft Ave. and Estudillo Ave.	Map Schedule
93	Two-way loop: Hayward BART, Mission Blvd., Bay Fair BART, Ashland Ave., Paseo Grande, Grant Ave., Bockman Rd., Hacienda Ave. and Meekland Ave.	Map Schedule
94	Hayward BART to Hayward Highlands via East St. and Hayward High School.	Map Schedule
95	Hayward BART to Fairview District via D St. and Maud Ave.	Map Schedule
97	Bay Fair BART to Union City BART via Hesperian Blvd., Chabot College, Union Landing Shopping Center and Alvarado-Niles Blvd.	Map Schedule
98	Two-way loop: Coliseum BART, Edgewater Dr., 98th Ave., MacArthur Blvd., 90th Ave., and 85th Ave.	Map Schedule
99	Bay Fair BART to Fremont BART via Mission Blvd., Hayward BART, South Hayward BART, Union City BART, Decoto Rd., Fremont Blvd. and Walnut Ave.	Map Schedule
200	Union City BART to Fremont BART via Decoto Road, Newark Blvd., Thornton Ave., Filbert St., Central Ave., Cedar Blvd., NewPark Mall, Mowry Ave., and Civic Center Dr.	Map Schedule
210	Ohlone College to Union Landing Shopping Center via Washington Blvd., Fremont Blvd. and Alvarado Blvd.	Map Schedule
212	Fremont BART to Pacific Commons via Walnut Ave., Fremont Blvd., and Auto Mall Parkway. On weekdays, continues to NewPark Mall via Christy St., Allbrae St., and Cedar Blvd.	Map Schedule
215	Fremont BART to Northwest Polytechnic University, Fremont, via Gallaudet Dr., Stevenson Blvd., Paseo Padre Pkwy., Grimmer Blvd., Washington Blvd., Osgood Rd., Grimmer Blvd., Fremont Blvd., Landing Pkwy., Warren	Map

	Ave., Benicia St., and Warm Springs Blvd.	Schedule
216	Union City BART to Ohlone College Newark Campus (weekends, Silliman Center) via Alvarado-Niles Rd., Niles Blvd., Mowry Ave., Fremont BART, Stevenson Blvd., Cedar Blvd., and NewPark Mall.	Map Schedule
217	Fremont BART to Great Mall Transit Center, Milpitas, via Walnut Ave., Mission Blvd., Warm Springs Blvd., Milpitas Blvd., India Community Center and Main St.	Map Schedule
232	Fremont BART to New Park Mall via Walnut Ave., Mission Blvd., Union City BART, Paseo Padre Pkwy., Ardenwood Blvd., Lido Faire Shopping Center and Cedar Blvd.	Map Schedule
239	Fremont BART to Milmont Dr. and Kato Rd., Fremont, via Walnut Ave., Paseo Padre Pkwy., Grimmer Blvd., Mission Blvd. Warm Springs Blvd., Dixon Landing Road and Milmont Dr.	Map Schedule
251	Fremont BART to Ohlone College, Newark Campus (weekends: Silliman Center) via Walnut Ave., Paseo Padre Pkwy., Thornton Ave., Newark Blvd., Central Ave., and Cherry St.	Map Schedule
275	Union City BART to Four Corners shopping area via Decoto Rd., Fremont Blvd., Thornton Ave., Willow St., Enterprise Dr., Filbert St., Sycamore St., Haley St., and Jarvis Ave.	Map Schedule
314	From West Oakland Post Office (7th St. & Campbell St.) to Edgewater Dr. & Hegenberger Blvd., Oakland, via via Downtown Oakland, Webster St., Santa Clara Ave., Alameda Towne Center, Otis Dr., Doolittle Dr., and Hegenberger Rd.	Map Schedule
339	Fruitvale BART to Chabot Space & Science Center via Fruitvale Ave., Lincoln Ave., Joaquin Miller Rd., and Skyline Blvd.	Map Schedule
356	E. E. Cleveland Senior Center to Alameda Towne Center via Palo Vista Gardens, Allen Temple Arms, Hegenberger Rd., Doolittle Dr., and Otis Dr.	Map Schedule
376	El Cerrito Del Norte BART to Pinole Vista via Cutting Blvd., Richmond BART, North Richmond, Contra Costa College, Parchester Village, and Richmond Pkwy. Return via Richmond Parkway Transit Center and Hilltop Mall.	Map Schedule
386	Hayward BART to Sabre St. & Mack St. (AC Transit Hayward Division) via Winton Ave. and Southland Drive.	Map Schedule

(Local lines: 68)

Transbay Lines

Line	Description	Links
B	Lakeshore Ave. & Longridge Dr. to Transbay Temporary Terminal, San Francisco via Longridge Dr., Trestle Glen Rd. and I-580.	Map Schedule
C	Highland Ave. & Highland Way, Piedmont, to Transbay Temporary Terminal, San Francisco via Moraga Ave., Piedmont Ave. and 40th St.	Map Schedule
CB	Warren Freeway and Broadway Terr. to San Francisco via Duncan Way, Harbord Ave., Broadway Terrace and Broadway.	Map Schedule
E	Caldecott Ln. and Tunnel Rd. to Transbay Temporary Terminal, San Francisco via Claremont Ave.	Map Schedule
F	UC Campus to Transbay Temporary Terminal, San Francisco via Shattuck Ave., Adeline St. and 40th St.	Map Schedule
FS	Solano Ave. & Colusa St. to Transbay Temporary Terminal, San Francisco via Shattuck Ave. and University Ave.	Map Schedule
G	Richmond St. & Potrero St., El Cerrito to Transbay Temporary Terminal, San Francisco via Colusa Ave., Solano Ave. and San Pablo Ave.	Map Schedule
H	Barrett Ave. & San Pablo Ave., El Cerrito, to Transbay Temporary Terminal, San Francisco via Arlington Ave., Monterey Ave. and Gilman St.	Map Schedule
J	Sacramento St. and University Ave., Berkeley to Transbay Temporary Terminal, San Francisco via Sacramento St., Ashby Ave. and Christie St.	Map Schedule
L	San Pablo Dam Rd. & Princeton Plaza Shopping Center to Transbay Temporary Terminal, San Francisco via El Portal Dr., Rollingwood Dr., San Pablo Ave. and Pierce St.	Map Schedule
LA	Hilltop Dr. Park & Ride to San Francisco via Hilltop Drive, Richmond Parkway and Richmond Parkway Transit Center. Some trips start from Hilltop Green Park.	Map Schedule
LC	Transbay Temporary Terminal, San Francisco to Hilltop Dr. Park & Ride via I-80, Pierce St., San Pablo Ave., El Portal Dr., I-80, Richmond Pkwy. and Hilltop Dr. From San Francisco only; travel to San Francisco via line L or LA.	Map Schedule
M	Hayward BART to Hillsdale Shopping Center via San Mateo Bridge and (commute hours only) Oracle Headquarters.	Map Schedule
NL	Eastmont Transit Center to Transbay Temporary Terminal, San Francisco via MacArthur Blvd., Grand Ave., downtown Oakland and West Grand Ave. Makes limited stops.	Map Schedule
NX	Seminary Ave. & MacArthur Blvd. to San Francisco via MacArthur Blvd. and I-580 (entering freeway at Grand Ave.). To San Francisco only; return via line NX1 or NX2.	Map Schedule
NX1	Transbay Temporary Terminal, San Francisco to Fruitvale Ave. & MacArthur Blvd. via I-580 (exiting at Grand Ave.) and MacArthur Blvd. From San Francisco only; travel to San Francisco via Line NX.	Map Schedule
NX2	Transbay Temporary Terminal, San Francisco to High St. & MacArthur Blvd. via I-580, Fruitvale Ave. and MacArthur Blvd. From San Francisco only; travel to San Francisco via Line NX.	Map Schedule
NX3	Marlow Dr. & Foothill Way to Transbay Temporary Terminal, San Francisco via MacArthur Blvd., Eastmont Transit Center and High St.	Map Schedule
NX4	Castro Valley Park & Ride to Transbay Temporary Terminal, San Francisco via Center St., Seven Hills Rd., Lake Chabot Rd. and Foothill Blvd.	Map Schedule
NXC	Transbay Temporary Terminal, San Francisco to Castro Valley Park & Ride via I-580, Fruitvale Ave., MacArthur Bl., Foothill Bl., Lake Chabot Rd., and Seven Hills Rd. From S.F. only; travel to S.F. via line NX, NX3, or NX4.	Map Schedule
O	Fruitvale BART to Transbay Temporary Terminal, San Francisco, via Fruitvale Bridge, Fernside Blvd., High St., Encinal Ave., Broadway, Santa Clara Ave. and Webster St.	Map Schedule
OX	Bay Farm Island to Transbay Temporary Terminal, San Francisco via Island Dr. Park & Ride, Encinal Ave. and Park St.	Map Schedule
P	From Highland Ave. & Highland Way, Piedmont, to Transbay Temporary Terminal, San Francisco via Oakland Ave., Harrison St., and I-580.	Map Schedule
S	Eden Shores, Hayward, to Transbay Temporary Terminal, San Francisco via Hesperian Blvd., Paseo Grande., Washington Ave., Lewelling Blvd., Farnsworth St., Merced St. and I-880.	Map Schedule
SB	Cedar Blvd. & Stevenson Blvd., Newark, to San Francisco via Cedar Blvd., Newark Blvd, Union City Blvd. and Hesperian Blvd.	Map Schedule

U	Fremont BART to Stanford University via Centerville Amtrak, Ardenwood Park & Ride, and the Dumbarton Bridge.	Map Schedule
V	Broadway and Broadway Terr. via Broadway Terrace, Moraga Ave., Park Blvd. and I-580.	Map Schedule
W	Broadway & Blanding Ave., Alameda, to Transbay Temporary Terminal, San Francisco via Fernside Blvd., High St., Otis Dr. and Webster St.	Map Schedule
Z	Transbay Temporary Terminal, San Francisco to San Pablo Ave.& Marin Ave., Albany via Christie St., Hollis St. and Sixth St. (Continues to Buchanan St. & Pierce St. in mornings.)	Map Schedule

(Transbay lines: 29)

All Nighter Lines

Line	Description	Links
800	All Nighter. Richmond BART to Market St. & Van Ness Ave., S.F. (Weekends: 24th St. BART), via San Pablo Ave., University Ave., Telegraph Ave. and downtown Oakland. Returns via Market St., the Transbay Temp. Terminal, and West Oakland BART.	Map Schedule
801	All Nighter. Downtown Oakland to Fremont BART via International Blvd., E. 14th St., Mission Blvd., Union City BART, Decoto Rd., and Fremont Blvd.	Map Schedule
802	All Nighter. Berkeley Amtrak to downtown Oakland via San Pablo Ave.	Map Schedule
805	All Nighter. Downtown Oakland to Oakland Airport via Grand Ave., MacArthur Blvd., and Coliseum BART.	Map Schedule
822	Early weekend mornings only from 24th St./Mission BART to Pittsburg/Bay Point BART via Mission St., Market St., the Transbay Temporary Terminal, 14th St. & Broadway, Rockridge BART, Walnut Creek BART, and Pleasant Hill/Contra Costa Centre BART.	Map Schedule
840	All Nighter. Downtown Oakland to Eastmont Transit Center via Foothill Blvd.	Map Schedule
851	All Nighter. Downtown Berkeley to Fruitvale BART via UC Campus South, College Ave., Broadway, downtown Oakland, Webster St., Santa Clara Ave., Broadway, and Fruitvale Ave.	Map Schedule

(All Nighter lines: 7)

Supplementary Lines

Line	Description	Links
604	North Berkeley BART to Hebrew Day School, Head Royce High School and Bentley School via University Ave., UC Campus South, College Ave. and Ashby Ave.	Map Schedule
605	University Ave. & Shattuck Ave., Berkeley, to Head Royce High School via UC Campus South, College Ave., Broadway Terrace, and Montclair.	Map Schedule
606	Highland Ave. and Moraga Ave., Piedmont, to Head Royce High School via Highland Ave., Crocker Ave. and Mandana Blvd.	Map Schedule
607	Point Richmond to Richmond High School via Macdonald Ave., Richmond BART, Harbour Way, Rumrill Blvd., and 23rd St.	Map Schedule
618	14th St. & Broadway, Oakland, to Montera Middle School via 11th/12th streets, Park Blvd., Liemert Blvd., and Mountain Blvd.	Map Schedule
620	Cedar Blvd. & Stevenson Blvd., Newark, to Newark Jr. High via Cedar Blvd., Central Ave., Sycamore St. and Thornton Ave.	Map Schedule
621	Ardenwood Blvd. & Commerce Dr., Fremont to American High School and Thornon Jr. High School via Paseo Padre Pkwy., Decoto Rd. and Fremont Blvd.	Map Schedule
623	Dixon Landing Rd. & Milpitas Blvd., Milpitas to Irvington High School or Horner Jr. High School via Warm Springs Blvd., Mission Blvd., Paseo Padre Pkwy., Auto Mall Pkwy. and Grimmer Blvd.	Map Schedule
624	Paseo Padre Pkwy. & Mission Blvd., Fremont to Mission San Jose High School via Paseo Padre Pkwy., Driscoll Rd. and Mission Blvd.	Map Schedule
625	Niles Blvd. & El Portal Ave., Fremont, to Washington High School and Centerville Jr. High School via Niles Blvd., Mowry Ave. and Fremont Blvd.	Map Schedule
626	Lido Faire Shopping Center to Newark Memorial High School via Newark Blvd. and Cedar Blvd.	Map Schedule
628	Lido Faire Shopping Center to Newark Memorial High School via Cedar Blvd.	Map Schedule
629	Lido Faire Shopping Center to Newark Memorial High School via Jarivs Ave., Haley St., Sycamore St. and Cherry St.	Map Schedule
631	Bay Farm Island to Encinal High School via Encinal Ave., Alameda High School, Central Ave., Webster St. and Lincoln Ave.	Map Schedule
638	Skyline High School to 73rd Ave. & MacArthur Blvd. via Redwood Rd., Hwy. 13, I-580, MacArthur Blvd. and 73rd Ave.	Map Schedule
641	Bancroft Ave. & 106th Ave., Oakland to Fremont High School via Bancroft Ave., Havenscourt Blvd. and Foothill Blvd.	Map Schedule
642	Skyline Blvd. & Tunnel Rd., Oakland via Broadway Terrace and Mountain Blvd. or Snake Rd. & Colton Blvd., Oakland via Colton Blvd., Saroni Dr., Snake Rd. and Mountain Blvd. to Montera Middle School.	Map Schedule
643	Montana St. & Fruitvale Ave., Oakland to Skyline High School via MacArthur Blvd., Coolidge Ave. and Joaquin Miller Rd.	Map Schedule
646	Coliseum BART to Skyline High School via 81st Ave., 82nd Ave., Fontaine St., Keller Ave., Hansom Dr. and Skyline Blvd.	Map Schedule
648	Fruitvale BART to Skyline High School via High St., Tompkins Ave. and Redwood Rd.	Map Schedule
649	Golf Links Rd. & Dunkirk Ave., Oakland, to Skyline High School via Golf Links Rd., Sequoyah Rd. and Skyline Blvd.	Map Schedule
650	Seminary Ave. & International Blvd., Oakland, to Skyline High School via Seminary Ave., Greenly Dr., Keller Ave., Hansom Dr. and Skyline Blvd.	Map Schedule
651	9th St. & Broadway, Oakland, to Holy Names High School via Broadway and Broadway Terrace.	Map Schedule
652	90th Ave. & International Blvd., Oakland, to Skyline High School via 90th Ave., 98th Ave., Sequoyah Rd.,	Map

	Hansom Dr. and Skyline Blvd.	Schedule
653	40th St. & San Pablo Ave., Emeryville to Montera Middle School via 40th St., MacArthur Blvd., and Lincoln Ave.	Map Schedule
654	Frutivale BART to Skyline High School via 35th Ave. and Redwood Rd.	Map Schedule
655	Frutivale BART to Montera Middle School via 35th Ave., Redwood Rd., Skyline Blvd., Joaquin Miller Rd. and Mountain Blvd.	Map Schedule
657	Coliseum BART to Oakland Technical High School via 73rd Ave. and MacArthur Blvd.	Map Schedule
658	40th St. & San Pablo Ave., Emeryville to Skyline High School via 40th St., MacArthur Blvd., Lincoln Ave., and Joaquin Miller Rd.	Map Schedule
660	40th St. & San Pablo Ave., Emeryville to Montera Middle School via 40th St., Broadway, Broadway Terrace, Florence Ave., Harbord Dr. and Mountain Blvd.	Map Schedule
662	40th St. & San Pablo Ave., Emeryville to Skyline High School via 40th St., Broadway, Broadway Terrace, Florence Ave., Harbord Dr., Mountain Blvd. and Joaquin Miller Rd.	Map Schedule
663	Broadway & Blanding Ave., Alameda, to Ralph Appezzato Mem. Pkwy. & 3rd St. via Fernside Blvd., High St., Encinal Ave., Park St., Otis Dr., Shoreline Dr., Westline Dr., Central Ave., Webster St., Lincoln Ave. and Encinal High School.	Map Schedule
667	Market St. & 6th St., North Richmond to El Cerrito High School and Portola Middle School via Market St., Fred Jackson Way, 7th St., Macdonald Ave. and San Pablo Ave.	Map Schedule
668	Richmond BART to El Cerrito High School and Portola Middle School via Harbour Way, Cutting Blvd. and San Pablo Ave.	Map Schedule
669	Contra Costa College to Juan Crespi Middle School via El Portal Dr., Church Lane, San Pablo Dam Rd., Castro Ranch Rd., Carraige Dr., Olinda Rd. Valley View Rd., Appian Way and Fitzgerald Dr.	Map Schedule
671	Contra Costa College to De Anza High School via Birmingham Dr., Shane Dr., Hilltop Dr., I-80, Fitzgerald Dr., Juan Crespi Middle School, Appian Way, and Valley View Rd.	Map Schedule
672	Broadway Ave. & College Ln. to Juan Crespi Middle School via Broadway, 11th St., Stanton Ave., Robert H. Miller Dr., Hilltop Dr., Hilltop Green, Appian Way and Fitzgerald Dr.	Map Schedule
675	Richmond BART to Portola Middle School and El Cerrito High School via Harbour Way, Cutting Blvd., Potrero Ave., 47th St., Carlson Blvd. and Fairmount Ave.	Map Schedule
676	Contra Costa College to De Anza High School via El Portal Dr., Moyers Rd., Groom Dr., , Hilltop Dr., I-80, Fitzgerald Dr., Juan Crespi Middle School, Appian Way, and Valley View Rd.	Map Schedule
679	Contra Costa College to Juan Crespi Middle School via El Portal Dr., Church Lane, San Pablo Dam Rd., May Rd. Valley View Rd., Appian Way and Fitzgerald Dr.	Map Schedule
680	Grand Ave. & MacArthur Blvd., Oakland, to Bishop O’Dowd High School via MacArthur Blvd.	Map Schedule
681	Macdonald Ave. & Richmond Parkway to Levonya DeJean Middle School via Macdonald Ave., Harbour Way, Cutting Blvd, S. 37th St. and Macdonald Ave.	Map Schedule
682	40th St. & Broadway, Oakland, to Bishop O’Dowd High School via Broadway, Broadway Terrace, Mountain Blvd. and Hwy. 13.	Map Schedule
684	Richmond BART to El Cerrito High School via Macdonald Ave., 23rd St., Garvin Ave., McBryde Ave., Arlington Blvd., Adams Middle School, Cuting Blvd., Glenmawr Ave., Navellier St., Scott St. and Ashbury Ave.	Map Schedule
687	Bay Farm Island to Lincoln Middle School via Bay Farm Island Bridge and Fernside Blvd.	Map Schedule
688	Grand Ave. & MacArthur Blvd., Oakland, to Monterey Ave. & Hopkins Ave. via MacArthur Blvd., Park Blvd., Mountain Blvd., Broadway Terrace, Broadway, College Ave., Alcatraz Ave., and Sacamento St.	Map Schedule
696	From Skyline Blvd. & Redwood Rd. to Oakland Technical High School via Skyline Blvd., Joaquin Miller Rd., Mountain Blvd., Montclair, Harbord Dr., Broadway Terrace and Broadway.	Map Schedule

(Supplementary lines: 47)

(Total lines: 151)

Find maps & schedules for these lines. Or call 511 and say "AC Transit" for trip-planning assistance.

Google Translator:

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Countywide Travel Demand Model

The Alameda countywide travel demand model is an essential tool for the CMP planning process. The model allows the Alameda CTC to anticipate and forecast the potential impacts of local land development decisions on the major roadways in the county. The model is periodically updated to be consistent with the most recent land use and socio-economic database of the Association of Bay Area Governments (ABAG) and assumptions of the Metropolitan Transportation Commission's regional travel demand model. The most recent Alameda countywide travel demand model completed in July 2014 includes land use and transportation assumptions updated to Plan Bay Area and several revised features.

Key features of the model

MODEL DOCUMENTATION

- Final Documentation for the Countywide Model
- Performance Measure Maps

Final Traffic Analysis Zones (TAZs)

- Planning Area 1 (North)
- Planning Area 2 (Central)
- Planning Area 3 (South)
- Planning Area 4 (East)

Model Vehicle Volumes

Below are the plots of the model volumes for a.m. peak 1-hour, p.m. peak 1-hour, a.m. peak 4-hour, p.m. peak 4-hour and daily for the four Planning Areas of Alameda County. Volume plots for each time period are organized by horizon year (2010, 2020 and 2040) for each planning area. The volume numbers appear directly on the network roadway links and are printed quite small to show volumes on as many links as possible, but you can use the Adobe viewer to zoom in on them (view at 800 percent recommended).

2010

Planning Area 1	Planning Area 2	Planning Area 3	Planning Area 4
AM 1 HR	AM 1 HR	AM 1 HR	AM 1 HR
AM 4 HR	AM 4 HR	AM 4 HR	AM 4 HR
Daily	Daily	Daily	Daily
PM 1 HR	PM 1 HR	PM 1 HR	PM 1 HR
PM 4 HR	PM 4 HR	PM 4 HR	PM 4 HR

2020

Planning Area 1	Planning Area 2	Planning Area 3	Planning Area 4

AM 1 HR	AM 1 HR	AM 1 HR	AM 1 HR
AM 4 HR	AM 4 HR	AM 4 HR	AM 4 HR
Daily	Daily	Daily	Daily
PM 1 HR	PM 1 HR	PM 1 HR	PM 1 HR
PM 4 HR	PM 4 HR	PM 4 HR	PM 4 HR

2040

Planning Area 1	Planning Area 2	Planning Area 3	Planning Area 4
AM 1 HR	AM 1 HR	AM 1 HR	AM 1 HR
AM 4 HR	AM 4 HR	AM 4 HR	AM 4 HR
Daily	Daily	Daily	Daily
PM 1 HR	PM 1 HR	PM 1 HR	PM 1 HR
PM 4 HR	PM 4 HR	PM 4 HR	PM 4 HR

Performance Measure Maps

In support of Alameda CTC's documentation of the 2013 Model update, the agency has created maps for the three following performance measures: vehicle miles traveled, transit accessibility and miles of congested roads. Maps are available for model study years 2010, 2020 and 2040.

VEHICLE MILES TRAVELED (VMT)

VMT Per Person	VMT Per Employee
2010	2010
2020	2020
2040	2040

TRANSIT ACCESSIBILITY

Transit accessibility is based on the number of jobs within a certain number of minutes of travel time by transit.

Jobs Within 30 Minutes	Jobs Within 60 Minutes
2010	2010
2020	2020
2040	2040

MILES OF CONGESTED ROADS

The color codes indicate network link volume/capacity ratios for the p.m. 4-hour peak period.

PM 4 HR Period
2010
2020
2040

Archive

Complete Model Documentation for the Prior Model Updated in 2011