Appendix D

2014 RTP Performance Measure Analysis

Introduction

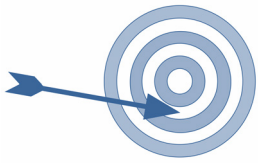
The performance of the 2014 RTP has been analyzed to determine how well the constrained list of transportation projects and programs advance the goals established for this RTP and affect the region's future. RTP performance can be assessed by setting targets and developing methodologies for forecasting how the projects on the constrained list, if implemented by 2035, will advance these targets. The adopted targets were intended to be aggressive, but reasonably obtainable.

The plan makes progress towards and meets many of the targets set forth for the RTP, though funding constraints make it impossible to fully meet all of the targets. The greenhouse gas emissions target as well as the economic benefit target have not only been met but exceeded. The discussion below describes how well the Santa Cruz County 2014 RTP performs for each of the targets. More detailed information on the analysis used to determine target performance can be found in the following sections. A summary of the performance results are outlined in **Figure D.2**. Performance in year 2035 is measured against base years as noted below.

GOAL 1. Improve people's access to jobs, schools, health care and other regular needs in ways that improve health, reduce pollution and retain money in the local economy.

Improve people's ability to meet most of their daily needs without having to drive. Improve access and proximity to employment centers.

- **Target 1A**. Increase the percentage of people that can travel to key destinations within a 30-minute walk, bike or transit trip by 20 percent by 2020 and 40 percent by 2035.[1]
- Base year: 2010
- Outcomes Advanced: Access & Mobility, Health, Safety, Equity, Economic Benefit, Cost Effectiveness, Climate &Energy



Plan falls short of target

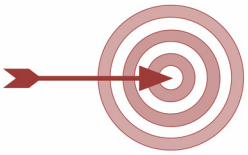
By improving people's ability to meet most of their daily needs without having to drive, this plan is improving access. New multimodal facilities placed near key destinations, which include residential, employment, and commercial centers, have the greatest potential to replace vehicle trips with walk, bicycle and transit trips. Bicycle and pedestrian facility improvements can create a safer environment for biking and walking. Placing these improvements near key destinations makes biking and walking more convenient for short trips. Projects that close the gaps in the bicycle and pedestrian network and shorten biking and walking routes

provide the greatest benefit in advancing this target. Transit projects that increase service frequency will also advance this target.

The percentage of the total county population within a 30 minute walk, bike or transit trip from a key destination in 2010 was already significant (73.9% for bike, 32.7% for walk, 54.6% for transit). This plan increases the population that is within a 30 minute bike or walk of key destinations to 74.3% for bike and 33.8% for walk but does not meet the established target of 75.9% of population with 30 minute bike access and 39.2% of the population with 30 minute walk access to key destinations. The gap between the 2010 baseline and the maximum population was closed by 9% for bike and 6% for walk compared to the 40% target (**Appendix C**).

Re-invest in the local economy by reducing transportation expenses from vehicle ownership, operation and fuel consumption. Reduce smog-forming pollutants and greenhouse gas emissions.

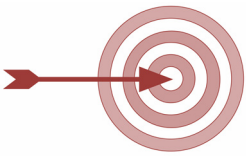
- **Target 1B.** Reduce per capita fuel consumption and greenhouse gas emissions by 1 percent by 2020 and 5 percent by 2035.
- Base year: 2005
- Outcomes Advanced: Access & Mobility, Health, Equity, Economic Benefit, Climate &Energy



Plan meets target

A reduction in greenhouse gas emissions from transportation will help to alleviate the effects of transportation on climate change. GHG emission reductions of 5% per capita by 2035 through land use and transportation investments have been mandated for the AMBAG region through the California Air Resources Board (CARB) and Senate Bill 375. The target identified for the Santa Cruz County 2014 RTP is a voluntary target of 5% per capita GHG emissions reduction based on transportation improvements that was developed to be consistent with regional efforts. The average Santa Cruz County resident travels approximately 15.3 miles per day. A five percent reduction by 2035 equates to shifting approximately 1 mile per day of motor vehicle travel to active transportation or reducing trip distances. Through prioritization of projects that promote transit use, biking, and walking, as well as changes in land use that shorten the distance people travel from home to work and home to shopping, per capita CO_2 emissions are reduced by 17.9% by 2035. Assuming that half of this reduction is due to transportation improvements (9.0%), this result not only meets but surpasses the Santa Cruz County 2014 RTP 5% reduction target.

- **Target 1C.** Re-invest in the local economy $5 million/year by 2020 and $10 million/year by 2035 from savings resulting from lower fuel consumption due to a reduction in vehicle miles traveled.
- Base year: 2005
- Outcomes Advanced: Access & Mobility, Economic Benefit, Cost Effectiveness, Climate &Energy

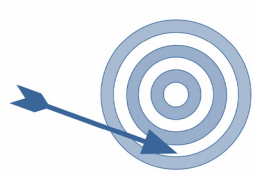


Plan meets target

Local economies benefit from less fuel consumption. A significantly greater proportion of household income is spent on transportation now than in the previous decade as a result of increases in vehicle, gasoline, and vehicle maintenance costs.[2] By reducing fuel consumption by reducing trip distances, idling, and through greater use of transit, bicycling and walking, and carpooling, the proportion of household income that is spent on transportation is reduced. Money otherwise spent on fuel is available for other expenditures. Research suggests that seventy three cents for every dollar not spent on fuel is reinvested locally.[3] Projects that provide travelers with convenient, safe, and competitive alternatives to the private automobile help advance this target. The plan exceeds the economic benefit target by reducing per capita fuel consumption by 17.9% allowing for $13 million/year to be reinvested in the local economy by 2035.

Improve the convenience and quality of trips, especially for walk, bicycle, transit, freight and carpool/vanpool trips.

- **Target 1Di.** Improve travel time reliability for vehicle trips, especially for transit, freight, carpool/vanpool.
- Base year: 2010
- Outcomes Advanced: Access & Mobility, Economic Benefit, Climate & Energy



Measure has not improved relative to existing conditions but has improved relative to 2035 no project

The 2014 RTP strives to minimize congestion challenges in our region through a travel time reliability target. Travel time reliability is a measure of how consistent the time is to drive from your origin to your destination and is an important measure of transportation service quality. Travel time reliability matters since being late to work, an appointment, or for a delivery have substantial repercussions for travelers and businesses. Improvements in travel time reliability for autos and transit allow people to better predict how long their trip will take even on regularly congested routes. For example, traffic management and operations projects and programs can significantly improve travel time reliability while improvements in average travel times from these types of projects may be modest **(Figure D.1**). Reliability measures will show a much greater improvement because they show the effect of improving the worst few days of unexpected delay.

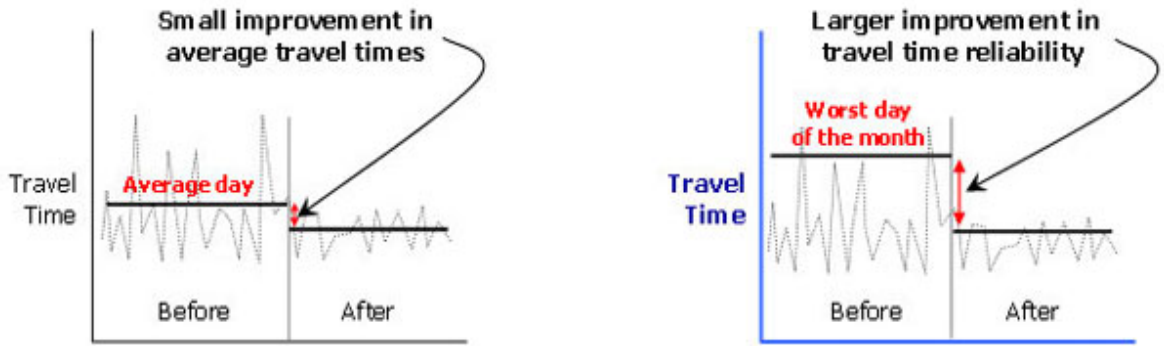
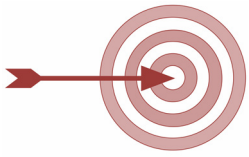


Figure D.1 – Reliability measures capture the benefits of traffic management

Source: Federal Highway Administration4

Projects in this plan that can improve travel time reliability include traffic signal synchronization, transit signal priority and queue jumps, incident management, and traveler information services. The performance analysis evaluated travel time reliability countywide, as well as for individual segments of Highway 1 and Highway 17. Forecasts of travel time reliability for 2035 based on project implementation do not improve the travel time reliability relative to the existing conditions but does make improvements relative to a no project alternative. The auxiliary lane projects planned for Highway 1 will allow vehicles more room to merge into traffic, smoothing the traffic flow. Although the full list of Highway 1 Corridor Program projects are not on the constrained list for the 2014 RTP, continual progress towards HOV lanes that allow for carpool and transit service to reduce travel times on Highway 1 will likely bring the greatest benefit to travel time reliability in the future.

- **Target 1Dii.** Improve multimodal network quality for walk and bicycle trips to and within key destinations.
- Base year: 2012
- Outcomes Advanced: Access & Mobility, Health, Safety, Equity, Economic Benefit, Cost Effectiveness, Climate & Energy

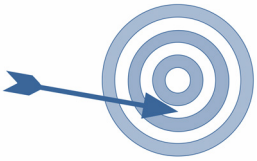


Plan meets target

While the network of bicycling and walking facilities throughout much of Santa Cruz County is substantial, improvements to the quality of this network could promote greater use. Separated or buffered bicycle facilities, wider bike lanes, lanes designed outside of the door zone of parked cars, all encourage use of bicycles as a means of travel. Sidewalks exist in much of the more populated areas of Santa Cruz County but there are gaps, which limit access for people with disabilities and are not always attractive due to proximity to heavy automobile volumes or speeds with little or no buffer between pedestrians and traffic. The quality of the multimodal network for bicycles and pedestrians, referred to as Multimodal Network Quality (MMNQ), provide both a qualitative and quantitative measure for the degree to which the active transportation options are safe and enjoyable (**Appendix C**). The projects in this plan improve the MMNQ and thus advance the target for both walk and bicycle trips within key destinations by designing facilities that are safe, convenient and comfortable to the user.

Improve health by increasing the percentage of trips made using active transportation, including bicycling, walking and transit.

- **Target 1E**. Decrease single occupancy vehicle (SOV) mode share by 4 percent by 2020 and by 8 percent by 2035.
- Base year: 2010
- Outcomes Advanced: Access & Mobility, Health, Safety, Equity, Economic Benefit, Cost Effectiveness, Climate & Energy



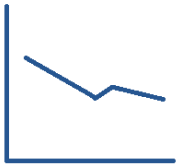
Plan falls short of target

Replacing trips traditionally made in a vehicle with walking or bicycling can lead to regular physical activity. Regular physical activity leads to improved public health and reduced obesity rates. Since the regional travel demand model can provide a more accurate percent reduction in single occupancy vehicle (SOV) mode share rather than a percent increase in active transportation mode share, the target is written as a reduction in SOV. This plan invests in bicycle and pedestrian trails that are separate from vehicle traffic to promote use by the beginning rider as well as increases/improvements in bicycle lanes, sidewalks and transit. While these investments do forecast an increase in the number of trips and miles people are walking and biking, forecasts predict a SOV mode share reduction of 6.4% based on vehicle miles traveled which falls short of the public health target of 8% reduction in SOV by 2035.

GOAL 2. Reduce transportation related fatalities and injuries for all transportation modes.

Improve transportation safety, especially for the most vulnerable users.

- **Target 2A.** Reduce injury and fatal collisions by mode by 20 percent by 2020 and by 50 percent by 2035.
- Base year: 2009-2011 average
- Outcomes Advanced: Health, Safety, Equity, Economic Benefit



Measure will be monitored over time to assess progress

- **Target 2B.** Reduce total number of high collision locations.
- Outcomes Advanced: Health, Safety, Equity, Economic Benefit

Improving the safety of transportation users, especially for the most vulnerable users, such as bicyclists and pedestrians, is a priority for Santa Cruz County as well as across California and the nation. Because approximately half of collisions nationwide take place at intersections[5], emphasis was placed on investing in transportation projects that would improve intersections with consideration for bicyclists and pedestrians. State Highway Operation and Protection Program (SHOPP) projects which are implemented by Caltrans on Santa Cruz County Highways (1, 9, 17, 129, 152, 236) focus on reducing collisions. Extra enforcement on Highway 17 through the Safe on 17 program, as well as separated or buffered bicycling and pedestrian facilities implemented by local jurisdictions have also been prioritized in this plan to improve safety. Although it has not been forecast how the projects will advance the safety target, the Statewide Integrated Traffic Records System (SWITRS) collision database will allow the RTC to monitor the number of collisions over time to assess how the investment of projects are advancing this target.

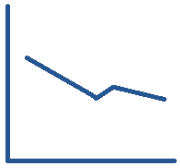
GOAL 3. Deliver access and safety improvements cost effectively, within available revenues, equitably and responsive to the needs of all users of the transportation system, and beneficially for the natural environment.

Maintain the existing system and improve the condition of transportation facilities.

- **Target 3A.** Increase the average local road pavement condition index (PCI) to 57 by 2020 and 70 by 2035.
- Base year: 2013
- Outcomes Advanced: Safety, Economic Benefit, Cost Effectiveness

Measure has improved relative to status quo levels of funding but has moved in opposite direction relative to existing conditions

- **Target 3B.** Reduce the number of transportation facilities in "distressed" condition by 3 percent by 2020 and 5 percent by 2035.
- Base Year: 2013
- Outcomes Advanced: Safety, Economic Benefit, Cost Effectiveness



Measure will be monitored over time to assess progress

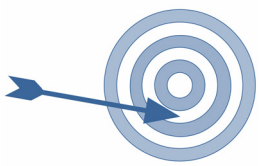
Pavement Condition Index
Good 70-100
Fair 50-69
Poor 25-49
Failed 0-24

A key focus of this RTP is on preserving the existing transportation infrastructure. Unfortunately, even with a significant share of the discretionary funding allocated for maintenance of local streets and roads (an increase of 10 million per year above typical status quo budget of $13 million), there are insufficient funds to bring the entire system into a state of good repair. Pavement, bicycle lanes, sidewalks, street lights, buses, and rail lines all require ongoing maintenance. The current pavement condition index of 53 ("At Risk" rating) for local streets and roads in Santa Cruz County indicates the need for substantial investment in maintenance. The transit system is also in need of maintenance and/or replacement to ensure continued and cost-effective service. This plan invests in pavement repairs, sidewalk and bicycle lane maintenance, bus replacements, transit centers in need of renovation, bus stops, transit service vehicles, and physical plants that need upgrades and maintenance. Despite these investments in maintaining existing transportation facilities or other maintenance activities, the local street and road pavement condition index is forecasted to drop to 43 by 2035 and thus the PCI target of 70 is not met. If only the status quo amount of the budget is spent on pavement maintenance, the PCI is expected to drop as low as 28 by 2035. This plan improves the PCI relative to status quo budget. See **Appendix C** for details on analysis and additional information on costs required for maintenance to advance target. Although it has not been forecast how the projects will reduce the number of transportation facilities in "distressed" condition, the local jurisdictions and the METRO track the

condition of their facilities which will allow the RTC to monitor how the investment of projects are advancing this target.

Enhance healthy, safe access to key destinations for transportation-disadvantaged populations.

- **Target 3C.** Reduce travel times and increase travel options for people who are transportation disadvantaged (TD) due to income, age, race, disability or limited English proficiency by increasing the percentage that are within a 30-minute walk, bike or transit trip to key destinations by 20% by 2020 and 40% by 2035 (relative to population in maximum buffer).



Plan falls short of target

- Base year: 2010
- Outcomes Advanced: Access & Mobility, Health, Safety, Equity, Economic Benefit, Cost Effectiveness, Climate &Energy

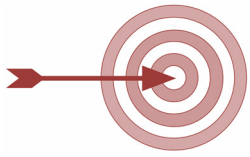
In advancing the goals of the RTP, the RTP works to ensure that diverse members of the region are able to equitably benefit from transportation investments. One measure analyzed was the percentage of transportation disadvantaged individuals (e.g. youth, elderly, minorities or low income) that can walk, bike, or take transit to key destinations within 30-minutes. Transportation-disadvantaged individuals are oftentimes unable to provide their own transportation or have difficulty accessing public transportation and are overrepresented in households without access to a vehicle. Lack of transit service, curb ramps or safe street crossings can create extra barriers that may prevent individuals from accessing jobs, housing, medical services, groceries, and other key destinations. Bicycle, pedestrian and transit facility improvements close to and within key destination areas will make biking, walking and riding transit safer, more convenient and thus more accessible to transportation disadvantaged populations.

The percentage of the transportation disadvantaged population within a 30 minute walk, bike or transit trip from a key destination in 2010 was already significant (78.7% for bike, 38.5% for walk, 58.8% for transit) and is greater than the total population by approximately 4 to 6% (**Appendix C**).

This plan increases the population that is within a 30 minute bike or walk of key destinations to 78.9% for bike (5.9% increase) and 39.6% for walk (6.4% increase) but does not meet the established target of 80.8% of population with 30 minute bike access (40% increase) and 45.2% of the population with 30 minute walk access (40% increase) to key destinations (**Appendix C**).

- **Target 3D.** Ensure transportation services (and impacts) are equitably distributed to all segments of the population.

- Outcomes Advanced: Access & Mobility, Health, Safety, Equity, Economic Benefit, Cost Effectiveness



Plan meets target

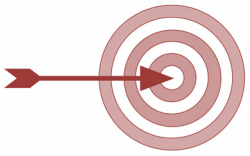
A key component of development and evaluation of the RTP was inclusion and consideration of the entire community to determine if the plan has the potential to affect certain neighborhoods and population groups in a disproportionate manner. Consistent with Title VI of the federal Civil Rights Act of 1964, Section 11135 of the California Government Code, and Executive Order 12898 on Environmental Justice, RTPs are required to ensure that any planned regional transportation improvements do not have a disproportionate adverse impact on low income or other under-represented groups and that minority and low-income populations receive equal benefits, on an equally timely basis, as other populations.

Planned regional transportation improvements were evaluated to ensure that they were equitably distributed to all segments of the population. Greater than 80% of the regional projects were found to benefit areas of the county with low income and minority populations. This analysis showed that new investments in transportation services are equitably distributed to all segments of the population and thus the target has been met.

Solicit Broad Public Input

- **Target 3E.** Maximize participation from diverse members of the public in RTC planning and project implementation activities.

- Outcomes Advanced: Equity



Plan meets target

The inclusion of the entire range of community interests in the development of the RTP is both best practice and required by both federal and state law. In order to ensure that transportation planning and projects reflect community interests, the RTC makes consistent efforts to include all county residents in the transportation discussions and decisions. The RTC joined AMBAG, Monterey and San Benito Counties to develop a public participation plan for the region that identifies options and opportunities for extensive outreach. Components of the plan include, but are not limited to:

- Contacts for community-based groups throughout the county, including neighborhood, health, senior, faith, environmental, low-income, and other social support groups

- Consultation with citizen and advisory committees

- Wide spread and easy access to transportation planning activities, including sections of the RTP as developed, through the RTC's website and social media

- Notifications about public hearings
- Bulletins to media partners
- Making documents available at local libraries
- Bilingual translation of materials, as appropriate

Development of the 2014 RTP has included participation by individuals and groups that represent our diverse community, consistent with the adopted Public Participation Plan, available online at www.ambag.org. At every juncture in developing the RTP, public participation was sought. This planning process meets the target for maximizing participation from the public. **Appendix A** provides a sample of the extensive public outreach done in developing the RTP.

Access and Environment

GOAL 1. Improve people's access to jobs, schools, health care and other regular needs in ways that improve health, reduce pollution and retain money in the local economy.

Target	Projects on Constrained List that can Advance Target	Findings	Score
Target 1A - Increase the percentage of people that can travel to key destinations within a 30-minute walk, bike or transit trip by 20 percent by 2020 and 40 percent by 2035.	• Bicycle and pedestrian facilities near major activity centers with emphasis on filling gaps in the network • Bicycle and pedestrian bridges over Highway 1 • Transit level of service improvements • Curb ramps	The percentage of the population that are within a 30 minute bike or walk of key destinations increase with implementation of the RTP but falls short of the target.	 *Plan falls short of target*
Target 1B - Reduce per capita fuel consumption and greenhouse gas emissions by 1 percent by 2020 and 5 percent by 2035.	• Bicycle, pedestrian, and transit facility improvements with emphasis on separated facilities • Bicycle, pedestrian, and transit amenities such as bus shelters and benches, signage, bike maps, bike parking • Bus rapid transit, such as transit priority • Educational and incentive programs to encourage and facilitate shifts to carpool, bike, walk, transit, telecommuting • Park and ride lots • Intersection Improvements that reduce idling	A reduction in per capita GHG emissions of 9% by 2035 from transportation improvements (assuming half of the 17.9% per capita GHG reductions from both land use and transportation improvements) has met and surpassed the 5% target.	 *Plan meets target*
Target 1C - Re-invest in the local economy $5 million/year by 2020 and $10 million/year by 2035 from savings resulting from lower fuel consumption due to a reduction in vehicle miles traveled.	• Bicycle, pedestrian, and transit facility improvements with emphasis on separated facilities • Bicycle, pedestrian, and transit amenities such as bus shelters and benches, signage, bike maps & racks • Bus rapid transit, such as transit priority • Educational and incentive programs to encourage shifts to carpool, bike, walk, transit • Park and ride lots	A reduction in fuel consumption allows $13 million to be re-invested into the local economy and thus the target has been met.	 *Plan meets target*

Access and Environment

GOAL 1. Improve people's access to jobs, schools, health care and other regular needs in ways that improve health, reduce pollution and retain money in the local economy.

Target	Projects on Constrained List that can Advance Target	Findings	Score
Target 1Di - Improve travel time reliability for vehicle trips.	• Hwy 1 Auxiliary Lanes • Intersection operational improvements • Roadway improvements such as merge lanes, transit turnouts • Signal synchronization • HOV signal priority and queue jumps • Bus rapid transit, such as transit priority • Freeway Service Patrol	Travel time reliability has decreased relative to existing conditions but has improved in comparison to 2035 no project.	 *Measure has decreased relative to existing conditions but has improved in comparison to 2035 no project*
Target 1Dii - Improve multimodal network quality for walk and bicycle trips to and within key destinations.	• Bicycle and pedestrian facilities in key destination areas with emphasis on filling gaps in the network • Two bicycle and pedestrian bridges over Highway 1 • Bicycle/pedestrian separated facilities • Bicycle and pedestrian treatments at intersections (e.g. crossing islands, painted boxes, bike signals etc) • Wider sidewalks buffered from automobile traffic • Traffic calming and greenways • Curb ramps	Bicycle and pedestrian network quality has improved with this plan.	 *Plan meets target*
Target 1E - Decrease single occupancy mode share by 4 percent by 2020 and by 8 percent by 2035.	• Bicycle, pedestrian, and transit facility improvements • Bus rapid transit, such as transit priority • Educational and incentive programs to encourage shifts to carpool, bike, pedestrian and , transit • Bicycle, pedestrian, and transit amenities such as bus shelters and benches, signage, bike maps, bike parking	Single occupancy vehicle mode share has decreased with this plan by 6.4% but falls short of the 8% target.	 *Plan falls short of target*

Safety

GOAL 2. Reduce transportation related fatalities and injuries for all transportation modes

Target	Projects on Constrained List that can Advance Target	Findings	Score
Target 2A - Reduce injury and fatal collisions by mode by 20 percent by 2020 and by 50 percent by 2035.	• Auxiliary lanes on Highway 1 • Intersection improvements with consideration for bicyclists and pedestrians • Bicycle and pedestrian treatments at intersections (e.g. crossing islands, painted boxes and bike signals) • Bicycle and pedestrian facility improvements with emphasis on separated facilities • Two bicycle and pedestrian bridges over Highway 1 • Traffic calming and greenways • Pedestrian crossings near schools and high pedestrian traffic areas	Due to the challenge of being able to forecast injuries and fatalities based on projects implemented, the number of injuries and fatalities for each mode can be monitored over time to assess progress.	 *Measure will be monitored over time to assess progress*
Target 2B - Reduce total number of high collision locations.	• Auxiliary lanes on Highway 1 • Intersection improvements with consideration for bicyclists and pedestrians • Bicycle and pedestrian treatments at intersections (e.g.crossing islands, painted boxes and bike signals) • Bicycle and pedestrian facility improvements with emphasis on separated facilities • Traffic calming and greenways • Pedestrian crossings near schools and high pedestrian traffic areas	Due to the challenge of being able to forecast injuries and fatalities based on projects implemented, the number of injuries and fatalities for each mode can be monitored over time to assess progress.	 *Measure will be monitored over time to assess progress*

Maintenance and Equity

GOAL 3. Deliver access and safety improvements cost effectively, within available revenues, equitably and responsive to the needs of all users of the transportation system, and beneficially for the natural environment.

Target	Projects on Constrained List that can Advance Target	Findings	Score
Target 3A - Increase the average local road pavement condition index to 57 by 2020 and 70 by 2035.	• Maintenance, repair and operation of local roadways • Caltrans SHOPP projects • Road rehabilitation and reconstruction	The pavement condition index (PCI) has decreased to 43 relative to existing PCI of 53 but is improved in comparison to status quo budget that could bring PCI down to 28. Target has not been met.	 *Measure has improved in comparison to status quo budget but has decreased relative to existing conditions*
Target 3B - Reduce the number of transportation facilities in "distressed" condition by 3 percent by 2020 and 5 percent by 2035.	• Maintenance, repair and operation of local roadways • Bus replacements • Upgrades to transit facilities • Caltrans SHOPP projects • Road rehabilitation and reconstruction	The number of transportation facilities in "distressed" condition can be monitored over time.	 *Measure will be monitored over time to assess progress*
Target 3C - Increase the percentage of people who are transportation disadvantaged due to income, age, race, disability, or limited English proficiency that are within a 30-minute walk, bike or transit trip to key destinations by 20% by 2020 and 40% by 2035.	• Bicycle and pedestrian facility improvements near schools and other transportation disadvantaged destinations with emphasis on filling gaps in the network and ADA improvements • Transit improvements such as increased service on high ridership routes • Curb ramps • Rail transit	The percentage of the transportation disadvantaged population that is within a 30 minute bike or walk of key destinations are increased but plan falls short of the target.	 *Plan falls short of target*

Maintenance and Equity

GOAL 3. Deliver access and safety improvements cost effectively, within available revenues, equitably and responsive to the needs of all users of the transportation system, and beneficially for the natural environment.

Target	Projects on Constrained List that can Advance Target	Findings	Score
Target 3D - Ensure transportation services (and impacts) are equitably distributed to all segments of the population.	• Bus rapid transit, such as transit priority • Transit improvements such as increased service on high ridership routes • Auxiliary lanes on Highway 1 • Monterey Bay Sanctuary Scenic Trail • Rail transit	The regional projects that are identified in the plan provide an equitable distribution to low income and minority populations and thus the target has been met.	 *Plan meets target*
Target 3E - Maximize participation from diverse members of the public in planning and project implementation activities.	• Public participation plan • Workshops • Web and social media outreach • Email distributions • Surveys • Press releases • Project sponsor board approvals	Public participation was solicited in developing the plan at every juncture and thus the target has been met.	 *Plan meets target*

Figure D.2 – Summary of 2014 Project List Performance for Advancing Targets

Source: Santa Cruz County Regional Transportation Commission

Performance Analysis Technical Methodology

The below technical discussion expands upon the performance discussion above by describing the target development, forecasting methodology, the baseline data and the performance results. RTC has been using performance measures for many years in developing the RTP but the 2014 RTP is the first time that targets have been defined and performance has been assessed based on the projects on the constrained project list. The performance targets are used to evaluate how well the 2014 RTP addresses the adopted goals and policies.

Target 1A. Increase the percentage of people who can travel to key destinations within a 30-minute walk, bike or transit trip by 20% by 2020 and 40% by 2035.[6]

Target Development

Transportation users consist of people and businesses that want to reach a destination. When you combine places to go with convenient, safe and comfortable routes, then you increase the options for accessing goods and services, jobs, activities and other destinations. New or improved multimodal facilities placed near key destinations, which include employment, population and commercial centers, have the greatest potential to replace vehicle trips with shorter walk and bicycle trips. The number of individuals who can travel from their home to services on a continuous network of buses, bicycle and pedestrian facilities is a measure of the extent to which individuals have access to goods and services in Santa Cruz County.

Areas that provide a centralized location for accessing a variety of goods and services are defined here as key destinations. RTC identified eleven key destinations throughout Santa Cruz County based on locations of employment centers[7] and commercial centers (determined from the local jurisdictions land use zoning maps in their general plans). These destinations are mapped in

Figure D.3 and are listed below. For analysis, Scotts Valley destinations were combined.

- UC Santa Cruz
- Downtown Santa Cruz
- Soquel Drive (Soquel Ave to Mattison)
- 41st Avenue Commercial Corridor
- Scotts Valley – Scotts Valley Drive and Mt. Hermon Rd
- Capitola Village
- Cabrillo College
- Watsonville Hospital
- Freedom/Green Valley Road
- Downtown Watsonville

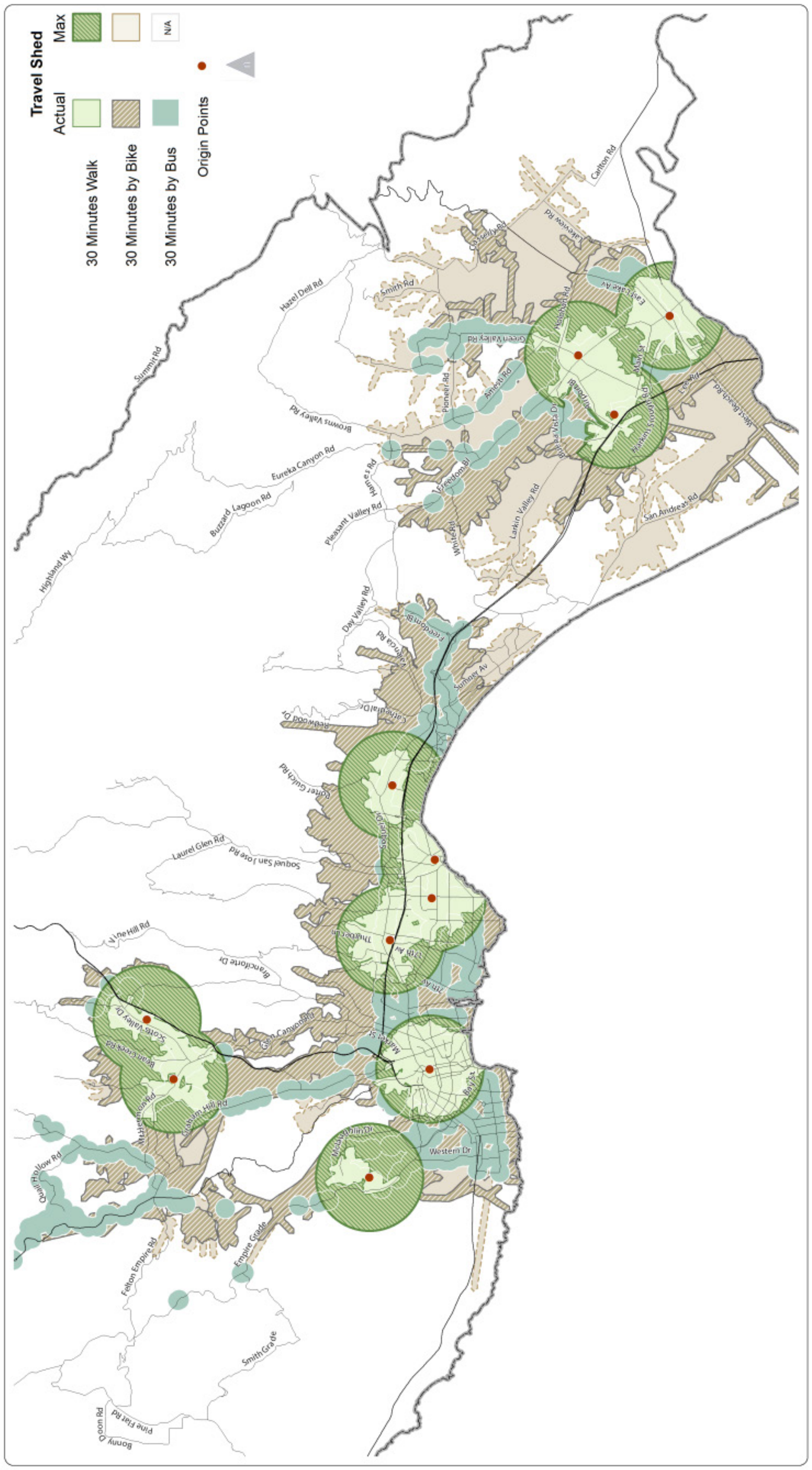


Figure D.3 – Key Destinations in Santa Cruz County, the Maximum Travel Buffer and the 2035 Travel Buffer

Source: Sustainable Transportation Council, Fehr & Peers

The population within 30 minute access by biking or walking to the central point of each key destination based on existing and proposed facilities is assessed to see how well this target is advanced given the projects prioritized in the 2014 RTP. Land use changes that locate more people near key destinations are another factor affecting the number of people who can access goods and services, but land use changes were not considered when analyzing this target because land use is outside the purview of the RTC. The access target discussed here addresses bicycle and pedestrian connectivity, whereas the multimodal network quality analysis under target 1Dii discusses the importance of analyzing the quality of the bicycle and pedestrian network.

The baseline population and maximum possible population that are within a 30 minute distance via walk and bike from key destinations are discussed below. The target for 2035 was set to close the gap between the 2010 baseline population and the maximum possible population by 40% by 2035 and an intermediate target of 20% by 2020.

Forecasting Methodology

ArcGIS network analyst was used to determine the proportion of the population that are within 30 minutes of travel via walking, bicycling, and transit from the central point of each of the key destinations (**Figure D.3)**. This target quantifies how access to key destinations increases through improvements to bike and walk facilities. Transit service improvements through increased frequency or additional routes would affect access in key destinations. Given the specific transit service improvements for the future are unknown as well as limitations of this analysis for transit, access improvements due to enhanced transit have not been analyzed.

The analysis used the following GIS data:

- Roadway centerline file with roadway functional classification and speed limits (from Santa Cruz County GIS)
- Bicycle lanes, trails, and paths (from RTC)
- Transit routes and stops (from Santa Cruz Metropolitan Transit District)
- City of Santa Cruz and Watsonville sidewalk coverage (from the Cities of Santa Cruz and Watsonville; sidewalk information currently unavailable for other areas)
- 2010 Population at the Traffic Analysis Zone (TAZ) level (from AMBAG)

Using the key destinations, a travelshed analysis was performed for each mode using network analyst. Travelshed refers to the area that people are able to travel given time, modes, physical attributes and constraints. For walking and bicycling, two types of travelsheds were developed: a "maximum travel" buffer and an "actual travel" buffer. An "actual travel" buffer provides the area around the central point of each key destination that can be accessed within 30 minutes by walking or biking based on existing facilities. The "maximum travel" buffer provides the area around the central point of each key destination that could be accessed if there was universal bicycle and pedestrian facility coverage. For transit, only the actual travel buffer analysis was performed, since transit could theoretically reach nearly every point in the county within 30 minutes under a maximum travel scenario. Once the area of the buffer is defined, the population living in the buffer can be determined from the census data.

Maximum Buffers. The maximum travel buffer was calculated differently for pedestrian and bicycle travel. For pedestrian travel, a circle was drawn around each key destination at the distance one could travel under ideal conditions (this would represent a transportation network that has a tight network of streets/trails with universal sidewalk coverage). For this analysis, it was assumed that under ideal conditions, a person can walk at 3.5 feet per second (a standard value used in transportation planning). This walking speed was applied to downtown Santa Cruz and Downtown Watsonville (areas with a relatively tight grid of streets) and a GIS network walkshed analysis was performed. Assuming 30 minutes of travel time at 3.5 feet per second, it was determined that one could walk 5,600 feet on the most direct routes. A "true" maximum walkshed is 6300 ft (30 minutes times 3.5 feet per second) but since there are almost no straight line paths leading from a key destination a circular maximum walk buffer of 5,600 feet was defined for each of the key destinations. One exception was made to this analysis for the Watsonville Airport area since it is not reasonable to expect that walking routes would ever be constructed across the airport. A portion of the circular buffer was removed to reflect this constraint.

A similar analysis was performed for bicycling. In this case, a maximum speed of 10 miles per hour was assumed and a GIS network bikeshed analysis was performed. Certain roads, such as freeways and minor mountainous roads were excluded since it is either illegal or impractical for a general member of the public to ride a bicycle on these routes. However, all reasonably foreseeable bicycle connectivity projects (including completion of the Monterey Bay Sanctuary Scenic Trail, connections to this trail, and new bicycle connections in areas anticipating future growth) were assumed in the maximum travel analysis. A circular buffer was not developed for maximum bicycle travel since physical constraints (hills, open spaces) make it impractical to assume that a bicycle network could be constructed that would provide complete bicycle access through the undeveloped and mountainous portions of the county.

Actual Travel Buffers. Actual travel buffers were developed for each key destination and for each mode based on the level of bicycle and pedestrian infrastructure and on the actual travel paths. For the walk mode, the walking speed is adjusted based on the prevalence of sidewalk facilities. In a hypothetical area with no sidewalk facilities, the walking speed in the analysis is reduced by 50%. In areas with 50% sidewalk coverage, the walk speed is reduced by 25%. Given the limited amount of sidewalk coverage data, analysis was based on an estimate of the percentage of sidewalk coverage for each key destination area. This percent coverage was estimated using GIS data for Santa Cruz and Watsonville and google streetview for other key destination areas. This analysis would be improved if actual sidewalk location data could be used to factor the walk speed on a street by street basis. For the bicycle network buffer, travel is allowed on any non-freeway street, however travel speed is reduced by 75% for roads with speeds in excess of 35 miles per hour that have no dedicated bicycle facilities (bicycle lanes or paths). Speeds were similarly reduced on mountainous roads, regardless of speed limit. These reductions in speeds reflect the fact that many potential cyclists are uncomfortable traveling on busy or steep roads, and therefore will either not travel by bike or take other longer routes to avoid these areas. Transit actual travel buffers were based on a five minute walk speed to stops and a 20 minute travel time on the routes, based on route schedules.

Baseline

The baseline results for each of the key destinations are shown in **Figure D.4**. The population within 30 minutes of each destination is based on population data from the 2010 census and bike, pedestrian and transit infrastructure from 2012.

Area	2010 Population within a 30-minute walk		2010 Population within a 30-minute bike ride		2010 Population within a 30-minute transit trip	
	Population	Proportion of County	Population	Proportion of County	Population	Proportion of County
Downtown Santa Cruz	21,691	8.3%	95,976	36.6%	84,721	32.3%
Scotts Valley (combined)	5,742	2.2%	17,385	6.6%	34,221	13.0%
UC Santa Cruz	1,413	0.5%	53,353	20.3%	54,717	20.9%
Soquel Dr (Soquel to Mattison)	4,258	1.6%	97,370	37.1%	87,641	33.4%
41st Ave	11,920	4.5%	86,263	32.9%	80,785	30.8%
Capitola Village	7,744	3.0%	77,236	29.5%	67,449	25.7%
Cabrillo College	2,508	1.0%	57,232	21.8%	59,417	22.7%
Green Valley / Freedom	12,749	4.9%	58,309	22.2%	44,544	17.0%
Watsonville Hospital	8,102	3.1%	57,351	21.9%	44,462	17.0%
Downtown Watsonville	16,934	6.5%	56,600	21.6%	44,276	16.9%

Figure D.4 – Total 2010 (baseline) population within 30 minutes of key destinations based on existing bicycle, pedestrian and transit infrastructure

Figure D.5 shows the baseline aggregate population within 30 minutes of the central point of any of the key destinations. Population within 30 minutes of key destinations via walking has the smallest percentage due to walking speed being slower than biking and riding transit. Percent of population that can access key destinations within 30 minutes via biking is the largest percentage due to the speed of biking relative to walking and no route limitations. Population that can access key destinations via transit is in between walking and biking as the analysis estimates the population within a maximum of a 5 minute walk to a bus stop, a 20 minute ride on the bus and a 5 minute walk to destination.

Figure D.3 shows the size of the access buffer areas for each mode.

Travel Mode	2010 Population within 30 minutes of key destinations	
	Population	Proportion of County
Walk	85,847	32.7%
Bike	193,792	73.9%
Transit	143,170	54.6%

Figure D.5 – Total 2010 (baseline) aggregate population within 30 minutes of any key destinations based on existing transit, bicycle and pedestrian infrastructure

Figure D.6 shows the maximum population within 30 minutes of each of the key destinations. The maximum population is the population that could access the central point of key destinations within 30 minutes by biking or walking if there was complete bicycle and pedestrian facility coverage in vicinity of key destinations.

Area	Maximum 2010 Population within a 30-minute walk		Maximum 2010 Population within a 30-minute bike ride	
	Population	Proportion of County	Population	Proportion of County
Downtown Santa Cruz	26,400	10.1%	98,905	37.7%
Scotts Valley (combined)	10,729	4.1%	21,173	8.1%
UC Santa Cruz	5,289	2.0%	53,764	20.5%
Soquel Dr (Soquel to Mattison)	15,171	5.8%	100,690	38.4%
41st Ave	21,666	8.3%	93,983	35.8%
Capitola Village	13,577	5.2%	87,396	33.3%
Cabrillo College	8,020	3.1%	61,775	23.6%
Green Valley / Freedom	19,418	7.4%	65,197	24.9%
Watsonville Hospital	10,690	4.1%	63,456	24.2%
Downtown Watsonville	24,008	9.2%	59,451	22.7%

Figure D.6 – Total 2010 Maximum* Population within 30 Minutes of Key Destinations

** Maximum reflects population if there was universal bicycle and pedestrian facility coverage*

Figure D.7 shows the maximum aggregate population within 30 minutes of any of the key destinations.

Travel Mode	2010 Maximum Population within 30 minutes of key destinations	
	Population	Proportion of County
Walk	128,029	48.8%
Bike	207,046	78.7%

Figure D.7 – Total 2010 Maximum* Aggregate Population within 30 Minute Walk and Bicycle Trips of Key Destinations

**Maximum reflects population if there was universal bicycle and pedestrian facility coverage*

Results

Figure D.8 shows the results for 2035 assuming that the walk and bike projects that have been prioritized (constrained) in the 2014 RTP are implemented. This analysis does not account for any shifts in population distribution that may occur in the county through 2035. Given current focus on mixed use and

higher density housing near key destinations, the percentage of the population that would live near key destination areas will likely increase. Thus the percentage of the population within a 30 minute walk or bike from key destinations would be even greater. Only an analysis on walk and bike access was performed since there was no information available about how future transit routes will be configured.

	2035 Population within 30 minute walk	2035 Population within 30 minute bike ride
Area	**Proportion of County**	**Proportion of County**
Downtown Santa Cruz	8.4%	36.8%
Scotts Valley	2.2%	7.0%
UC Santa Cruz	0.5%	20.5%
Soquel Dr (Soquel to Mattison)	2.3%	37.4%
41st Ave near Hwy 1	4.9%	34.5%
Capitola Village	3.4%	32.1%
Cabrillo College	1.0%	22.2%
Green Valley / Freedom	4.9%	22.4%
Watsonville Hospital	3.1%	22.2%
Downtown Watsonville	6.6%	21.6%

Figure D.8 – Population within 30 minutes of Key Destinations in 2035 based on 2014 RTP Project List

Figure D.9 shows the aggregate population within 30 minutes of any of the key destinations based on implementing the bike and pedestrian projects that are prioritized in this plan.

Population within 30 minutes of Key Destinations				
	2010 Baseline	2014 RTP Implementation for 2035	2035 Target	Maximum Population
Travel Mode	% of County	% of County	% of County	% of County
Walk	32.7%	33.8%	39.2%	48.8%
Bike	73.9%	74.3%	75.9%	79.0%

Figure D.9 – Aggregate Population within 30 Minutes of Key Destination in 2035, based on the 2014 RTP Project List

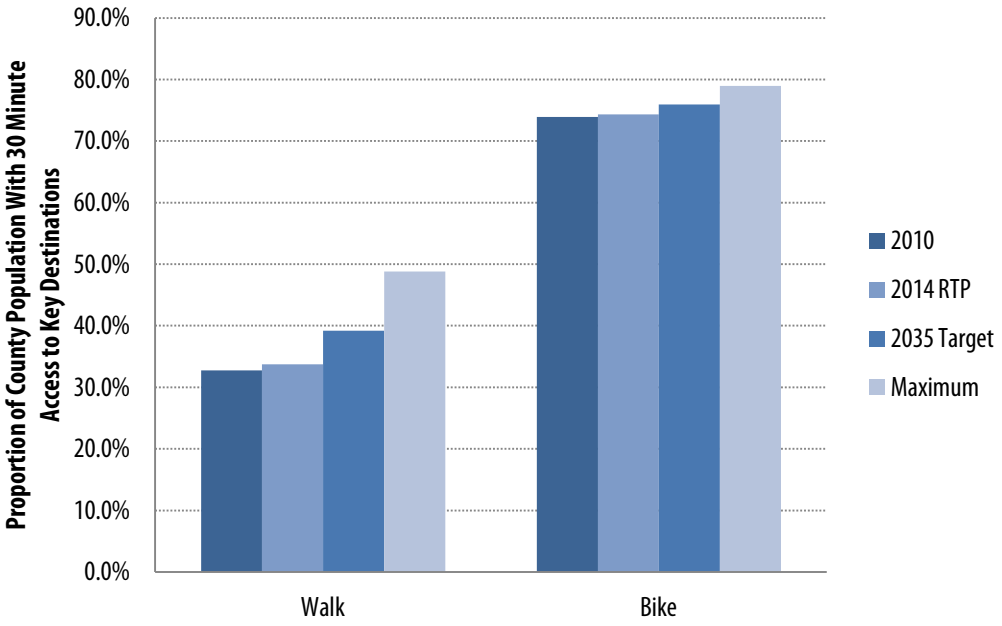


Figure D.10 – Walk and Bicycle Access Improvements Near Key Destinations for Total Population

The results show that despite investment in additional pedestrian and bicycle infrastructure, the proportion of the population within 30 minutes of key destinations does not substantially increase (**Figure D.10**). The target for 2035 was set to close the gap between the 2010 baseline population and the maximum possible population by 40%. It was calculated by taking 40% of the difference between the baseline and the maximum possible population within the key destinations and adding to the baseline (**Figure D.9**). Progress is made towards the target but the 2035 target to close the gap by 40% between the 2010 baseline and the maximum population was not met. The gap between the 2010 baseline and the maximum population was closed by 9% for bike and 6% for walk compared to the 40% target.

This analysis shows that large portions of the county have robust bicycle infrastructure that provides good connectivity near key destinations. Currently, the pedestrian networks near key destinations are not as complete although the analysis is limited due to lack of sidewalk data throughout many areas of the county.

Target 1B. Reduce per capita fuel consumption and greenhouse gas emissions by 1% by 2020 and 5% by 2035.

Target Development

A 5% reduction in per capita greenhouse gas emissions by 2035 for passenger vehicles is a voluntary target that was set by the Regional Transportation Commission (RTC) to be consistent with requirements established by the state for the Monterey Bay region. The California Air Resources Board (ARB) requires a five percent reduction in per capita greenhouse gas (GHG) emissions for passenger vehicles to be achieved through the Association of Monterey Bay Area Governments (AMBAG) Sustainable

Communities Strategy. This reduction in GHG comes from coordination of land use and transportation planning primarily through a reduction in vehicle miles traveled and improvements in vehicle speed. The Santa Cruz County RTP target is based on changes in the transportation system only and does not consider effects of land use changes as land use is outside the purview of the RTC. Vehicle technology improvements and low carbon fuel requirements are expected to generate significant greenhouse gas emission reductions. These reductions are also above and beyond this 5% and are not accounted for in the 2014 RTP since they are outside the authority of the RTC. The 2014 RTP relies on reductions in vehicle miles traveled along with improvements in vehicle speed to achieve the five percent greenhouse gas emissions reduction target.

The average per capita vehicle miles traveled in Santa Cruz County is 15.3 miles per person per day. An emissions reduction of 5% corresponds to an average reduction in vehicle miles of travel or mode shift (carpooling, transit, biking, or walking) of approximately ¾ of a mile per person per day, 5 miles per week, or 275 miles per year. If one day a week, commuters switched from driving alone to either working from home or commuting to work by carpooling, biking, walking, or riding transit, this goal would be readily met.

Forecasting Methodology

Fuel consumption and GHG emissions from a given vehicle fleet mix are the result of two factors—vehicle-miles of travel (VMT) and vehicle speeds. As VMT increases, fuel consumption and GHG increases as well. Vehicle speed is also relevant for GHG emissions because of the following:

- Vehicles traveling at low speeds are generally less efficient than vehicles traveling at moderate speeds since engine and auxiliary losses (e.g., air conditioning, electrical load) represent a larger share of fuel consumption and GHG emissions at low speeds

- Vehicles traveling at high speeds face additional air-resistance, which reduces efficiency

- Acceleration and deceleration, or speed consistency is important for estimating fuel consumption and GHG emissions. Congested, stop-and-go travel is inefficient since fuel consumption and GHG emissions related to idling and accelerating a vehicle from a stop can be considerable. A roadway facility with frequent stop and go conditions will generate more GHG emissions than one with consistent travel speeds (even if that speed is relatively low).

Traveling at the mid-range of speeds (30 to 60 mph) and reducing stop-and-go traffic to maintain speed consistency are effective means of reducing GHG emissions. **Figure D.11** summarizes these factors. Steady state, as referenced in **Figure D.11** refers to consistent travel at a given speed, as opposed to real-world activity that includes stop-and-go driving.

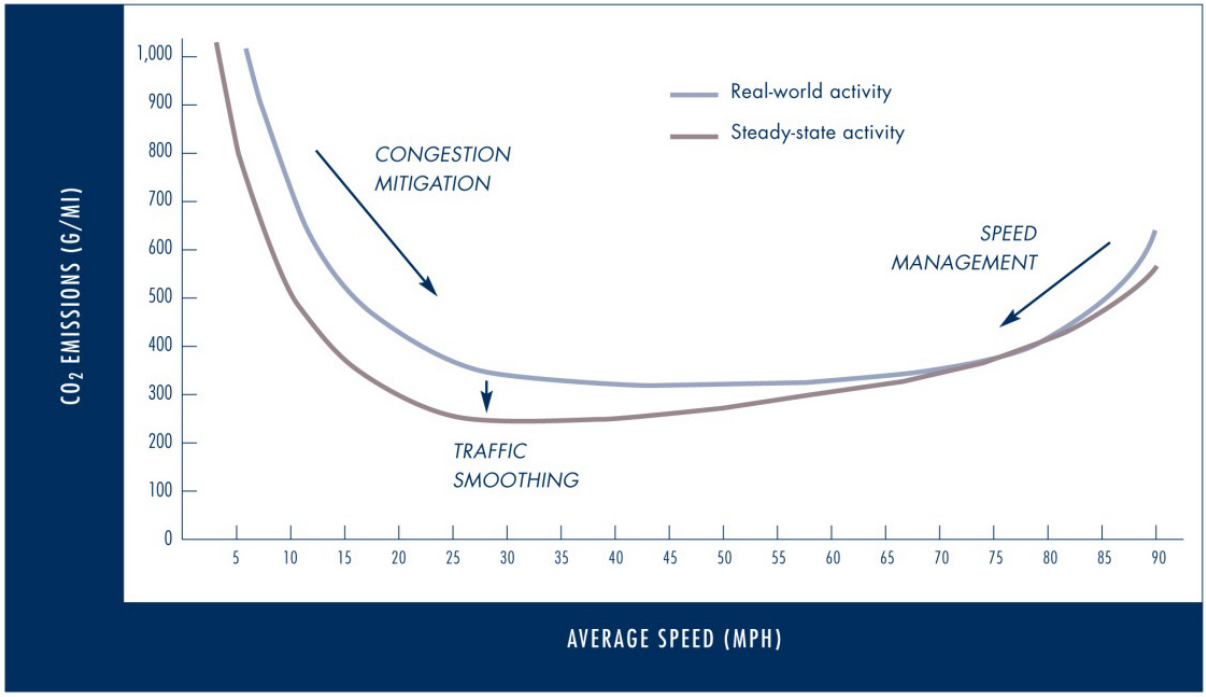


Figure D.11 – CO_2 Emissions versus Average Vehicle Speed

Source: UC Berkeley Transportation Center[8]

This section describes how fuel consumption and GHG emissions are forecast for the 2014 RTP based on changes in vehicle miles traveled, vehicle speeds and speed consistency. To forecast fuel consumption and GHG emissions, the following data from the AMBAG regional travel demand model are used:

- Roadway link traffic volumes
- Roadway link lengths
- Estimated roadway link speeds

Using this information, total passenger vehicle VMT is calculated for every link (e.g., volume x length). Then a spreadsheet program is used to tally up the total VMT that occurs in five mile-per-hour speed ranges. VMT is adjusted to take out all trips that travel through the AMBAG region (external to external trips) and half of the trips that travel either from inside to outside the region (internal to external) or from outside to inside the region (external to internal). These adjustments are consistent with ARB requirements for AMBAG's Sustainable Communities Strategy.

With the VMT data organized by speed, the California Air Resources Board's EMFAC model is used to calculate the GHG emissions from Santa Cruz County. The fuel consumption and CO_2 emission factors based on the passenger vehicle fleet mix for Santa Cruz County are used to calculate the final results. CO_2 emissions is used as a measure of GHG emissions since CO_2 data was more readily available from the EMFAC model results and the relative reduction in CO_2 will be the same as GHG emission reductions since CO_2 accounts for such a large percentage of the GHG emissions. Due to the inability of the travel demand model to model various different types of transportation projects including transportation demand management, transportation system management, and bicycle and pedestrian infrastructure, the

VMT and GHG emissions were than reduced through postprocessing. Postprocessing is a process where the travel model outputs are manually adjusted using factors derived from research studies and other analytic tools.

Baseline

The 2005 baseline per capita CO_2 emission rate for Santa Cruz County from transportation is 15.0 lbs/day. This CO_2 emission rate corresponds to an average vehicle miles traveled per person of 15.3 miles/day. A reduction of 5% by 2035 would require the per capita CO_2 emissions to be reduced to 14.3 lbs/day due to reductions in vehicle miles traveled and improvements in vehicle speed.

Results

The greenhouse gas emissions results for Santa Cruz County for 2035 based on the list of projects that have been prioritized in the 2014 RTP are estimated to be a **17.9%** reduction relative to 2005. This corresponds to a CO_2 per capita emission rate of 12.3 lbs/day/person for 2035 which includes reductions from both transportation and land use changes. The regional travel demand model results determined 13.1% of this reduction (**Figure D.12**) and the postprocessing accounts for the remainder of the reduction (4.7%) (**Figure D.12**). [The postprocessing reduction of 5.46% (**Figure D.13**) is applied to the 2035 VMT and CO_2 results from model as opposed to the 2005 values and thus results in an additional 4.7% reduction relative to 2005.] See the documentation at the end of this target discussion for additional information on how the postprocessing was calculated. The per capita CO_2 reduction of 17.9% is slightly greater than the per capita VMT reductions of 17.1% likely due to more efficient vehicle speeds and speed consistency in 2035 relative to 2005 (**Figure D.14**).

Because of the synergistic effects of land use and transportation on reducing GHG emissions, it is difficult to determine how much of the reduction comes from transportation improvements versus land use changes. All of the postprocessing reductions are based on transportation investments and therefore at a minimum, transportation effects account for 4.7% of the GHG reductions. Assuming half of the GHG reduction that has been forecasted for 2035 is due to transportation (9.0%), this result not only meets but surpasses the 5% target.

VMT and GHG Calculations for Passenger Vehicles	2005	2035
Daily VMT (miles/workday/capita) - modeled	15.29	13.40
Daily CO2 (lbs/workday/capita) - modeled	15.02	13.05
Modeled reduction in VMT from 2005		-12.4%
Modeled reduction in CO2 from 2005		-13.1%
Daily VMT (miles/workday/capita) - modeled and postprocessed		12.67
Daily CO2 (lbs/workday/capita) - modeled and postprocessed		12.34
Total per capita VMT % Reduction from 2005		**-17.1%**
Total per capita CO2 % Reduction from 2005		**-17.9%**

Figure D.12 – Per Capita Reductions of Vehicle Miles Traveled and Greenhouse Gas Emissions for 2014 RTP relative to 2005 for Passenger Vehicles

Project Type	Postprocessing Reductions for VMT/GHG Emissions
Pedestrian facility and traffic calming improvements	-0.30%
Bicycle facility improvements	-2.22%
Intelligent Transportation Systems/Transportation System Management programs	-0.13%
Transportation Demand Management programs	-1.75%
Transit improvements	-0.80%
Increased work at home	-0.26%
Total Postprocessing Reductions	**-5.46%**

Figure D.13 – Postprocessing Reductions of Vehicle Miles Traveled and Greenhouse Gas Emissions for 2014 RTP relative to 2005

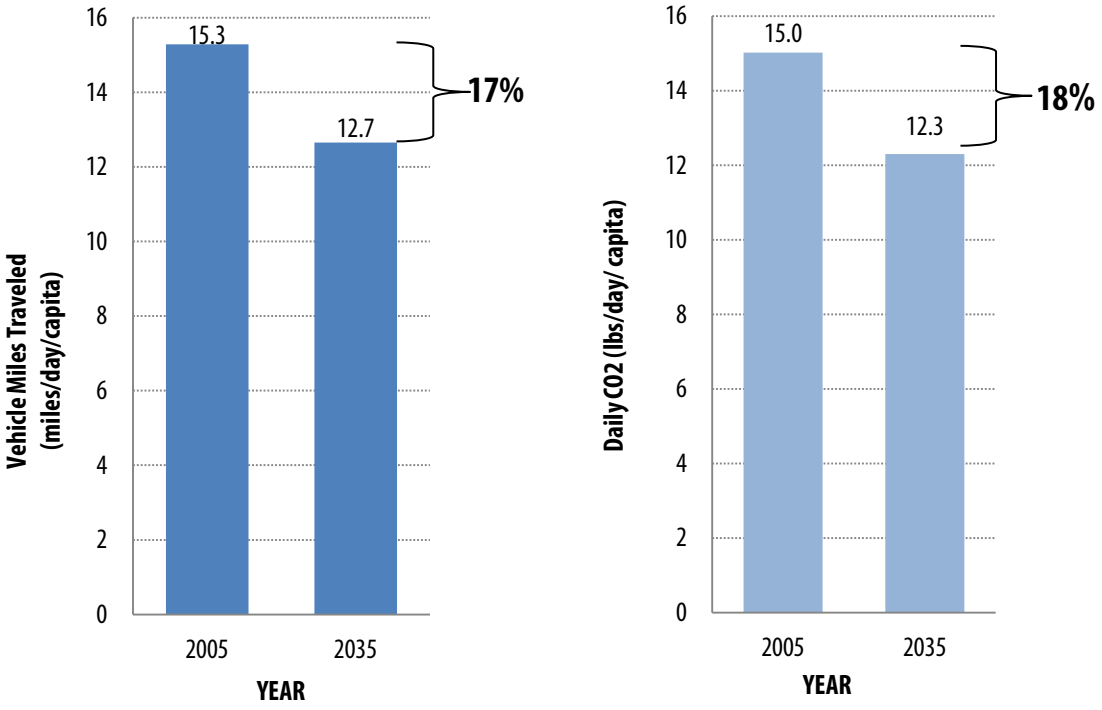


Figure D.14 – 2035 per capita VMT and GHG reductions compared to 2005

VMT and GHG Postprocessing Reduction Methodology

Based on information from AMBAG, the new regional travel model either does not model or is not sensitive to the following transportation projects or programs:

- Pedestrian projects
- Bike projects
- Intelligent Transportation Systems/ Transportation System Management (ITS/TSM) projects
- Transportation Demand Management (TDM) projects
- Transit enhancements – the model's mode choice component is "static" and is therefore insensitive to new or enhanced transit service
- Work at home – the model's mode choice component does not have the ability to vary the percentage of people who work at home

Based on these limitations, Fehr & Peers evaluated postprocessing adjustments to account for the reductions in VMT/GHG from projects in the categories above. The postprocessing was based primarily on the research identified in the following documents:

- *Quantifying Greenhouse Gas Emissions Mitigation Measures*, CAPCOA, 2010[9]
- *Moving Cooler*, Urban Land Institute, 2009[10]
- *INDEX 4D: A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*, Criterion Planners and Fehr & Peers, 2001[11]
- *Appendix C-4: Final Environmental Impact Report For The Metropolitan Transportation Plan/Sustainable Communities Strategy For 2035*, SACOG, 2012[12]

Below is a brief documentation of how the adjustments were calculated.

Pedestrian Projects

Fehr & Peers estimated the total percent growth in new or substantially enhanced pedestrian facilities based on the research prepared for the STARS access analysis. For each of the TAZs within Santa Cruz County, the percent increase in pedestrian infrastructure was input based on the project list and the estimated existing pedestrian facility coverage in the area. The population-weighted average percent increase was then calculated for the entire county. The results found that—on average—pedestrian infrastructure expanded by about 6% in the county. This growth in pedestrian facilities was multiplied by a VMT reduction elasticity from *INDEX 4D Method*[13]. This resulted in a population-weighted VMT/GHG reduction of -0.24%.

In addition, there are numerous traffic calming projects in the RTP. Since the INDEX method does not account for traffic calming, data from CAPCOA 2010[14], were used. The CAPCOA document, citing data from *Moving Cooler*,[15] identified a low-level reduction of -0.25% of VMT, assuming that traffic calming

was present at approximately 25% of streets and about 25% of intersections on those streets have traffic calming measures. Based on an observation of the project list, it did not seem appropriate that this many traffic calming measures would be implemented, so the minimum reduction was factored by one-quarter for this analysis. The result is a -.063% reduction in VMT.

Bike Projects

Fehr & Peers used GIS data to calculate the percent increase in bicycle facilities as part of the RTP. The result is a 57% increase in the mileage of bicycle facilities (bike lanes and trails) since 2006 (year closest to 2005 when comparable bikeway mileage data was available). This increase was multiplied against the elasticity factor from the INDEX 4D[16] method to yield a 2.2% reduction in VMT/GHG. Note that this 2.2% reduction results in a total VMT reduction for the county of about 91,000 miles.

Intelligent Transportation System/Transportation System Management

Fehr & Peers consulted Moving Cooler[17] to estimate the VMT reducing benefits of ITS/TSM projects. Moving Cooler presents general VMT reductions resulting from some overall strategies. Therefore, it is difficult to be highly specific when applying Moving Cooler results, however, it is the most authoritative source on the topic. Based on a review of the RTP project list, the following ITS/TSM projects were assumed to be implemented at an "expanded current practice" level: incident management, signal control management, and traveler information. Many other ITS/TSM programs are also implemented within the County, but these have less substantial investments and were not considered for inclusion. Based on this assumption, Moving Cooler methodology estimates a VMT/GHG reduction of 0.125%.

Transportation Demand Management

The CAPCOA[18] report was referenced to estimate the extent of benefit from TDM programs. The RTP project list identifies fairly extensive (but voluntary) TDM programs for workplaces and residences. Based on this and the range of VMT reductions assumed for TDM in the CAPCOA report, the following reductions were calculated:

- Commute-based reductions: 75% of workplace commuters have exposure to voluntary TDM; 35% of all VMT is commute-based; 5% reduction in VMT = -1.32% countywide VMT.

- Residence non-work-based reductions: 25% of residents have exposure to voluntary TDM; 35% of all VMT is home-based non-commute; 5% reduction in VMT = -0.44% countywide VMT.

This results in a total VMT reduction of 1.75%.

Transit

Ideally the VMT reducing effects of transit would be identified by the regional travel model but the current AMBAG model is not sensitive to the majority of transit projects. The project list identifies several major expansions to transit in Santa Cruz, including new commuter rail, BRT service, and enhanced freeway express bus service. In looking at other commuter rail and BRT services around the country, combined with Santa Cruz Metro's existing daily ridership totals, it was assumed that these new services could bring 3,500 new daily boardings to the system. This compares to the current daily boarding total of about 19,000 for the Metro system. Since the new service is oriented toward faster and potentially more

frequent service, relatively long trips were assumed, averaging 9 miles in length. The 3,500 new boardings each at 9 miles in length would result in a VMT reduction of about 0.8%.

Work at Home

Fehr & Peers followed SACOG's lead in extrapolating an observed trend toward increasing work-at-home. In the SACOG area, the work at home percentage increased by about 1% between 2000 and 2010 (using US Census Bureau data). SCCRTC determined a similar increase for Santa Cruz over the same period, therefore the same reduction will be assumed for 2035 conditions as was determined by SACOG. The result was a 0.26% VMT/GHG reduction due to increasing work-at-home.

Summary Table

Figure D.13 summarizes the aggregate VMT/GHG postprocessing reduction for the 2014 RTP.

Santa Cruz County 2035 Total GHG Emissions

Based on the list of projects that have been prioritized in the 2014 RTP, it is estimated that by 2035 in Santa Cruz County per capita GHG emissions from passenger vehicles will be reduced by 17.9% relative to 2005. Given a projected population increase of 18.6% from 2005 to 2035, the total reductions in VMT and GHG emissions from passenger vehicles can also be assessed (**Figure D.15**). The decrease in per capita VMT and GHG is substantial enough in SCC that the total VMT and CO_2 will be slightly decreased in 2035 compared to 2005 when taking into account population growth.

There are three main ways to reduce GHG emissions; 1) reducing the number of vehicle miles traveled (VMT), 2) increasing the fuel economy of vehicles and 3) reducing the amount of carbon in fuel. Governor Schwarzenegger's executive order S-3-05 of 2005[19] is to reduce GHG Emissions in 2050 to 80% below 1990 levels. Assuming a 10% reduction in the amount of carbon in fuel, what combinations of VMT reduction and fuel economy (mpg) are needed to reach this goal?

Figure D.16 shows the average per capita VMT with the scale on the left side and the average mpg for vehicles with the scale on the right side. The bars labeled 1990 provide an estimate of the average per capita VMT and fuel economy in 1990. **Figure D.16** shows that if the per capita number of miles traveled is reduced to 90% of 1990 numbers, an average fuel economy of passenger vehicles of about 100 mpg for automobiles on the road (C1) would be necessary to reach the 2050 goal. If the number of per capita VMT is reduced to 80% of 1990 levels, fuel economy would have to be about 90 mpg (C2). If per capita VMT is reduced to 70%, fuel economy would have to be about 80 mpg (C3). If per capita VMT is reduced to 60%, fuel economy would have to be about 70 mpg (C4) and if per capita VMT is reduced to 50%, fuel economy would have to be about 55 mpg (C5).

In 2012, President Obama set the average fuel economy standard for cars and light duty trucks to 54.5 mpg by 2025.[20] This is the average fuel economy standard for automobiles produced in 2025. Another 10 to 15 years will likely be required in order to get the average fuel economy of automobiles on the street to be 54.5 mpg. To reduce GHG by 80% by 2050 it will likely require a VMT reduction of 30-40% along with an average fuel economy of 70 to 80 mpg for automobiles on the road. The 2014 RTP with a reduction in per capita VMT of 17.9% by 2035 is on track but there are still improvements needed to get to a total GHG reduction of 80% relative to 1990 by 2050.

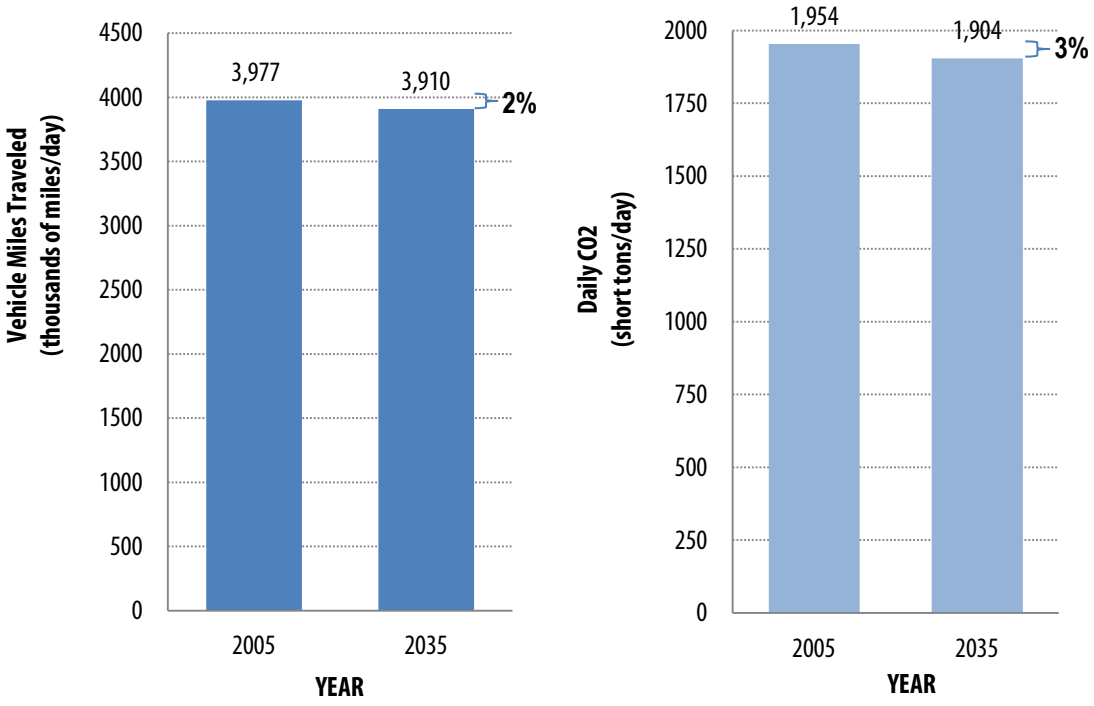


Figure D.15 – Total 2035 VMT and GHG emissions relative to 2005

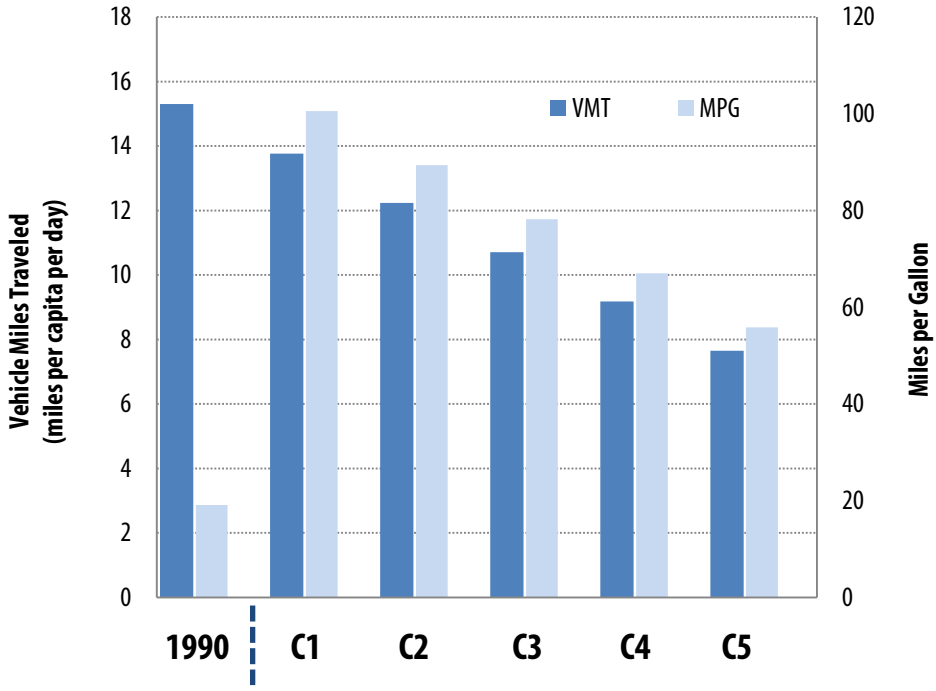


Figure D.16 – Per Capita Vehicle Miles Traveled Versus Fuel Economy (mpg) Necessary to Reduce GHG Emissions by 80% from 1990 levels by 2050

Note: Fuel Economy (mpg) equals the average fuel economy of cars and light duty trucks on roadways.
Source: Santa Cruz County Regional Transportation Commission

Target 1C. Re-invest in the local economy $5 million/year[21] by 2020 and $10 million/year by 2035 from savings resulting from lower fuel consumption due to a reduction in vehicle miles traveled.

Target Development

Economic benefit is a key leg of the "Triple Bottom Line" sustainability stool. The STARS Economic Benefit analysis is based on the "Green Dividend" work of Impresa, Inc. economist Joe Cortright. The Green Dividend analysis, sponsored by CEO's for Cities[22], shows that when people reduce vehicle miles traveled (VMT), they reduce spending on fuel and vehicle use, which is then available to invest in the local economy.

The 2035 target to reinvest $10 million per year in the local economy assumes at least a 5% per capita reduction in vehicle miles traveled (VMT). The calculations were based on the following assumptions:

- Economic benefits are in 2014 dollars
- 2035 population will be 308,582 based on AMBAG projections
- $4 per gallon fuel cost
- 5 percent reduction in per capita VMT relative to 2005
- Fuel efficiency (miles per gallon) will be about 32 percent greater in 2035 based on state fuel economy standards (Pavley)
- 2035 business as usual per capita VMT is equivalent to 2005 per capita VMT (15.3 miles/workday/capita)

Comparing 2035 fuel consumption expenditures with a 5 percent reduction in per-capita VMT relative to 2035 business as usual VMT results in approximately $11 million/year in household savings from a reduction in fuel use. Establishing an economic benefit target will help the RTC and local jurisdictions develop, analyze and prioritize projects that reduce fuel consumption and thereby retain money in the Santa Cruz County economy.

Forecasting Methodology

For the 2014 RTP, the economic benefit of reduced fuel consumption is quantified based on the estimated VMT per capita for 2035. VMT results are derived from the AMBAG Regional Travel Demand model adjusted by postprocessing to account for projects/programs that cannot be modeled or the model is not sensitive to. The postprocessing includes effects of bicycle, pedestrian, transportation demand management, transportation system management projects/programs as discussed under target 1B. In addition to the assumptions used in the target development, the economic benefit calculation takes into consideration the following assumptions:

- 73 % of the cost of fuel leaves the local economy (27% of cost of fuel stays in local economy, 73% leaves local economy and therefore 73 cents of every dollar not spent on fuel is available to invest locally)[23]

- 62% of the amount available to invest locally is retained in the local economy based on buying from locally-owned businesses[24] (62 cents out of every dollar is retained in the local economy)

- Total increase that can be invested in local economy based on reduction in fuel consumption equals 35% * fuel consumption savings. [Note: 35% is determined from increase in the amount available to be reinvested in local economy compared to fuel, 35% = 62%-27%.]

Baseline

The economic benefit is relative to 2035 business-as-usual conditions, which in this case is assumed to have no reduction in per capita VMT compared to 2005 conditions. The baseline data is shown in **Figure D.17**.

Results

The 2014 RTP forecasts a reduction in per capita VMT of 17.9%. A reduction in VMT will cause a decrease in fuel consumption which translates into an average annual household savings of $332 and an annual increase in money invested in the local economy of $13 million/year for Santa Cruz County (**Figure D.17**). An economic benefit of $13 million/year by 2035 meets and surpasses the economic benefit target of $10 million/year.

Measure	2035 Business as Usual	2035 RTP Implementation
Average Weekday VMT (miles/capita/day)	15.3	12.7
Annual Countywide Fuel Consumption (gallons)	55,000,000	46,000,000
Annual Countywide Fuel Expenditures ($)	$220,300,000	$182,500,000
Annual Countywide Savings ($)		$37,800,000
Annual Savings per Household ($)		**$332**
Annual Reinvestment Increase in Santa Cruz County Economy ($)		**$13,200,000**

Figure D.17 – Economic Benefit to Santa Cruz County based on reduction in VMT and Fuel Consumption

Target 1Di. Improve travel time reliability for vehicle trips.

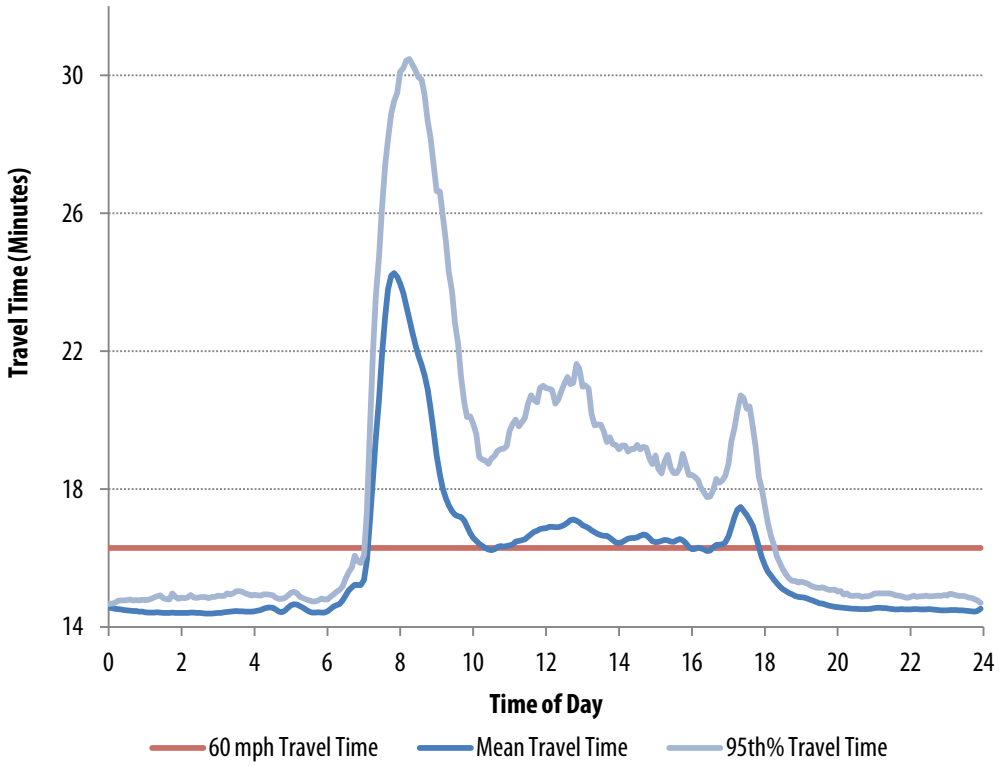
Target Development

Travel time reliability—a consistency or dependability in travel times, as measured from day to day – is universally desired and an important measure of transportation service quality. Travelers want to know that a trip will take a half-hour today, a half-hour tomorrow, and so on. Travel time reliability (TTR) matters since being late to work, an appointment, or for a delivery have substantial repercussions for both travelers and businesses. Literature from the Federal Highway Administration (FHWA) and many academic journals cite travel time *reliability* as a more important measure than *average* travel time between destinations because it is challenging for people to try to plan around the unpredictable nature of travel[25]. A common goal of transportation agencies is to reduce travel time variability by striving to keep the time it takes to take a trip as close as possible to the average trip time. This target seeks to improve travel time reliability for vehicle trips relative to the baseline travel time reliability as discussed below.

Baseline

The baseline travel time data for Highway 1 travel between Watsonville (at Hwy 129) and Santa Cruz (at Ocean St) were measured from Caltrans Performance Monitoring System (PeMS) data.[26] Highway 1 travel time in the northbound direction for this segment was available at 5 minute intervals (**Figure D.18**). Highway 1 travel times in the southbound direction along this segment was only available at 1 hour intervals and thus the travel time reliability was adjusted based on PeMs Highway 1 northbound data averaged over a 15 minute interval. The travel time reliability measure is based on the 95% travel time which is defined as the time when 95% of the trips will be shorter than this time. Both the travel time and 95% travel time versus time of day are plotted for Highway 1 northbound from Watsonville to City of Santa Cruz in **Figure D.18**. Note that the greater the difference between the curves at the peak hour indicates a lesser degree of travel time reliability.

A travel time index (TTI) is a way to normalize congestion levels across facilities with different free-flow speeds. A travel time index is determined by taking average travel time divided by the free flow travel time. The free flow speed assumed here is the posted speed limit (65 mph for highways). Similarly, the 95% travel time index is the 95% travel time divided by the free flow time. Baseline AM and PM peak 15 minute average travel time indices and 95% travel time indices for Highway 1 are presented in **Figure D.19**.



*Caltrans PeMS vehicle detection data from Sept 1, 2012 through August 31, 2013 (non-holiday weekdays, 5 minute granularity).

Figure D.18 – Travel Time and Travel Time Reliability for Highway 1 Northbound from Watsonville (Hwy 129) to City of Santa Cruz (Ocean St)

Source: Santa Cruz County Regional Transportation Commission and Caltrans Performance Monitoring System (PeMS)

Baseline data for Highway 17 and countywide urban arterial average were not available through PeMs and thus were extracted from the 2010 AMBAG travel demand model results. The Highway 17 and countywide data was adjusted based on the Highway 1 PeMs data to alleviate differences between actual and modeled data. The results are presented in **Figure D.19**.

Facility	AM Peak 15 Minute Average				PM Peak 15 Minute Average			
	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI
Highway 1 NB – Watsonville to Santa Cruz	24.2	29.2	1.48	1.79	17.4	20.5	1.07	1.26
Highway 1 SB – Santa Cruz to Watsonville	16.2	18.3	0.99	1.12	28.2	33.8	1.73	2.07
Highway 17 NB – Santa Cruz to County Line	23.3	32.2	1.28	1.77	19.1	26.9	1.05	1.48
Highway 17 SB – County Line to Santa Cruz	18.9	26.5	1.01	1.42	25.3	34.7	1.36	1.86
Urban Arterials	985.8	1,382.8	1.01	1.42	994.3	1,392.5	1.02	1.43

Figure D.19 – Baseline Travel Time Reliability Results

Source: Santa Cruz County Regional Transportation Commission, Sustainable Transportation Council, Fehr & Peers

Forecasting Methodology

There are few applications where travel time reliability is predicted for planning purposes. For the 2014 RTP analysis, travel time reliability was forecasted using data from the AMBAG regional travel demand model and adjusted based on the baseline travel demand model results relative to the baseline PeMS data. Travel time reliability is an indicator of the variation in travel times from one day to the next whereas the travel demand model only estimates average travel times over the course of one day. A methodology for forecasting travel time reliability based on correlations with average travel times will be used for this analysis as discussed below.

Data used from the AMBAG regional travel demand model to forecast travel time reliability are:

- Link travel time
- Link volume-to-capacity (v/c) ratio

Travel time reliability is calculated for the following facilities in Santa Cruz County:

- Arterial roads within the urban areas of the county based on their designation in the AMBAG model (**Figure D.20**).
- Highway 1 between SR 129 and Ocean St in City of Santa Cruz
- Highway 17 between Highway 1 and the County Line

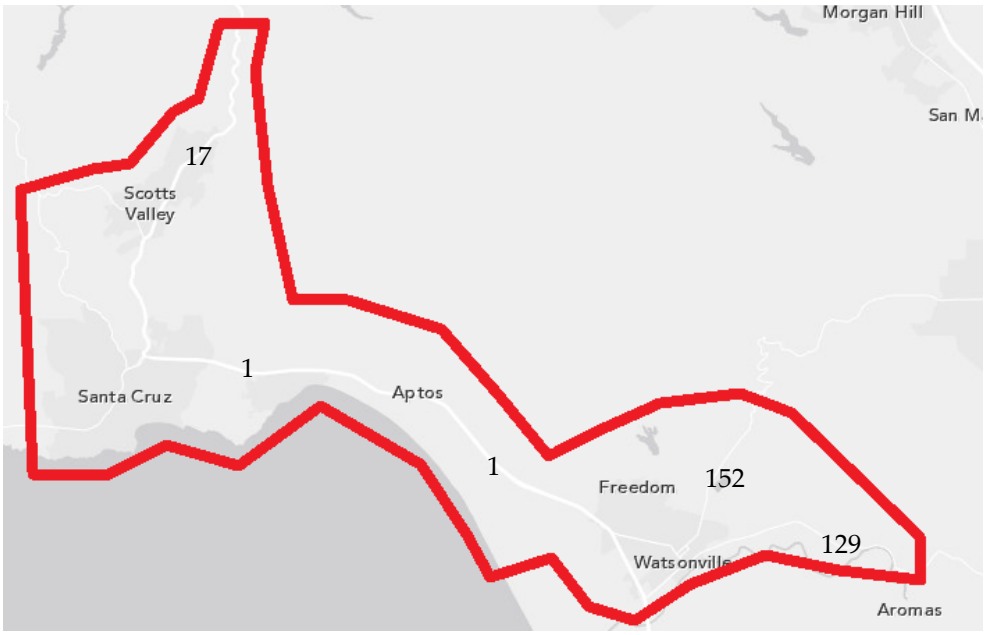


Figure D.20 – The Study Area That Defines the Arterial Roads That Will Be Included in the Countywide Travel Time Reliability Calculation

Using the AMBAG travel demand model data from the AM and PM peak hour runs, the average peak hour travel times for each freeway and arterial segment in the study area (**Figure D.20**) were extracted and summed together to develop an average peak hour travel time for this urban area of the county. Total average travel times for Highway 1 and Highway 17 routes are developed by summing the VMT-weighted average travel times for each segment that makes up the route. Peak hour travel times were than adjusted using the baseline data from PeMs to peak 15 minute average travel times for both AM and PM.

With the AM and PM average peak 15 minute travel times known for the facilities of interest, travel time indices (TTI) are calculated using a free flow speed of 60 mph. Next, 95th percentile TTIs are estimated using an observed relationship between average 15 minute TTIs and 95th percentile TTIs based on the PEMS baseline data from Highway 1:

$$95\text{th percentile TTI} = 1.5 * \ln(\text{average TTI}) + 1.4$$

The form of this equation was based on national research conducted by R. Margiotta in a paper to the Transportation Research Board[27]. The national dataset was not used since it estimated higher 95th percentile TTIs than were observed in Santa Cruz County. With the relationship between average travel times and 95th percentile travel times, as developed above, 95th percentile TTIs for 2035 can be forecast from travel times generated from the AMBAG travel demand model results for 2035. The travel time reliability measure using 95th percentile TTIs can thus be assessed. The travel time and travel time reliability values were adjusted to account for the additional reduction in VMT due to the postprocessing as discussed under target 1B.

Results

The travel time and travel time reliability results based on the 2014 RTP project list are summarized in **Figure D.21**. Travel times increase and travel time reliability decreases between 2010 (**Figure D.19**) and 2035 (**Figure D.21**), particularly for the freeway sections of Highway 1 and Highway 17. The travel time increases and travel time reliability decreases only marginally for the arterial streets within the urban portion of Santa Cruz County.

Travel times would be greater and travel time reliability would be less in the absence of the 2014 RTP projects. **Figure D.22** shows the travel time and travel time reliability results for the 2035 No Project scenario. As shown, Highway 1 average travel times are between 3-18% higher under the No Project Scenario compared to 2035 Project. Highway 17 travel times are 5-18% higher under the No Project Scenario compared to 2035 Project. Forecasts of travel time reliability for 2035 based on project implementation (**Figure D.21**) do not improve the travel time reliability relative to existing baseline conditions but does make improvements relative to a no project alternative (**Figure D.22**).

	AM Peak 15 Minute Average				PM Peak 15 Minute Average			
Facility	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI
Highway 1 NB – Watsonville to Santa Cruz	24.9	33.2	1.53	2.04	20.6	28.6	1.26	1.75
Highway 1 SB – Santa Cruz to Watsonville	17.4	24.4	1.07	1.50	28.3	36.3	1.74	2.23
Highway 17 NB – Santa Cruz to County Line	25.0	34.1	1.37	1.87	19.7	27.7	1.08	1.52
Highway 17 SB – County Line to Santa Cruz	19.5	27.3	1.04	1.47	27.3	36.7	1.46	1.97
Urban Arterials	987.5	1,384.0	1.02	1.43	1,003.4	1,407.2	1.03	1.45

Figure D.21 – 2035 Travel Time Reliability Results

Source: Santa Cruz County Regional Transportation Commission, Sustainable Transportation Council, Fehr & Peers

Facility	AM Peak 15 Minute Average				PM Peak 15 Minute Average			
	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI	Avg Travel Time (min)	95% Travel Time (min)	Avg TTI	95% TTI
Highway 1 NB – Watsonville to Santa Cruz	25.6	33.9	1.57	2.08	24.3	32.6	1.49	2.00
Highway 1 SB – Santa Cruz to Watsonville	20.5	28.4	1.26	1.74	29.7	37.5	1.82	2.30
Highway 17 NB – Santa Cruz to County Line	29.3	38.5	1.61	2.11	19.8	27.7	1.09	1.52
Highway 17 SB – County Line to Santa Cruz	19.5	27.4	1.05	1.47	34.5	43.3	1.85	2.32
Urban Arterials	994.3	1,393.8	1.02	1.43	1,011.2	1,418.3	1.04	1.46

Figure D.22 – 2035 No Project Travel Time Reliability Results

Source: Santa Cruz County Regional Transportation Commission, Sustainable Transportation Council, Fehr & Peers

Target 1Dii. Improve multimodal network quality (MMNQ) for walk and bicycle trips to and within key destinations.

Target Development

The level of use of bicycle and pedestrian facilities is highly dependent on the quality of the facility.[28] As outlined in the Monterey Bay Area Complete Streets Guidebook, not only the presence of sidewalks but wider sidewalks, landscape buffers, and streets with lower automobile speeds and volumes can lead to more people walking more often. Bicycle paths that are separated from automobile and truck traffic and bike greenways on low speed and low traffic volume roads will attract more people bicycling more frequently. Establishing a multimodal facility quality target underscores the importance of the quality of the bicycle and pedestrian network for promoting greater use of active transportation in order to reduce GHG emissions, reduce congestion, and improve health. This target is to improve the quality of the bicycle and pedestrian network relative to a 2012 base year.

Forecasting Methodology

Multimodal quality measures are an evolution of the traditional auto-focused Level of Service standards (LOS). LOS provides an assessment of the quality of transportation service a facility provides under different conditions. Multimodal LOS (MMLOS) can be used to evaluate the quality of pedestrian, bicycle or transit facilities but the focus in the 2014 RTP is on pedestrian and bicycle facilities, given that transit routing and service levels are dynamic.

MMLOS has been around for many years, however, only recently has it begun to be more widely discussed and applied. The most recent version of the *Highway Capacity Manual (HCM)* (Transportation Research Board, 2010) includes a MMLOS for pedestrian and bicycle facilities but this method is extremely data intensive and thus challenging for most jurisdictions to apply. It also is influenced heavily by speed, traffic volume and at times minimizes or negates the benefits in investments in active transportation infrastructure that provide a buffer from the higher speeds and volumes.

Fehr & Peers and the Sustainable Transportation Council (STC) developed an alternative methodology that takes some of the quantitative elements of the HCM methodology and simplifies it so it can be utilized more readily. This methodology is known as Multimodal Network Quality (MMNQ). As part of the 2014 Regional Transportation Plan, STC and Fehr & Peers assessed the MMNQ of the baseline and 2035 pedestrian and bicycle network in Watsonville based on the projects on the constrained list for the 2014 RTP. A MMNQ in Watsonville is being used as an indicator for how well the transportation investments through 2035 improve the quality of the pedestrian and bicycle network countywide. This analysis can be performed on additional locations throughout Santa Cruz County for an improved assessment of the quality of the active transportation network but the resources were not available for that level of analysis. The following are the steps used for development of the MMNQ performance measure for the 2014 RTP.

1. Define a complete network of streets/corridors for bicycle travel throughout the City of Watsonville and for pedestrian travel in Downtown Watsonville.

2. With a complete network of bicycle and pedestrian transportation facilities identified, determine appropriate design standards for given areas and given street typologies. For example, it may be

appropriate to define a sidewalk standard that is 9 feet wide with street trees in a downtown area. On low volume suburban residential streets, the standard may call for a sidewalk on only one side of the street. The Complete Streets Guidebook of Monterey Bay Area, as well as many jurisdictions, have identified citywide or subarea pedestrian and bicycle design standards.

3. Define a rating system with service score designations as green, yellow, and red. A green score is defined as a high quality route. A yellow score indicates acceptable conditions, while a red score would not be attractive to most potential users.

4. Apply the rating system to the prioritized, fiscally constrained RTP project list.

5. In addition to ratings for each segment of the bike or pedestrian network, composite MMNQ scores were calculated for pedestrian and bicycle modes within the entire study area. The composite scores are calculated by determining an average score for the network. Green segments receive a score of 2, yellow a score of 1, and red a score of 0. The total segment scores are indexed to 100, where a network that is entirely composed of green routes would score 100.

6. The MMNQ system is designed to be easy to monitor over time to track progress. Since it is often based on adopted design standards and modal plans, it is also simple to update and keep current.

Baseline and Results

Pedestrian Network Quality. Pedestrian network quality was determined for downtown Watsonville in the vicinity of Main St from Freedom Boulevard to Riverside Drive. The design standards and their associated scoring criteria were defined for both arterials/collectors and local roads (**Figure D.23**). Sidewalk presence or absence and sidewalk width was determined from data available from the City of Watsonville GIS department. The service score designations are shown as green (high), yellow (medium), and red (low). A green score is defined as a high quality pedestrian route. A yellow score indicates acceptable conditions, while a red score would not be attractive to many potential pedestrians. The entire street network in the downtown area was included as part of the pedestrian network as shown in **Figure D.24**. Both the baseline conditions (**Figure D.25**) and the 2035 Scenario (**Figure D.26**) were scored.

The 2012 baseline conditions show that sidewalks exist along both sides of the street on most roadways in downtown Watsonville (**Figure D.25**). Most of the local roads thus have a green score and many of the arterials with standard width sidewalks and no buffer have a yellow score. The baseline quality shows a composite score of 55 out of a maximum of 100 for the pedestrian network (**Figure D.27**). As pedestrian projects are implemented through 2035, the quality of the pedestrian network improves with the addition of the Monterey Bay Sanctuary Scenic Trail and Pajaro River Levee Trail as well as sidewalk improvements along a number of the roadways. The composite score is increased to 71 out of a maximum of 100. Pedestrian multimodal network quality is improved by 2035 and thus the target is met.

Network Score	Along Arterials and Collectors	Local Roads
	6′ Sidewalk and 3′ buffer or tree wells on both sides	Sidewalks on both sides
	Sidewalk on both sides, but narrow, no buffer, or missing curb ramps	Sidewalk on one side
	No Sidewalk on one or both sides	No Sidewalk

Figure D.23 – Pedestrian MMNQ Score

Source: Sustainable Transportation Council, Fehr & Peers

Figure D.24 – Pedestrian Network in Downtown Watsonville

Source: Sustainable Transportation Council, Fehr & Peers

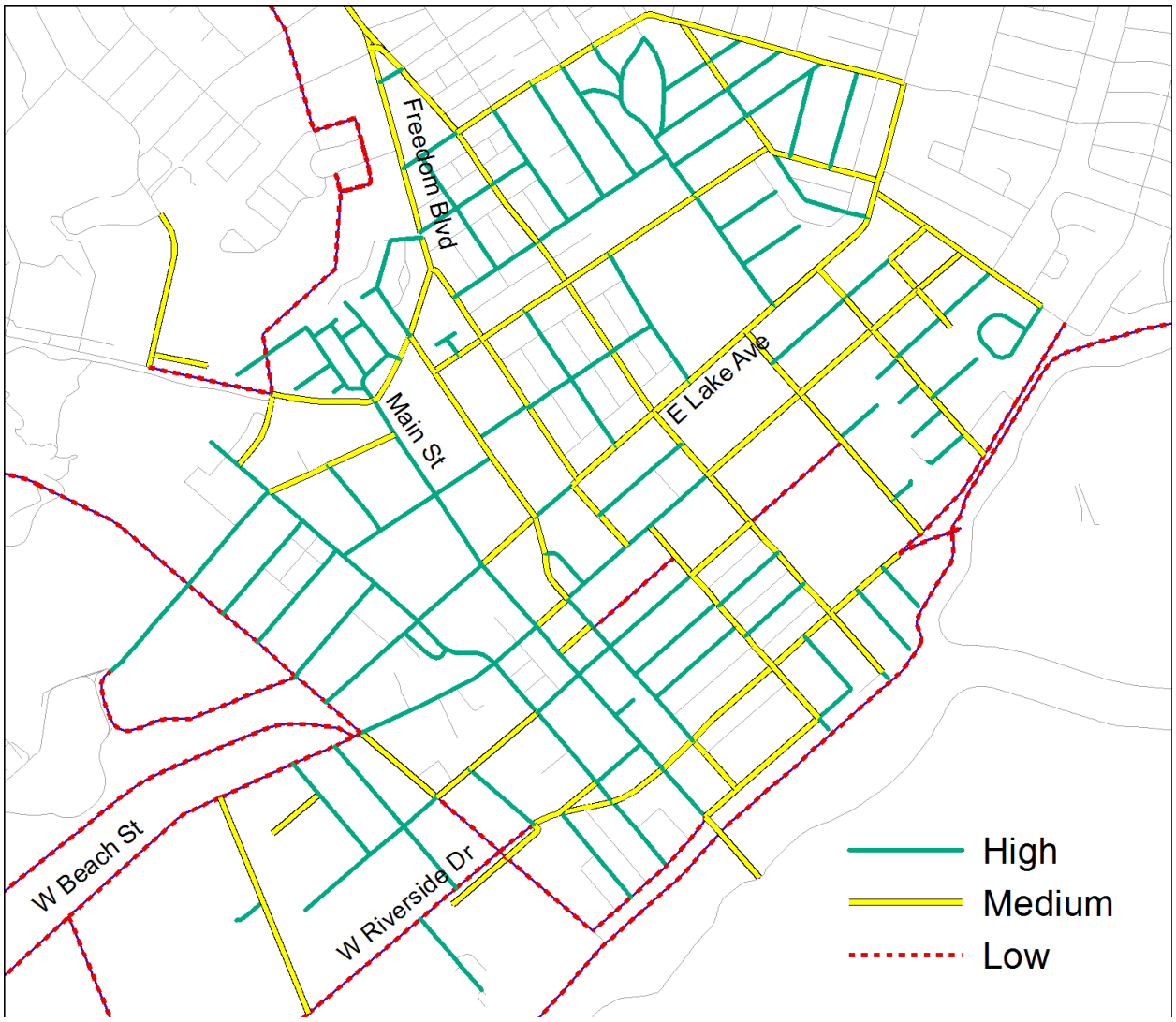


Figure D.25 – 2012 Baseline of Pedestrian Network in Downtown Watsonville with MMNQ Score

Source: Sustainable Transportation Council, Fehr & Peers

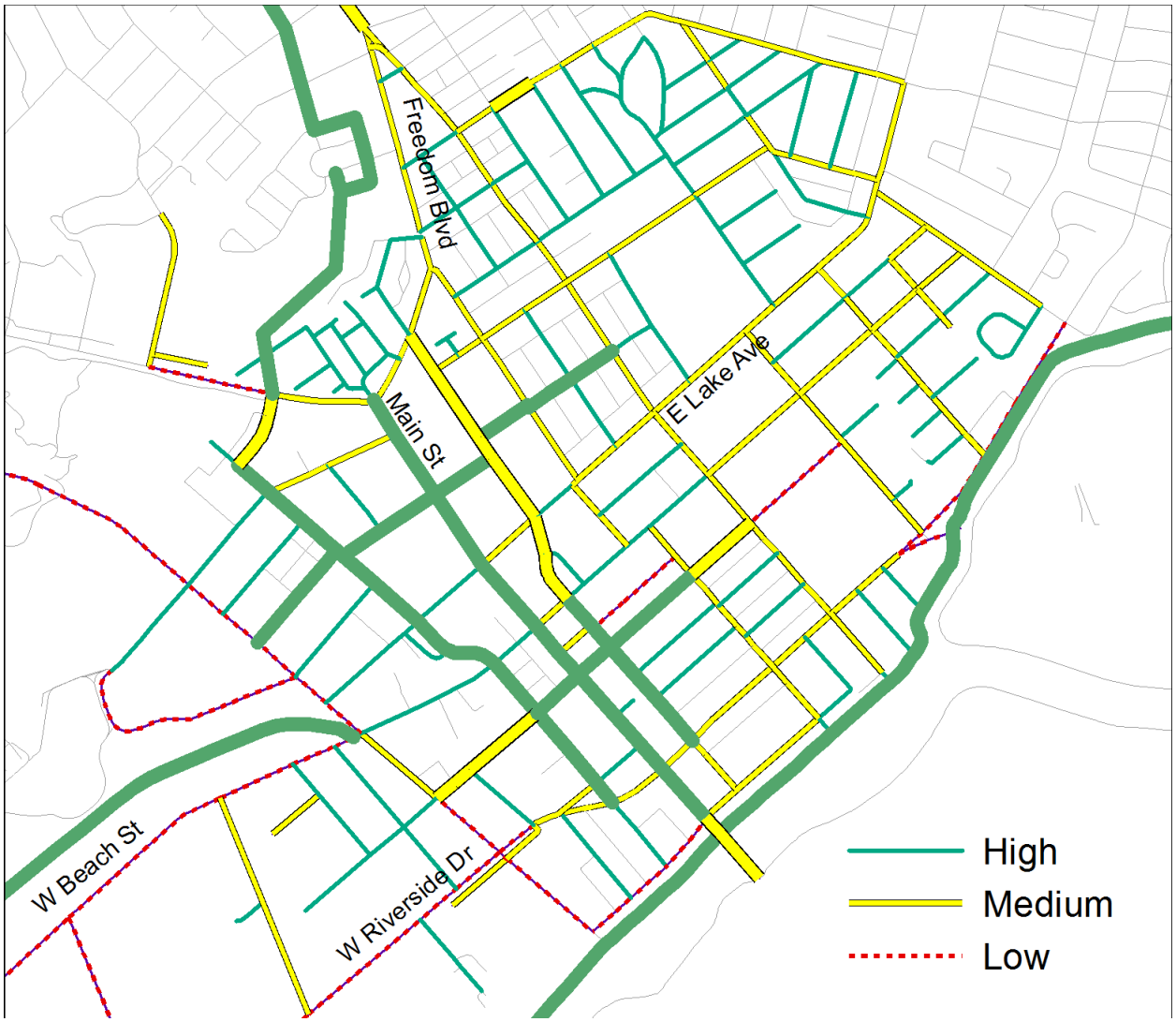


Figure D.26 – 2035 Pedestrian Network in Downtown Watsonville and the MMNQ Score*

Source: Sustainable Transportation Council, Fehr & Peers

**Wider lines designate location of projects that have been added to network through 2035.*

Condition	Pedestrian Network	Bicycle Network
Max Possible Score	100	100
2012 Baseline System Score	55	26
2035 Score	71	39

Figure D.27 – Watsonville Composite MMNQ Score

Source: Sustainable Transportation Council, Fehr & Peers, 2013.

Bicycle Network Quality. The scoring system for the bicycle network varies based on the type of bicycle facility provided: bike route (routes are not striped and not necessarily signed), bike lane, or buffered/separated trail which may be shared with pedestrians. As shown in **Figure D.28** below, roadway classification and speed are intended to guide the determination of which bicycle facility type is most appropriate for a given roadway in Watsonville. The service score designations are shown as green (high), yellow (medium), and red (low). A green score is defined as a high quality bike route. A yellow score indicates acceptable conditions, while a red score would not be attractive to many potential bicyclists. Arterials with speeds greater than 30 mph can get a green rating if the bike facility is buffered from traffic. Unlike with the pedestrian MMNQ analysis, bicycle MMNQ analysis is not performed on every street. Only the streets identified as having a facility in the Watsonville Bicycle Master Plan or the 2014 RTP project list were included in this analysis, since some streets may not be appropriate for cycling (**Figure D.29**). Bicycle system MMNQ analysis was prepared for the 2012 baseline conditions (**Figure D.30**) and 2014 RTP prioritized projects through 2035 (**Figure D.31**).

The 2012 baseline conditions for bicycles show that there is a substantial amount of the defined network that has a score of red either due to a lack of bicycle lanes on collector or arterial roadways or traffic speeds greater than 40 mph. The baseline quality shows a composite score of 26 out of a maximum of 100 for the bicycle network (**Figure D.27**). As projects are implemented through 2035, the quality of the bicycle network improves through addition of the Monterey Bay Sanctuary Scenic Trail, Pajaro River Levee Trail and the Watsonville Slough trails, as well as a number of bicycle lane improvements along the roadways. Using this set of criteria, in order to have green scores along arterial routes where the speed limit is greater than or equal to 40 mph, some sort of buffer is needed to separate the bicycle facility from traffic. The composite score for 2035 is increased to 39 out of a maximum of 100. Bicycle multimodal network quality has been improved and thus the target has been met.

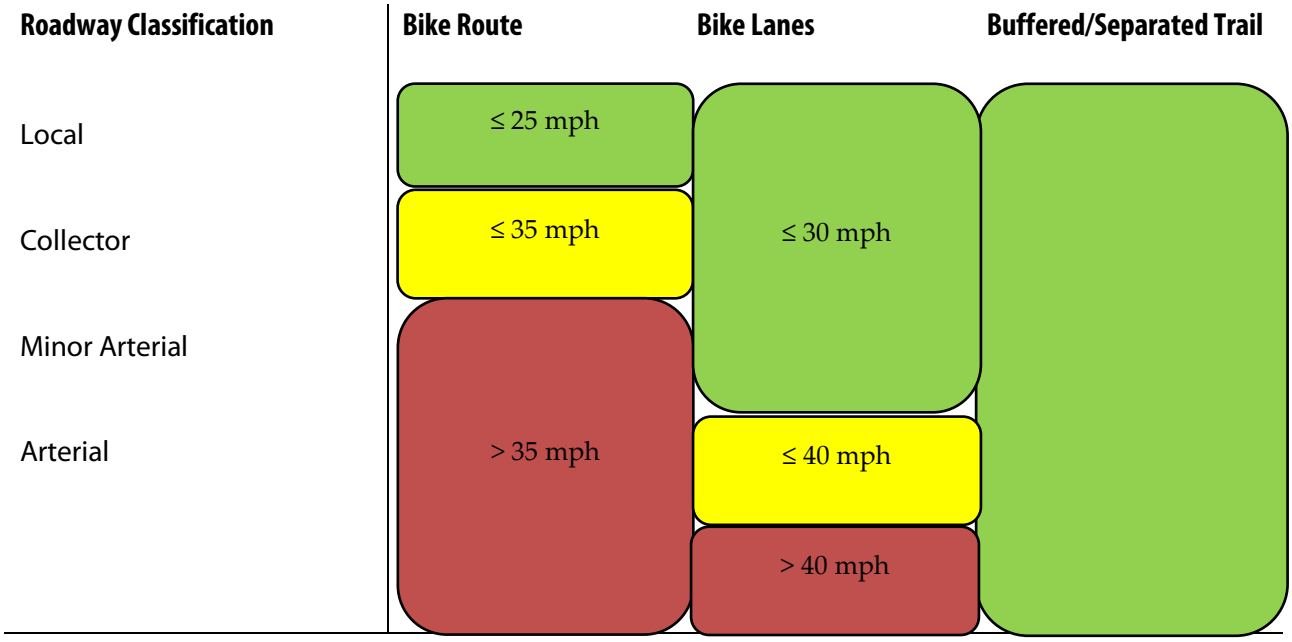


Figure D.28 – Bike Score: Bicycle MMNQ Score

Source: Sustainable Transportation Council, Fehr & Peers

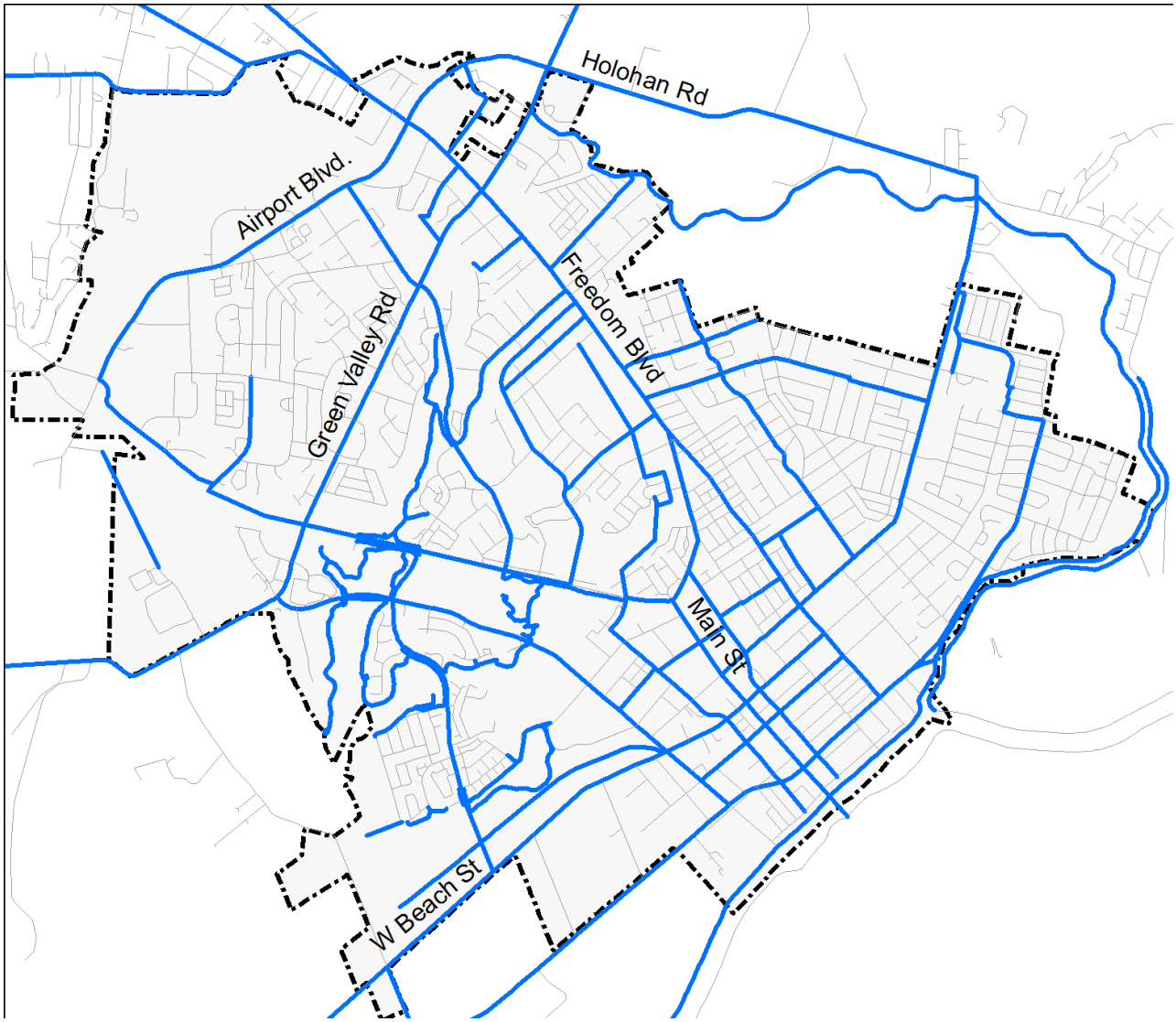


Figure D.29 – Bicycle Network Identified for City of Watsonville

Source: Sustainable Transportation Council, Fehr & Peers

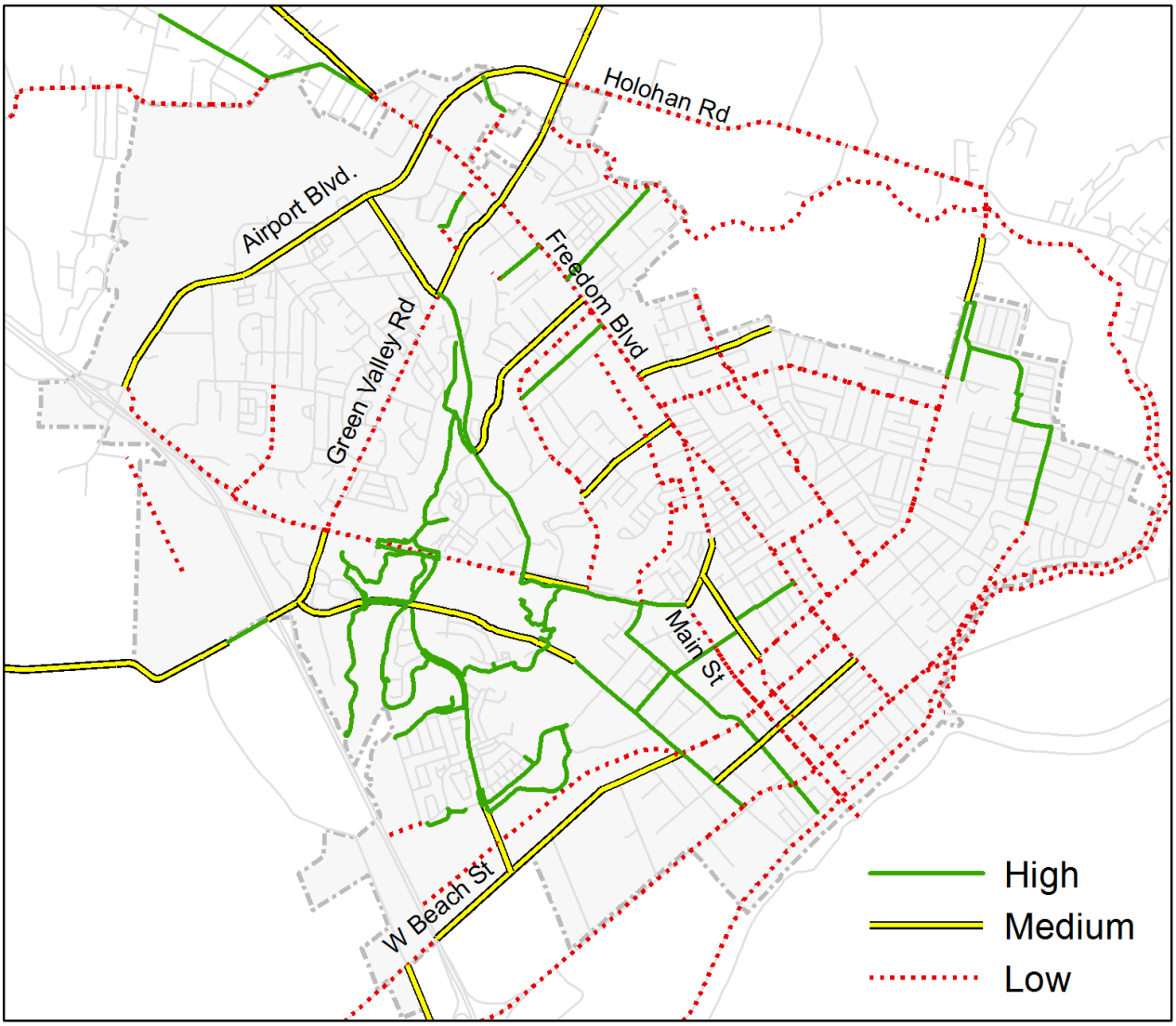


Figure D.30 – 2012 Baseline of Bicycle Network in City of Watsonville with MMNQ Score

Source: Sustainable Transportation Council, Fehr & Peers

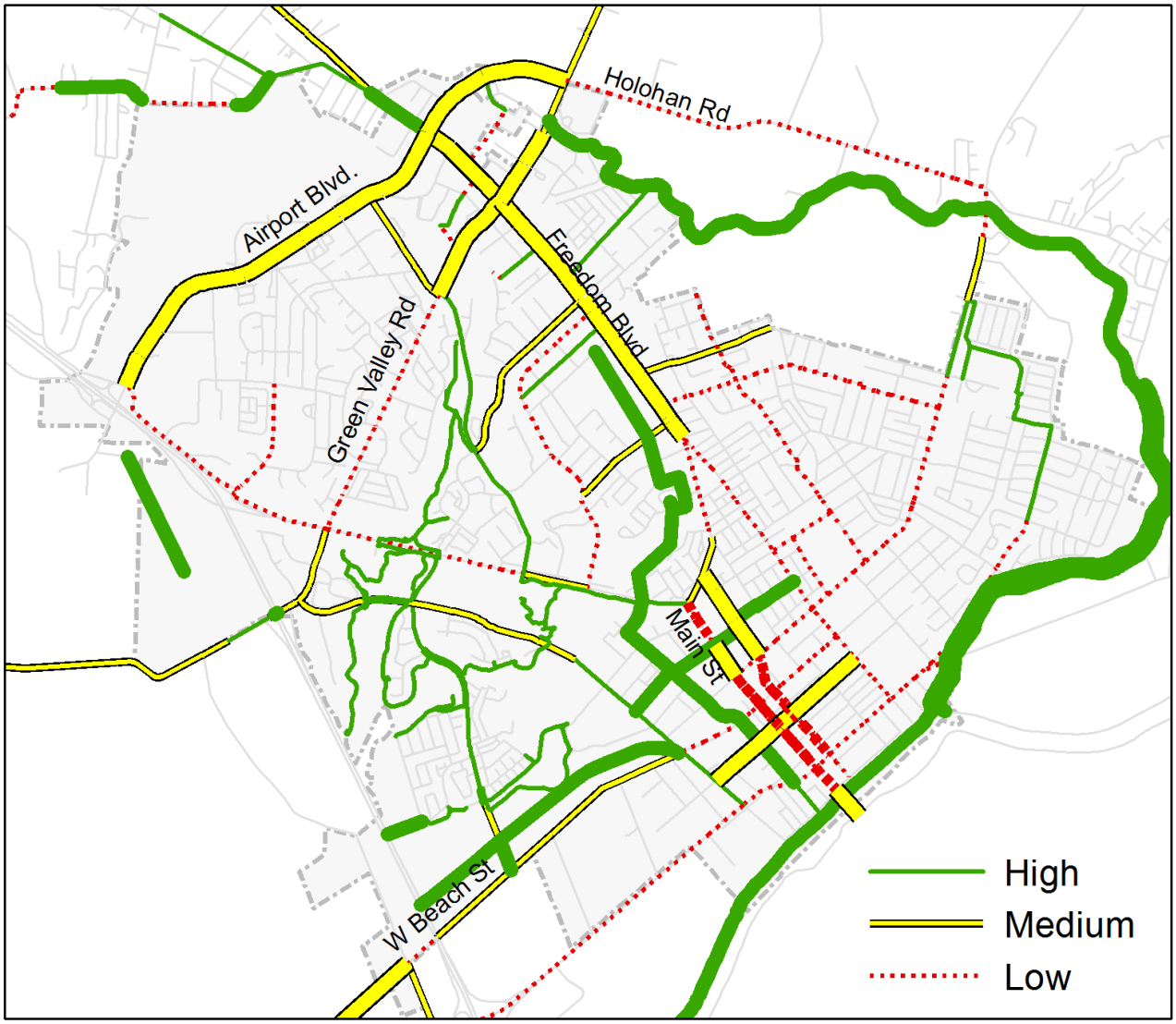


Figure D.31 – 2035 Scenario of Bicycle Network in City of Watsonville with MMNQ Score*

Source: Sustainable Transportation Council, Fehr & Peers

**Wider lines designate location of projects that have been added to network through 2035.*

Target 1E. Decrease single occupancy vehicle (SOV) VMT[29] mode share by 4 percent by 2020 and by 8 percent by 2035.[30]

Target Development

Over the past decade, an increasing body of research links walking and bicycling to improved health, and high levels of driving to health problems.[31] Replacing trips traditionally made in a vehicle with walking or bicycling can lead to regular physical activity which can result in lower rates of chronic disease including cancer, diabetes, stroke and heart disease. According to research by Dr. Lawrence Frank of the University of British Columbia, "every hour a person spends in a car each day makes them six per cent more likely to be obese, while each additional kilometer a person walks makes them five per cent less likely to be obese."[32] Measuring the reduction in the number of miles people drive alone provides an estimate of the shift to walking, biking and taking transit, and thus is a barometer of physical activity and health for Santa Cruz County residents.

In order to set a target for active transportation, an average shift of 1 mile/day from single occupant vehicle to biking/walking was chosen. Given the 15.3 VMT/capita/day for Santa Cruz County for 2005, it is reasonable to assume that 1 mile out of this 15.3 miles/capita/workday can be replaced with bike/pedestrian trips. Since the regional travel demand model can provide a more accurate percent reduction in single occupant vehicle (SOV) mode share rather than a percent increase in active transportation mode share, the target is written as a reduction in SOV. One mile shift to active transportation out of 15.3 miles/day is 6.5% reduction in VMT. Additional increases in transit and HOV mode shares were assumed as well, resulting in a total target reduction in SOV of 8%. An average one mile per person reduction in VMT/day through a shift from driving to a combination of biking, walking, and walking to transit will burn approximately 400 calories/person/week[33] which can cause a reduction in weight of approximately 5 pounds per year[34]. Reducing single occupant vehicle (SOV) mode share not only has health benefits but also decreases climate pollution and fuel consumption, and retains money in the local economy.

Forecasting Methodology

The reduction in the single occupant vehicle mode share for 2035 based on the projects prioritized for this 2014 RTP was determined using the results of the AMBAG regional travel demand model (RTDM) for 2010 and 2035. The mode split data from the 2035 travel demand model are based on person trips rather than VMT. The RTDM results were adjusted based on the postprocessing adjustments to the VMT/GHG as discussed under target 1B as the reductions in VMT will affect the split between modes. Assumptions for the average length of trips for each mode were made in order to get a mode share based on vehicle miles traveled.

Baseline

The baseline for the percentage of single occupant vehicle mode share is also based on the results of the AMBAG regional travel demand model for 2010 model run. The model has been calibrated to the mode share determined from the 2011-2012 California Household Travel Survey data for the AMBAG region. The 2010 baseline SOV VMT mode share for Santa Cruz County is 58.6%.

Results

The results from the regional travel demand model and postprocessing show that based on the projects prioritized in the 2014 RTP, the mode share is 52.2% for 2035. This equates to a reduction of 6.4%, which narrowly misses the target of 8%. Despite missing the SOV mode share target, a significant increase in non-auto travel is achieved, which will help to create a community where active transportation is more the norm.

Target 2A. Reduce injury and fatal collisions by mode by 20% by 2020 and by 50% by 2035.

Target 2B. Reduce total number of high collision locations.

Target Development

The collision reduction target was based on similar targets that have been set in other regions of California as well as nationally. Based on the goals of the California Strategic Highway Safety Plan of 2006, the Metropolitan Transportation Commission for the San Francisco Bay Area set a target of 50% reduction in injuries and fatalities by 2040 for their 2013 Metropolitan Transportation Plan.[35] The FHWA's national highway safety objective "Towards Zero Deaths" and the American Association of State Highway and Transportation Officials (AASHTO) goal of halving fatalities in two decades are aggressive goals to improve transportation safety[36]. The California Highway Patrol Statewide Integrated Traffic Records System (SWITRS) data indicates that there was a 13% decrease in injuries and fatalities from collisions in Santa Cruz County between 2002 and 2011. The target of 50% reduction in motor vehicle injuries and fatalities strives to continue this trend for motor vehicle safety into the future. The number of bicyclists and pedestrians that have been injured or killed in Santa Cruz County has not shown a reduction over the last decade (**Figure D.32**). The target of 50% reduction in injury and fatal collisions for bicyclists and pedestrians endeavors to considerably improve safety for the most vulnerable users of the transportation system.

In order to better assess collision levels, fatalities and injuries for all modes should be quantified relative to the number of miles traveled for that mode and look at patterns over multiple years. Typically, motor vehicle collisions are assessed through use of a Mileage Death Rate statistic which considers the number of collisions divided by the total vehicle miles of travel in a given area. Due to the lack of data on the number of miles traveled for bicyclists and pedestrians, this relative comparison is not possible. It is also important to evaluate the number of collisions over a number of years to better determine the trends in the data. As data and/or assessment methodologies become more available, this relative comparison may be possible in future RTPs.

Forecasting Methodology

Given that projects included in planning documents, such as the RTP, do not include specific design information for projects, it is not possible to estimate the reduction in injuries and fatalities due to improvements in the transportation network. Therefore, safety improvements based on the 2014 RTP implementation have not been forecast. Instead, RTC staff has identified projects with the potential to improve safety and advance the safety targets especially for bicyclists and pedestrians. Projects such as

separated bicycle and pedestrian paths, intersection improvements, safety educational and enforcement programs, and State Highway Operation and Protection Program (SHOPP) projects are included in the 2014 RTP. Monitoring the number of injury and fatal collisions over time for motor vehicles, pedestrians and bicyclists will provide the best assessment for how targets are being advanced. Safety performance monitoring allows the RTC, Caltrans, and other entities to prioritize projects based on injury and fatal collision statistics.

Baseline

A baseline for monitoring injury and fatal collisions in Santa Cruz County for motor vehicles, pedestrians and bicyclists was determined using the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS) collision database. This SWITRS data can be downloaded from the Transportation Injury Mapping System (TIMS) website that is a component of the Safe Transportation Research Education Center (SafeTREC) at the University of California, Berkeley[37]. This database is a comprehensive set of all reported transportation collisions throughout California. At the time of this writing, data from SWITRS is available through the year 2011. Injury and fatal collisions from the last 9 years can be found in **Figure D.32**. The baseline injury and fatal collisions for motor vehicles, pedestrian and bicyclists are taken from an average of 2009 through 2011 as shown in **Figure D.32**.

SANTA CRUZ COUNTY	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVERAGE 2009-2011
Ped Injury and Fatal Collisions	89	94	81	84	92	100	80	100	79	85	88
Ped Injuries	89	92	83	88	97	102	80	100	79	87	89
Ped Fatalities	6	7	2	5	3	4	3	4	3	2	3
Bicycle Injury and Fatal Collisions	150	171	160	151	152	145	191	180	145	169	165
Bicycle Injuries	147	169	159	149	152	149	189	177	149	171	166
Bicycle Fatalities	0	1	0	1	1	2	2	3	0	1	1
Motor Vehicle Injury and Fatal Collisions	1307	1387	1212	1218	1201	1231	1209	1210	1129	1139	1159
Motor Vehicle Injuries	1456	1563	1355	1320	1323	1336	1225	1239	1222	1153	1205
Motor Vehicle Fatalities	18	17	17	17	17	20	25	19	9	6	11

Figure D.32 – Santa Cruz County Collision Data

Source: California Highway Patrol Statewide Integrated Traffic Records System (SWITRS) via the Transportation Injury Mapping System (TIMS)[38]

Results

Progress towards the target can be determined through monitoring the motor vehicle, bicycle and pedestrian injury and fatal collisions over time.

Target 3A. Increase the average local road pavement condition index to 57 by 2020 and 70 by 2035.

Target Development

Santa Cruz County continues to struggle to maintain its roadways. While some roads in the county are in good condition, the average Pavement Condition Index (PCI) for Santa Cruz County roads fell from a

rating of "At Risk" in 2008 to "Poor" in 2012; one of only seven counties in the state with a condition rating this low (**Figure D.33**).

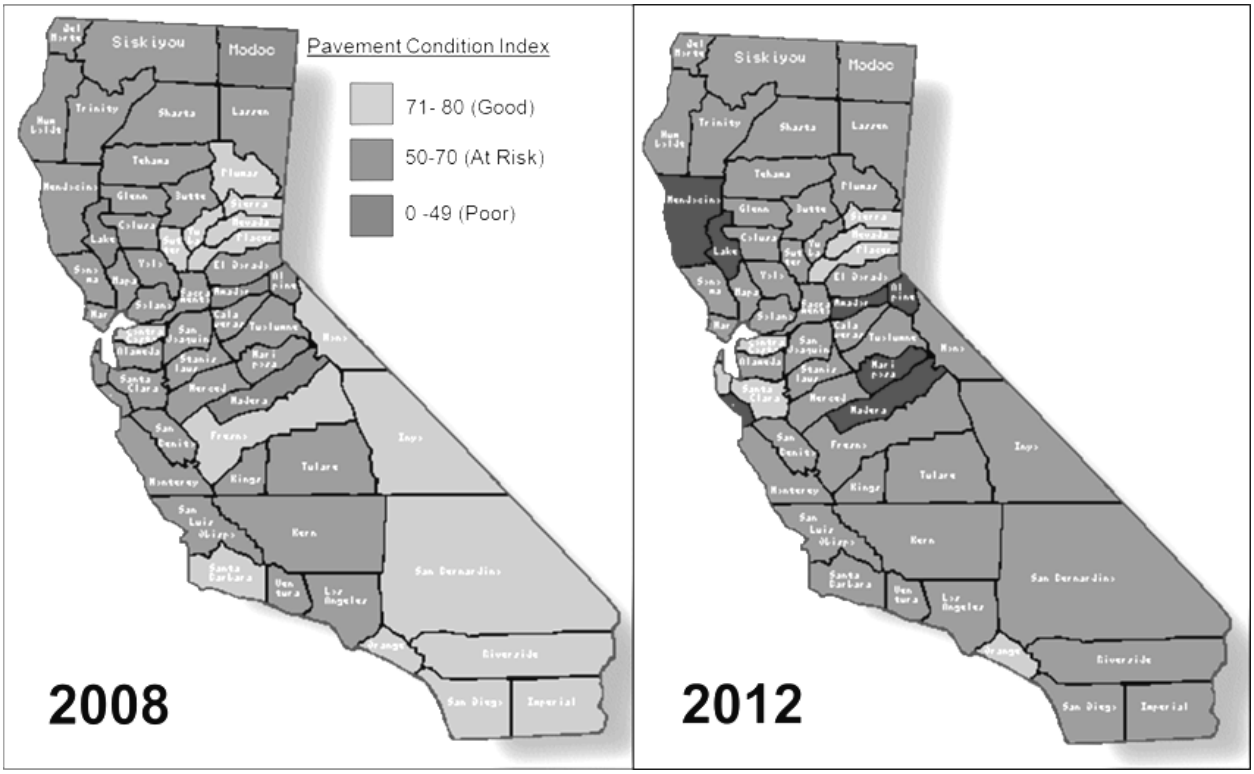


Figure D.33 – 2008 and 2012 Pavement Condition Index Estimates for Counties in California

Source: California Statewide Needs Assessment Project.[39]

Local jurisdictions in Santa Cruz County have estimated the cost to immediately address the backlog of roadway repairs that are needed to bring the average condition of the county roadway system to a PCI of 70 would be over $150 million. Achieving the pavement condition index target of 70 by 2035 will bring the rating up from "At Risk" to "Good". Once the pavement condition can be brought up to a rating of 70, the cost to maintain roadways is substantially reduced. As shown in **Figure D.34**, it is significantly more cost-effective to seal roadways on a regular basis to prolong their life than to rebuild roads that are severely deteriorated. For instance, road rehabilitation costs are 6 to 10 times more expensive than ongoing preventative maintenance ($800k-$2.5M vs $140K/mile over 20 year). Therefore, best practices are to maintain roadways at a PCI of 70-80, which will require the minimum amount of funds to maintain the system.

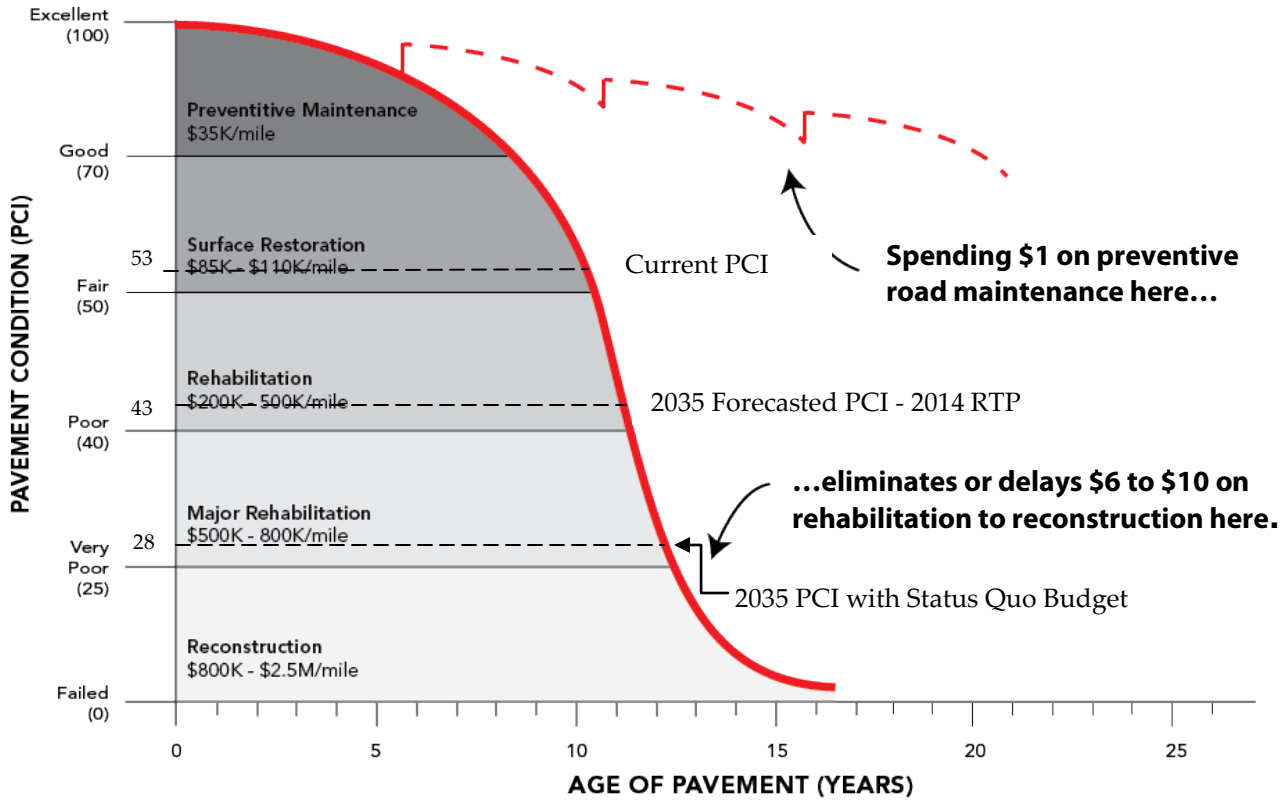


Figure D.34 – Pavement Deterioration Curve - Cost per Mile to Maintain Local Roads

Note: Cost estimates relate only to pavement, (the area from curb to curb).
Source: Metropolitan Transportation Commission, Federal Highway Association, International Slurry Surfacing Association

Forecasting Methodology, Baseline and Results

The pavement condition index for 2035 has been estimated based on how much funding is allocated for maintenance in the financially constrained RTP project list. Due to a one-time influx of funds from Proposition 1B and the federal recovery act, the 2013 Santa Cruz County baseline PCI improved to 53, up from the 2012 PCI rating of 49. The projected PCI for 2035 was calculated from the latest estimates from each of the jurisdictions and the roadway centerline miles (**Figure D.35**). Based on the "State of the Pavement Report" for the Unincorporated County for both 2013[40] and 2011,[41] it was estimated that approximately $23 million per year countywide ($512 million through 2035) will be needed for pavement maintenance just to keep the PCI at the present level (PCI 53) (**Figure D.36**). The total operations and maintenance budget countywide to keep the PCI at the present level of 53 will require $33 million per year ($724 million through 2035). The amount of funds required to bring Santa Cruz County roads up to an average PCI of 70 is approximately $770 million for 22 years just for pavement and total funds for all operations and maintenance is approximately $980 million through 2035(**Figure D.36**). However, funding available countywide for local roadway operations and maintenance in the financially constrained RTP is $23 million/year ($515 million through 2035) of which approximately $14 million/year ($303 million through 2035) is available for pavement. Linearly interpolating the PCI at this level of funding provides an estimated PCI of 43 in 2035 (**Figure D.36**). Even with a significant share of the discretionary funding allocated for maintenance of local streets and roads (an increase of 10 million per year above typical

status quo budget) and assuming a sales tax and vehicle registration fee are approved by voters, the projected 2035 pavement condition index falls below existing conditions of 53 to a PCI of 43. If only the status quo amount of $3.2 million/year is spent on pavement maintenance ($12.8 million/year for all operations and maintenance) and additional funds are not designated to improving the pavement condition of local roads, the PCI is expected to drop to 28 by 2035 (**Figure D.36**).

The repercussions of deferred maintenance are alarming. **Figure D.34** shows how maintenance costs increase exponentially as the PCI of a pavement deteriorates. Plotted on this graph are the PCIs that are predicted for 2035 based on funding levels. Maintenance costs will double or triple if the current PCI of 53 drops to the forecasted PCI of 43 based on the level of funding of this RTP. If funding for maintenance stays at the typical status quo level, maintenance costs will increase by six times the current amount. Clearly, Santa Cruz County must continue to look for additional funding to maintain our current transportation network beyond the funding sources identified in the Financial Element of this RTP.

Jurisdiction	Center Line Miles	Average PCI (2012-2013)	Annual Average Pavement Budget	Optimum Annual Pavement Budget
Capitola	25	68	$75,000	$600,000
City of Santa Cruz	140	51	$2,400,000	$5,500,000
Scotts Valley	36	53	Unavail.	Unavail.
Watsonville	90	35	$700,000	$1,500,000
Unincorporated County	599	55	$0	$12-14M/yr
Total Countywide	**890**	**53**	$3,175,000	$20M/year

Figure D.35 – 2012-2013 Pavement Condition Index for Jurisdictions in Santa Cruz County

Sources: Unincorporated County, Capitola, City of Santa Cruz, Scotts Valley, Watsonville

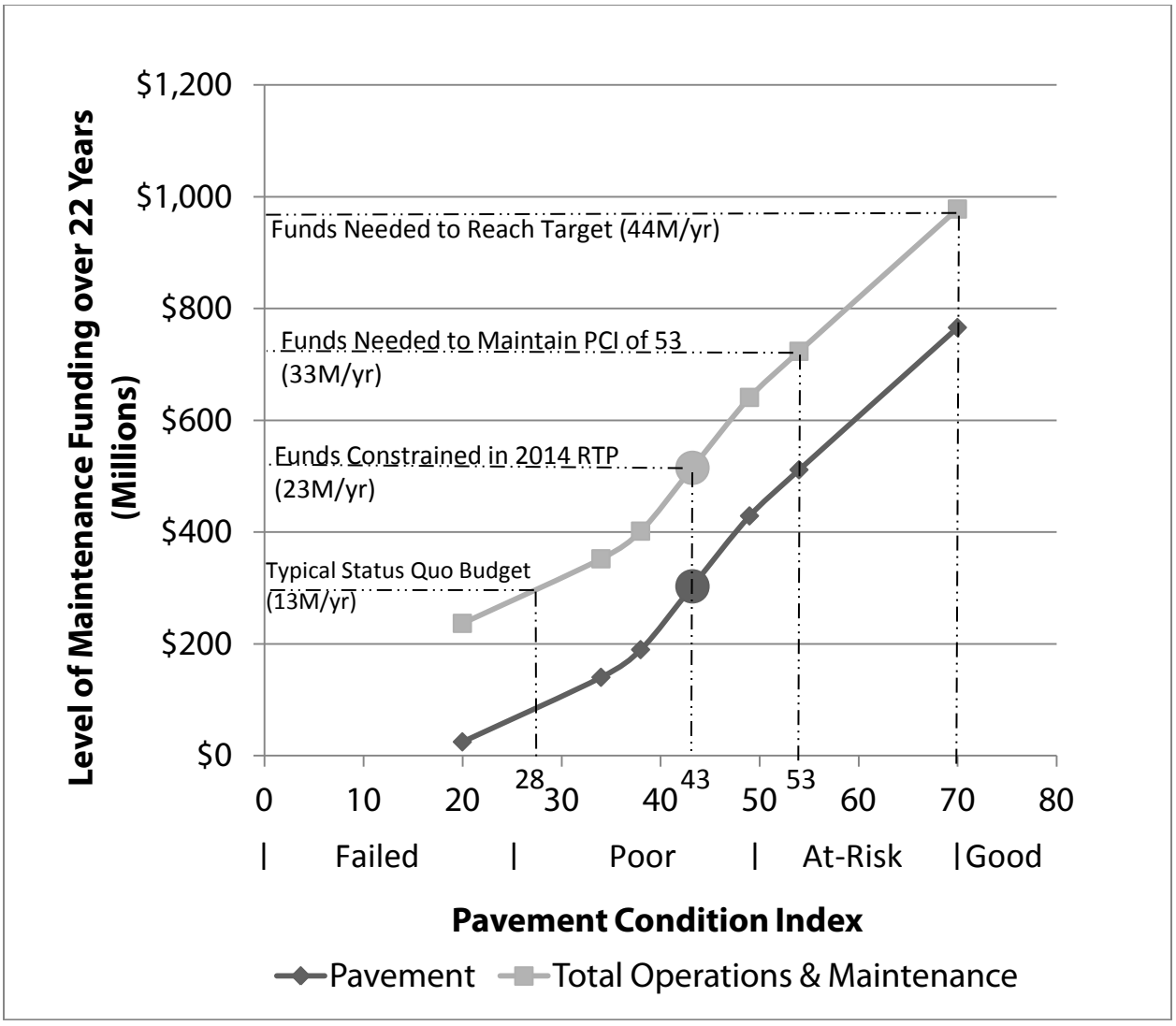


Figure D.36 – Pavement Condition Index Relative to Level of Local Street and Road Maintenance Funding through 2035

Estimated PCI of 42 for 2035 based on level of maintenance funding in RTP project list.

Target 3B. Reduce the number of transportation facilities in "distressed" condition by 3 percent by 2020 and 5 percent by 2035.

Target Development

"Distressed" facilities are defined as any roadway with a PCI of 49 or less (Poor (25 to 49) or Failed (0 to 24) rating). Local jurisdictions' pavement management systems or programs prioritize funding for keeping roadways that are in good condition maintained and slowly bringing the roads that are distressed into good repair. A reduction of 3 percent by 2020 and 5 percent by 2035 of the miles of transportation facilities that are distressed will follow this strategy.

Forecasting Methodology

The number of "distressed" facilities will not be forecast for the 2035 project list as the project descriptions do not provide enough detail on how maintenance funds will be utilized. The public works departments of the local jurisdictions use a Pavement Management Strategy to best use limited funds for maintenance to balance out the facilities that are maintained at best practice levels with major road rehabilitation projects on "distressed" facilities. The number of "distressed" facilities can be monitored over time to assess how this target is being advanced based on updates to the pavement condition from the local jurisdictions. Similarly, the number of distressed transit facilities will be monitored over time to assess progress towards the target.

Baseline

The 2013 baseline of "distressed" (Poor or Failed rating) roadway facilities is 38% based on the 2013 State of the Pavement Update for the unincorporated county (37% of 599 centerline miles) and the City of Santa Cruz (44% of 135 centerline miles). The unincorporated county and the City of Santa Cruz accounts for approximately four-fifths of the centerline miles in the county and thus is a good approximation for the entire county.

The baseline of "distressed" transit facilities could include buses, transit centers, bus shelters etc. The 2013 baseline of "distressed" transit facilities is 28% based on the number of buses that need to be replaced (31 out of 109 that have exceeded their useful life of 12 years). The average cost for a new bus is $469,000. Other transit facilities are also in distressed condition but they are more difficult to quantify.

Results

The number of "distressed" roadway facilities can be monitored over time based on updates on the pavement condition from the local jurisdictions, primarily the State of the Pavement Report update from the unincorporated county. The Metro also tracks the age of their buses which can be monitored regularly.

Target 3C. Reduce travel times and increase travel options for people who are transportation disadvantaged due to income, age, race, disability or limited English proficiency by increasing the percentage that are within a 30-minute walk, bike or transit trip to key destinations by 20% by 2020 and 40% by 2035.[42]

Target Development

People experiencing poverty or language barriers, people of color, older adults, youth and people with disabilities (defined here as transportation disadvantaged) tend to experience a disproportionately small share of benefits from transportation investments, particularly because traditional transportation investment prioritize vehicles. These groups are overrepresented in households without access to a

vehicle. Other elements of the transportation system, such as lack of ADA compliance or safe street crossing also create extra barriers that may prevent these groups from experiencing the full benefit of transportation investments. This target strives to address these inequities by analyzing the population of transportation disadvantaged people that are able to access key destinations within 30 minutes by walk, bike or transit.

RTC identified key destinations throughout Santa Cruz County based on locations of employment centers[43] and commercial centers (determined from the local jurisdictions land use zoning maps in their general plans). These destinations are mapped in

Figure D.3 and listed under Target 1A. The transportation disadvantaged population that is within a 30 minute walk or bike from the central point of each key destination based on existing and proposed facilities is assessed to see how well this target is advanced given the projects prioritized in the 2014 RTP. Land use changes that locate more people near key destinations are another factor affecting the number of people who can access goods and services, but were not considered when developing this target because land use is outside the purview of the RTC.

The baseline transportation disadvantaged population and maximum possible population that are within a 30 minute distance via walk and bike from key destinations were determined as discussed below. The target for 2035 was set to close the gap between the 2010 baseline population and the maximum possible population by 40% by 2035 and an intermediate target of 20% by 2020.

Forecasting Methodology

The forecasting methodology for this target is the same as Target 1A. Please refer to that section for details. The only difference is that instead of total population, subgroups of population that may be transportation disadvantaged are analyzed at the transportation analysis zone (TAZ) level – the unit of geographic area that is used by the travel demand model. The subgroups are detailed below:

- Populations under the age of 18 and over 70, and
- Populations with household incomes less than $15,000, and
- Minority populations

Baseline

The baselines for each of the key destinations are shown in **Figure D.37**. The transportation disadvantaged population within 30 minutes of each of the destinations is based on the population data from the 2010 census.

Transportation Disadvantaged Population within 30 minutes of Key Destinations						
Area	2010 Population within a 30-minute walk		2010 Population within a 30-minute bike ride		2010 Population within a 30-minute transit trip	
	Population	Proportion of County	Population	Proportion of County	Population	Proportion of County
Downtown Santa Cruz	12,716	8.0%	52,812	33.2%	46,624	29.3%
Scotts Valley	2,934	1.8%	8,353	5.3%	18,609	11.7%
UC Santa Cruz	812	0.5%	29,016	18.3%	30,135	19.0%
Soquel Dr (Soquel to Mattison)	2,479	1.6%	53,049	33.4%	47,890	30.1%
41st Ave near Hwy 1	7,042	4.4%	47,718	30.0%	44,151	27.8%
Capitola Village	4,229	2.7%	42,644	26.8%	37,459	23.6%
Cabrillo College	1,258	0.8%	30,423	19.1%	33,098	20.8%
Green Valley / Freedom	11,834	7.4%	52,983	33.3%	55,930	35.2%
Watsonville Hospital	7,517	4.7%	52,275	32.9%	40,459	25.4%
Downtown Watsonville	15,888	10.0%	51,830	32.6%	40,355	25.4%

Figure D.37 – Transportation Disadvantaged Population within 30 Minutes of Key Destinations – Baseline Conditions

Figure D.38 shows the aggregate population within 30 minutes of the key destinations.

Transportation Disadvantaged Population within 30 minutes of Key Destinations		
Travel Mode	Population within 30 minutes of any key destination	
	Population	Proportion of County
Walk	61,194	38.5%
Bike	125,170	78.7%
Transit	93,514	58.8%

Figure D.38 – Total Transportation Disadvantaged Population within 30 Minutes of any Key Destination – Baseline Conditions

Figure D.39 shows the maximum minority and transportation disadvantaged population within 30 minutes of any of the key destinations based on universal bicycle and pedestrian facility coverage.

Transportation Disadvantaged Population within 30 minutes of Key Destinations				
Area	Maximum 2010 Population within a 30-minute walk		Maximum 2010 Population within a 30 minute bike ride	
	Population	Proportion of County	Population	Proportion of County
DT Santa Cruz	15,296	9.6%	54,306	34.2%
Scotts Valley	5,331	3.4%	10,528	6.6%
UC Santa Cruz	3,040	1.9%	29,177	18.4%
Soquel Dr (Soquel to Mattison)	8,920	5.6%	54,597	34.3%
41st St near Hwy 1	12,411	7.8%	51,262	32.2%
Capitola Village	7,633	4.8%	47,849	30.1%
Cabrillo College	3,870	2.4%	32,853	20.7%
Green Valley / Freedom	17,896	11.3%	58,448	36.8%
Watsonville Hospital	9,852	6.2%	56,958	35.8%
Downtown Watsonville	22,330	14.0%	54,126	34.0%

Figure D.39 – Minority and Transportation Disadvantaged Population within 30 Minutes of Key Destinations – Maximum Possible

Figure D.40 shows the aggregate population within 30 minutes of the key destinations.

Transportation Disadvantaged Population within 30 minutes of Key Destinations		
Travel Mode	Maximum 2010 Population within 30 minutes of any key destination	
	Population	Proportion of County
Walk	88,053	55.4%
Bike	133,529	84.0%

Figure D.40 – Maximum Total Minority and Transportation Disadvantaged Population within 30 Minutes of any Key Destination

Results

Figure D.41 shows the results for 2035 assuming that the walk and bike projects that have been prioritized (constrained) in the 2014 RTP are implemented. This analysis does not account for any shifts in population distribution that may occur in the county through 2035. Given current focus on mixed use and higher density housing near key destinations, the percentage of the population that would live near key destination areas will likely increase. Thus the percentage of the population within a 30 minute walk or bike from key destinations would be even greater. Only an analysis on walk and bike access was performed since there was no information available about how future transit routes will be configured.

Transportation Disadvantaged Population within 30 minutes of Key Destinations				
Area	Population within a 30 minute walk		Population within a 30 minute bike ride	
	Population	Proportion of County	Population	Proportion of County
Downtown Santa Cruz	12,839	8.1%	53,038	33.4%
Scotts Valley	2,959	1.9%	8,868	5.6%
Watsonville Hospital	7,517	4.7%	53,039	33.4%
UC Santa Cruz	812	0.5%	29,179	18.4%
Soquel Dr (Soquel to Mattison)	3,556	2.2%	53,447	33.6%
41st Ave near Hwy 1	7,507	4.7%	49,557	31.2%
Capitola Village	4,880	3.1%	46,544	29.3%
Cabrillo College	1,281	0.8%	31,060	19.5%
Green Valley / Freedom	11,982	7.5%	53,380	33.6%
Downtown Watsonville	16,151	10.2%	51,871	32.6%

Figure D.41 – Transportation Disadvantaged Population within 30 Minutes of Key Destinations based on 2014 RTP Project List

Figure D.42 shows the aggregate population within 30 minutes of any of the ten key destinations.

Transportation Disadvantaged Population within 30 minutes of Key Destinations				
	2010 Baseline	2014 RTP Implementation	2035 Target	Maximum Population
Travel Mode	% of Population	% of Population	% of Population	% of Population
Walk	38.5%	39.6%	45.2%	55.4%
Bike	78.7%	79.0%	80.8%	84.0%

Figure D.42 – Total Transportation Disadvantaged Population within 30 Minutes of any Key Destination based on 2014 RTP Project List

Figure D.43 summarizes the findings.

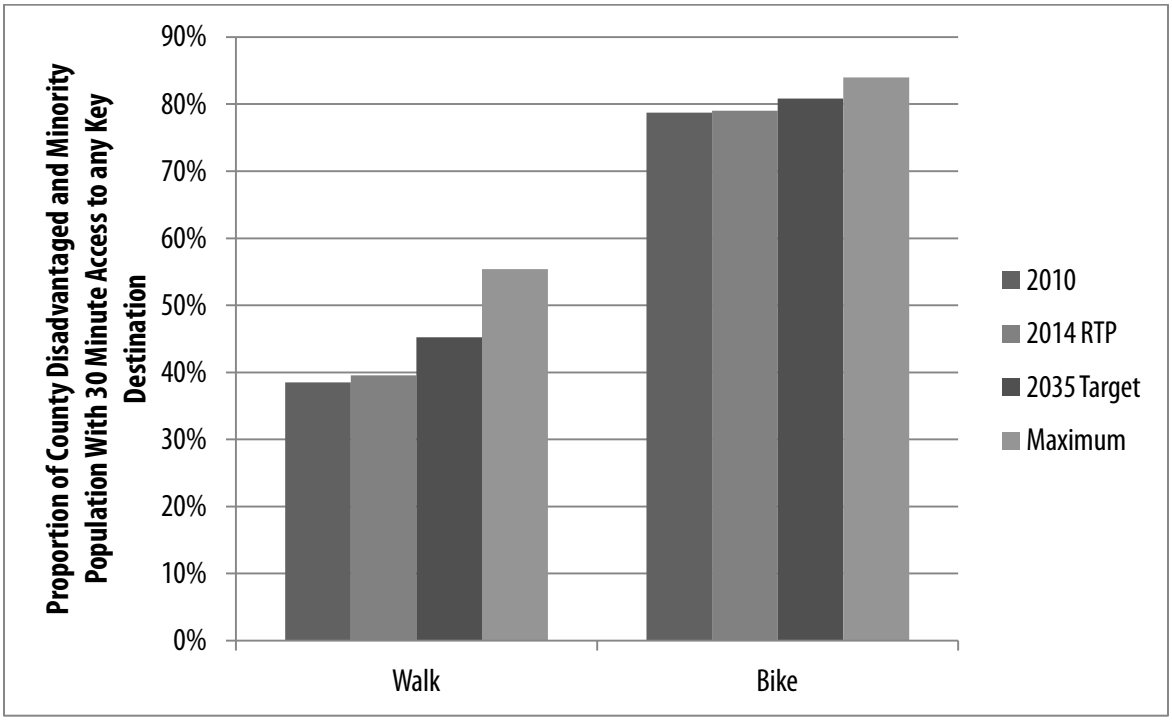


Figure D.43 – Walk and Bicycle Access Improvements near Key Destinations for Transportation Disadvantaged Population

The results show that despite investment in additional pedestrian and bicycle infrastructure, the proportion of the transportation disadvantaged population within 30 minutes of key destinations does not substantially increase (**Figure D.43**). The target for 2035 (**Figure D.42**) was set to close the gap between the 2010 baseline population and the maximum possible population by 40%. It was calculated by taking 40% of the difference between the baseline and the maximum possible population within the key

destinations and adding to the baseline (**Figure D.42**). Closing the gap by 40% is equivalent to increasing the percentage of the population within 30 minutes of key destinations by 2.1% for bike and 6.7% for walk by 2035. Progress is made towards the target but the 2035 target to close the gap by 40% between the 2010 baseline and the maximum population was not met. The gap between the 2010 baseline and the maximum population was closed by 6% for bike and 6% for walk compared to the 40% target.

This analysis shows that larger proportions of the transportation disadvantaged population relative to the total population live near key destinations and that large portions of the county currently have robust bicycle infrastructure that provides good connectivity near key destinations. By investing in active transportation projects with emphasis in key destination areas, transportation disadvantaged people will receive a greater benefit from these investments than the total population.

Target 3D. Ensure transportation services (and impacts) are equitably distributed to all segments of the population.

Target Development

A disproportionately small share of benefits from transportation investments that traditionally prioritize vehicles tend to be realized by disadvantaged populations such as: low income individuals, persons with language barriers, older adults, youth, people of color, and people living with disabilities. These groups are overrepresented in households without access to a vehicle. Other elements of the transportation system, such as lack of Americans with Disabilities Act (ADA) compliance or safe street crossings also create extra barriers that may prevent disadvantaged groups from experiencing the full benefit of transportation investments. Both federal and state laws require that regional transportation system improvements do not have a disproportionate adverse impact on low income or other under-represented groups, and that minority and low income populations receive equal benefits, on an equally timely basis, as other populations. The target is to ensure transportation services and impacts are equitably distributed.

Forecasting Methodology

A geographic analysis was performed by AMBAG to assess equity considerations of the 2014 MTP and 2014 RTP transportation projects and programs. Each regional transportation project was mapped in order to determine whether it is located within or adjacent to areas of low income and/or minority populations based on 2010 census data.

Results

The analysis showed that of all the funding allocated for regional projects within Santa Cruz County through 2035, 85% benefit low income populations, 82% benefit poverty populations and 80% benefit minority populations. Given the high level of regional projects and programs that benefit low income, poverty and minority populations, transportation services and impacts are equitably distributed to all segments of the population.

Target 3E. Maximize participation from diverse members of the public in RTC planning and project implementation activities.

Target Development

Inclusion of the wide spectrum of community interests in the development of the RTP is a key part of the process. The greater the level of involvement, the more likely the plan will serve the needs of the community and further advance the goals of the RTP. The Santa Cruz County Regional Transportation Commission makes use of various methods to provide interested parties with timely information and opportunities to participate in the planning process. The outreach strategies are designed and adapted to generate a robust and informed level of broad-based citizen involvement. The target is to maximize participation from the public.

Results

The RTC joined AMBAG, Monterey and San Benito Counties to develop a public participation plan for the region that identified opportunities for outreach. Components of the plan that have been implemented for developing the 2014 RTP include, but are not limited to:

- Workshops and solicitation of input at various junctures in the development of the RTP to provide information and gain feedback from public
- Maintenance of an email distribution list of community-based groups throughout the county, including neighborhood, health, senior, faith, environmental, low-income, and other social support groups
- Regular updates sent to the email distribution list that informs the public about the RTP process and solicits input
- Community surveys
- Work with citizen and advisory committees
- Information, including sections of the RTP as developed, posted on the RTC website
- Notifications about public hearings
- Bulletins to media partners
- Hard copies of documents available at local libraries
- Bilingual translation of materials, as appropriate

Participation by all in development of the 2014 RTP has been encouraged, consistent with the adopted Public Participation Plan, available online at www.ambag.org.

Notes for Appendix C

[1] The targets are relative to the 2010 maximum population within the key destinations and will close the gap between the baseline population and maximum population by 20% by 2020 and 40% by 2035.

[2] "Housing and Transportation Costs Outpacing Incomes," The Center for Neighborhood Technology, posted October 17, 2012, accessed January 2014, http://www.cnt.org/2012/10/17/housing-and-transportation-costs-outpacing-incomes/.

[3] Joe Cortright, "Portland's Green Dividend," CEOs for Cities, Chicago, Illinois (2007), http://blog.oregonlive.com/commuting/2009/09/pdxgreendividend.pdf.

[4] "Travel Time Reliability Measures," Operations Performance Measurement Program, U.S. Department of Transportation, Federal Highway Administration, accessed January 2014, http://ops.fhwa.dot.gov/perf_measurement/reliability_measures/index.htm.

[5] "Intersection Safety," U.S. Department of Transportation, Federal Highway Administration, accessed January 2014, http://safety.fhwa.dot.gov/intersection/.

[6] The targets are relative to the 2010 maximum population and will close the gap between the baseline population and maximum population by 20% by 2020 and 40% by 2035.

[7] "OnTheMap," U.S. Census Bureau, Center for Economic Studies, accessed December 2013, http://onthemap.ces.census.gov.

[8] Barth and Boriboonsomsin, "Traffic Congestion and Greenhouse Gases," *Access*, Number 35. University of California Transportation Center, Berkeley, CA (Fall 2009).

[9] Barbara Lee, "Quantifying Greenhouse Gas Mitigation Measures," California Air Pollution Control Officers Association (August 2010), http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

[10] Cambridge Systematics, Inc., "Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions," Urban Land Institute, Washington, D.C. (2009).

[11] Criterion Planners/Engineers and Fehr & Peers Associates, "Index 4D Method: A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes," Technical Memorandum, prepared for the U.S. Environmental Protection Agency, Washington D.C. (October 2001).

[12] "Metropolitan Transportation Plan Sustainable Communities Strategy 2035," Sacramento Area Council of Governments, accessed January 2014, http://www.sacog.org/2035/mtpscs/.

[13] See note 11 above.

[14] See note 9 above.

[15] See note 10 above.

[16] See note 11 above.

[17] See note 10 above.

[18] See note 9 above.

[19] *California Executive Order S-3-05*, Governor Arnold Schwarzenegger, State of California, June 2005, http://gov.ca.gov/news.php?id=1861.

[20] "Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards," Office of the United States Press Secretary, The White House (August 28, 2012), http://www.whitehouse.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard.

[21] 2014 dollars.

[22] Joe Cortright, "The Green Dividend," CEO for Cities, accessed December 2013, http://www.ceosforcities.org/city-dividends/green/.

[23] See note 22 above.

[24] Civic Economics, "Buy Local First, Indie Impact Study Series 2013: A National Comparative Study, Utah, Salt Lake City, Ogden and Wayne County," accessed January 2014, http://www.localfirst.org/component/k2/item/217.

[25] "Travel Time Reliability Measures," U.S. Department of Transportation, Federal Highway Administration, Operations Performance Measurement Program, accessed December 2013, http://www.ops.fhwa.dot.gov/perf_measurement/reliability_measures.

[26] "Caltrans Performance Measurement System (PeMS)," California Department of Transportation, accessed January 2014, http://pems.dot.ca.gov/.

[27] Cambridge Systems, Inc., "Analytical Procedures for Determining the Impacts of Reliability Mitigation Strategies," Transportation Research Board, Washington D.C. (2013), http://www.trb.org/Main/Blurbs/166935.aspx.

[28] "National Cooperative Highway Research Program, Report 616: Multimodal Level of Service Analysis for Urban Streets," Transportation Research Board of the National Academies (2008), http://prj.kittelson.com/hcm/v4/docs/NCHRP%20Report%20616.pdf.

[29] Vehicle Miles Traveled.

[30] Mode share in this context is based on VMT, not trips. A 4 percent decrease in single occupancy vehicle mode share includes increasing bicycle trip mode share to 6 percent and pedestrian mode share to 8 percent by 2020. An 8 percent decrease in single occupancy vehicle mode share includes increasing bicycle trip mode share to 10 percent and pedestrian trip mode share to 14 percent by 2035.

[31] Barbara McCann, "Driving, Walking, and Where You Live: Links to Obesity – A report on new research being published in the *American Journal of Preventive Medicine*, 'Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars,'" McCann Consulting, accessed December 2013, http://www.ahtd.info/yahoo_site_admin/assets/docs/JournalofPreventiveMedicine_linkbetweendrivingobesity.14484631.pdf.

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[33] "Free Walking Calorie Calculator Tool," Everyday Health Media, LLC, accessed January 2014, http://www.everydayhealth.com/Calories-Burned-Walking.htm.

[34] Mayo Clinic Staff, "Counting calories: Get back to weight0-loss basics," Mayo Clinic (June 2012), accessed January 2014, http://www.mayoclinic.com/health/calories/WT00011.

[35] "California Strategic Highway Safety Plan, Version 2," California Business, Transportation, and Housing Agency (2006), http://www.dot.ca.gov/hq/traffops/survey/SHSP/SHSP-Booklet-version2_%20PRINT.pdf.

[36] "Strategic Highway Safety Plan," American Association of State Highway and Transportation Officials (2005), http://safety.transportation.org/plan.aspx.

[37] "TIMS – Transportation Injury Mapping System," SafeTREC, Safe Transportation Research & Education Center, University of California, Berkeley, accessed December 2013, http://tims.berkeley.edu.

[38] See note 37 above.

[39] "Reports," Save California Streets, accessed December 2013, http://www.savecaliforniastreets.org/reports.html.

[40] Nichols Consulting Engineers, "State of the Pavements, 2013 Update," Santa Cruz County Public Works (2013).

[41] Nichols Consulting Engineers, "State of the Pavements, 2011 Update," Santa Cruz County Public Works (2011).

[42] The targets are relative to the 2010 maximum population within the key destinations and will close the gap between the baseline population and maximum population by 20% by 2020 and 40% by 2035.

[43] "OnTheMap," U.S. Census Bureau, Center for Economic Studies, accessed December 2013, http://onthemap.ces.census.gov.