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***MTIS FINAL REPORT/SELECTION  
OF LOCALLY PREFERRED  
INVESTMENT STRATEGY***

***FOR THE WATSONVILLE JUNCTION TO  
SANTA CRUZ CORRIDOR***

***For:***

***Santa Cruz County***

***Regional Transportation Commission***

***By:***

***Parsons Brinckerhoff***

***December 10, 1998***



**MTIS FINAL REPORT/SELECTION OF  
LOCALLY PREFERRED INVESTMENT STRATEGY**

**TASK 14 REPORT**

**Prepared By  
Parsons Brinckerhoff**

**Submitted to  
Santa Cruz County Regional Transportation Commission**

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## Santa Cruz MTIS List of Reports

This sheet represents a listing of the technical reports to be prepared and submitted as part of the Santa Cruz Major Transportation Investment Study (MTIS) for the Watsonville Junction to Santa Cruz Corridor. This report is highlighted in bold below.

<b>Task</b>	<b>Report Name</b>	<b>Completion/ Acceptance</b>
3	Santa Cruz MTIS Goals and Objectives Report, describes the goals and objectives of the study	12/2/94
5	Travel Demand Model Methodology Report, describes the transportation modeling process to be used	5/28/87
6	Screening of Alternatives Report, describes various alternatives suggested for study	3/6/95
8	Detailed Definition of Alternatives Report, presents a detailed description of the study alternatives	5/22/97
9	Travel Forecast Results Report, presents in summary form key corridor level data comparisons	2/16/98
10A	Transportation Impacts Methodology Report, describes the methodology to be used for assessing transportation impacts	7/1/96
10B	Transportation Impacts Technical Report, provides a detailed analysis of corridor transportation impacts	2/16/98
11	Environmental Screening Technical Report, presents the results of the environmental screening analysis	3/16/98
12A	Cost Methodology Report, describes the capital and operating cost methodology	3/28/96
12B	Capital Cost Results Report, presents the results of the capital cost analysis	7/2/98
12C	Operating & Maintenance Cost Results Report, presents the results of the O&M cost analysis	7/6/98
12D	Revenue Estimate Methodology and Results Report, describes the methodology to be used for estimating future revenues	12/11/95
13A	Financial Analysis Methodology Report, describes the methodology to be used for comparing costs and revenues	12/11/95
13B	Financial Analysis Report, presents the results of the revenue analysis	9/2/98
<b>14</b>	<b>Santa Cruz MTIS Final Report, describes the Locally Preferred Alternative</b>	<b>12/10/98</b>

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## **EXECUTIVE SUMMARY**

The Watsonville Junction to Downtown Santa Cruz to UCSC Campus Major Transportation Investment Strategy (MTIS) technical efforts have been completed. This report summarizes the results from this MTIS, evaluates the alternative investment strategies, and concludes with the consultant team's recommendations in terms of the recommended investment strategy to be pursued by the SCCRTC.

The recommended investment strategy is to pursue additional funding through a new 1/4-cent sales tax and a federal earmark to construct by the year 2006 a busway and bikeway project in the Santa Cruz Branch Line right-of-way between Natural Bridges and State Park Drive. As part of this concept and in the near-term, it is also recommended that an Intercity Recreational Rail service on weekends be instituted and test marketed for the longer term.

With these recommendations implemented, the consultant team believes that the transportation challenges facing the region are being addressed to a degree; without them it is clear that travel in the region will deteriorate over time as the region grows.

### **Summary of MTIS Results**

A summary of each technical task is presented below:

Task 4, Public Participation, remains on-going and will consist of several efforts during the Fall of 1998. Efforts conducted to date include:

- A rail bulletin.
- Demonstration trains.
- Public opinion surveys.
- Various public meetings and workshops.

To date, it is clear from the public input and interest in the MTIS that a broad-based consensus does not presently exist to implement one study alternative over another. There continues to be, for example, strong advocates for widening Highway 1 for carpool lanes and strong advocates for implementing rail service in the corridor. There are also a bus oriented and "do nothing" contingents in the community. Further public input, review and comments will be gathered during the upcoming public input phase in the Fall of 1998.

Task 5, Model Development, established the methodology for the travel forecast model and identified several areas of further model development that would enhance the capability of the travel demand model to forecast the unique travel patterns in Santa Cruz County. These changes could potentially results in travel patterns different from those presented in the MTIS. The three areas of recommended further study are:

- Conduct a more-detailed visitor study including trip diaries to determine the existing travel patterns and needs of the visitor community;

- Conduct a more-detailed study of future UCSC student off-campus housing. It is generally believed that as the student population continues to grow, supply and demand considerations will push student housing further east into Live Oak and other areas on the east side of the City of Santa Cruz. If this is the case, student travel patterns can be expected to change from closer-in walk/bicycle trips to farther-out transit/auto trips; and
- Conduct a more-detailed Cabrillo College housing location and user characteristics survey to better understand the needs of these students.

Task 6, Screening of Alternatives, led to the identification of eight alternative investment strategies based on a two-phase screening process. First, 34 alternative concepts were initially identified leading to the screening of 15 alternatives. The 15 alternative concepts were then reviewed with the public and decision-makers and subsequently refined into eight “investment strategies” for detailed study. The eight investment strategies were studied in detail in this MTIS. Also, it should be noted that, as stated in [Section 3.1](#) of this document, there were certain key design or implementation decisions made that influenced the costs of the alternatives studied.

Task 8, Detailed Definition of Alternatives, provided a set of engineering drawings and cross-sections, as well as graphic and written descriptions of the alternatives. The information presented in this task was used to develop the cost estimates and served as the basis for developing the travel forecasts.

Task 9, Travel Forecasts, resulted in a series of traffic and transit travel forecasts that were reviewed by and accepted by a “Peer Review” of travel forecasting experts. In addition to this, the reader is reminded of the following anticipated future conditions based on the Association of Monterey Bay Area Governments (AMBAG) forecasts:

- Population in Santa Cruz County is anticipated to increase by 28% between 1990 and 2015, growing from 239,000 to 306,000.
- Residential Housing in Santa Cruz County is anticipated to increase by 24% between 1990 and 2015, growing from 86,000 units to 107,000 units.
- Employment in Santa Cruz County is anticipated to increase by 36% between 1990 and 2015, growing from 104,000 to 141,000 jobs.

Task 10, Transportation Impacts, presented the results of the travel forecasting process. The key results presented in this task were:

- Under the “Do Nothing” or Baseline alternative, the level of vehicle travel--as reflected by the forecasted amount of Vehicle Miles of Travel (VMT)--is projected to increase by 45% (more than the growth in population and employment in the County) between 1990 and 2015. Moreover, the level of congestion--as reflected by the forecasted amount of Vehicle Hours of Travel (VHT)--is projected to increase by 119% between 1990 and 2015. As a result, there will be a significant increase in both vehicle travel and congestion between now and 2015.
- Of all the alternatives tested in the MTIS, a very modest decrease in VMT (1.5% to 1.8%) is anticipated with the exception of the Widening of Highway 1 alternative which actually increases VMT by slightly less than 1%. A decrease in

VHT (1.7% to 3.3%) is anticipated with implementation of all the investment strategies.

- In terms of traffic congestion relief, the “rail” investment strategies provide the greatest relief to the arterial and non-freeway state highway systems in the County. The “Widening of Highway 1” investment strategy provides the greatest relief to the Freeway system in the County.
- In terms of transit effects, it is noted that the “Do Nothing” or Baseline alternative will not allow transit service in the county to maintain its present-day share (2.14%) of all trips. The greatest share of transit trips is achieved with the *Improved Bus Service* (Alternative 8) investment strategy. It should be noted that even with this alternative, the County is projected to capture 2.7% of all trips on transit--which is significantly less than the regional goal of 10% of all trips.
- Of the approximate 1,000,000 person trips forecasted to occur in Santa Cruz County on an average day, approximately 15% of them are projected to occur by pedestrian or bicycle travel (as compared to a model estimate of 17% today).
- With regard to transit usage, the UCSC campus was consistently identified as capturing the greatest number of transit trips and mode share of the four key activity areas evaluated--UCSC, Downtown Santa Cruz, Capitola Village, and Downtown Watsonville. Conversely, Downtown Watsonville consistently captured the least number of trips by transit.
- Finally, with the busway and rail investment strategies, 83% of the boardings are forecasted to occur between the UCSC campus and Capitola.

Task 11, Environmental Scan, resulted in an analysis of environmental issues in the corridor and provided recommendations for the next phase of environmental review. The key conclusion from the scan was that none of the investment strategies appear to have a fatal flaw in terms of environmental effects that would preclude their development. Mitigation measures will be required, however, to implement one or more of the alternatives.

Task 12, Capital and Operating & Maintenance Costs identified the associated costs for each of the alternatives. It is noted that given the level of engineering detail available to the consultant team during this phase of study, there are relatively large contingency factors used to produce the cost estimates. The cost estimates have been reviewed and approved by the independent Peer Review team.

Task 13, Financial Analysis, provides an analysis of the *financial condition* and *financial capability* of the region to continue the status quo and/or construct and operate & maintain the various alternatives tested. The key results of this task were:

- The Baseline investment strategies (as presently defined) can continue with a modest surplus using existing funding sources. However, none of the other investment strategies (as presently defined) can be fully constructed and/or maintained with present revenue sources.

- With the addition of a new 1/4-cent countywide sales tax dedicated entirely to transit, the TSM and busway investment strategies could be constructed and operated with a surplus. However, neither the rail investment strategies, the widening of Highway 1, nor the Improved Bus strategy can be constructed and/or maintained without other new financial resources *beyond a 1/2-cent sales tax*.
- As noted in the document, given that the MTIS is intended to improve travel mobility in the Santa Cruz region, other financial strategies are suggested and need to be considered by decision-makers in order to match the region's financial resources with solutions for the region's growing travel congestion problems.

Task 14, MTIS Report, is this report and provides a summary of the findings and the consultant's recommended investment strategy.

Task 15, Intercity Recreational Rail Study, was completed in August, 1996 and provides an assessment of the operational infrastructure considerations for running a weekend recreational rail service between the San Francisco Bay Area and the Santa Cruz community. The assessment identified possible operators, ridership potential, infrastructure improvements, a potential operating plan, and the institutional and financial issues associated with the provision of an intercity recreational rail service. The study concluded with a recommendation for a near-term operating strategy and operating plan. Also presented was a matrix of potential future improvements and operating effects for medium and long-term service concepts.

### **Recommended Investment Strategy**

The consultant's recommendation for the Watsonville-Santa Cruz-UCSC corridor is to construct and operate a combined busway and bikeway facility along the Santa Cruz Branch Line right-of-way from Natural Bridges in Santa Cruz east to State Park Drive in Aptos. This is a long-term strategy and the cash flow analysis of this strategy assumes that the Busway would not be operational until the year 2006.

In the near-term, it is recommended that the region allocate \$15.6 million for track upgrades and lease payments to Union Pacific to test market an Intercity (weekend) Recreational Rail service. The region should also move forward with the environmental review and design of the busway concept. In order to accomplish this recommendation, the region must also identify new sources of revenue. The new sources proposed are:

- A one-quarter cent sales tax dedicated to transit and the Busway project. It is also recommended that an additional 1/4 cent sales tax be dedicated to Countywide road projects.
- The existing federal "earmark" for the Busway is assumed to cover 50% of the capital cost (construction and equipment) of the facility.

As discussed in the text, this recommendation is made for several reasons including:

- The interregional rail component is a means of testing this potential long-term strategy with limited public moneys.

- The busway/bikeway provides an additional means of east-west capacity as an alternative means of travel to Highway 1 and the parallel arterial streets that are projected to be over capacity by the year 2015.
- The busway/bikeway provides a flexible transit-based means of travel that strengthens the regions commitment to alternate modes. And
- The busway provides an improved means of access to the beaches, the new SCMTD maintenance facility, as well as the major activity centers in the corridor.

For these reasons and others, the consultant team is recommending an investment strategy that will benefit the community in the future but it is acknowledged that, as *presently defined*, the strategy is not the most cost-effective transit option studied.

## **1.0 STUDY BACKGROUND**

### **1.1 Major Transportation Investment Study**

This report documents the results of the Major Transportation Investment Study (MTIS) prepared for the Watsonville Junction - Santa Cruz - University of California at Santa Cruz (UCSC) Corridor. The technical studies prepared for the MTIS defined, analyzed, and evaluated multimodal transportation strategies for meeting long-term travel needs in the corridor. The study process resulted in the selection of a “locally preferred investment strategy” (Preferred Investment Strategy) for the corridor.

The preparation of a Major Investment Study (MIS) is a requirement of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) before a project is included in local transportation plans or Transportation Improvement Programs. The MTIS is also required prior to the allocation of discretionary federal funds for major transit projects. The Federal Transit Administration (FTA) issued a Final Policy Statement on December 19, 1996 that remains in place with the passage of the new federal transportation bill (TEA 21). The policy is under revision but, at this time, requires the:

- Continued rating of local financial commitment and,
- Remains the basis for recommendations on funding levels and allocation of funds at the federal level.

The MTIS evaluated several transportation modes in the corridor including, rail transit, bus service expansion and carpool lanes on Highway 1. The MTIS planning process employed a computer model to forecast travel demand; assessed the transportation and environmental impacts; calculated the costs and potential revenue of the project, and estimated overall financial performance. The aim of the MTIS planning process is to select a Preferred Investment Strategy. The MTIS considers both local decision-making and Federal Transit Administration (FTA)/Federal Highway Administration (FHWA) guidelines.

MTIS oversight was provided by the Santa Cruz County Regional Transportation Commission (SCCRTC). The findings in this report are the culmination of a process that began in 1980 in response to a SCCRTC policy to “significantly increase the mix and availability of convenient and accessible alternatives to the private automobile in Santa Cruz County.”

### **1.2 Study Goals and Objectives**

The goals of the study, developed at the beginning of the MTIS process, are based on input from the public and the Rail Oversight Committee, consisting of elected city and county officials and representatives of UCSC and the Santa Cruz Metropolitan Transit District (SCMTD). The study goals guide the technical analyses and focus study resources on an appropriate range of alternatives to be developed and evaluated. The study goals are summarized below:

#### **Study Process Goals**

- Undertake a transportation planning analysis in the study corridor which is multimodal and intermodal.

- Undertake a transportation planning analysis which maximizes public input, recognizes the environmental sensitivity of the study corridor, is responsive to federal requirements, and presents information in understandable formats.
- Provide an analysis of the alternatives strategies recognizing the need for the most efficient use of limited financial resources.

### **Evaluation Goals**

- Provide a transportation system that is consistent with the needs and desires of the residents of the region and promotes the efficient use of land consistent with the planning policies contained in the various General Plans of the county.
- Develop a transportation system that is appropriate to the physical, cultural, and natural environment of Santa Cruz County.
- Provide a well-integrated, efficient, and multimodal transportation system which meets the needs of all Santa Cruz County residents.
- Provide a transportation strategy that makes the most efficient use of limited financial resources.

Each of the goals were supported by objectives. The objectives state desired action or results to be achieved. They are summarized in [Appendix 1](#).

## **1.3 Corridor Description**

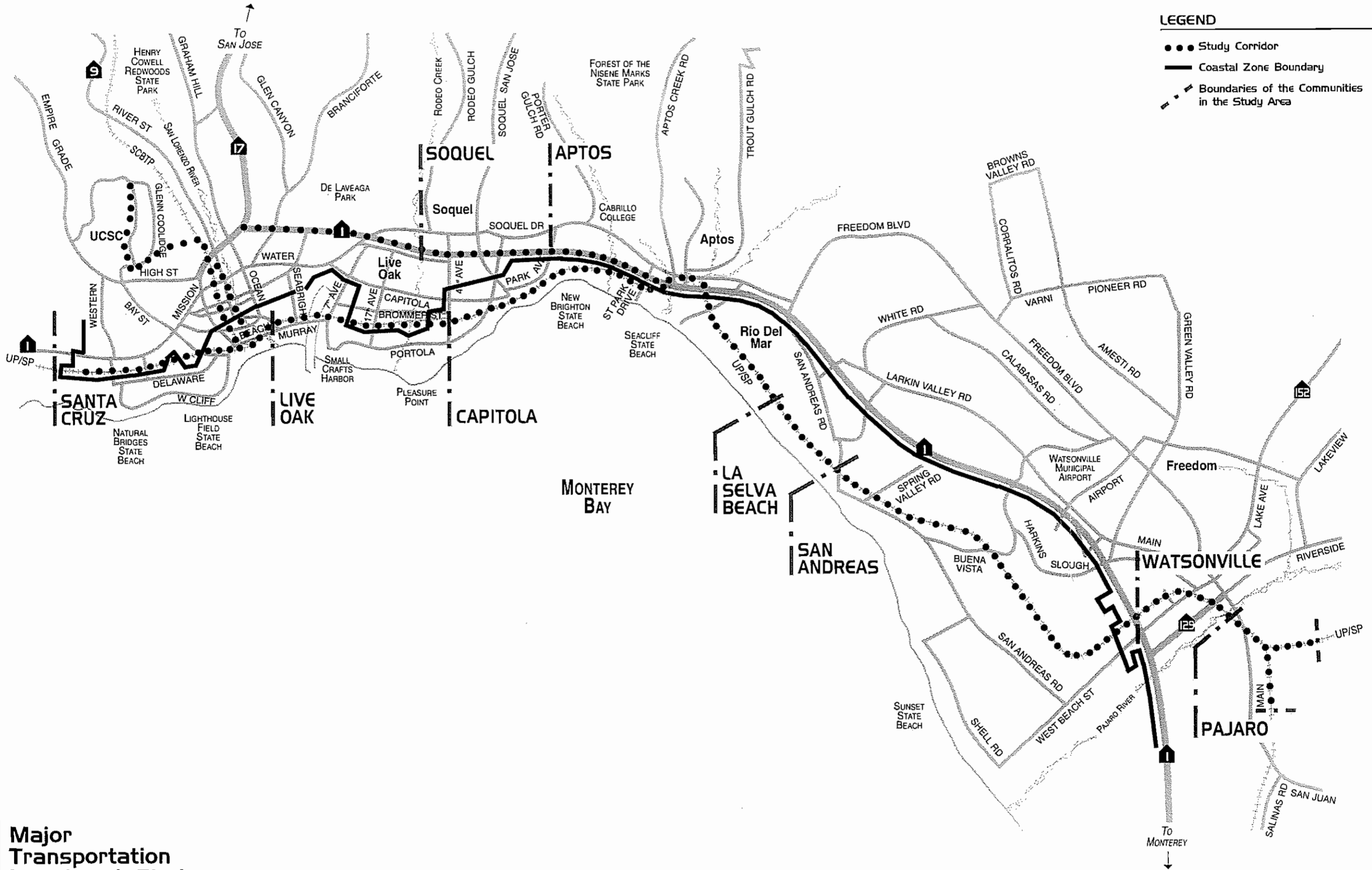
The location of the Watsonville-Santa Cruz Corridor is shown in [Figure 1-1](#). The corridor extends from Watsonville Junction north to the city of Santa Cruz and to the UCSC Campus. The corridor is approximately 20 miles in length and centered on the UP Santa Cruz Branch Line rail alignment, Highway 1, and a broad area between downtown Santa Cruz and the UCSC campus.

The population of Santa Cruz County is concentrated in the cities of Watsonville, Capitola, and Santa Cruz and in the communities of Aptos, Live Oak, Soquel, Carbonera, Seacliff, Rio del Mar, La Selva Beach and Freedom. Other residential areas are located in rural areas outside the study corridor. The corridor also contains two major educational institutions, UCSC, located on the north side of Santa Cruz, and Cabrillo College, located in Aptos, near the middle of the corridor. Santa Cruz County's proximity to the Bay Area and its natural amenities have also made the county, including the study corridor, a popular tourist destination.

## **1.4 Corridor Travel**

### **1.4.1 Current Conditions**

The Watsonville Junction - Santa Cruz - UCSC corridor contains a mix of transportation facilities that includes freeways, arterial and local streets, and bus transit.



**LEGEND**

- Study Corridor
- Coastal Zone Boundary
- - - Boundaries of the Communities in the Study Area



Major  
Transportation  
Investment Study



### **Highways and Arterials**

Highway 1 and Highway 17 are the primary corridors for vehicle traffic in the County. The Highway 1 corridor links south Santa Cruz County, the Monterey Bay area, downtown Santa Cruz, the UCSC campus, and provides access Highway 17 and jobs in Santa Clara County. Arterial and local streets facilitate circulation within and between neighborhoods and cities.

Based on traffic monitoring programs by the SCCRTC and City of Santa Cruz in 1990-93, the average daily traffic volume (ADT) on Highway 1, between Highway 17 and Soquel Drive, is about 95,000 vehicles. West of Highway 17, the ADT is about 47,500. Highway 17 operates with about 66,000 vehicles on an average weekday, north of Highway 1<sup>1</sup>. Arterial ADTs range from 11,000 to 35,000 in the Santa Cruz area; 11,000 to 39,000 in the Soquel - Capitola area; 9,000 to 19,000 in the Watsonville area. Highway 1 currently experiences traffic congestion during weekday peak periods. During weekends and summer months, Highway 1 and several east-west arterials experience stop-and-go traffic due to Santa Cruz Beach Boardwalk and other beach traffic. It is estimated that weekend traffic volumes can be up to 40 percent greater than average peak weekday traffic levels.

### **Transit**

The Santa Cruz Metropolitan Transit District (SCMTD) is the primary transit provider in Santa Cruz County. The District operates 27 urban collector, express and urban local feeder routes in the study area. Most bus routes serve local travel and few routes traverse the entire corridor. Express services use a limited portion of Highway 1 for part of their routes. SCMTD operates three transit centers in the study area including downtown Santa Cruz, downtown Watsonville, and Capitola Mall. The transit system experiences overcrowding on several bus routes, especially those serving the UCSC campus and in Watsonville. Routes that serve the UCSC campus experience passenger loads of up to 150 percent over capacity.

In addition to SCMTD scheduled bus service, shuttle service is also provided in the study area. These shuttles operate during the summer and provide access to beaches in Capitola and Santa Cruz. In season, approximately, 500 to 700 passengers ride the shuttles daily.

### **Rail**

The study corridor is traversed by the Union Pacific (UP) rail right-of-way corridor. This corridor extends 20.2 miles from the Natural Bridges area of Santa Cruz to Watsonville Junction. Some segments of the corridor have been incorporated into four of the MTIS Alternatives (4, 5, 6, and 7). Rail operations on the corridor are currently limited to service for a cement plant operation in nearby Davenport and a handful of other customers.

A secondary rail line in the study corridor connects downtown Santa Cruz and the Felton area to the north. The Santa Cruz and Big Trees railroad operates a recreational excursion train and supports limited freight traffic. Part of this right-of-way has been incorporated into two of the MTIS rail alternatives (Alternatives 4 and 5).

### **Parking**

Spillover parking from visitors, students and commuters frequently affects residential neighborhoods. This problem occurs in neighborhoods around the UCSC campus and the beaches. Neighborhood parking permit programs have been adopted near the campus to provide access to residents and maintain parking availability. In the beach areas on weekends

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<sup>1</sup> SCCRTC, Traffic Monitoring Program, 1990-93; City of Santa Cruz Dept. of Public Works.

and during summer months, a combination of strategies, including permit parking, parking meters, and red zone towing, are in use to control neighborhood parking problems.

#### **1.4.2 Projected Corridor Growth - 1990 to 2015**

Population and employment in the study area are projected to increase significantly between 1990 and 2015 according to forecasts prepared by the Association of Monterey Bay Area Governments (AMBAG). The population of Santa Cruz County is expected to increase 28 percent and employment by 36 percent. Planned increases in student enrollment and university employment at UCSC will contribute to this growth. Student enrollment is expected to increase by 20 to 50 percent by 2005, accommodating between 12,000 and 15,000 students. Increases in population and employment will affect transportation in the corridor by increasing the total number of trips by all modes.

The location of new development in the County is influenced by the topography of the region. The Santa Cruz Mountains to the north and northeast constrain most future population growth to Monterey Bay's coastal terraces. The ability to provide added roadway capacity to accommodate the employment and population growth will also be constrained by these natural features.

#### **1.4.3 Future Conditions - Baseline Alternative**

The MTIS travel forecasting model established the 2015 Baseline conditions for Santa Cruz County, representing conditions that would occur if no major transportation improvements are made. The Baseline conditions include only improvements listed in the State Transportation Improvement Plan (STIP), the Santa Cruz County Regional Transportation Improvement Plan (fiscally constrained list), and the SCMTD Short-Range Transit Plan.

Under the Baseline conditions, travel within Santa Cruz County is expected to increase to about 1,070,000 weekday person-trips by 2015, a 27 percent increase over 1990 levels. The growth in travel is expected to place greater demands on the County's transportation system. The volume of weekday automobile trips is projected to increase 27 percent by year 2015, and transit ridership is expected to increase by 25 percent.

#### **Roadway Conditions**

Traffic level-of-service is a qualitative measure of congestion on freeways, state highways and arterial streets. Level-of-service (LOS) A indicates free flow conditions, while LOS D, E, and F indicates increasing levels of congestion. LOS F corresponds to stop-and-go conditions.

The number of miles of freeways, state highways and arterial streets operating at LOS F will increase substantially between 1990 and 2015. For example, in 1990, about eight lane miles of the County's freeways operated at LOS F. By 2015, the number of freeways lane miles at LOS F is expected to increase to nearly 29 miles, a 253 percent increase. Similarly, the number of lane miles of state highway and arterial streets operating at LOS F is expected to grow by 345 percent and 414 percent, respectively.

Other measures of projected automobile use also indicate that Santa Cruz County's roadway network would operate with higher levels of congestion in year 2015. Daily vehicle miles traveled (VMT) is projected to increase by 45 percent between 1990 and 2015. Peak hour VMT would grow at a faster rate, increasing by 72 percent. Daily auto vehicle hours traveled (VHT) is projected to increase by 119 percent and peak hour VHT by 250 percent between 1990

and 2015. The VHT grows significantly faster than VMT because worsening congestion requires more time to travel a given distance.

Growing roadway congestion would also result in lower travel speeds for automobiles. The average daily speed on the roadway network is expected to fall from 33 miles per hour (mph) in 1990 to 21.8 mph under 2015 Baseline conditions. Peak hour average speed would also decrease from 29 mph to 14.2 mph under Baseline conditions.

### **Transit Conditions**

As noted above, transit ridership would increase by 25 percent without transit improvements. UCSC would attract the largest share of all transit trips in the County, increasing by 10 percent between 1990 and 2015 Baseline.

Under Baseline conditions as defined by the MTIS Study, transit funding would remain at today's levels, and no new service would be implemented. As a result, total daily service hours would decrease by 10 percent by year 2015 due to additional financial costs (e.g. inflation) and increased traffic congestion, resulting in fewer vehicle and revenue miles with the same number of service hours. This assumption could be revisited, but if constant service levels were maintained, transit costs would increase due to inflation and Federal/State mandates.

Travel times, a measure of transit quality of service, are projected to worsen significantly by 2015. For example, travel time between UCSC and downtown Watsonville is projected to increase 161 percent, from 44 minutes to almost two hours due to the projected increase in congestion on the state highway and arterial street system.

## **1.5 Remainder of this Report**

The remainder of this report discusses the following:

- The evaluation process used to develop the MTIS multimodal alternative strategies;
- Alternative descriptions;
- Transportation, traffic, parking and other potential impacts that may be generated by the alternatives;
- Results of the environmental screening of alternatives; and
- A financial analysis of each alternative, as well as comparative costs and benefits

The report ends with a discussion of the recommended investment strategy.

## 2.0 EVALUATION CRITERIA

The MTIS evaluation criteria and performance measures assist decision makers in screening alternatives and assessing their impacts and effectiveness. The first phase of the MTIS planning process considered primarily local concerns. During this phase, an initial list of 24 alternative strategies for the corridor was reduced to the eight investment strategies studied in the MTIS. In the second phase of the project, the evaluation used both federally mandated and locally developed evaluation criteria and performance measures. The second evaluation phase included the preparation of all the project technical analyses assessing each alternative.

Because the MTIS is federally-funded, certain procedures must be followed. Specifically, the Federal Transit Administration (FTA) has developed criteria and procedures to ensure that candidate New Start “fixed guideway” projects are responsive to the ISTEA mandate and apply nationally recognized standards to assess the performance of candidate projects.

### 2.1 Screening Criteria

A list of 19 criteria were used in the first and second phases of the screening process. These criteria allow a comprehensive evaluation of each strategy by assessing environmental issues, long-range corridor planning, mobility improvement, costs and cost effectiveness. The criteria are listed below:

#### **Long-Range Corridor Planning**

- Support Social and Economic Vitality
- Reduce Automobile Impacts
- Consistency with UCSC Requirements
- Consistency with Local & Regional Plans

#### **Environmental Issues**

- Environmental/Cultural Impacts
- Air Quality Improvements
- Energy Consumption
- Sensitivity to Established Districts
- Noise/Vibration Effects
- Visual Effects

#### **Mobility Improvements**

- Ability to Meet Travel Needs
- Activity Centers Served
- Travel Characteristics
- Transit Ridership Goal
- Access
- Interconnectivity
- System Expansion

#### **Cost & Cost Effectiveness**

- Capital and Operating Costs
- Federal Requirements

### 2.2 Federal Criteria

The FTA uses a uniform nationwide set of evaluation measures to determine which projects receive federal assistance. However, it is not required that the selection of the Locally Preferred Investment Strategy be based on the FTA measures. The FTA can consider measures other than those used by the federal government in its funding decisions. The MTIS uses a combination of the federal performance measures and local evaluation criteria in the detailed evaluation of alternatives.

The federal criteria measures and the local evaluation and performance measures (*in italics*) are defined below:

- **Cost Effectiveness:** The total incremental (annualized capital and O&M) cost (expressed in constant dollars) for an additional passenger trip, compared with the Baseline and transportation system management (TSM) alternatives in terms of annualized capital and O&M costs and ridership.
- **Mobility Improvements:** The projected aggregate monetary value of travel time savings attributable to the new investment, compared to the TSM alternatives.

*The absolute number of zero car households (or alternatively, the people resident in those households) located within one-half mile of transit stations and other boarding points for the proposed alternative, compared to the TSM alternative.*

- **Operating Efficiencies:** The forecast change in operating cost per vehicle service hour for that part of the system directly affected by the proposed new investment, compared to the TSM alternative.

*The Forecast Change in Passenger Vehicle Service Hours, compared to the TSM alternative.*

*The Forecast Change in Passenger Miles per Vehicle Service Hour, compared to the TSM alternative.*

- **Environmental Benefits:** The forecast change in emissions of criteria pollutants and greenhouse gas emissions ascribable to the proposed new investment, compared to the TSM alternative. “Criteria pollutants” are those air pollutants for which specific standards have been set under the Clean Air Act Amendment. Consideration of Santa Cruz region air quality concerns were required.

*The forecast change in fuel consumption ascribable to the proposed new investment, compared to the TSM alternative.*

- **Transit Support of Existing Land Use Policies and Future Patterns:** The degree to which local land use policies foster transit-supporting land use. The FTA document *Revised Measures for Assessing Major Investments - A Discussion Draft* identifies measures qualitatively assessing this performance measure.

## 2.3 Evaluation Process

The alternative strategies for the Santa Cruz corridor were evaluated using the Multiple Measure Method. This approach estimates the impacts of each alternative using several units of measure. Information was developed, highlighting the differences between alternatives and key tradeoffs. Ultimate selection of the recommended preferred investment strategy by the Consultant was made considering the evaluation criteria, local concerns and the values of the community, and the Consultant’s professional judgment.

## **3.0 ALTERNATIVES CONSIDERED**

In the Major Transportation Investment Study (MTIS), eight alternative investment strategies were studied in detail. These eight alternatives were developed based on input received from the public, input received from the Rail Oversight Committee (ROC), and the technical requirements of the corridors studied. The alternatives studied were the result of an initial 34 alternative concepts that were screened to 14 alternative concepts that were reviewed and evaluated by the public and then further refined into eight investment strategies for detailed study. This chapter presents an overview of the initial screening process and a summary of the detailed definition of the final alternatives studied in the MTIS.

### **3.1 Screening and Selection of Alternative Investment Strategies**

The MTIS process began in the winter of 1994/95. In the very early stages of the MTIS process, a total of 34 alternative concepts were identified working with the Santa Cruz County Regional Transportation Commission (SCCRTC) staff, the ROC and from input from the consultant team. The general categorization of these 34 concepts were:

- Three (3) concepts focused on minimal improvements in the region;
- Five (5) concepts focused on the “management” of the transportation system including some increase in the bus system;
- Four (4) concepts focused on the construction of new roadway facilities;
- Seven (7) concepts focused on the University of California, Santa Cruz campus to downtown Santa Cruz to Watsonville “corridor unifying” transit strategies;
- Three (3) concepts focused on improving the downtown Santa Cruz to UCSC transit transfer and connection;
- Ten (10) concepts focused on reduced operating segments of a corridor unifying rail or bus concept that would link the UCSC campus with the mid-County area; and
- Two (2) minimal operating rail concepts that would link Harvey West to the Capitola area.

These 34 alternative concepts were conceptually defined and reviewed with the SCCRTC staff and the ROC and this led to the identification of 15 “Alternatives” for further review and public comment. The 15 alternatives reviewed with the public consisted of the following general groupings:

- One (1) alternative that assumed a continuation of the status quo (Baseline);
- One (1) alternative that focused on the management of the system plus expansion of the bus fleet;
- Three (3) alternatives that focused on widening Highway 1 for:
  - Carpool lanes;
  - General purpose lanes; and
  - Carpool lanes plus a new Eastern Access to the UCSC campus.
- Four (4) alternatives that were “guideway-oriented” (i.e. rail or busway) and corridor unifying:
  - Rail from Watsonville Junction (WJ) to UCSC via Bay Street;
  - Rail from WJ to UCSC via the Pogonip;
  - Rail from WJ to UCSC via Cabrillo College and the Pogonip; and
  - Busway from Watsonville to UCSC via Hwy. 1, the Santa Cruz Branch Line right-of-way, and Bay Street.

- Five (5) alternatives that were “guideway-oriented” (i.e. rail or busway), but not corridor unifying:
  - Rail from WJ to Harvey West (HW) with a bus connection to UCSC;
  - Rail from WJ to HW; Cog Rail to UCSC;
  - Rail from WJ to HW; Aerial Tram to UCSC.
  - Rail from WJ to HW; Busway from the Boardwalk to UCSC via Bay Street; and
  - Rail from WJ to Natural Bridges; bus service along Bay Street to UCSC.
- And finally, one (1) alternative focused on providing rail service from a “mid-County” point (to be determined) to the UCSC campus via either the Pogonip or Bay Street.

These 15 alternatives were presented to the public at two community meetings occurring on February 1, 1995 (Watsonville) and on February 2, 1995 (Santa Cruz) to obtain input and direction. A total of 150 people attended the two meetings and their written and verbal comments were grouped into three general categories:

- There was a contingent that supported the widening of Highway 1 for either General Purpose or Carpool users;
- There was a contingent that supported the provision of rail service. Within this group, there was little support for the provision of rail on Bay Street and more support for the provision of rail via Harvey West and the Pogonip. There was also some support expressed for providing rail as far east as Watsonville; and
- There was a small group who expressed support for bus improvements or for doing nothing different than the status quo.

Based on the input received from the public, the consultant team prepared a “Screening of Alternatives for Detailed Study” memorandum in March of 1995 which included a matrix application of the evaluation criteria. This information was then presented to the Rail Oversight Committee and the SCCRTC staff for review and comment.

Based on the comments received, an initial selection of eight (8) alternative investment strategies were identified and conceptually defined by the consultant team. These eight investment strategies were then presented to the public at five (5) neighborhood meetings for input. The five (5) neighborhood meetings occurred as follows:

- April 25, 1995 in La Selva Beach;
- April 26, 1995 in Live Oak;
- May 1, 1995 on the UCSC campus;
- May 2, 1995 in Santa Cruz; and
- May 4, 1995 in Watsonville.

In addition to the neighborhood meetings, several “Expert Panels” were convened focusing on specific areas of interest -- finance, downtown Santa Cruz alignments, energy and environmental concerns and freight rail issues, -- to provide additional input to the team on the 8 proposed investment strategies.

Based on the input received, a final set of eight (8) investment strategies were selected by the Rail Oversight Committee in the summer of 1995. These investment strategies were then subject to detailed definition and analyzed for engineering and costing, environmental effects, ridership forecasting, and the ability of the region to finance the strategies. The eight alternative investment strategies selected are discussed in the following section.

In addition to the public involvement and staff/ROC input and selection of the investment strategies, there were four critical decisions that the ROC made during the definition and analysis phase of the MTIS which had an effect on the strategies and their costs. The key decisions made were:

- A 10% reduction in the Baseline transit service to account for increasing costs without additional offsetting funding.
- The assumption that compressed natural gas (CNG) buses would be phased in over time as an air quality strategy. This decision raised the per-unit cost of buses over a standard diesel powered vehicle; also improved noise and air quality inputs.
- A decision on which of the rail stations would be park-and-ride (PNR) and which would be walk-and-ride (WNR) in an effort to be responsive to local community concerns. This decision may or may not have affected the ridership forecasts for the alternatives.
- The decision and direction that a “freight window” would not occur on the Santa Cruz Branch line. A freight window is a concept used on other rail systems (San Diego and Baltimore) that share passenger and freight operations where the freight service operates in the middle of the night and the passenger service operates during the daytime hours. By not having a “freight window” in the evening, the costs of the rail alternative were increased for required double tracking for passing areas, additional signal control the consultant concluded would be required by the Federal Railroad Administration, and a much stronger (and more expensive) rail vehicle that the consultant concluded would be required by the Federal Railroad Administration.
- The decision to extend the rail service as far east as Watsonville (as opposed to stopping mid-County) recognizing the desire to at least test the viability of the extension. This decision added to the overall cost of the rail investment strategies.
- The Baseline transit service is assumed within the TSM transit service and the TSM is assumed within all of the other alternatives.

Each of these decisions had an effect on the operating concepts and costs associated with the investment strategies evaluated in detail during the MTIS process. The detailed definition of the eight investment strategies is presented in the next section.

### **3.2 Detailed Definition of Alternative Investment Strategies**

The following is a summary of the eight alternative investment strategies evaluated for design, costing, environmental effect, and financial feasibility during the MTIS process. Appendix B of this document presents graphic illustrations of each of these investment strategies. More detailed information on the alternative investment strategies is available in the *Task 8, Detailed Definition of Alternatives Report, May 1997*.

- **Alternative 1: Baseline** -- The Baseline, or Do-Nothing, alternative represents conditions in 2015 if no new major transportation improvements are implemented beyond those already planned or funded. This alternative is required to establish a base against which all other alternatives are compared. It is also used as the basis against which the cost-effectiveness of major transit capital investment alternatives are evaluated.

The Baseline alternative includes only those highway and transit improvements included in the Santa Cruz County Regional Transportation Improvement Plan (RTIP), the Santa Cruz Metropolitan Transit District Short-Range Transit Plan, plus a short list of other planned local projects. A moderate decrease in bus service for Santa Cruz County is also assumed in response to projected static funding levels in conjunction with increased costs due to unfunded federal mandates and inflation. As a result, total daily service hours decrease by 10% by 2015 due to additional financial costs (e.g., inflation) and increased traffic congestion resulting in fewer service miles with the same number of service hours. All other features of the transportation system would remain as today.

All elements of the Baseline alternative act as building blocks and are included in all of the other alternatives.

- **Alternative 2: Transportation Systems Management (TSM)** -- This alternative is a lower-capital-cost approach to addressing transportation problems than the Highway Widening, Busway, or Rail alternatives. As with the other alternatives, the TSM alternative includes all facilities and services of the Baseline alternative described above.

The TSM alternative improves transit services above the Baseline alternative. SCMTD's bus fleet would be 109 buses (including spares) which is a 42% increase (33% increase in revenue hours). The alternative also tests a relatively low-cost set of multi-modal transportation improvements, improved bicycle and pedestrian facilities, and a centralized transportation resource center for information on using alternative forms of transportation. Bus service improvements are designed to maintain the current level of service, as well as, add new services to address minor system deficiencies.

- **Alternative 3: Widen Highway 1 for Carpool/Bus Lanes** -- This alternative includes Alternative 2 TSM plus the widening of State Highway 1 to accommodate carpool (also referred to as high occupancy vehicle - HOV) lanes for use by buses and carpools with 2 or more occupants (2+) during the peak commute periods.

Alternative 3 includes the addition of one lane in each direction on Highway 1 between the Highway 1/Highway 17 Interchange to the west, and State Park Drive to the east. In addition, a carpool lane connection to northbound Highway 17 would eventually be constructed along with ramp metering and ramp bypass lanes for carpools and buses. The HOV lanes are used only by carpools and buses during the peak weekday commute periods, and is available for use by all vehicles during the rest of the day and weekends.

- **Alternative 4: Rail Transit from Watsonville Transit Center to UCSC Via Harvey West** -- This alternative includes Alternative 2 TSM plus development of new rail service for the 22-mile Watsonville-Santa Cruz-UCSC Corridor. This service operates from the Watsonville Transit Center west and north on the Union Pacific Railroad (UP) tracks to a station north-west of the Municipal Wharf in Santa Cruz, then north on the Santa Cruz Big Trees and Pacific (SCBTP) rail right-of-way to Encinal Street in the Harvey West Industrial Park. From Encinal Street the alignment would continue to Sylvania Avenue, to Harvey West Boulevard, to the base of the Pogonip Open Space Reserve. The alignment would then follow roughly the

southern edge of the Pogonip to Glenn Coolidge Drive, to Hagar Drive, and up to the vicinity of the UCSC bookstore.

This alternative also includes a bicycle path in the rail right-of-way, Highway 1 pedestrian overcrossing, which is constructed near Cabrillo College, and a new shuttle service to serve the Live Oak area.

- **Alternative 5: Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges** -- This alternative includes Alternative 2 TSM plus development of new rail service for the 20-mile Watsonville-Santa Cruz Corridor. The service operates from the historic railroad station near the Watsonville Transit Center and follows the UP right-of-way north to West Beach Street. From West Beach Street, the alignment would continue north on the UP tracks to a station just north of the Santa Cruz Municipal Wharf, then north along Pacific Avenue and Front Street to Encinal Street in the Harvey West Industrial Park where the rail line terminates at a station on the right-of-way.

The section along Front and River between the intersections of North Pacific and River and Front and River Streets operate as a one-way couplet. Northbound service follows River Street and southbound follows North Pacific and Front Streets. Service from Natural Bridges operates on the UP right-of-way as a dedicated rail shuttle between Natural Bridges and the Wharf station.

As with Alternative 4, a bicycle facility, a Highway 1 pedestrian overcrossing near Cabrillo College, and a new shuttle service to serve the Live Oak area are elements of this alternative.

- **Alternative 6: Busway** -- This alternative includes Alternative 2 TSM plus development of a new busway using the UP rail right-of-way between Natural Bridges in west Santa Cruz east to Capitola near the Highway 1 Interchange at Park Avenue, a distance of 6 miles. One lane is provided in each direction, with 13 bus stops located along the route. The busway is designed to provide safe and concurrent operation of buses, freight rail traffic, and bicycles in the right-of-way. No Highway 1 pedestrian overcrossing would be built under this alternative; rather a new shuttle service would be established to serve Cabrillo College. A shuttle also serves the Live Oak area. The bike facility is part of this alternative.
- **Alternative 7: Rail Transit from Downtown Watsonville to Harvey West** -- This alternative includes Alternative 2 TSM plus development of new rail service for the 20-mile Watsonville-Santa Cruz Corridor. While this alternative follows an alignment similar to Alternative 4, no rail service is provided to UCSC. The alignment follows the existing SCBTP rail alignment on Chestnut Street to Harvey West. Service operates from the location of the historic train station (near the intersection of Walker and West Beach Streets) west and north to Harvey West near downtown Santa Cruz via the existing UP and SCBTP rail rights-of-way. No Highway 1 pedestrian overcrossing would be built under this alternative; instead, a new shuttle service would be established to serve Cabrillo College. A shuttle also serves the Live Oak area. And the bike facility is part of this alternative.
- **Alternative 8: Improved Bus Service** -- This alternative includes Alternative 2 TSM plus additional bus transit service to respond to projected population growth

between now and the year 2015. Specific service improvements include new express bus service to Santa Cruz, California State University at Monterey Bay, and San Jose. Also new local service is provided within the City of Watsonville; to Harvey West, Aptos, Capitola, San Lorenzo Valley, and to the westside of Santa Cruz and the UCSC campus. Under this alternative, SCMTD's bus fleet was increased to 169 vehicles (including spares). This was a 119% increase in vehicles and a 118% increase in revenue hours over the Baseline alternative.

As with Alternatives 4 and 5, a Highway 1 pedestrian overcrossing would be constructed near Cabrillo College, and a new shuttle service would be established to serve the Live Oak area.

Table 3-1 on the following page presents a summary of the transit service and other improvements included in each of the alternatives.

TABLE 3-1

SUMMARY OF DETAILED DEFINITIONS OF ALTERNATIVES

Description of Alternative	Major Capital Improvements in Corridor	Fixed Routes	Bus Fleet Size	Annual Revenue Bus Hours	Rail Fleet Size	Annual Revenue Rail Hours
<p><b>1. Baseline</b></p> <p>The Alternative represents conditions in 2015 if no new major highway or transit improvements are implemented.</p> <p>The existing transit system would continue to operate as it does today with no new service provided. Transit funding would remain at today's levels, and as a result, total daily service hours would decrease by 10%.</p>	<ul style="list-style-type: none"> <li>Widen Mission Street</li> <li>Improve Hwy. 1/Hwy. 17 Interchange</li> <li>Improve Harkins Slough Road/ Highway 1 Interchange</li> <li>Widen River Street (3 locations)</li> <li>Extend Errington Road</li> <li>SCMTD Westside Industrial Park Administrative/Maintenance Facility</li> </ul>	<p>Local 31</p> <p>Express 2</p>	<p>Peak 64</p> <p>Total 77</p>	189,300	N/A	N/A
<p><b>2. Transportation Systems Management (TSM) (includes Baseline)</b></p> <p>The Alternative will provide a set of service improvements to maintain current level of service and to address system deficiencies; bicycle and pedestrian facilities; and a centralized transportation resource center.</p>	<ul style="list-style-type: none"> <li>Sidewalks and pedestrian-oriented walkways and landscaping</li> <li>Bike and pedestrian facilities</li> </ul>	<p>Local 34</p> <p>Express 3</p> <p>Shuttle 1</p>	<p>Peak 91</p> <p>Total 109</p>	252,200	N/A	N/A
<p><b>3. Widen Highway 1 for Carpool/Bus Lanes (includes TSM Improvements)</b></p> <p>Highway 1 would be widened to accommodate a Carpool lane for use by carpools and buses with two or more occupants during the weekday peak commute periods. Improvements would include extending Highway 17 Express service to Watsonville; express bus service to CSUMB; and express bus service to UCSC from Mid County or Watsonville.</p>	<ul style="list-style-type: none"> <li>HOV lane would be built between the Hwy. 1/Hwy. 17 Interchange and State Park Drive</li> </ul>	<p>Local 34</p> <p>Express 4</p> <p>Shuttle 1</p>	<p>Peak 99</p> <p>Total 119</p>	288,100	N/A	N/A

Note: The peak number refers to total number of buses in service during the highest hours-of-service; and the total number includes spare buses for maintenance and reserve.

N/A = information not available.

Source: Travel forecasts prepared by Parsons Brinckerhoff, February 1997.

TABLE 3-1 (continued)

SUMMARY OF DETAILED DEFINITIONS OF ALTERNATIVES

Description of Alternative	Major Capital Improvements in Corridor	Fixed Routes	Bus Fleet Size	Annual Revenue Bus Hours	Rail Fleet Size	Annual Revenue Rail Hours
<p><b>4. Rail Transit From Watsonville Transit Center to UCSC Via Harvey West (includes TSM Improvements)</b></p> <p>The proposed rail service would operate from the Watsonville Transit Center north to the UCSC campus via Harvey West via the existing SP and Big Trees and Pacific right-of-ways. A Highway 1 pedestrian overcrossing would be built near Cabrillo College, and a new shuttle service would operate serving the Live Oak area.</p>	<ul style="list-style-type: none"> <li>Rail track upgrades, grade crossings, etc.</li> <li>Cog rail guideway from Harvey West Blvd. to the UCSC campus</li> <li>New rail maintenance/storage facility</li> <li>Construction of 19 rail stations between Watsonville and the UCSC campus</li> <li>Bicycle path using the UP right-of-way</li> <li>Highway 1 pedestrian overcrossing</li> </ul>	<p>Local 34 Express 3 Shuttle 2</p>	<p>Peak 90 Total 108</p>	264,200	<p>Peak 18 Total 22</p>	346,500
<p><b>5. Rail Transit From Watsonville Transit Center to Harvey West and Natural Bridges (includes TSM Improvements)</b></p> <p>The proposed rail service would operate from the Watsonville Transit Center north to Harvey West. A rail shuttle service would provide connections between the rail line and Natural Bridges to the west side of Santa Cruz. The alternative includes the Highway 1 pedestrian overcrossing and Live Oak transit service described under Alternative 4.</p>	<ul style="list-style-type: none"> <li>New track connection along Front and River Streets in downtown Santa Cruz</li> <li>New rail maintenance/storage facility</li> <li>Pedestrian barriers, sound walls, etc.</li> <li>Construction of 20 rail stations between Watsonville and Natural Bridges</li> <li>Bicycle path using the UP right-of-way</li> <li>Highway 1 pedestrian overcrossing</li> </ul>	<p>Local 34 Express 3 Shuttle 2</p>	<p>Peak 86 Total 103</p>	255,200	<p>Peak 16 Total 19</p>	369,600
<p><b>6. Busway (includes TSM Improvements)</b></p> <p>A busway would be constructed using the SP right-of-way between Natural Bridges to Seacliff Beach. No Highway 1 pedestrian overcrossing would be built; rather, a new shuttle service would serve Cabrillo College. A shuttle would also serve the Live Oak area.</p>	<ul style="list-style-type: none"> <li>Busway would be a two-lane paved bus facility, with an 8-foot two-way bicycle lane on the opposite side. Buses would use the trackway to pass a stalled bus or bicycle on the bus lane side of the track.</li> <li>Construction of 13 busway stations between Watsonville and Natural Bridges</li> </ul>	<p>Local 35 Express 3 Shuttle 3</p>	<p>Peak 90 Total 108</p>	261,000	N/A	N/A

Note: The peak number refers to total number of buses in service during the highest hours-of-service; and the total number includes spare buses for maintenance and reserve.

N/A = information not available.

Source: Travel forecasts prepared by Parsons Brinckerhoff, February 1997.

**TABLE 3-1 (continued)**

**SUMMARY OF DETAILED DEFINITIONS OF ALTERNATIVES**

Description of Alternative	Major Capital Improvements in Corridor	Fixed Routes	Bus Fleet Size	Annual Revenue Bus Hours	Rail Fleet Size	Annual Revenue Rail Hours														
<p><b>7. Rail Transit from Downtown Watsonville to Harvey West (includes TSM Improvements)</b></p> <p>This alternative would follow an alignment similar to Alternative 4, however no rail service would be provided to UCSC. No Highway 1 pedestrian overcrossing would be built; rather, a new shuttle service would serve Cabrillo College. A shuttle would also serve the Live Oak area.</p>	<ul style="list-style-type: none"> <li>• Rail track upgrades, grade crossings, etc.</li> <li>• New rail maintenance/storage facility</li> <li>• Pedestrian barriers, sound walls, etc.</li> <li>• Construction of 17 rail stations between Watsonville and Encinal Street in Santa Cruz</li> <li>• Bicycle path using the UP right-of-way</li> </ul>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Local</td> <td style="width: 50%; text-align: right;">34</td> </tr> <tr> <td>Express</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Shuttle</td> <td style="text-align: right;">3</td> </tr> </table>	Local	34	Express	3	Shuttle	3	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Peak</td> <td style="width: 50%; text-align: right;">89</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">107</td> </tr> </table>	Peak	89	Total	107	262,800	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Peak</td> <td style="width: 50%; text-align: right;">14</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">17</td> </tr> </table>	Peak	14	Total	17	369,500
Local	34																			
Express	3																			
Shuttle	3																			
Peak	89																			
Total	107																			
Peak	14																			
Total	17																			
<p><b>8. Improved Bus Service (includes TSM Improvements)</b></p> <p>Alternative includes specific bus service such as new express bus service to Santa Cruz, California State University, Monterey, and San Jose; within the City of Watsonville; and to Harvey West, Aptos, Capitola, San Lorenzo Valley, and to the westside of Santa Cruz.</p>	<ul style="list-style-type: none"> <li>• Highway 1 pedestrian overcrossing</li> </ul>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Local</td> <td style="width: 50%; text-align: right;">40</td> </tr> <tr> <td>Express</td> <td style="text-align: right;">6</td> </tr> <tr> <td>Shuttle</td> <td style="text-align: right;">2</td> </tr> </table>	Local	40	Express	6	Shuttle	2	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Peak</td> <td style="width: 50%; text-align: right;">141</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">169</td> </tr> </table>	Peak	141	Total	169	412,700	N/A	N/A				
Local	40																			
Express	6																			
Shuttle	2																			
Peak	141																			
Total	169																			

Note: The peak number refers to total number of buses in service during the highest hours-of-service; and the total number includes spare buses for maintenance and reserve.  
N/A = information not available.  
Source: Travel forecasts prepared by Parsons Brinckerhoff, February 1997.

## 4.0 TRANSPORTATION IMPACTS

Task 10, Transportation Impacts, presented the results of the travel forecasting process. The key results presented in this task are summarized below and discussed in summary fashion in this chapter.

- Under the “Do Nothing” or Baseline alternative, the level of vehicle travel--as reflected by the forecasted amount of Vehicle Miles of Travel (VMT)--is projected to increase by 45% (more than the growth in population and employment in the County) between 1990 and 2015. Moreover, the level of congestion--as reflected by the forecasted amount of Vehicle Hours of Travel (VHT)--is projected to increase by 119% between 1990 and 2015. As a result, there will be a significant increase in both vehicle travel and congestion between now and 2015.
- Of all the alternatives tested in the MTIS, a very modest decrease in VMT (1.5% to 1.8%) is anticipated with the exception of the Widening of Highway 1 alternative which actually increases VMT by slightly less than 1%. A decrease in VHT (1.7% to 3.3%) is anticipated with implementation of the investment strategies.
- In terms of traffic impacts, the “rail” investment strategies provide proportionally more benefits to the arterial and non-freeway state highway systems in the County. The “Widening of Highway 1” investment strategy provides proportionally more benefits to the Freeway system in the County.
- In terms of transit effects, it is noted that the “Do Nothing” or Baseline alternative will not allow transit service in the County to maintain its present-day share of all trips (2.14%). The greatest share of transit trips is achieved with the *Improved Bus Service* (Alternative 8) investment strategy. It should be noted that even with this alternative, the County is projected to capture 2.7% of all trips on transit--which is significantly less than the regional goal of 10% of all trips.
- Of the approximate 1,000,000 person trips forecasted to occur in Santa Cruz County on an average day, approximately 15% of them are projected to occur by pedestrian or bicycle travel in the year 2015. This is over existing conditions and is a model-generated forecast using existing travel characteristics and future population/employment conditions.
- With regard to transit usage, the UCSC campus was consistently identified as capturing the greatest number and mode share of the four key activity areas evaluated--UCSC, Downtown Santa Cruz, Capitola Village, and Downtown Watsonville. Conversely, Downtown Watsonville consistently captured the least number of trips by transit.
- Finally, with the busway and rail investment strategies, 83% of the boardings are forecasted to occur between the UCSC campus and Capitola.

## 4.1 Transit Impacts

### 4.1.1 Transit System Requirements

This section describes the operations requirements of each of the project alternatives including, transit vehicle fleet size, and annual mileage and hours of operation.

The Baseline Alternative would reduce bus service compared to the existing bus system. The existing bus system has a total fleet of 79 buses with 66 peak hour buses. The Baseline Alternative would reduce service to 77 total buses and 64 peak hour buses. All of the proposed build alternatives would increase the number of buses compared to Baseline conditions.

Alternative 4 would use a modified rack and adhesion (COG) rail vehicle capable of holding approximately 125 seated and standing passengers. Alternatives 5 and 7 would use a Siemens rail vehicle which is 75 to 80 feet long, with a capacity of about 125 seated and standing passengers. Buses under all alternatives are assumed to seat 40 passengers. [Table 4-1](#) shows the estimate of the number of transit vehicles required under each alternative and yearly miles and hours of operation.

Transit vehicle revenue hours measures the number of hours transit vehicles are in revenue service, excluding dead-heading and other non-revenue travel. Transit vehicle revenue hours roughly correspond to the level of transit service provided. [Table 4-1](#) shows the transit vehicle miles traveled (VMT) and vehicle hours traveled (VHT) for each alternative.

There would be 2,742,000 transit VMT in 2015 under Baseline conditions, 11 percent less than for 1990 (3,072,000). Under the Baseline Alternative the transit system in 2015 would have fewer annual vehicle revenue hours of service than in 1990 (189,300 compared to 208,900), reflecting a 10% planned service cut necessitated by rising costs.

Alternative 2, the TSM Alternative, proposes improvements in bus service that result in one third more bus revenue hours compared to the Baseline condition. The TSM bus system is incorporated into all the build alternatives. All the fixed guideway alternatives (4, 5, 6, and 7) would have additional hours of revenue service to provide buses to feed the rail or busway system. Alternative 3 (Widen Highway 1 for Carpool Lanes) would have additional hours of revenue service to operate buses on the carpool/bus lane on Highway 1. Alternative 5 (Rail to Harvey West and Natural Bridges) would provide over 400 million annual seat miles of service, the most capacity of any alternative and nearly four times the capacity of the Baseline scenario. Alternative 8, Improved Bus Service, proposes the most extensive transit coverage of the project alternatives, having more than double the hours of service projected for Baseline conditions.

### 4.1.2 Transit Ridership

This section describes the number of person trips and share of transit as a proportion of total trips for Santa Cruz County.

**TABLE 4-1**  
**TRANSIT FLEET REQUIREMENTS, VEHICLE MILES AND HOURS**  
**(1990 & 2015)**

Alternatives	Number of Vehicles				Vehicle Miles (annual total) <sup>c</sup>		Revenue Hours (annual total) <sup>d</sup>	
	Peak Buses	Fleet Buses <sup>b</sup>	Peak Rail/Busway	Fleet Rail/Busway <sup>b</sup>	Bus	Rail/Busway	Bus	Rail/Busway
Current (1990) <sup>a</sup>	66	79	--	--	3,072,000	--	208,900	--
1. Baseline (2015)	64	77	--	--	2,742,500	--	189,300	--
<i>change from Current</i>	-3%	-3%	--	--	-11%	--	-9%	--
2. Transportation Systems Management	91	109	--	--	3,188,500	--	252,200	--
<i>change from Current</i>	38%	38%	--	--	4%	--	21%	--
<i>change from Baseline</i>	42%	42%	--	--	16%	--	33%	--
3. Widen Highway 1 for Carpool/Bus Lanes	99	119	--	--	3,656,500	--	288,100	--
<i>change from Current</i>	50%	50%	--	--	19%	--	38%	--
<i>change from Baseline</i>	55%	55%	--	--	33%	--	52%	--
4. Rail Transit from WTC Center to UCSC	90	108	18	22	3,178,000	1,593,600	264,200	100,200
<i>change from Current</i>	36%	36%	--	--	3%	--	26%	--
<i>change from Baseline</i>	41%	41%	--	--	16%	--	40%	--
5. Rail Transit from WTC to Harvey West and Natural Bridges	86	103	16	19	3,101,500	1,370,600	255,200	86,500
<i>change from Current</i>	30%	30%	--	--	1%	--	22%	--
<i>change from Baseline</i>	34%	34%	--	--	13%	--	35%	--
6. Busway	90	108	7	9	3,184,000	564,000	261,000	42,700
<i>change from Current</i>	36%	36%	--	--	4%	--	25%	--
<i>change from Baseline</i>	41%	41%	--	--	16%	--	38%	--
7. Rail Transit from Downtown Watsonville to Harvey West	89	107	14	17	3,184,000	1,347,100	262,800	72,300
<i>change from Current</i>	35%	35%	--	--	4%	--	26%	--
<i>change from Baseline</i>	39%	39%	--	--	16%	--	39%	--
8. Improved Bus Service	141	169	--	--	5,326,500	--	412,700	--
<i>change from Current</i>	114%	114%	--	--	73%	--	98%	--
<i>change from Baseline</i>	120%	120%	--	--	94%	--	118%	--

Notes: <sup>a</sup> Using FY 1995/96 operational data from the Santa Cruz Metropolitan Transit District. Memo from M. J. Dorfman to S. Galloway. August 15, 1996.

<sup>b</sup> Fleet Vehicles = peak pull-out + 20% spare (rounded up for any fraction > 0.25). <sup>c</sup> Rounded to the nearest 500. <sup>d</sup> Rounded to the nearest 100.

Source: travel forecasts prepared by Parsons Brinckerhoff; May 1997.

Total transit riders (shown in [Table 4-2](#)) represents the total number of daily bus and rail or busway riders. Transit ridership is projected to grow by 25 percent from 17,900 daily trips in 1990 to 22,400 trips in 2015 for Baseline conditions.

All build alternatives would increase transit ridership compared to the Baseline condition. Alternative 8, Improved Bus Service, would attract 29,300 total transit riders, the most of any alternative. This is the result of the frequent service and broad coverage of the alternative's bus service (141 peak hour buses). Alternative 4 (Cog Rail) and Alternative 5 (Rail Transit) would each attract 28,400 transit riders, the most of the fixed-guideway alternatives (4, 5, 6, and 7). The direct service to the UCSC campus in Alternative 4 only accounts for 200 additional riders compared to Alternative 7 (Rail Transit), which would terminate at Harvey West.

Transit mode share is the percentage of all travelers using all public transit modes (bus and rail) compared to all travel modes. The Santa Cruz County Regional Transportation Plan (RTP) has the objective of transit serving 10 percent of all person-trips (pp. 2-8). Public transit use accounted for 2.14 percent of all trips in 1990. By 2015, it is expected that the transit mode share would drop slightly to 2.09 percent of all trips. Two factors account for this. First, the growing traffic congestion in the County does not automatically result in an increase in transit ridership, particularly if transit travel times are equal to or worse than using a car. Second, due to the current general plans, high rates of growth are projected for current low density rural and suburban areas where the private auto dominates and transit typically shows poor performance.

Alternative 8 (Improved Bus) would have the highest transit mode share, capturing 2.73 percent of daily trips. Alternative 4 would have the highest transit mode share (2.65%) of the fixed guideway alternatives (4, 5, 6, and 7). Alternative 6 (Busway), would have the lowest transit mode share of all build alternatives (2.37%). Alternative 6 (Busway) would also have the lowest transit mode share of the fixed guideway alternatives (4, 5, 6 and 7) primarily because the facility would not serve downtown Santa Cruz, a major destination in the County. None of the alternatives would meet the RTP transit mode share goal of ten percent.

As shown in Tables 4-3a and 4-3b, UCSC is the single largest transit destination and the majority of the boardings occur between UCSC and mid Santa Cruz County. By 2015, the number of transit trips to the campus is expected to grow by 76 percent for Baseline conditions. Transit trips to other county destinations are also projected to increase but at a slower rate than trips to the university. Transit trips to downtown Santa Cruz and downtown Watsonville would increase by about 30 percent while trips to Capitola Village would experience comparatively little growth.

The proposed transit alternatives (4, 5, 6, 7 and 8) would attract more new passengers in the northern portion of the corridor, UCSC and downtown Santa Cruz. Alternative 4 would attract nearly 1,400 new transit trips to the UCSC campus, the most of any alternative.

The Mid-County (Capitola Village) and South County (Watsonville) areas would generate substantially less new transit trips. Despite the investment in new transit infrastructure and increased service levels, the number of transit trips to downtown Watsonville would remain small under all the alternatives.

**TABLE 4-2**  
**SANTA CRUZ COUNTY WEEKDAY PERSON TRIPS & TRANSIT MODE SPLIT**  
**(1990 & 2015)**

Alternatives	Automobile Trips <sup>a</sup>	Transit Trips <sup>a, b</sup>	Transit Mode Split	Walk/Bike Trips <sup>a</sup>
Current (1990)	700,600	17,900	2.14%	119,600
1. Baseline (2015) <i>change from Current</i>	892,500 27%	22,400 25%	2.09% -2%	155,100 30%
2. Transportation Systems Management <i>change from Baseline</i>	893,100 0.07%	25,400 13%	2.37% 13%	154,600 0%
3. Widen Highway 1 for Carpool/Bus Lanes <i>change from Baseline</i>	894,000 0.17%	26,200 17%	2.44% 17%	153,700 -1%
4. Rail Transit from Watsonville Transit Center to UCSC via Harvey West <i>change from Baseline</i>	890,400 -0.24%	28,400 27%	2.65% 26%	154,200 -1%
5. Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges <i>change from Baseline</i>	891,200 -0.15%	28,400 27%	2.64% 26%	154,200 -1%
6. Busway <i>change from Baseline</i>	892,500 0.00%	24,800 11%	2.31% 11%	154,600 0%
7. Rail Transit from Watsonville Transit Center to Harvey West <i>change from Baseline</i>	890,500 -0.22%	28,200 26%	2.63% 26%	154,200 -1%
8. Improved Bus Service <i>change from Baseline</i>	890,000 -0.28%	29,300 31%	2.73% 30%	154,000 -1%

Notes: <sup>a</sup> Number of auto person trips and linked transit trips rounded to the nearest 100.

<sup>b</sup> Linked transit trips does not include visitor trips.

**TABLE 4-3a**  
**DAILY TRANSIT TRIPS TO SELECTED DESTINATIONS**  
**(1990 & 2015)**

		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
	Current (1990)	2,517	1,053	753	61
1	Baseline (2015)	4,432	1,325	760	81
2	Transportation Systems Management	5,155	1,451	866	90
3	Widen Highway 1 for Carpool/Bus Lanes	5,138	1,465	901	93
4	Rail Transit from Watsonville Transit Center to UCSC via Harvey West	5,820	1,490	1,035	97
5	Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	5,427	1,457	956	96
6	Busway	5,235	1,408	970	91
7	Rail Transit from Downtown Watsonville to Harvey West	5,633	1,509	1,057	99
8	Improved Bus Service	5,397	1,581	1,115	107

**TABLE 4-3b**  
**TOTAL DAILY RAIL BOARDINGS BY GEOGRAPHIC AREA**  
**YEAR 2015**

Station Groupings	Alternative			
	4	5	6	7
Watsonville	293	349	--	365
Aptos/Rio Del Mar	533	808	419	1,043
Capitola	889	705	655	959
East Santa Cruz/Live Oak	957	623	1,288	1,019
Santa Cruz Beach Area	357	220	401	326
Downtown Santa Cruz	1,389	536	--	1,575
UCSC	435	--	--	--
Westside Santa Cruz	--	414	693	--
<b>Total Boardings</b>	<b>4,853</b>	<b>3,655</b>	<b>3,456</b>	<b>5,287</b>

--" Alternative does not use this station

It is projected that Alternative 7 (Rail Transit) would have the highest number of daily boardings (5,300 boardings). The larger number of rail boardings in Alternative 7, compared to Alternative 4 (Cog Rail), may be the result of forced transfers between bus and rail as passengers attempt to reach the campus or other destinations and different feeder bus configurations at individual stations. The Busway alternative (Alternative 6) would have the lowest number of daily boardings (3,450 boardings). Alternative 6 does not have direct access to downtown Santa Cruz, limiting its ridership potential.

#### 4.1.3 Transit Travel Times

Table 4-4 compares transit travel times between UCSC, downtown Santa Cruz, Capitola Village, and downtown Watsonville. Transit travel times were estimated for the AM peak hour, door-to-door travel and include in-vehicle travel time, time spent getting to transit and waiting for transit vehicles.

Transit travel times are projected to increase slightly by 2015 under Baseline conditions if transit improvements are not made. For example, travel between UCSC and downtown Watsonville is projected to increase to from 60-67 minutes in 1990 to 62-69 minutes in 2015.

Travel times would improve to each destination under the build alternatives, compared to Baseline conditions. The greatest improvement for travel to downtown Santa Cruz would occur with Alternatives 3, 4, and 8 (a 13% reduction in travel time). In addition, Alternative 8 would reduce transit travel time to UCSC by up to 19 percent, and reduce travel time to Capitola Village by 26 percent. Under Alternative 3, the transit travel times to Watsonville would decrease by 27%, and by 23% and 22% with Alternatives 4 and 7, respectively.

TABLE 4-4

**TRANSIT TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015**

Alternatives	Origin	DESTINATION			
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
Current (1990) <sup>a</sup>	UCSC		22	53	67
	Downtown Santa Cruz	19		36	50
	Capitola Village	49	34		56
	Downtown Watsonville	58	43	54	
	<b>Average Travel Time for All Destinations</b>	<b>42</b>	<b>33</b>	<b>48</b>	<b>58</b>
1. Baseline	UCSC		23	56	69
	<i>change from Current</i>		1	4% 3	6% 2
	Downtown Santa Cruz	20		38	51
	<i>change from Current</i>	1	5%	2	6% 1
	Capitola Village	52	37		59
	<i>change from Current</i>	3	6% 3	9%	3
Downtown Watsonville	60	45	57		
<i>change from Current</i>	2	3% 2	5% 3	6%	
<b>Average Travel Time for All Destinations</b>	<b>44</b>	<b>35</b>	<b>50</b>	<b>60</b>	
	<b>Average Change for All Destinations</b>				
	<b>Minutes</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>
	<b>% change from Existing</b>	<b>5%</b>	<b>6%</b>	<b>6%</b>	<b>3%</b>
2. Transportation Systems Management	UCSC		23	51	49
	<i>change from Baseline</i>		0	0% (5)	(9%) (20)
	Downtown Santa Cruz	19		36	34
	<i>change from Baseline</i>	(1)	(5%)	(2)	(5%) (17)
	Capitola Village	49	35		56
	<i>change from Baseline</i>	3	(6%) (2)	(5%)	(3)
	Downtown Watsonville	49	34	54	
<i>change from Baseline</i>	(11)	(18%) (11)	(24%) 3	(5%)	
<b>Average Change for All Destinations -</b>					
<b>Compared to Baseline</b>					
<b>Minutes</b>	<b>(5)</b>	<b>(4)</b>	<b>(3)</b>	<b>(13)</b>	
<b>% Change</b>	<b>(11%)</b>	<b>(11%)</b>	<b>(6%)</b>	<b>(22%)</b>	

TABLE 4-4 (Continued)

TRANSIT TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015

Alternatives	Origin	Destination			
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
3. Widen Highway 1 for Carpool/Bus Lanes	UCSC		23	50	48
	<i>change from Baseline</i>		0 (0%)	(6) (10%)	(21) (30%)
	Downtown Santa Cruz	20		35	34
	<i>change from Baseline</i>	0 0%		(3) (7%)	(17) (33%)
	Capitola Village	49	35		49
	<i>change from Baseline</i>	(3) (6%)	(2) (5%)		(10) (17%)
Downtown Watsonville	48	34	50		
<i>change from Baseline</i>	(12) (20%)	(11) (24%)	(7) (12%)		
	<b>Average Change for All Destinations - Compared to Baseline</b>		<b>(5) (11%)</b>	<b>(5) (10%)</b>	<b>(16) (27%)</b>
	<b>Minutes</b>		<b>(5)</b>	<b>(5)</b>	<b>(16)</b>
	<b>% Change</b>		<b>(11%)</b>	<b>(10%)</b>	<b>(27%)</b>
4. Rail Transit from Watsonville Transit Center to UCSC	UCSC		23	52	48
	<i>change from Baseline</i>		0 0%	(4) (7%)	(22) (31%)
	Downtown Santa Cruz	21		37	33
	<i>change from Baseline</i>	1 5%		(1) (3%)	(18) (34%)
	Capitola Village	49	35		57
	<i>change from Baseline</i>	(3) (6%)	(2) (5%)		(2) (4%)
Downtown Watsonville	48	33	53		
<i>change from Baseline</i>	(12) (20%)	(12) (27%)	(4) (7%)		
	<b>Average Change for All Destinations - Compared to Baseline</b>		<b>(5) (12%)</b>	<b>(3) (6%)</b>	<b>(14) (23%)</b>
	<b>Minutes</b>		<b>(5)</b>	<b>(3)</b>	<b>(14)</b>
	<b>% Change</b>		<b>(12%)</b>	<b>(6%)</b>	<b>(23%)</b>

TABLE 4-4 (Continued)

TRANSIT TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015

Alternatives	Origin	Destination						
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville			
5. Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	UCSC		24	57	49			
	<i>change from Baseline</i>		1	4%	1	1%	(20)	(29%)
	Downtown Santa Cruz	17		37	40			
	<i>change from Baseline</i>	(3)	(15%)	(1)	(3%)	(11)	(22%)	
	Capitola Village	49	36		65			
	<i>change from Baseline</i>	(3)	(6%)	(1)	(3%)	6	10%	
Downtown Watsonville	49	34	50					
<i>change from Baseline</i>	(11)	(18%)	(11)	(24%)	(7)	(12%)		
	<b>Average Change for All Destinations - Compared to Baseline</b>							
	<b>Minutes</b>	<b>(6)</b>	<b>(3)</b>	<b>(2)</b>	<b>(8)</b>			
	<b>% Change</b>	<b>(14%)</b>	<b>(9%)</b>	<b>(4%)</b>	<b>(13%)</b>			
6. Busway	UCSC		30	54	57			
	<i>change from Baseline</i>		7	30%	(2)	(4%)	(12)	(17%)
	Downtown Santa Cruz	21		41	41			
	<i>change from Baseline</i>	1	5%	3	8%	(10)	(20%)	
	Capitola Village	53	37		59			
	<i>change from Baseline</i>	1	2%	0	0%	0	0%	
Downtown Watsonville	57	41	58					
<i>change from Baseline</i>	(3)	(5%)	(4)	(9%)	1	2%		
	<b>Average Change for All Destinations - Compared to Baseline</b>							
	<b>Minutes</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>(7)</b>			
	<b>% Change</b>	<b>0%</b>	<b>3%</b>	<b>0%</b>	<b>(12%)</b>			

TABLE 4-4 (Continued)

TRANSIT TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015

Alternatives	Origin	Destination						
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville			
7. Rail Transit from Downtown Watsonville to Harvey West	UCSC		23	52	49			
	<i>change from Baseline</i>		0	0%	(4)	(7%)	(21)	(30%)
	Downtown Santa Cruz	19		38	35			
	<i>change from Baseline</i>	(1)	(5%)	0	0%	(16)	(32%)	
	Capitola Village	49	35		57			
	<i>change from Baseline</i>	(3)	(6%)	(2)	(5%)	(2)	(4%)	
8. Improved Bus Service	Downtown Watsonville	49	35	60				
	<i>change from Baseline</i>	(11)	(18%)	(10)	(23%)	3	5%	
	<b>Average Change for All Destinations - Compared to Baseline</b>		<b>(5)</b>	<b>(4)</b>	<b>0</b>	<b>(13)</b>		
	<b>Minutes</b>		<b>(12%)</b>	<b>(11%)</b>	<b>0%</b>	<b>(22%)</b>		
	<b>% Change</b>							
7. Rail Transit from Downtown Watsonville to Harvey West	UCSC		21	42	49			
	<i>change from Baseline</i>		(2)	(9%)	(14)	(25%)	(20)	(29%)
	Downtown Santa Cruz	18		28	42			
	<i>change from Baseline</i>	(2)	(10%)	(10)	(26%)	(9)	(18%)	
	Capitola Village	40	28		43			
	<i>change from Baseline</i>	(12)	(23%)	(9)	(24%)	(16)	(27%)	
8. Improved Bus Service	Downtown Watsonville	49	42	42				
	<i>change from Baseline</i>	(11)	(18%)	(3)	(9%)	(15)	(26%)	
	<b>Average Change for All Destinations - Compared to Baseline</b>		<b>(8)</b>	<b>(5)</b>	<b>(13)</b>	<b>(15)</b>		
	<b>Minutes</b>		<b>(19%)</b>	<b>(15%)</b>	<b>(27%)</b>	<b>(26%)</b>		
	<b>% Change</b>							

Source: Travel demand forecast prepared by Parsons Brinckerhoff, 1998.

## 4.2 Traffic Impacts

This section documents changes in traffic conditions due to the project alternatives.

### 4.2.1 Roadway Congestion

Roadway congestion is measured in several ways. 1) comparisons of vehicle miles traveled (VMT) and vehicle hours traveled (VHT); 2) average roadway speeds and 3) traffic levels-of-service (LOS). Located in the Appendix C, Figures 1 through 4 illustrate the projected LOS in the corridor at key locations for each strategy tested.

[Table 4-5](#) compares daily and peak hour VMT, VHT, and average vehicle speed of the proposed alternatives with Baseline conditions.

The daily auto VMT in Santa Cruz County is projected to grow by over 45 percent between 1990 and 2015, increasing to over 7.8 million vehicle miles per day under Baseline conditions. The peak hour VMT is expected to grow faster than the daily VMT during this period, increasing by 72 percent and reflecting increasing work trip length. Daily auto VHT is projected to increase by 119 percent and peak hour VHT by 250 percent between 1990 and 2015. The VHT grows faster than VMT because worsening congestion requires more time to travel a given distance. Peak hour average speed on the roadway network is expected to fall from 29 miles per hour (mph) in 1990 to 14.2 mph under 2015 Baseline conditions.

All the build alternatives would lower the daily auto VHT, compared to Baseline conditions. Under Alternative 3, Widen Highway 1 for Carpool/Bus Lanes, daily VHT would be 1.7 percent less than Baseline conditions, the smallest improvement for any of the proposed alternatives. Alternative 3 would show the greatest peak hour average speed compared to Baseline conditions (14.5 mph vs. 14.2 mph).

Alternatives 2, 4, 5, 6, 7, and 8 would all reduce daily VMT by between 1.5 and 1.8 percent compared to Baseline conditions. Alternative 4 (Rail Transit) and Alternative 8 (Improved Bus) would reduce daily VMT by 1.8 percent, compared to Baseline, the most of the alternatives. Alternative 4 would decrease peak hour VHT by 4.4 percent compared to Baseline conditions, the most of any alternative.

**TABLE 4-5**  
**SANTA CRUZ COUNTY**  
**DAILY & PEAK HOUR VMT, VHT AND AVERAGE SPEED**

Alternatives	Daily Travel			Peak Hour Travel		
	Daily VMT	Daily VHT	Average Daily Speed	Peak Hour VMT	Peak Hour VHT	Peak Hour Speed
Current (1990)	5,408,700	163,900	33.0	1,776,700	61,300	29.0
1 Baseline	7,818,300	358,200	21.8	3,052,700	214,524	14.2
Change from Current	45%	119%	-34%	72%	250%	-51%
2 Transportation Systems Management	7,697,400	347,600	22.1	2,963,100	205,700	14.4
Change from Baseline	-1.5%	-2.9%	1.4%	-2.9%	-4.1%	1.2%
3 Widen Highway 1 for Carpool/Bus Lanes	7,884,500	352,200	22.4	3,003,700	206,800	14.5
Change from Baseline	0.8%	-1.7%	2.5%	-1.6%	-3.6%	2.1%
4 Rail Transit from Watsonville Transit Center to UCSC via Harvey West	7,679,200	346,400	22.2	2,959,500	205,200	14.4
Change from Baseline	-1.8%	-3.3%	1.6%	-3.1%	-4.4%	1.4%
5 Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	7,684,100	346,600	22.2	2,960,300	205,200	14.4
Change from Baseline	-1.7%	-3.2%	1.6%	-3.0%	-4.3%	1.4%
6 Busway	7,694,600	347,300	22.2	2,964,100	205,600	14.4
Change from Baseline	-1.6%	-3.0%	1.5%	-2.9%	-4.2%	1.3%
7 Rail Transit from Downtown Watsonville to Harvey West	7,685,200	346,700	22.2	2,960,700	205,300	14.4
Change from Baseline	-1.7%	-3.2%	1.5%	-3.0%	-4.3%	1.3%
8 Improved Bus Service	7,677,200	346,400	22.2	2,957,900	205,200	14.4
Change from Baseline	-1.8%	-3.3%	1.5%	-3.1%	-4.3%	1.3%

Table 4-6 compares the miles of congested roadways between the proposed alternatives and Baseline conditions. Congestion is measured qualitatively in terms of roadway level-of-service. Level-of-service (LOS) A indicates free flow conditions, while LOS F corresponds to stop-and-go conditions.

The number of lane-miles of freeways, state highways, and arterial streets operating at LOS F would increase substantially between 1990 and 2015. For example, in 1990, about 8 lane-miles of the County's freeways operated at LOS F. By 2015, the number of freeway lane-miles at LOS F is expected to increase to nearly 29 miles, a 253 percent increase. Similarly, the number of lane-miles of state highway and arterial streets operating at LOS F is expected to grow by 345 percent and 414 percent, respectively.

**TABLE 4-6**  
**SANTA CRUZ COUNTY PEAK PERIOD LEVEL OF SERVICE OF FREEWAY, STATE HIGHWAY, AND ARTERIALS**  
**(1990 & 2015)**

Alternatives	Freeway Lane-Miles			State Highway Lane-Miles			Arterial Lane-Miles <sup>a</sup>		
	LOS D	LOS E	LOS F	LOS D	LOS E	LOS F	LOS D	LOS E	LOS F
Current (1990)	3.87	5.52	8.08	4.84	5.96	16.01	14.46	12.66	28.51
1. Baseline	3.38	2.40	28.54	15.74	6.26	71.24	28.06	19.94	146.66
<i>change from Current</i>	-13%	-52%	253%	225%	5%	345%	94%	58%	414%
2. Transportation Systems Management	4.48	2.50	28.54	15.96	12.46	71.44	33.78	12.24	137.78
<i>change from Baseline</i>	33%	4%	0%	1%	99%	0%	20%	-39%	-6%
3. Widen Highway 1 for Carpool/Bus Lanes	6.28	3.76	29.00	15.84	11.94	72.08	30.06	14.88	137.30
<i>change from Baseline</i>	86%	57%	2%	1%	91%	1%	7%	-25%	-6%
4. Rail Transit from Watsonville Transit Center to UCSC via Harvey West	4.48	2.50	28.54	15.96	12.76	71.14	33.46	11.80	137.02
<i>change from Baseline</i>	33%	4%	0%	1%	104%	0%	19%	-41%	-7%
5. Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	4.48	2.50	28.54	15.96	12.76	71.14	34.10	11.40	137.02
<i>change from Baseline</i>	33%	4%	0%	1%	104%	0%	22%	-43%	-7%
6. Busway	4.48	2.50	28.54	15.96	12.46	71.44	33.52	11.60	138.56
<i>change from Baseline</i>	33%	4%	0%	1%	99%	0%	19%	-42%	-6%
7. Rail Transit from Downtown Watsonville to Harvey West	4.48	2.50	28.54	15.96	12.46	71.44	33.40	11.92	137.52
<i>change from Baseline</i>	33%	4%	0%	1%	99%	0%	19%	-40%	-6%
8. Improved Bus Service	4.48	2.50	28.54	15.96	12.76	71.14	32.48	11.98	138.12
<i>change from Baseline</i>	33%	4%	0%	1%	104%	0%	16%	-40%	-6%

Note: <sup>a</sup> Arterial lane-miles include both major and minor arterial roadways.

Source: Travel forecasts prepared by Parsons Brinckerhoff; July 1997.

None of the build alternatives (Alternatives 2, 3, 4, 5, 6, 7, and 8) would reduce the number of freeway lane-miles operating at LOS F.<sup>1</sup> Alternative 3 (Carpool Lanes) would slightly increase the number of freeway lane-miles operating at LOS F. Because the projected level of congestion on Highway 1 would be so severe, adding several miles of Carpool lanes merely increases the number of lane-miles that are congested.

State highways and arterial streets would show similarly small changes between alternatives. For example, for state highways there would be less than one lane-mile difference between the build alternatives and Baseline conditions for roadway miles operating at LOS F. Between 1990 and 2015, the percentage of county roads that operate under uncongested conditions would fall from 73 percent to less than 47 percent while the miles of roadway operating under congested conditions would nearly double under Baseline conditions. Table 4-7 illustrates the percentage of all Santa Cruz County roads that would operate under uncongested conditions (LOS A-C) and congested conditions (LOS D-F).

**TABLE 4-7**  
**PERCENT OF SANTA CRUZ COUNTY ROADWAYS OPERATING AT LOS A TO F**  
**(1990 & 2015)**

		Level-of-Service				
		A --> C	D	E	F	Total
	1990	73.0%	4.8%	2.6%	19.6%	100.0%
1	Baseline	46.7%	7.8%	4.7%	40.8%	100.0%
2	Transportation Systems Management	47.2%	9.0%	4.5%	39.3%	100.0%
3	Widen Highway 1 for Carpool/Bus Lanes	47.7%	8.5%	5.0%	38.8%	100.0%
4	Rail Transit from Watsonville Transit Center to UCSC via Harvey West	47.4%	8.9%	4.5%	39.2%	100.0%
5	Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	47.4%	9.0%	4.4%	39.2%	100.0%
6	Busway	47.1%	8.9%	4.4%	39.5%	100.0%
7	Rail Transit from Downtown Watsonville to Harvey West	47.3%	8.9%	4.5%	39.3%	100.0%
8	Improved Bus Service	47.4%	8.8%	4.5%	39.3%	100.0%

The proposed alternatives would all increase the miles of uncongested county roads that would operate at LOS A-C. The variation between the proposed alternatives, however, would be small. For example, Alternative 3 (Carpool Lanes) would have the highest percentage of road miles operating between LOS A and LOS C (47.7%). The Busway Alternative would have 47.1 percent of the county's roads operating at LOS A, B or C, the lowest percentage of any alternative.

#### 4.2.2 Impacts of Transit Operations on Traffic

<sup>1</sup> The travel forecast model calculates miles of congested freeway by roadway link, the distance between consecutive freeway interchanges. Therefore, changes in traffic volumes between the alternatives may not register as a change in roadway miles operating at a particular level-of-service unless the volume change is sufficient to change the calculated LOS.

This section documents the impacts of on-street operation of rail and busway vehicles. The analysis is confined to Alternatives 4, 5, 6, and 7, the rail and busway alternatives. The operation of additional buses on surface streets proposed in these alternatives has not been analyzed.

Alternatives 4 and 7 would install a curb-height, 12 foot median, and other track improvements on Chestnut Street in Santa Cruz. The improvements would eliminate on-street parking but would still permit a travel lane in each direction as under existing conditions. There would no impact to through traffic. The improvements may, however, require restrictions on mid-block left-turns to and from driveways.

### 4.2.3 Auto Travel Times

Table 4-8 compares auto travel times between major Santa Cruz County destinations in the study corridor, UCSC, downtown Santa Cruz, Capitola Village, and downtown Watsonville. The table shows current conditions (1990) and Baseline conditions (2015) and presents the percentage changes in travel times for the proposed alternatives compared to Baseline conditions.<sup>2</sup> All forecasts are for the AM peak hour.

Between 1990 and 2015, congestion in Santa Cruz County is expected to worsen and auto travel time increase for all major destinations in the county under the Baseline scenario. Motorists with destinations in downtown Santa Cruz, Capitola Village, and downtown Watsonville would be expected to have travel times increase between 19% and 24% compared to today. Motorists bound for UCSC, however, would experience an average increase in travel times of 63 percent. Increased travel time to the university is proportionally higher because of the limited number of access streets compared to other destinations.

None of the proposed alternatives except Alternative 3 (Widen Highway 1 for Carpool Lanes) would reduce the auto travel time to the four major destinations. While Alternative 3 would increase auto travel times between UCSC and Downtown Santa Cruz by 4%, travel time to Capitola would decrease by 16%. Travel times from Capitola Village would decrease by 11 percent to UCSC and to downtown Santa Cruz by 25%. This alternative would reduce travel times by adding vehicular capacity to the freeway system. The actual travel time changes are projected to be between approximately 1 and 4 minutes.

All the transit alternatives (Alternative 4, 5, 6, 7, and 8) would slightly increase auto trip times to all four destinations compared to Baseline. Auto travel times to UCSC and to downtown Santa Cruz and Capitola Village would increase by between 2 and 4 percent under all the transit alternatives (less than 1 minute).

The auto travel times increase under the transit alternatives an insignificant amount; thus it should be concluded that the transit alternatives do not capture enough auto trips to significantly reduce the travel times of the remaining auto users.

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<sup>2</sup> Travel times are model-generated numbers reflecting the network and traffic assignments. The value of this analysis is to assess the *changes* in travel times and not the actual times themselves.

**TABLE 4-8**

**AUTO TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015**

Alternatives	Origin	DESTINATION						
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville			
Current (1990) <sup>a</sup>	UCSC		8.2	16.2	36.2			
	Downtown Santa Cruz	11.0		9.8	29.8			
	Capitola Village	18.8	9.6		22.8			
	Downtown Watsonville	34.6	25.4	19.2				
	<b>Average Travel Time for All Destinations</b>	<b>21.5</b>	<b>14.4</b>	<b>15.1</b>	<b>29.6</b>			
1. Baseline	UCSC		8.4	18.6	44.4			
	<i>change from Current</i>		0.2	2%	2.4	15%	8.2	23%
	Downtown Santa Cruz	21.8		11.6	37.4			
	<i>change from Current</i>	10.8	98%	1.8	18%	7.6	26%	
	Capitola Village	31.4	11.4		28.6			
	<i>change from Current</i>	12.6	67%	1.8	19%	5.8	25%	
	Downtown Watsonville	51.8	31.8	23.8				
	<i>change from Current</i>	17.2	50%	6.4	25%	4.6	24%	
	<b>Average Change for All Destinations</b>							
	<b>Minutes</b>	<b>13.5</b>	<b>2.8</b>	<b>2.9</b>	<b>7.2</b>			
	<b>% Change</b>	<b>63%</b>	<b>19%</b>	<b>19%</b>	<b>24%</b>			
2. Transportation Systems Management	UCSC		8.6	19.0	45.0			
	<i>change from Baseline</i>		0.1	2%	0.5	2%	0.6	1%
	Downtown Santa Cruz	21.8		11.8	37.8			
	<i>change from Baseline</i>	0.0	0%	0.2	2%	0.3	1%	
	Capitola Village	32.0	12.0		28.8			
	<i>change from Baseline</i>	0.5	2%	0.6	5%	0.1	1%	
	Downtown Watsonville	53.4	33.4	24.8				
	<i>change from Baseline</i>	1.6	3%	1.6	5%	0.9	4%	
	<b>Average Change for All Destinations - Compared to Baseline</b>							
	<b>Minutes</b>	<b>0.7</b>	<b>0.8</b>	<b>0.5</b>	<b>0.3</b>			
	<b>% Change</b>	<b>2%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>			

TABLE 4-8 (Continued)

**AUTO TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015**

Alternatives	Origin	Destination			
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
3. Widen Highway 1 for Carpool/Bus Lanes	UCSC		8.7	15.6	40.6
	<i>change from Baseline</i>		0.2	4% (2.9)	(16%) (3.8) (9%)
	Downtown Santa Cruz	21.8		8.2	33.4
	<i>change from Baseline</i>	0.1	0%	(3.3) (28%)	(4.2) (12%)
	Capitola Village	28.2	8.5		28.4
	<i>change from Baseline</i>	(3.1) (11%)	(2.9) (25%)		(0.3) (1%)
Downtown Watsonville	49.2	29.4	24.8		
<i>change from Baseline</i>	(2.6) (5%)	(2.4) (8%)	0.9 4%		
	<b>Average Change for All Destinations - Compared to Baseline</b>				
	<b>Minutes</b>	<b>(1.8)</b>	<b>(1.7)</b>	<b>(1.8)</b>	<b>(2.8)</b>
	<b>% Change</b>	<b>(6%)</b>	<b>(11%)</b>	<b>(11%)</b>	<b>(8%)</b>
4. Rail Transit from Watsonville Transit Center to UCSC	UCSC		8.6	19.0	45.0
	<i>change from Baseline</i>		0.1	2% 0.4	2% 0.6 1%
	Downtown Santa Cruz	21.6		11.8	37.6
	<i>change from Baseline</i>	(0.2) (1%)		0.1 2%	0.1 1%
	Capitola Village	31.6	12.0		28.6
	<i>change from Baseline</i>	0.2 1%	0.5 5%		0.0 0%
Downtown Watsonville	53.2	33.4	25.0		
<i>change from Baseline</i>	1.2 3%	1.4 5%	1.2 5%		
	<b>Average Change for All Destinations - Compared to Baseline</b>				
	<b>Minutes</b>	<b>0.4</b>	<b>0.8</b>	<b>0.6</b>	<b>0.2</b>
	<b>% Change</b>	<b>1%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>

TABLE 4-8 (Continued)

**AUTO TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015**

Alternatives	Origin	Destination			
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
5. Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	UCSC		8.6	19.0	44.9
	<i>change from Baseline</i>		0.1 2%	0.4 2%	0.5 1%
	Downtown Santa Cruz	21.6		11.7	37.7
	<i>change from Baseline</i>	(0.1) (1%)		0.1 1%	0.3 1%
	Capitola Village	31.6	11.8		28.7
	<i>change from Baseline</i>	0.2 1%	0.4 4%		0.0 0%
Downtown Watsonville	53.0	33.2	24.7		
<i>change from Baseline</i>	1.2 2%	1.4 4%	0.9 4%		
	<b>Average Change for All Destinations - Compared to Baseline</b>				
	<b>Minutes</b>	<b>0.4</b>	<b>0.7</b>	<b>0.5</b>	<b>0.3</b>
	<b>% Change</b>	<b>1%</b>	<b>4%</b>	<b>3%</b>	<b>1%</b>
6. Busway	UCSC		8.6	19.0	45.1
	<i>change from Baseline</i>		0.2 2%	0.5 2%	0.6 2%
	Downtown Santa Cruz	21.8		11.8	37.8
	<i>change from Baseline</i>	0.1 0%		0.2 2%	0.3 1%
	Capitola Village	32.0	12.0		28.7
	<i>change from Baseline</i>	0.6 2%	0.6 5%		0.0 0%
Downtown Watsonville	53.3	33.3	24.7		
<i>change from Baseline</i>	1.5 3%	1.5 5%	0.9 4%		
	<b>Average Change for All Destinations - Compared to Baseline</b>				
	<b>Minutes</b>	<b>0.7</b>	<b>0.8</b>	<b>0.5</b>	<b>0.3</b>
	<b>% Change</b>	<b>2%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>

TABLE 4-8 (Continued)

**AUTO TRAVEL TIMES (IN MINUTES) BY ALTERNATIVE COMPARED TO BASELINE  
AM PEAK HOUR, 1990 & 2015**

Alternatives	Origin	Destination			
		UCSC	Downtown Santa Cruz	Capitola Village	Downtown Watsonville
7. Rail Transit from Downtown Watsonville to Harvey West	UCSC		8.6	19.0	45.0
	<i>change from Baseline</i>		0.1 2%	0.4 2%	0.5 1%
	Downtown Santa Cruz	21.4		11.8	37.7
	<i>change from Baseline</i>	(0.2) (2%)		0.1 2%	0.2 1%
	Capitola Village	31.6	11.9		28.6
	<i>change from Baseline</i>	0.2 1%	0.5 4%		0.0 0%
8. Improved Bus Service	Downtown Watsonville	53.0	33.4	24.8	
	<i>change from Baseline</i>	1.2 2%	1.5 5%	0.9 4%	
	<b>Average Change for All Destinations - Compared to Baseline</b>	<b>0.4</b>	<b>0.7</b>	<b>0.5</b>	<b>0.2</b>
	<b>Minutes</b>	<b>1%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>
	<b>% Change</b>				
7. Rail Transit from Downtown Watsonville to Harvey West	UCSC		8.6	19.0	45.0
	<i>change from Baseline</i>		0.1 2%	0.4 2%	0.6 1%
	Downtown Santa Cruz	21.6		11.8	37.7
	<i>change from Baseline</i>	(0.1) (1%)		0.1 2%	0.2 1%
	Capitola Village	32.0	12.0		28.6
	<i>change from Baseline</i>	0.6 2%	0.6 5%		0.0 0%
8. Improved Bus Service	Downtown Watsonville	53.4	33.6	24.9	
	<i>change from Baseline</i>	1.6 3%	1.8 6%	1.1 5%	
	<b>Average Change for All Destinations - Compared to Baseline</b>	<b>0.7</b>	<b>0.8</b>	<b>0.5</b>	<b>0.3</b>
	<b>Minutes</b>	<b>2%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>
	<b>% Change</b>				

Source: Travel demand forecast prepared by Parsons Brinckerhoff, 1998.

Alternatives 4 and 5 would operate in downtown Watsonville on West Beach Street between the existing railroad tracks at Walker Street and Watsonville Transit Center. The operation of 8 hourly trains as proposed would not affect traffic on this street.

Alternative 5 would operate on North Pacific Avenue, Front Street, and River Street in the City of Santa Cruz. On North Pacific Avenue, Alternative 5 (Rail Transit) would operate in a curb-height right-of-way along one side of the street, eliminating a parking lane. Rail transit would operate along with auto traffic on this street and at the Water Street traffic signal. Transit operations would not interfere with traffic flow on this segment. On Front and River Streets,

Alternative 5 would operate in a raised curb-height median in the center of the roadway. A single transit would not interfere with traffic flow on Front or River Streets. Alternatives 4, 5, 6, and 7 would have a potential impact on cross streets at existing grade crossings. Crossing gates would be down for an average of about 30 seconds for each passage of a rail or busway vehicle. At locations where the rail vehicles operate on local streets, there may be delays to bus operations. No significant traffic congestion or deterioration in peak hour traffic level-of-service was identified to occur at the proposed grade crossings. Table 4-9 show the average vehicle delay at grade crossings.

**TABLE 4-9  
AVERAGE VEHICLE DELAY AT RAILROAD GRADE CROSSINGS**

<b>Street Crossing</b>	<b>Average Delay per Vehicle (sec.)</b>
Walker Street @ West Beach Street	34.9
Trout Gulch Road	13.1
State Park Drive	22.7
Monterey Avenue	22.9
7th Avenue	23.7
Front Street @ Pier	39.9
W. Cliff Dr./Beach	39.6
Highway 1 (Mission)	23.8
Glenn Coolidge Drive	26.6
California & Bay	24.5

**Auto Trips At Proposed Transit Stations**

At proposed rail and busway transit stations, additional auto trips will be made by transit patrons who drive and park at the stations and those that are driven to the station by others. Table 4-10 summarizes the number of additional auto trips that would be made to and from the proposed transit stations<sup>3</sup> in the AM peak hour.

Most transit stations under the proposed alternatives would attract only small numbers of new auto trips. The Potrero Street Station, proposed in Alternatives 4 and 7, would be the busiest station in terms of auto traffic. The station would add 189 and 169 new auto trips in the AM

<sup>3</sup> Traffic impacts at transit stations are provided only for stations with parking. The remaining stations would generate very few auto trips, less than 60 trips for all the remaining stations combined.

peak hour, respectively. The station would create minimal changes in traffic conditions on nearby streets.

None of the alternatives would add sufficient traffic to local street to reduce roadway level of service in the vicinity of the proposed transit stations.

**TABLE 4-10**  
**A.M. PEAK HOUR TRAFFIC VOLUMES AT RAIL AND BUSWAY STATIONS (2015)**

Stations	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Downtown Watsonville	22	25	0	31
Aptos Village	9	13	0	12
Seacliff Beach	7	5	0	8
Cabrillo College/New Brighton	8	6	0	8
Capitola Village	13	10	16	12
41st Avenue	25	23	30	33
7th Avenue	74	118	102	73
Potrero Street	189	0	0	169
Natural Bridges	0	75	111	0
All Other Stations	52	58	52	50

Notes: Alternatives 4, 5 and 6 terminate at the Watsonville Transit Center and Alternative 7 terminates at the intersection of West Beach Street and Walker Street in Downtown Watsonville.  
Source: Travel demand forecast prepared by Parsons Brinckerhoff, 1997.

#### 4.2.4 Auto Occupancy

Average vehicle occupancy (AVO) describes the average number of persons per vehicle. The measure indicates the mix of single occupant vehicles (SOVs) and Carpools (Carpools). Carpool use in Santa Cruz County is expected to remain stable between 1990 and 2015, accounting for 26 percent of all auto trips. Lowering SOV use is a key goal of the Regional Transportation Plan. [Table 4-11](#) compares changes in SOV and Carpool use between the project alternatives.

AVO would remain nearly the same in 2015 as it did in 1990. This measure is stable across all alternatives, with each causing negligible changes in county-wide mode choice patterns. Each of the alternatives would have an average vehicle occupancy of 1.29 persons per vehicle. The inability of the alternatives to have an effect on this measure is due to the confinement of improvements to a single corridor, while AVO measures mode choice county-wide.

Carpool use would increase by 0.3 percent in Alternative 3 with the provision of carpool/bus lanes on Highway 1. Carpool use would decrease slightly in the transit alternatives (4, 5, 6, 7, and 8) compared to the Baseline condition because some Carpool users would likely switch to transit when more transit service is provided. Alternatives 4 and 8 would have the lowest Carpool use but would have the highest transit use.

### 4.3 Parking Impacts

This section documents the impacts that the proposed project alternatives would have on the parking demand at transit stations and identifies locations where parking would be permanently or temporarily removed for construction of transit facilities.

**TABLE 4-11**  
**AUTO OCCUPANCY (1990 & 2015)**

Alternative	Number of Single Occupant Vehicles <sup>a</sup>	Number of Carpools <sup>b</sup>	Average Vehicle Occupancy
Current (1990)	397,000	143,000	1.297
1. Baseline (2015)	508,000	181,000	1.295
<i>change from Current</i>	28%	27%	-0.2%
2. Transportation Systems Management	508,500	181,100	1.295
<i>change from Baseline</i>	0.1%	0.1%	0.0%
3. Widen Highway 1 for Carpool/Bus Lanes	508,500	181,700	1.296
<i>change from Baseline</i>	0.1%	0.4%	0.1%
4. Rail Transit from Watsonville Transit Center to UCSC via Harvey West	507,000	180,600	1.295
<i>change from Baseline</i>	-0.2%	-0.2%	0.0%
5. Rail Transit from Watsonville Transit Center to Harvey West and Natural Bridges	507,500	180,800	1.295
<i>change from Baseline</i>	-0.1%	-0.1%	0.0%
6. Busway	508,000	181,000	1.295
<i>change from Baseline</i>	0.0%	0.0%	0.0%
7. Rail Transit from Watsonville Transit Center to Harvey West	507,000	180,700	1.295
<i>change from Baseline</i>	-0.2%	-0.2%	0.0%
8. Improved Bus Service	507,000	180,600	1.295
<i>change from Baseline</i>	-0.2%	-0.2%	0.0%

<sup>a</sup> Single-Occupant Vehicle, rounded to the nearest 500.

<sup>b</sup> Carpool, rounded to the nearest 100.

#### 4.3.1 Rail & Busway Station Parking Demand

The total parking demand shown in [Table 4-12](#) represents the amount of parking that would need to be provided at each station to accommodate transit patrons that drive to the station.

The actual size of the parking lots at individual stations would depend on the amount of available on-street parking, the availability of land for parking lots and local policy regarding the development of station areas. Neighborhoods in Santa Cruz, Capitola Village, the beaches and several other areas already enforce parking restrictions (meters and time limits) that would discourage the use of on-street parking by transit patrons. A proposed transit station in these areas would have no drive and park access.

Potrero Street would require the largest parking lots in Alternatives 4 and 7, exceeding 500 and 450 spaces, respectively. A 500 space parking lot would require about 3.6 acres<sup>4</sup>. The 7th Street Station would require between 215 and 274 parking spaces, depending on the alternative. The 41st Avenue Station would require between 50 and 100 parking spaces. The Watsonville Transit Center (Alternatives 4 and 5) would require about 65 parking spaces and Downtown Watsonville (Alternative 7) would require about 90 parking spaces. The remaining stations are projected to have a relatively small demand for parking.

**TABLE 4-12**  
**PARKING DEMAND AT RAIL OR TRANSIT STATIONS BY ALTERNATIVES (2015)**

Station	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Downtown Watsonville	N/A	N/A	0	87
Watsonville Transit Center	67	64	N/A	N/A
Aptos Village	26	26	N/A	34
Seacliff Beach	17	12	N/A	23
Cabrillo College/New Brighton	28	16	N/A	25
Capitola Village	34	20	35	31
41st Avenue	70	46	71	91
7th Avenue	218	274	254	215
Potrero Street	521	N/A	N/A	464
Natural Bridges	N/A	172	265	N/A

Source: Travel forecast prepared by Parsons Brinckerhoff, 1997.

Due to limitations in the travel forecast model, transit trips with auto access may be assigned disproportionately to an individual station. Transit patrons who drive (park-and-ride) to the station may use any of several nearby stations where parking is provided and access is convenient. Therefore, the demand for parking at the Potrero Street and 7th Avenue stations may be overstated and motorists would be more evenly distributed at several nearby stations.

If projected parking demand exceeds the available parking supply at any given station, there exists the potential for “spillover parking” in adjacent residential areas. Control of spillover parking may require residential parking permit programs or parking time limits.

### 4.3.2 Parking Supply Impacts

This section estimates the net change in the number of parking spaces resulting from installation and operation of transit stations and on-street tracks under Alternatives 4, 5, 6, and 7. Because there would be no construction on surface streets proposed in Alternatives 2, 3 and 8, there would be no impacts to parking. Table 4-12 shows the number of on-street and off-street parking spaces that would be permanently closed and the number of spaces that would be temporarily unavailable during construction.

<sup>4</sup> Assumes 90° parking on a level rectangular site with 25 9-foot parking stalls in 20 parallel rows.  $(25 \times 9') \times ((48' \times 2) \text{ [end rows]} + (66' \times 9) \text{ [interior double rows]}) = 155,250 \text{ ft}^2 \Rightarrow 3.6 \text{ acres.}$

Alternative 4 (Cog Rail) would create the largest permanent loss of on-street parking spaces, resulting in a loss of over 200 spaces in the city of Santa Cruz and over 20 spaces in the city of Watsonville. Alternative 4 would also have the largest temporary loss of parking due to construction, affecting 375 on-street spaces over the course of construction in Santa Cruz and Watsonville. Most of the temporary parking loss due to construction would occur in the vicinity of Harvey West Park (Harvey West Boulevard, Sylvania Avenue, and Encinal Street).

**TABLE 4-13  
PARKING IMPACTS**

On-Street Locations	Permanent Parking Loss				Temporary Parking Loss During Construction			
	4	5	6	7	4	5	6	7
Chestnut Street	15	0	0	15	103	0	0	103
Beach Street	0	0	0	0	60	60	60	60
North Pacific Avenue	0	24	0	0	0	24	0	0
Harvey West Boulevard	71	0	0	0	71	0	0	0
Sylvania Avenue	68	0	0	0	68	0	0	0
Encinal Avenue	49	20	0	0	49	20	0	0
River Street	0	0	0	0	0	55	0	0
Front Street	0	44	0	0	0	132	0	0
West Beach Street (Watsonville)	24	0	0	24	24	0	0	24
<b>TOTAL PARKING IMPACT</b>	<b>227</b>	<b>88</b>	<b>0</b>	<b>39</b>	<b>375</b>	<b>291</b>	<b>60</b>	<b>187</b>

Alternative 6 (Busway) would have the least impact to parking, resulting in no permanent parking loss and a temporary loss of 60 spaces for construction of the busway on Beach Street. Alternative 7 (Rail Transit) would require the permanent closure of 39 on-street parking spaces and the temporary closure of 187 spaces during construction.

None of the proposed alternatives would result in the loss of on-street parking outside the cities of Santa Cruz and Watsonville. In addition, none of the project alternatives would result in the physical loss of off-street parking in private or public lots.

#### 4.4 Other Impacts

##### 4.4.1 Pedestrian & Bicycle Impacts

The proposed alternatives would result in potential beneficial and negative impacts to bicycle and pedestrian facilities and circulation.

Alternative 2 (TSM) would provide new sidewalks and pedestrian-oriented landscaping improvements. These improvements would also be included as part of the other project alternatives (Alternatives 3 through 8). These improvements would generally improve pedestrian circulation. Alternatives 4, 5, and 8 would also include a Highway 1 pedestrian overcrossing at Cabrillo College to facilitate pedestrian travel between the campus and new bus stops on the freeway (Alternative 8, Improved Bus Service) and the Cabrillo College/New Brighton rail station (Alternatives 4 and 5). A component of Alternatives 4, 5, 6, and 7 is a proposed bikeway, an exclusive bicycle and pedestrian facility constructed primarily within the

Union Pacific right-of-way (ROW). This bike path would provide connectivity and improved access between Santa Cruz and Watsonville for bicyclists and pedestrians and would be considered a beneficial impact.

The Bikeway would share the roadway with mixed traffic flow on Beach Street prior to entering the rail ROW. Bike lanes currently exist on this street; however, modifications to the cross-section would be required to accommodate the railway tracks (Alternatives 4, 5, and 7) and may preclude the bike lanes. Further design would be required to accommodate two-way bicycle traffic on this street. Additional analysis would also be required to design the bike path where it leaves the railroad ROW in Aptos Village.

The proposed alternatives would not affect pedestrian and bicycle facilities and circulation in the City of Watsonville.

Beach Street in Santa Cruz currently has bike lanes and operates with large volumes of pedestrians due to its proximity to the one-way Boardwalk. Beach Street would be modified to accommodate railroad tracks and a transit station under Alternatives 4, 5, and 7). The cross-sections proposed for this street do not include bike lanes; however, the width proposed for the travel lanes would not inhibit bicycle flows, and the roadway could be re-designated as a bicycle route (Class III) for continuity with the bikeway system.

Alternatives 4 and 7 would operate on Chestnut Street in Santa Cruz. The roadway would be modified to accommodate the train tracks, affecting the existing bicycle lanes. The proposed travel lane widths would be sufficient for bicycle traffic, and the roadway could be re-designated as a bicycle route for continuity. The final design should maintain existing bike lanes wherever feasible.

In Alternatives 4 and 5, the train would operate on surface streets in the City of Santa Cruz, including Harvey West Boulevard and Sylvania Avenue (Alternative 4, Cog Rail), River and Front Streets, and North Pacific Avenue (Alternative 5, Rail Transit). Encinal Street would be used in both alternatives. Only Front Street currently has a bicycle lane or is a designated bike route. The elimination of the bike lane on the street would still permit shared auto and bicycle use. Pedestrian access would be maintained along all sidewalks. Transit station design would be able to accommodate bicycle and pedestrian access.

#### **4.4.2 Freight & Goods Movement**

This section identifies potential impacts of the proposed alternatives on freight and goods movement by trucks within the study area. According to the County's General Plan, the roadways with the highest percentage of truck traffic are the state highways, including Highway 1 and Highway 17.<sup>5</sup> The Carpool alternative (Alternative 3) would somewhat improve conditions for truck traffic on Highway 1 by adding additional freeway capacity (in the form of Carpool lanes). However, the freeway is still projected to operate poorly in the future.

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<sup>5</sup> *Santa Cruz County 1993 General Plan and Local Coastal Program*, Santa Clara County Planning Department, August 1993.

The rail alternatives (Alternatives 4, 5, and 7) and the Busway alternative (Alternative 6) would cross truck routes at grade crossings, creating slight delays to cross traffic. Alternatives 4, 5 and 7 would also upgrade the track and improve freight operations by allowing the freight rail service to operate at a faster speed (if allowed by local jurisdiction).

Alternatives 4 and 5 would operate in downtown Watsonville on West Beach Street between the existing railroad tracks at Walker Street and the Watsonville Transit Center. This street serves mostly local traffic and the industrial area adjacent to downtown. The operation of 8 trains per hour would not affect traffic flow on this street. However, West Beach Street has several warehouses that have loading docks that require trucks to park perpendicular to the street to load and unload cargo. Large tractor-trailers combinations may jut into the traffic lane, potentially blocking the lane. The raised median on this segment may not allow traffic to drive along the tracks to avoid large trucks.

#### **4.4.3 Construction Impacts**

This section evaluates the impacts of construction on transportation, including traffic, transit operations, pedestrian and bicycle circulation, and freight and goods movement. In general, the impacts of construction would be temporary and could be minimized by detours, construction staging, and by restricting construction to off-peak times.

Construction impacts to transportation would result from the laying of new track and construction of track improvements, sidings, and stations. Construction impacts would also occur at locations where materials staging or the construction of new facilities temporarily block or delay vehicles or pedestrians. Potential locations for these type of impacts include streets where railroad tracks would be constructed on surface streets. For example, Alternative 4 (Cog Rail) would install or upgrade tracks on Chestnut Street, Harvey West Boulevard, Encinal Avenue, Sylvania Avenue, and Beach Street in Santa Cruz, and West Beach Street in Watsonville. Alternative 5 would install tracks on North Pacific Street, Front Street, River Street, and Encinal Street in Santa Cruz and on West Beach Street in Watsonville.

Construction activity and materials staging at proposed transit stations would generally take place within the station sites themselves and would not affect transportation. There may be temporary parking or traffic restrictions imposed if construction activity is required on adjacent streets.

##### **Construction Impacts to Transit Operations**

Construction activity at transit stations, along the railroad tracks and on local streets would potentially affect bus operations, potentially creating service delays and necessitating detours.

Alternative 5 (Rail Transit) would require construction activity on Front and River Street for installation of tracks and a curb-height median. Because many buses serving Metro Center use these streets, there would be potential delays to all buses using Metro Center. Impacts to bus operations at Metro Center would be temporary and could be minimized by designating detours for buses and limiting construction activities to non-peak hours.

##### **Construction Impacts to Traffic**

Construction of Alternatives 4, 5, 6, and 7 would result in the temporary closure of local streets, blockage of traffic lanes, use of traffic detours and an increase in construction truck traffic.

Construction of Carpool lanes in Alternative 3 would take place in the freeway median and may require lane narrowing and shoulder closures during construction, and potential nighttime freeway closures. Construction of the Carpool lanes may require rebuilding all interchange structures between the Highway 1/Highway 17 interchange and Park Avenue and the Emeline Street and Market Street undercrossing. Traffic using these streets would likely experience delays resulting from temporary closures and detours.

Alternatives 4 and 7 would upgrade tracks in the median of Chestnut Street. Construction at this location would result in temporary closures of individual blocks of the street. Alternative 5 (Rail Transit) would require construction activity on North Pacific Avenue, Front Street, and River Street for installation of tracks in a curb-height median.

Alternatives 4, 5, 6, and 7 would require track upgrades on Beach Street near the municipal wharf, potentially creating delays to traffic bound to and from the Santa Cruz Beach Boardwalk. Impacts to traffic could be minimized by confining construction activity to off-peak times and requiring that minimum number of traffic lanes remain open at all times.

Alternatives 4 and 7 would require installation of railroad tracks in the median of West Beach Street in Watsonville. This street has low traffic volumes and construction activity is not expected to increase delays.

#### **Construction Impacts to Pedestrian and Bicycle Circulation & Facilities**

Construction of the project alternatives would potentially result in temporary closures of bike lanes and sidewalks at locations where tracks are to be installed on surface streets and adjacent to proposed transit stations.

Construction of track improvements and transit stations near the Boardwalk could intrude into heavy-use pedestrian areas greatest along the Santa Cruz Beach. To minimize this disruption, construction materials should be staged off site and construction activity should be suspended on the weekends.

#### **Construction Impacts to Freight & Goods Movement**

Construction impacts to local truck traffic would be identical to those for automobile traffic. Impacts would occur when construction staging or activities block roadways and interfere with traffic flow. In addition, under Alternatives 4 and 5 tracks would be laid on West Beach Street in Watsonville. This street serves adjacent warehouses and nearby industrial areas near downtown. Construction on the street may interfere with truck access to adjacent businesses.

The construction impacts on the movement of rail-related freight vary from being negligible to moderate to significant. The bus-only strategies (Baseline, TSM (2) and Improved Bus (8)) would have negligible impacts on the freight operations. The Busway (6) would have moderate impacts due to construction activities in the corridor and at the bridge crossings. The impacts might be short-term shutdown of existing freight operations and/or some scheduling conflicts to build the Busway. The rail-related strategies (4, 5, and 7) are anticipated to have the potential for significant construction-related impacts due to the need to replace and upgrade the entire rail line. This could result in both temporary closures and full closures of freight service for periods of time. With full closures, the freight movement would need to be shifted to alternative trucking means of movement.

## 5.0 ENVIRONMENTAL ASSESSMENT

The identification of impacts in this document is the result of a screening-level analysis which is of sufficient detail to make informed decisions regarding investment strategy alternatives proposed for the Watsonville-Santa Cruz corridor in this MTIS. Task 11, Environmental Scan, resulted in a first phase analysis of environmental issues in the corridor and provided recommendations for the next phase of environmental review. The key conclusion from the scan was that none of the investment strategies appear to have a fatal flaw in terms of environmental effects that would preclude their development. Mitigation measures will be required, however, to implement one or more of the alternatives.

### 5.1 Environmental Setting

Potential impacts were evaluated for the areas adjacent to or within the MTIS study corridor. The corridor extends along the existing UP/SP tracks from Santa Cruz (including proposed on-street rail spurs in the cities of Santa Cruz and Watsonville) and along Highway 1 from the Highway 17 interchange in Santa Cruz to the State Park Drive interchange in Aptos. It includes nine distinct communities: Santa Cruz, Live Oak, Soquel, Capitola, Aptos, La Selva Beach, San Andreas (planning area), Watsonville, and Pajaro. The study corridor also includes the potential rail extensions from Davenport Junction to Natural Bridges Drive and from Harvey West in Santa Cruz to the UCSC Campus Bookstore via the Pogonip Open Space Preserve.

Because the MTIS evaluates several transportation modes in multiple corridors, the environmental setting that could be affected varies between alternatives. The HOV lane alternative (Alternative 3) would have its potential impacts in the Highway 1 corridor. The rail and busway alternatives (Alternatives 4, 5, 6 and 7) could result in impacts within or adjacent to the UP rail right-of-way and on local streets. Potential impacts generated by the TSM Alternative (Alternative 2) and the Improved Bus Alternative (Alternative 8) would be limited to those caused by improvements in bus service, and bicycle and pedestrian facilities. [Figure 1-1](#) shows corridors where impacts would likely occur.

The Highway 1 corridor is predominantly urbanized. Throughout the corridor, Highway 1 crosses urban open space areas, defined by creek and gulch areas, which contain riparian and archaeological resources. The topography varies from flat terraces to steep hillsides.

The characteristics of the UP rail right-of-way corridor are varied throughout the study area. The far southwest segment of the corridor is defined by industrial and commercial uses. The far northwest segment of the corridor passes through park land and the Pogonip Open Space Reserve and terminates at the UCSC campus which is located in a hilly area. West of these segments, the corridor continues through several communities, including areas rich in historic properties. The topography of the corridor varies, crossing ravines, riverbeds and gulches, often via trestle bridges, as well as beach areas. East of Aptos, the corridor is characterized by the ocean bluff community of La Selva Beach, the San Andreas rural area, and agricultural and industrial uses. The corridor terminates at or near the historic Watsonville train depot, located in an industrial area of the city.

## 5.2 Impacts

The impacts summarized in this section are the result of an environmental screening analysis prepared for the MTIS. The level of detail in this analysis was sufficient to identify and compare potential environmental and socioeconomic effects of the alternatives. An impact was identified if the environment would be significantly changed or different due to the implementation of the project. However, the impacts identified in this report have not been determined to be “significant” in a National Environmental Policy Act/California Environmental Quality Act (NEPA/CEQA) context.

This section describes the approach for identifying impacts within each environmental category, as well as the major findings of the environmental scan. A more detailed description of potential impacts associated with each alternative is contained in the *Task 11 Environmental Screening Analysis Technical Report*, prepared for the MTIS.

### Land Use and Socioeconomic

Land use impacts were identified by assessing existing land use and demographics within the proposed highway and rail corridors and by reviewing plans for future land use. The following criteria were used to determine if the Build alternatives would generate land use impacts:

- residential and business displacements
- compatibility with future land uses and public policies
- potential effects on surrounding land uses, and
- effects on community facilities and services

Each build alternative is consistent with local and county plans and policies. The alternatives differ in the number and type of displacements.

The provision of two HOV lanes (Alternative 3) and related interchange and overcrossing improvements on Highway 1 would require the displacement of up to 32 commercial and residential structures.

The Rail alternatives (Alternatives 4, 5 and 7), as well as the Busway alternative (Alternative 6), would result in land use impacts due to the construction of new stations and park-and-ride lots. Improvements for Alternatives 4 and 7 are not expected to require the displacement of any structures, although joint use or displacement of existing parking lots may be necessary. Alternative 5, however, may require displacement of commercial and industrial land uses and adjacent parking on Front Street, North Pacific Avenue, and River Street.

### Cultural Resources

The proposed alternatives could affect cultural or historic resources. A file search of the California State Office of Historic Preservation (SHPO) identified known historic, archaeological, and other cultural resources adjacent to or potential affected by the proposed alternatives. The potential significance of impacts of cultural or historic resources impacts was determined by assessing the sensitivity of resources and the proximity to proposed physical improvements or operations.

Because only about 30 percent of the corridor has been surveyed for cultural resources, there is substantial likelihood that unidentified cultural resources may exist in the project area. The geographical location and features of both the highway and rail corridor suggest that Native American archaeological sites may be located within the project corridors. Therefore, it is likely that archaeological resources may be affected by one or more of the Build alternatives. The identification of actual resources cannot be completed until more detailed surveys are performed.

## **Noise and Vibration**

Potential noise impacts of rail transit facilities were identified by comparing existing with projected noise exposure and considering the varying sensitivity of noise receptors under different background conditions.

Noise impacts of new rail service is a function of the speed of the passing train, the length of the train, the number of daily trains, and the existing ambient noise environment. Areas sensitive to noise impacts would be locations where quiet is an essential feature (e.g., residential areas).

The rail alternatives could generate noise impacts at four to five locations (see Task 11 report, 3/16/98, Table 4-4, pg. 4-30) where existing noise exposure was measured. The projected noise levels are not expected to exceed 60 L<sub>dn</sub>, the strictest noise and land use compatibility guidelines for the study area. There would be no conflict with local compatibility guidelines. However, the locations do exceed FTA guidelines and, if federal money is used, would require noise mitigation analysis.

The added noise level from increased bus services, proposed under Alternatives 2, 3, 4, 5, 6, 7 and 8, would be less than 1 dBA, undetectable by the human ear.

For highway projects, noise impacts would occur when predicted traffic noise levels substantially exceed existing noise levels (not future no-build noise levels). An increase of 10-15 decibels is considered to be substantial.

Noise impacts are expected to occur where Highway 1 would be widened to accommodate the proposed HOV lanes (Alternative 3). The projected noise levels would be about 1 dBA higher, compared to baseline conditions.

Ground vibration caused by the proposed rail transit is the result of vehicle operation (DMU, cog rail and bus), geological conditions and track conditions. Potential ground vibration impacts are measured based on maximum levels of ground-borne vibration and the frequency of vibration-causing events. The equipment proposed for use in the rail alternatives and the operation of the rail service is not expected to generate a substantial vibration impact within the project corridor.

## **Visual Resources**

The proposed alternatives could have visual impacts on surrounding areas in the corridors. Potential impacts have been assessed based on the potential to modify or obstruct views of:

- water features including views to the ocean and coastal areas;
- riparian areas along the alignment, particularly the creeks, gulches, and San Lorenzo River crossings;
- parks and open space, including parks, preserves, and beaches;

- urban development/man-made amenities such as the Santa Cruz boardwalk and pier and the bridges and trestles along the railroad alignment; and
- scenic roadways designated in local and County planning documents.

In the city of Santa Cruz, placing inconsistent visual elements into an existing street or historic area, would be considered a potential visual impact.

Each of the rail alternatives, as well as the busway alternative, would introduce new visual elements into existing streets. Construction of station platforms and park-and-ride lots; modification of bridges, rail trestles highway structures; and installation of sound walls could result in obstruction of views from adjacent areas or create other visual impacts. Other dilapidated bridges or drainage crossings would be replaced with new structures. The visual effects of bridge and other crossing replacements would be temporary, limited to construction activities and post-construction revegetation.

Other visual changes would result from the rail alternatives due to widening of some existing bridges to accommodate the parallel bikeway. A new pedestrian overpass, built as part of Alternatives 4, 5 and 8, would have a minor impact to views in the Highway 1 corridor.

The construction of intermittent sound walls along Highway 1 and the loss of vegetation required for the HOV alternative (e.g. Soquel Avenue interchange), would partially obstruct views from the highway. The overall character of vistas along this portion of the designated scenic route, however, would not change significantly.

### **Parks, Recreation and Open Space**

Potential impacts to public recreational and Section 4(f) resources are considered to be:

- use of land from a public park, recreational facility or wildlife refuge;
- interference with access to or accessibility of a public park or recreational facility;
- project-generated noise levels in excess of federal noise acceptability criteria;
- change in the visual setting or views to and from a public park, recreational facility, or preserve;
- crossing/blockage of a pedestrian/bicycle trail; or
- temporary impacts to use and enjoyment of a park or recreational area due to air, noise, traffic, or other construction-related activity in or adjacent to the park.

Several sensitive open space corridors are located along Highway 1, including Branciforte Creek, Arana Gulch, Rodeo Gulch, and Soquel Creek. If widening of the existing right-of-way is required at these locations for the HOV alternative, a loss of open space may occur which could be considered a Section 4(f) impact.

New Brighton State Beach Park would be affected by the rail, busway and bus alternatives due to track improvements and construction of a station and a park-and-ride lot, resulting in a Section 4(f) impact. Direct impacts would also be generated by the rail alternatives at Seacliff and Manresa State Beaches as a result of the proposed joint use of their parking lots for park-and-ride lots. The construction of Alternative 4 would also create Section 4(f) impacts where the alignment crosses Harvey West Park, the southernmost tip of Pogonip Preserve and the Spring Trail.

## Public Safety

The public safety issues assessed for all the proposed alternatives include:

- security of transit system patrons
- safety of vehicles and system operations.

To ensure patron security, transit stations and other facilities would be well-lit, difficult to vandalize, easy to clean, and would include security systems. Each of the proposed alternatives would also extend the existing police protection of the current bus system and its users to include new bus routes and additional bus runs.

At-grade rail crossings of local streets have been identified as a public safety concern for the rail and busway alternatives. Table 5-1 shows the number of at-grade crossings for each of the alternatives that would utilize the UP rail alignment. These crossings vary from limited-use private roads to complex arterial street and highway crossings. Alternative 5 would require the greatest number of at-grade crossings of the UP alignment (45).

**TABLE 5-1**  
**NUMBER OF RAILROAD AT-GRADE CROSSINGS**

Alternative	Number of At-Grade Crossings
4	39
5	45
6	28
7	38

Source: Parsons Brinckerhoff, Inc., 1998.

Operation of the HOV lane in Alternative 3 would require the California Highway Patrol (CHP) enforce HOV lane restrictions. CHP enforcement is intended to reduce weaving in and out of the HOV lane by lane violators and to increase the apprehension of violators. The HOV facility should incorporate enforcement areas<sup>1</sup> into its design.

## Air Quality

To compare the potential air quality impacts of the build alternatives, the daily emission from vehicle, bus and rail transportation sources were estimated for four pollutants: Reactive Organic Gases (ROG), Nitrogen Oxides (NOx), Particulate Matter (PM) and Carbon Monoxide (CO). Within Santa Cruz County, transportation-related emissions are the largest source of CO, a major source of ROG and NOx, and a minor source of PM.

Each alternative would change amount of vehicles on the street system and the mileage driven by the county bus system, altering the daily emissions generated from these two sources. Additionally, some alternatives would introduce a new rail service. Assumed to be powered by diesel locomotives, rail service would create a new transportation-related source of emissions. The projected level of emissions generated by each alternative is influenced by the Vehicle

<sup>1</sup> Paved areas where CHP officers can park and observe traffic.

Miles Traveled (VMT) forecast for the vehicle, bus and rail components. Average speed also influences emissions.

Table 5-2 summarizes the changes in emissions for each of the alternatives. The table also shows the Monterey Bay Unified Air Pollution Control District (MBUAPCD) thresholds of significance for construction and operational impacts.

**TABLE 5-2  
SUMMARY OF EMISSIONS CHANGES FROM BASELINE  
BY ALTERNATIVE**

Alternative	Pollutant (pounds per day)			
	ROG	NOx	PM	CO
1. Baseline	0.0	0.0	0.0	0.0
2. Transportation Systems Management	-22.1	-86.1	0.0	-963.5
3. Widen Highway 1 for Carpool/Bus Lanes	+82.2	+152.8	+13.9	-317.2
4. Rail Transit From Watsonville Transit Center to UCSC via Harvey West	-28.0	+15.7	+1.6	-1,322.7
5. Rail Transit From Watsonville Transit Center to Harvey West & Natural Bridges	-29.6	-1.0	+0.5	-1,295.3
6. Busway	+2.7	-42.9	+6.6	-1,030.3
7. Rail Transit From Downtown Watsonville to Harvey West	-26.0	+3.7	+1.5	-1,298.0
8. Improved Bus Service	+55.3	+44.0	+24.9	-916.9
MBUAPCD Significance Threshold	+150.0	+150.0	+82.0	+550.0

Source: Parsons Brinckerhoff, Inc. 1998

The TSM alternative (Alternative 2) and Rail Service to Natural Bridges (Alternative 5) are the only alternatives to have a beneficial impact for three types of emissions--ROG, NOx, and CO--as compared with the Baseline alternative. However, NOx emissions for Alternative 5 are reduced by a very small amount totaling just 1 pound per day.

The other alternatives are projected to increase emissions over Baseline conditions. In particular, the HOV alternative (Alternative 3), two of the rail alternatives (4 and 7), and the Improved Bus Service alternative (Alternative 8) are projected to have increased NOx levels. In addition, Alternative 3 would produce NOx emissions that would exceed MBUAPCD thresholds. However, because of the diesel fleet mix and projected VMT, the rail alternatives would decrease reactive organic gases (ROG) and carbon monoxide (CO).

### Biological Resources

The identification of potential impacts to biological resources is based on a preliminary assessment of resources along the proposed rail and highway corridors. The California Environmental Quality Act (CEQA) Appendix G defines a "significant" project impact as one that would:

1. substantially affect a rare or endangered species of animal or plant or the habitat of the species;
2. interfere substantially with the movement of any resident or migratory fish or wildlife species; or,
3. substantially diminish habitat for fish, wildlife, or plant species.

The HOV, rail and busway (Alternatives 3, 4, 5, 6 and 7) alternatives have the potential to affect corridors for wildlife movement and migration, create temporary sedimentation impacts at creek and river crossings and result in the loss of riparian vegetation at creeks and gulches. Implementation of these alternatives could also affect habitat associated with the Monarch butterfly, purple needle grass, burrowing owl and the Santa Cruz tar plant. Some of these impacts would be temporary during construction.

### **Natural Resources and Hazards**

The identification of potential impacts to groundwater and surface water, as well as potential floodplain and seismic hazard impacts is based on a preliminary assessment of resources along the proposed project corridors and the potential effects of project features. Project features include the construction of bridge, trestle and highway-related structures or modifications of existing structures.

Potential impacts to water resources are considered to be:

- introduction of a significant new source of transportation-related urban pollutants;
- substantial removal or disruption of water-bearing alluvial deposits or aquifers;
- installation of extensive impervious surfaces; and
- substantial disruption, sedimentation, or diversion of surface water bodies, streams, or other drainage course.

Potential impacts due to floodplain or seismic hazards are considered to be:

- crossings of, or increased transportation-related development within areas identified as 100-year floodplains, particularly the creeks, gulches, and San Lorenzo River crossings; and
- development of transportation facilities which would increase exposure to seismic hazards or destabilize steep slopes.

Generally, the rail and busway alternatives are expected to have higher risk of intrusion into floodways due to the location of the existing rail corridor alignment through designated 100-year floodplains along the coast. The rail and busway alternatives would also have minor lateral encroachment into the San Lorenzo and Pajaro River floodplains. The HOV alternative (Alternative 3) may require freeway widening within the 100-year floodplain of Soquel Creek. Each of the Build alternatives are likely to create surface water impacts from sedimentation and loss of vegetation.

## Potential Contaminants

Potentially contaminated sites were compiled from a list of known hazardous materials sites in the study area, within the UP alignment and areas near proposed stations. The width of the study area varied from 600 feet for Resource Conservation and Recovery Act (RCRA) sites to one mile for Federal National Priorities List (Superfund) sites. If sites are located in potential construction areas, further analysis and potential clean-up of the sites may be required. [Table 5-3](#) compares the number of potentially contaminated sites for each alternative.

**TABLE 5-3  
NUMBER OF SITES WITH POTENTIAL CONTAMINANTS**

Alternative	Number of Sites
1. Baseline	0
2. Transportation Systems Management	0
3. Widen Highway 1 for Car pool/Bus Lanes	28
4. Rail Transit From Watsonville Transit Center to UCSC via Harvey West	89
5. Rail Transit From Watsonville Transit Center to Harvey West and Natural Bridges	105
6. Busway	73
7. Rail Transit From Downtown Watsonville to Harvey West	77
8. Improved Bus Service	0

Source: Parsons Brinckerhoff, Inc. 1998.

Alternative 5 has a high number of sites because a large portion of the rail alignment passes through industrial areas, east to Natural Bridges.

## Energy

Operational (direct) energy and construction (indirect) energy use were calculated for the study area.

For each alternative, the operational energy calculation was based on projected 2015 traffic volumes and total VMT for all vehicles operating within the study area. The construction energy calculation uses the one-time, non-recoverable energy costs associated with construction of the roadways, rail and other transportation-related facilities, such as stations.

The TSM Alternative (Alternative 2), the Busway Alternative (Alternative 6) and the Improved Bus Service Alternative (Alternative 8) would result in lower operational energy consumption, compared to baseline conditions. The TSM alternative would result in the lowest energy consumption compared to the other alternatives.

Alternative 4 would consume approximately 56,000 more barrels of oil annually than the baseline alternative. Overall, this alternative would result in a moderate increase in energy consumption and have the highest energy consumption of all of the alternatives.

## Conclusions

The following conclusions were drawn based on the analysis presented in the environmental screening document:

1. There are no fatal flaws associated with any of the investment strategies tested.
2. The investment strategies which consist of constructing a facility or guideway (Alternatives 3, 4, 5, 6, and 7) have greater environmental effects than the No Build alternative (Alternative 1) or the investment strategies focused on bus improvements (Alternatives 2 and 8). However, environmental effects are but one criterion for assessing the alternatives and other criteria such as transportation system enhancement, increased accessibility, regional goals, public acceptance/non-acceptance, costs and funding, etc. must also be assessed.
3. There are no environmental effects resulting from any of the alternatives that would be unavoidable significant adverse impacts -- **with one exception. The rail extension between the Davenport Junction Wye and Natural Bridges may be perceived as a community disruption for which mitigation may not reduce the level of effect.**

[Table 5-4](#) summarizes the associated effects of the eight alternatives when compared to the 14 environmental criteria.

[Table 5-5](#) evaluates the potential for impacts to occur for each alternative for each criterion. This assessment is preliminary and subject to more-detailed analysis in future studies; the assessment is for information only.

## Future Environmental Analysis Required

However, future development of a preferred investment strategy for the corridor would require an environmental review consistent with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Information from the environmental screening and the MTIS public involvement program would be used to determine the type of environmental document required and the alternatives to be assessed in the NEPA/CEQA environmental document.

The type of NEPA/CEQA document required is determined through the identification of impacts and mitigation through environmental technical studies. If the technical studies conclude that any potential impacts could be mitigated to a level of less-than-significant, the project could be reviewed with a NEPA Environmental Assessment/CEQA Initial Study. If potentially significant environmental effects could result, it may be necessary to prepare a more detailed NEPA environmental impact statement/CEQA environmental impact report (EIS/EIR). Typically, an EIR/EIS is prepared for the environmental documentation of major transportation investments. Additional technical analyses would also be prepared for a more extensive understanding of potential impacts and mitigation.

TABLE 5-4

COMPARISON OF BUILD ALTERNATIVES

IMPACT CATEGORY	Alternative 2: TSM	Alternative 3: Widen Highway 1 for HOV	Alternative 4: Rail Transit - Watsonville Junction to UCSC via Harvey West	Alternative 5: Rail Transit - Watsonville Transit Center to Harvey West and Natural Bridges	Alternative 6: Busway	Alternative 7: Rail Transit - Downtown Watsonville to Harvey West	Alternative 8: Improved Bus Service
<b>Socioeconomics / Land Use</b>	Transit improvements would not create impact.	Consistent with local and County planning. Potential for numerous residential and commercial displacements due to widening of Hwy. 1.	Consistent with local and County planning. Conjunctive use of Seacliff Beach parking lot as park-and-drive lot. Use of park land at New Brighton, Harvey West Park, and Pogonip Preserve.	Consistent with local and County planning. Conjunctive use of Seacliff Beach parking lot as park-and-drive lot. Potential partial displacement of commercial property (no buildings) at Front/Pacific; use of park land at New Brighton State Beach. Potential neighborhood barrier at Bay/Almar Streets.	Consistent with local and County planning. Potential neighborhood barrier between Bay and Almar Streets.	Consistent with local and County planning. Conjunctive use of Seacliff Beach parking lot as park-and-drive lot. Use of park land at New Brighton State Beach.	Transit improvements would not create impact.
<b>Noise and Vibration</b>	Transit improvements would not create impact.	Potential noise impacts could occur along Highway 1; would not create vibration impacts.	Noise impacts are projected to occur at 3 or 4 of the 10 sites evaluated; does not appear to create vibration impacts.	Noise impacts are projected to occur at 2 of the 10 sites evaluated; does not appear to create vibration impact.	Noise impacts are projected to occur at none (0) of the sites evaluated; does not appear to create vibration impact.	Noise impacts are projected to occur at 3 of the 10 sites evaluated; does not appear to create vibration impact.	Transit improvements would not create impact.
<b>Cultural Resources (Potential Section 4(f) Effects)</b>	Transit improvements would not create impact.	Potential impacts to cultural resources where the Hwy. 1 alignment crosses drainage's.	Potential impacts to cultural resources where the rail alignment crosses drainage's, hillside terraces, water-related woodlands. Potential impacts to historic properties in Aptos Village and downtown Santa Cruz.	Potential impacts to cultural resources where the rail alignment crosses drainage's, hillside terraces, water-related woodlands. Potential impacts to historic properties in Aptos Village and the Santa Cruz Boardwalk.	Heightened potential for impacts to cultural resources where the busway alignment crosses drainage's, hillside terraces, water-related woodlands. Potential impacts to historic property at the Santa Cruz Boardwalk.	Potential impacts to cultural resources where the rail alignment crosses drainage's, hillside terraces, water-related woodlands. Potential impacts to historic properties in Aptos Village and the Santa Cruz Boardwalk.	Limited potential for impacts to cultural resources in the vicinity of New Brighton Road and Cabrillo College Drive.
<b>Visual Impacts</b>	No change.	Vegetation loss on widened highway alignment. Views of highway corridor altered by potential new noise walls.	Pedestrian crossing on Hwy. 1; station at New Brighton in park; stations added to existing streetscapes; alignment crosses open grassland in southern-most end of the Pogonip Preserve.	Pedestrian crossing on Hwy. 1; station at New Brighton in park; stations added to existing streetscapes.	Stations added to existing streetscapes.	Station at New Brighton in park; stations added to existing streetscapes.	Pedestrian crossing on Hwy. 1.
<b>Parks, Recreation and Open Space (Potential Section 4(f) Effects)</b>	Transit improvements would not create impact.	No displacement of park or recreation areas along corridor. Loss of open space adjacent to locations of Hwy. 1 widening.	Potential for direct impacts at New Brighton State Beach, Boardwalk, Harvey West Park, and Pogonip Preserve. Increased use of Seacliff Beach parking lot as park-and-ride lot.	Potential for direct impacts at New Brighton State Beach and Boardwalk. Increased use of Seacliff Beach parking lot as park-and-ride lot.	Potential for direct impacts at New Brighton State Beach entrance drive and Boardwalk.	Potential for direct impacts at New Brighton State Beach and Boardwalk. Increased use of Seacliff Beach parking lot as park-and-ride lot.	Transit improvements would not create impact.

TABLE 5-4 (continued)

COMPARISON OF BUILD ALTERNATIVES

IMPACT CATEGORY	Alternative 2: TSM	Alternative 3: Widen Highway 1 for HOV	Alternative 4: Rail Transit - Watsonville Junction to UCSC via Harvey West	Alternative 5: Rail Transit - Watsonville Transit Center to Harvey West and Natural Bridges	Alternative 6: Busway	Alternative 7: Rail Transit - Downtown Watsonville to Harvey West	Alternative 8: Improved Bus Service
<b>Public Safety</b>	No change compared to Baseline condition.	Enforcement areas would be constructed at points along alignment.	Alignment would have 47 at-grade crossings.	Alignment would have 53 at-grade crossings.	Alignment would have 28 at-grade crossings.	Alignment would have 45 at-grade crossings.	No change compared to Baseline condition.
<b>Air Quality</b>	Decreases ROG, NOx and CO emissions; no change in PM.	Decreases CO emissions; increases ROG, NOx and PM emissions; exceeds MBUAPCD threshold for NOx.	Decreases ROG and CO emissions; increases NOx and PM emissions (mainly from diesel operations).	Decreases ROG, NOx, and CO emissions; slightly increases PM emissions (mainly from diesel operations).	Decreases NOx and CO emissions; increases ROG and PM emissions (commitment to alternative fueled vehicles will reduce emission levels).	Decreases ROG and CO emissions; increases NOx and PM emissions (mainly from diesel operations).	Decreases CO emissions; increases ROG, NOx and PM emissions (commitment to alternative fueled vehicles will reduce emission levels).
<b>Natural Resources</b>							
• Ground Water	No change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No change compared to baseline condition.
• Surface Water	No change compared to baseline condition.	Sedimentation in drainage ravines crossed by Hwy 1. Loss of riparian vegetation.	Sedimentation in wetlands (temporary). Loss of riparian vegetation.	Wetlands impacts at Natural Bridges. Sedimentation in wetlands (temporary). Loss of riparian vegetation.	Comparatively greater impacts than rail alternatives in the UP/SP corridor. Wetlands impacts at Natural Bridges. Sedimentation in wetlands (temporary). Loss of riparian vegetation.	Sedimentation in wetlands (temporary). Loss of riparian vegetation.	Minimal impacts if construction occurs in urban areas.
• Floodplain Encroachment	Transit Improvements would not create impact.	Potential new encroachment at widened Highway 1 crossings of drainage ravines and at Soquel Creek.	Minor expansion of lateral encroachment through San Lorenzo and Pajaro River floodplains.	Minor expansion of lateral encroachment through San Lorenzo and Pajaro River floodplains.	Moderate expansion of lateral encroachment through San Lorenzo floodplain.	Minor expansion of lateral encroachment through San Lorenzo and Pajaro River floodplains.	Transit Improvements would not create impact.
• Seismic Hazards	No change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No significant change compared to baseline condition.	No change compared to baseline condition.

TABLE 5-4 (continued)

COMPARISON OF BUILD ALTERNATIVES

IMPACT CATEGORY	Alternative 2: TSM	Alternative 3: Widen Highway 1 for HOV	Alternative 4: Rail Transit - Watsonville Junction to UCSC via Harvey West	Alternative 5: Rail Transit - Watsonville Transit Center to Harvey West and Natural Bridges	Alternative 6: Busway	Alternative 7: Rail Transit - Downtown Watsonville to Harvey West	Alternative 8: Improved Bus Service
<b>Biological Resources</b>	No change compared to baseline condition.	Potential temporary impacts to wildlife movement corridors. Sedimentation (temp.), loss of riparian vegetation in creeks and gulches. Short-term impacts upon monarch butterfly.	Potential impact to wildlife movement corridors (e.g., Pogonip). Sedimentation in wetlands (temp.); loss of riparian vegetation. Species affected: burrowing owl, monarch butterfly, purple needlegrass, S. C. tarplant.	Potential impact to wildlife movement corridors. Wetlands impacts at Natural Bridges. Sedimentation in wetlands (temp.); loss of riparian vegetation. Species affected: burrowing owl, monarch butterfly, purple needlegrass, S. C. tarplant.	Potential impact to wildlife movement corridors. Wetlands impacts at Natural Bridges. Sedimentation in wetlands (temp.); loss of riparian vegetation. Species affected: burrowing owl, monarch butterfly, purple needlegrass, S. C. tarplant.	Potential impact to wildlife movement corridors. Sedimentation in wetlands (temp.); loss of riparian vegetation. Species affected: burrowing owl, monarch butterfly, purple needlegrass, S. C. tarplant.	Minimal impacts if construction occurs in urban areas.
<b>Potential Contaminants</b>	N/A	28 sites on or near alignment.	89 sites on or near alignment.	105 sites on or near alignment.	73 sites on or near alignment.	77 sites on or near alignment.	N/A
<b>Energy</b>	Would result in consumption of 33K less barrels of oil annually.	Would result in consumption of 22K more barrels of oil annually.	Would result in consumption of 56K more barrels of oil annually.	Would result in consumption of 43K more barrels of oil annually.	Would result in consumption of 32K less barrels of oil annually.	Would result in consumption of 43K more barrels of oil annually.	Would result in consumption of 32K less barrels of oil annually.

## 6.0 FINANCIAL ANALYSIS

Two elements are used to evaluate the Region's financial capacity to support the transportation strategies proposed in this MTIS:

- The general *financial condition* of the Region's existing transportation system and its non-federal funding entities
- The *financial capability* of the Region and its funding entities, including the adequacy of its funding sources to meet future operating and capital costs for an expanded, multi-modal transportation system.

This section describes the anticipated capital and operating costs of the proposed alternatives and existing and new revenue sources to fund improvements. The section concludes with a comparison of projected costs and revenues and a summary of anticipated cash flow. The key results of this task were:

- The Baseline investment strategies (as presently defined) can continue with a modest surplus using existing funding sources. However, none of the other investment strategies (as presently defined) can be fully constructed and/or maintained with present revenue sources.
- With the addition of a new 1/4-cent or 1/2-cent countywide sales tax dedicated entirely to transit, the TSM and busway investment strategies could be constructed and operated with a surplus. However, neither the rail investment strategies, the widening of Highway 1, nor the Improved Bus strategy can be constructed and/or maintained without other new financial resources *beyond the 1/2-cent sales tax*.

### 6.1 Costs

#### 6.1.1 Capital Costs

Elements of the capital costs include stations, yards and shops, rolling stock, right-of-way acquisition, track work and ancillary technologies. The capital cost estimate also includes other costs for engineering design, construction management, project administration, escalation and contingencies.

The TSM Alternative (Alternative 2) would have the lowest capital costs of the build alternatives, about \$15.5 million more than baseline conditions. Alternative 4 (Rail Transit to UCSC) would cost \$384 million more than the Baseline Alternative, the highest capital costs of the proposed alternatives. Alternative 3 (Carpool Lanes on Highway 1) would cost \$262.7 million, 93 percent of which are freeway improvements. [Table 6-1](#) itemizes the capital cost categories for the proposed alternatives.

#### 6.1.2 Operating and Maintenance Costs

This section presents operating and maintenance (O&M) cost estimates for each of the Santa Cruz MTIS alternatives. Costs were estimated separately for bus and rail. Bus O&M costs are based on 1996 Santa Cruz Metropolitan Transit District (SCMTD) operating costs. Because rail transit currently does not operate in Santa Cruz County, costs were based on the operating

characteristics of the Peninsula Commute Service (PCS or Caltrain), adjusted to account for the proposed self-propelled diesel rail cars and rack/adhesion technologies. O&M costs are based on the quantity of service supplied (e.g., annual revenue miles) and the size of the proposed transit system (e.g., route miles). [Table 6-2](#) summarizes the annual O&M costs for the proposed alternatives and changes in cost compared to Baseline conditions and the TSM Alternative.

Annual operating costs for the year 2015 range from \$22.2 million for the Baseline alternative to \$44.8 million for the Improved Bus Service alternative (Alternative 8). O&M costs for the TSM alternative (\$28.7 million) would be \$6.5 million (29%) higher than the Baseline alternative. The Improved Bus Service alternative would have O&M costs that are \$23.1 million, double the cost of the Baseline alternative and \$16.6 million higher (58%) than the TSM alternative.

Annual rail operating costs range from \$14.3 million for Alternative 7 to \$18.6 million for Alternative 4. When combined with bus service and joint costs, the total O&M cost for Alternative 7 would be \$43.2 million and \$47.7 million for Alternative 4. The total O&M costs for Alternative 7 would be \$21.1 million (95%) higher than the Baseline alternative and \$14.6 million higher (51%) than the TSM alternative. The combined bus and rail O&M costs for Alternative 7 would be \$25.5 million (115%) higher than the Baseline alternative and \$19.0 million higher (66%) than the TSM alternative.

[Table 6-3](#) compares the costs per vehicle (bus and rail) hour and costs per vehicle mile between the proposed alternatives.

At \$95.12 per vehicle-hour, Alternative 6 (Busway) would have the lowest cost per vehicle-hour for bus operations and \$4.56 less per hour than under Baseline conditions. Alternative 8 (Improved Bus) would cost \$8.42 per vehicle-mile to operate the bus, the lowest of the build alternatives and \$0.34 more per vehicle-mile than Baseline conditions. Alternative 5 would have the lowest costs per rail vehicle-hour (\$738.80/hour) of the rail alternatives. Alternative 7 would have the lowest cost per rail vehicle-mile (\$21.16/mile) of the rail alternatives.

**TABLE 6-1**  
**CAPITAL COSTS**  
**(\$000, 1998)**

Alternative	Construction				Rolling Stock			Other Costs	TOTAL
	Road Improvements	Bus-Related Improvements	Rail	Subtotal	Buses	Rail Vehicles	Subtotal	Management, Escalation, Project Reserve, etc.	
1 Baseline	85,425	4,050	N/A	<b>89,475</b>	37,060	N/A	<b>37,060</b>	<b>43,977</b>	<b>\$170,512</b>
2 Transportation Systems Management	1,600	N/A	N/A	<b>1,600</b>	11,616	N/A	<b>11,616</b>	<b>2,249</b>	<b>15,465</b>
3 Widen Hwy 1 for Carpool/Bus Lanes	171,143	N/A	N/A	<b>171,143</b>	15,246	N/A	<b>15,246</b>	<b>76,320</b>	<b>262,709</b>
4 Rail Transit from Watsonville Transit Center to UCSC	8,170	N/A	144,084	<b>152,254</b>	11,253	121,000	<b>132,253</b>	<b>99,581</b>	<b>384,088</b>
5 Rail Transit from Watsonville Transit Center to Harvey West	8,170	N/A	137,851	<b>146,021</b>	9,438	62,700	<b>72,138</b>	<b>81,088</b>	<b>299,247</b>
6 Busway	6,970	51,478	N/A	<b>58,448</b>	14,520	N/A	<b>14,520</b>	<b>27,577</b>	<b>100,545</b>
7 Rail Transit from Downtown Watsonville to Harvey West and Natural Bridges	6,970	N/A	138,659	<b>145,629</b>	10,890	56,100	<b>66,990</b>	<b>79,352</b>	<b>291,971</b>
8 Improved Bus	2,200	N/A	N/A	<b>2,200</b>	33,396	N/A	<b>33,396</b>	<b>5,425</b>	<b>41,021</b>

Notes: Capital costs for Alternatives 2, 3, 4, 5, 6, 7 and 8 include only the costs for improvements unique to the alternative. Baseline improvements, which are a part of all the alternatives, are not included. All costs are in 1998 dollars.

**TABLE 6-2**  
**SUMMARY OF ANNUAL O&M COSTS**  
**(MILLION, 1998)**

Alternative	Bus	Highway	Rail	Joint	Total Cost	Marginal Cost	
						From No Action	From TSM
1. Baseline Year 2015	\$22.2	NA	NA	NA	<b>\$22.2</b>	NA	NA
2. TSM	\$28.2	NA	NA	\$0.5	<b>\$28.7</b>	\$6.5	NA
3. Widen Highway 1 for Carpool/Bus Lanes	\$31.7	\$0.05 <sup>2</sup>	NA	\$0.5	<b>\$32.1</b>	\$10.0	\$3.4
4. Rail: WTC to UCSC	\$28.7	NA	\$18.9	\$0.5	<b>\$48.1</b>	\$25.9	\$19.4
5. Rail: WTC to Harvey West & Natural Bridges	\$27.7	NA	\$16.4	\$0.5	<b>\$44.6</b>	\$22.4	\$15.9
6. Busway	\$32.0	\$0.09	NA	\$0.5	<b>\$32.5</b>	\$10.3	\$3.8
7. Rail: Downtown Watsonville to Harvey West	\$28.6	NA	\$14.6	\$0.5	<b>\$43.6</b>	\$21.4	\$14.9
8. Improved Bus Service	\$44.8	NA	NA	\$0.5	<b>\$45.3</b>	\$23.1	\$16.6

Notes: Joint Costs are the costs of operating the Transportation Resource Center.

**TABLE 6-3  
COMPARISON OF UNIT COSTS**

Alternative	Annual O&M Cost (\$millions)	Cost per Vehicle Hour	Cost per Vehicle Mile
<b>BUS:</b>			
1. Baseline Year 2015	\$22.2	\$99.68	\$8.08
2. TSM	\$28.2	\$98.87	\$8.85
3. Widen Highway 1 for Carpool/Bus Lanes	\$31.7	\$98.72	\$8.67
4. Rail: WTC to UCSC	\$28.7	\$96.37	\$9.02
5. Rail: WTC to Harvey West & Natural Bridges	\$27.7	\$96.23	\$8.95
6. Busway	\$32.0	\$95.12	\$8.55
7. Rail: Downtown Watsonville to Harvey West	\$28.5	\$96.41	\$8.96
8. Improved Bus Service	\$44.8	\$100.55	\$8.42
<b>RAIL:</b>			
4. Rail: WTC to UCSC	\$18.6	\$740.83	\$23.29
5. Rail: WTC to Harvey West & Natural Bridges	\$16.0	\$738.80	\$23.31
7. Rail: Downtown Watsonville to Harvey West	\$14.3	\$788.50	\$21.16

## 6.2 Revenues

There are several local, state and federal sources of revenue potentially available to build and operate the MTIS alternatives, including:

### Local Revenue Sources

- Local Transit Sales Tax
- Transit Passenger Fare Revenues
- Other Transit Revenues (advertising, etc.)
- Transportation Development Act
- AB 2766 Air Pollution District Funds
- Local Contributions (e.g., transportation impact fees, redevelopment funds, transient occupancy taxes)

### State Revenue Sources

- State Transit Assistance
- Proposition 116 Rail Funds
- Regional Transportation Improvement Program Funds
- Petroleum Violation Escrow Account Funds
- Transit Capital Improvement Funds
- Fuel Tax Revenues
- Inter-regional Transportation Improvement Program Funds

### Federal Revenue Sources

- FTA Section 5307 Funds
- Surface Transportation Program Funds
- Transportation Enhancement Activities Funds
- FTA Section 5309 (New Start) funds.
- FTA Section 5309 (Bus Capital) Funds
- Congestion Mitigation & Air Quality Program Funds

### Potential New Revenue Sources

- Regional Gas Tax
- Countywide Sales Tax (quarter- or half-cent)
- Private Sector Contributions
- Sales Tax on Fuel
- Trackage Fees

### 6.2.1 Potential New Funding Sources

As the Federal share of operating revenue declines, the role of local and state funding becomes increasingly important. The largest source of potential new local operating revenue would be derived from a local transit sales tax, potentially supplying about one fourth of total revenue. These funds are presently dedicated to providing bus service. If new revenue is required, one option to consider is a county-wide transportation sales tax. If implemented at a 1/2-cent level, it could be expected to contribute about \$250 million in operating revenue; a county-wide 1/4 cent sales tax would contribute about \$125 million - both over 17 years. Existing levels of State fuel tax revenues could contribute \$137 million toward capital costs, the largest single source of existing capital revenue.

Another significant potential new source of capital funds for a Fixed Guideway (rail or busway) alternative would be the federal Fixed Guideway New Starts (Section 5309) program. This program may be able to provide 50% (or more) towards building the project if federal performance criteria are met. A combination of existing revenue and potential new revenue sources could provide up to \$1.2 billion toward transportation improvements in the region.

### 6.3 Cash-Flow Analysis

The cash flow analysis presented in the Task 13, *Financial Analysis Report* evaluated the Region's ability to acquire, construct, operate and maintain all of the facilities and services proposed for three of the seven build alternatives: Transportation Systems Management (Alternative 2), Widening of Highway 1 with Carpool Lanes (Alternative 3), and Rail Service from Watsonville to Harvey West (Alternative 7). Selection of these alternatives allowed for a multi-modal financial comparison of bus, highway and rail alternatives being considered for the corridor and represent a range of costs. [Table 6-4](#) compares the capital and operating costs and revenues for the three alternatives and the Baseline.

Between 1998 and 2015, the Region could expect to receive \$1.0 billion in transportation revenue assuming the Baseline conservative assumptions noted in the Task 13 report and no new local funding, but also an overall continuation of the transportation funding process. Based on these anticipated funds, the Region would have the financial capacity to continue current transportation programs and services under the Baseline alternative and generate a combined surplus of \$106.9 million. Sufficient operating revenues would be available to meet projected operating costs of \$558.3 million and generate an \$18.2 million surplus. The capital program is anticipated to cost \$425.3 million, with adequate revenues available from a combination of local, state, and federal sources to meet the anticipated \$336.8 million capital cost and generate a \$88.7 million surplus.

**TABLE 6-4**  
**COST SUMMARY FOR FOUR MTIS ALTERNATIVES**  
**(MILLION OF ESCALATED \$)**

	<b>Baseline (Alt. 1)</b>	<b>TSM (Alt. 2) *</b>	<b>Widening of Highway 1 for Carpool Lanes (Alt. 3) *</b>	<b>Rail Service from Watsonville to Harvey West (Alt. 7) *</b>
Operating Revenues:	\$576.5	\$832.4	\$833.6	\$844.3
Operating Cost:	558.3	646.6	664.7	774.9
Operating Surplus/Deficit	18.2	185.8	168.9	69.4
Capital Revenues:	\$425.3	\$427.3	\$451.3	\$669.6
Capital Cost:	336.8	359.9	790.3	824.4
Capital Surplus/Deficit:	88.7	67.4	(339.0)	(154.8)
Combined Cumulative Surplus/Deficit	\$106.9	\$253.2	(\$170.1)	(\$85.4)

\* Assumes new revenue source of 1/2 cent sales tax (TSM only requires a 1/4-cent sales tax).

Assuming a new local revenue source (sales tax), four alternatives were analyzed.

The TSM alternative would experience no operating deficits, with the use of new revenue from a countywide (1/4-cent) sales tax measure. On the capital side, the cash flow revealed in sufficient revenues to meet anticipated expenses associated with the acquisition of vehicles and the expansion of local bus transit service. However, the concept overall has a surplus of \$253.2 million.

For Alternative 3, widening of Highway 1 with carpool lanes, the Region will experience no operating deficits, given the infusion of funds from the new one-half cent countywide sales tax. However, construction of the Carpool facility would result in an overall deficit totaling (\$70.1) million.

For Alternative 7, (Rail service between downtown Watsonville and Harvey West), the Region would not experience operating deficits in part due to funds from the proposed one half-cent countywide sales tax. Annual capital deficits would occur between 2003 and 2009 when most of the rail upgrades are scheduled to occur. The capital deficit totals \$154.8 million and the overall deficit for this investment strategy is forecasted to be \$85.4 million over the 17-year period.

### 6.3.1 Conclusions and Potential Funding Strategy

The Baseline alternative can be funded with existing revenues, generating \$107 million (without an additional 1/4 or 1/2-cent sales tax) surplus.

The TSM alternative would have sufficient funding with a new 1/4-cent sales tax. Without this new revenue source, the alternative is not financially feasible.

Widening of Highway 1 with Carpool/Bus Lanes (Alternative 3) and Rail Service from Watsonville to Harvey West (Alternative 7) would have insufficient funds to meet operations and capital requirements, even with a new one-half cent increase in the local sales tax and reasonable estimates of funding from state and local sources.

Given the objective of the MTIS study to improve travel mobility within the Watsonville-Santa Cruz Corridor, it may be possible to devise a strategy to address the funding deficits. The strategy could incorporate one or more of the following elements.

- With approval by voters, establish a new countywide one-half cent sales tax and maintain it in perpetuity. (A quarter-cent would only require voter approval.) This would allow the Region to finance improvement projects through borrowing. Future sales tax revenue could then be used to repay the principal and debt service as well as fund county road maintenance and transit system O&M costs.
- Phase-in over a longer period of time new major transportation improvement projects or services (e.g., the purchase of new vehicles, the development of rail service, etc.). In the MTIS evaluation, a 2015 planning horizon was assumed; conceivably extending the implementation of new services out later would assist in the management of the cash flow and allow for the deferral of other projects.
- Implement the Widening of Highway 1 with Carpool Lanes or Rail Service from Watsonville to Harvey West alternatives with a lower level or more focused level of bus service. This would result in lower operating and capital costs than the alternatives evaluated in this analysis.
- Extend the replacement cycle from 12 to 14 years or more for transit vehicles.

These alternative funding strategies were taken into account in the development of a recommended investment strategy discussed in Section 7.0.