

Yerba Buena Island Project Report Traffic Forecast Report

1.0 INTRODUCTION

This report presents the traffic forecasting procedures and the results of the forecasted future traffic volumes on the Bay Bridge and six on- and off-ramps to and from Yerba Buena Island in both eastbound and westbound directions.

2.0 EXISTING TRAFFIC VOLUMES

Figure 1 presents the existing traffic volumes on the Bay Bridge and ramps in both the eastbound and westbound directions, during both the AM and PM peak hours, respectively. Existing Bay Bridge ramp traffic volumes were collected by Fehr & Peers from May 4th (Sunday) to May 10th, (Saturday) 2008. Average traffic volumes for the three mid-week weekdays (Tuesday (May 6, 2008) to Thursday (May 8, 2008)) were selected for the analysis. The AM peak hour was identified as 8:00 a.m. to 9:00 a.m. and the PM peak hour was identified as 4:00 to 5:00 p.m. The Bay Bridge mainline traffic volumes were obtained from the Freeway Performance Measurement System¹ (PeMS) database for the same three days and during the same peak hour to ensure consistency. The data point is located approximately 2,300 feet west of the Bay Bridge westbound metering lights. It should be noted that the Bay Bridge traffic volumes do not represent the actual demand; it represents the actual volumes counted at this point. Westbound traffic volumes at this point are constrained by the number of vehicles controlled by metering lights during both the AM and PM peak periods, and Caltrans sets a limit of 9,600 vehicles per hour onto the Bay Bridge.

There are no metering lights in the eastbound direction in the Bay Bridge corridor. Due to the complex on- and off-ramp configuration on the San Francisco side of the Bay Bridge and chronic traffic queuing at the approaches to the Bay Bridge, the eastbound Bay Bridge capacity was estimated using the highest counted traffic volumes from the PeMS database. PeMS data were examined between 2003 and 2007 and the highest volume counted was 9,785 vehicles on April 12, 2007 between 4:00 p.m. and 5:00 p.m. Thus, it was determined that the eastbound capacity is approximately 9,750 vehicles per hour.

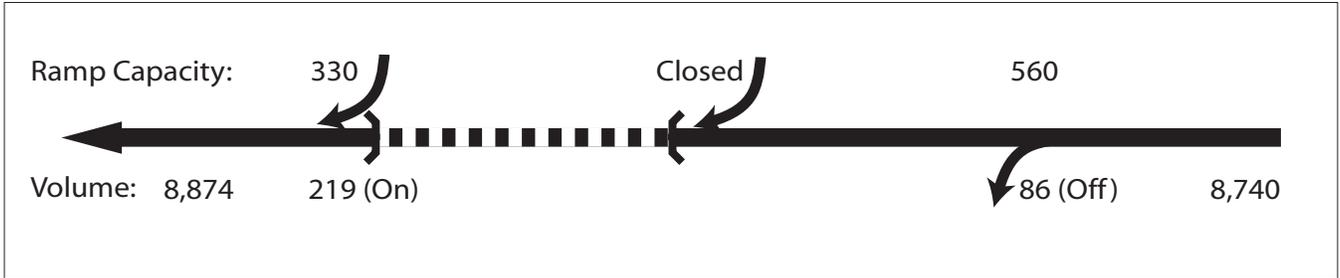
2.1 Historical Traffic Volumes on the Bay Bridge

A review of historical data published by the Metropolitan Transportation Commission (MTC) showed that traffic volumes during the AM peak period were effectively the same in 2001 as in 1991 in both the eastbound and westbound directions. However, traffic volumes during the PM peak period increased in both eastbound and westbound directions during the same time period. A recent report prepared by the MTC, *Bay Area Transportation: State of the System 2005*, shows a reduction of 4 percent in average daily traffic on the Bay Bridge in the westbound direction.

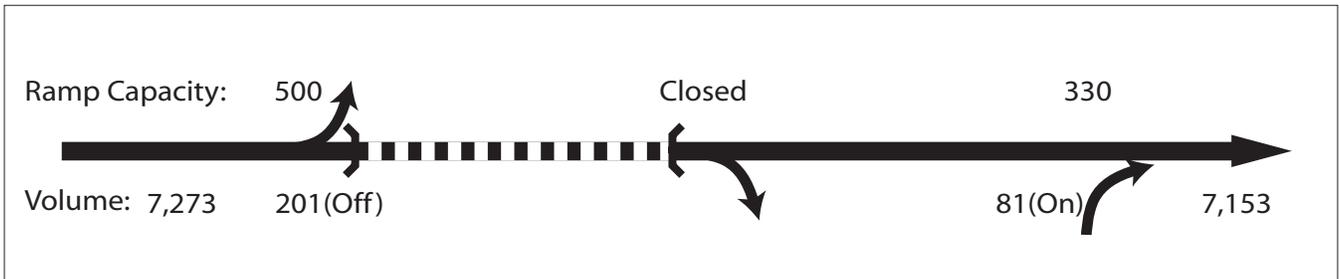
¹ PeMS data were obtained from <https://pems.eecs.berkeley.edu/>

AM PEAK HOUR

Westbound

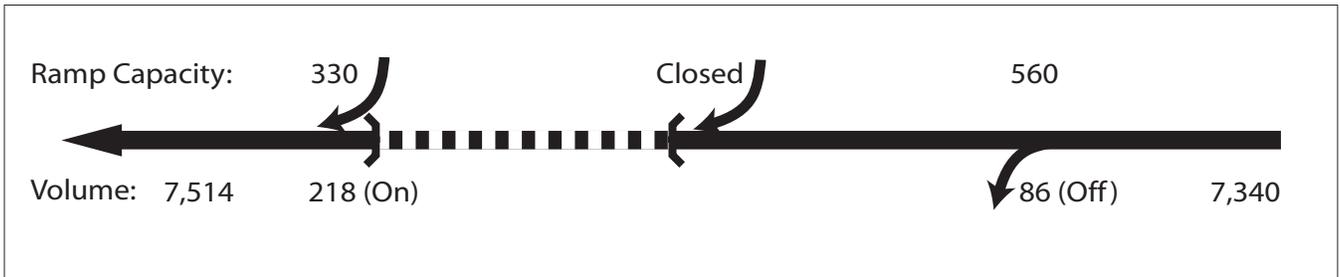


Eastbound

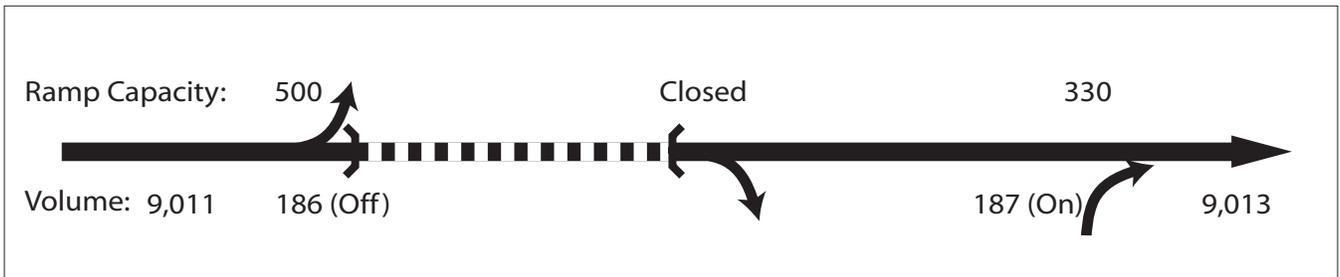


PM PEAK HOUR

Westbound



Eastbound



It should be noted that Bay Bridge peak hour traffic volumes vary substantially. Table 1 presents the mean, 85 percentile, and highest volumes counted in 2006 and 2008.

Table 1 - PeMs Traffic Data (2006 and 2008)

| | AM Peak Hour | | PM Peak Hour | |
|---------------|--------------|-----------|--------------|-----------|
| | Eastbound | Westbound | Eastbound | Westbound |
| 2006 | | | | |
| Mean | 7,000 | 8,276 | 8,766 | 7,271 |
| 85 percentile | 8,012 | 9,331 | 9,404 | 8,047 |
| Maximum | 8,552 | 9,571 | 9,777 | 8,493 |
| 2008 | | | | |
| Mean | 6,838 | 8,759 | 8,853 | 7,195 |
| 85 percentile | 7,244 | 9,385 | 9,351 | 7,891 |
| Maximum | 7,561 | 9,732 | 9,591 | 8,485 |

3.0 FUTURE TRAFFIC VOLUMES

The future year for this project is 2035, 20 years from the completion of the proposed project. Future traffic demand volumes for the Treasure Island and the Bay Bridge were estimated using two different methods and then integrated to ensure consistency. Future demand volumes for the Treasure Island were estimated based on the proposed land use program for the *Treasure Island and Yerba Buena Island Redevelopment Plan (TIYBIRP)* and was regarded as a full-build of the Treasure Island. Future demand volumes for the Bay Bridge were based on the MTC’s travel forecasting model for the AM peak hour and San Francisco County Transportation Authority’s (SFCTA) travel forecasting model for the PM peak hour. Both forecasting methods and integration procedures are described in detail below.

3.1 Future Traffic Demand on the Treasure Island

Future traffic demand volumes for the Treasure Island development project was obtained from the trip generation report prepared by Fehr and Peers, and recently approved by the San Francisco Planning Department for use in the *TIYBIRP EIR*. Vehicle trip generation for the *TIYBIRP EIR* was calculated using the methodology described in Appendix A, a technical memorandum titled “Proposed 4-D Adjustments to Trip Generation Rates Treasure Island Transportation Impact Analysis”. Future traffic volumes were estimated for the baseline transit investments only (only those funded improvements were included in the modal split analysis).

Table 2 presents the proposed land use program for TIYBIRP and estimated person and vehicle trips for the TIYBIRP under the baseline transit scenario. Table 1 (baseline transit) shows that TIYBI RP would generate approximately 2,416 vehicle trips during the AM peak hour (1,062 inbound and 1,354 outbound vehicle trips) and approximately 3,835 vehicle trips during the PM peak hour (2,136 inbound and 1,699 outbound vehicle trips) during the PM peak hour.

It should be noted that the vehicle trips presented in Table 2 are total vehicle trips that would be generated by the proposed developments on Treasure Island and Yerba Buena Island at build out, including the vehicles currently accessing Treasure Island and Yerba Buena Island and will

remain after the construction of the TIYBIRP project. The net increase in vehicle volumes would be 1,664 vehicles during the AM peak hour and 2,909 vehicles during the PM peak hour².

Table 2 - Yerba Buena Island and Treasure Island Redevelopment Plan Trip Generation by Mode (Baseline Transit Scenario)

| Land Use | Total Use | Person Trips | | | | | Vehicle Trips ² | | |
|------------------------------------|-------------|--------------|-------------|--------------|-----------------------|---------------|----------------------------|--------------|--------------|
| | | Ferry | Bus | Auto | Internal ¹ | Total | In | Out | Total |
| <i>Weekday AM Peak Hour</i> | | | | | | | | | |
| Residential | 6,000 units | 431 | 526 | 1,405 | 1,387 | 3,749 | 234 | 838 | 1072 |
| Hotel | 500 rooms | 100 | 126 | 352 | 339 | 917 | 163 | 103 | 266 |
| Retail | 270,000 sf | 131 | 222 | 858 | 712 | 1,923 | 346 | 260 | 606 |
| Open Space | 300 acres | 9 | 15 | 59 | 48 | 131 | 33 | 8 | 41 |
| Marina ³ | 400 | 6 | 8 | 34 | 29 | 77 | 11 | 13 | 24 |
| Flex | 325,000 sf | 41 | 50 | 134 | 133 | 358 | 87 | 14 | 101 |
| Police/Fire | 135,000 sf | 33 | 40 | 107 | 106 | 286 | 67 | 13 | 80 |
| School | | 91 | 111 | 296 | 291 | 789 | 121 | 105 | 226 |
| Total | | 840 | 1098 | 3,245 | 3,045 | 8,230 | 1,062 | 1,354 | 2,416 |
| <i>Weekday PM Peak Hour</i> | | | | | | | | | |
| Residential | 6,000 units | 510 | 623 | 1,534 | 1,778 | 4,445 | 757 | 430 | 1187 |
| Hotel | 500 rooms | 50 | 63 | 165 | 186 | 464 | 66 | 60 | 126 |
| Retail | 270,000 sf | 397 | 669 | 2418 | 2320 | 5,804 | 895 | 823 | 1718 |
| Open Space | 300 acres | 17 | 29 | 107 | 102 | 255 | 31 | 45 | 76 |
| Marina ³ | 400 | 9 | 14 | 53 | 50 | 126 | 19 | 18 | 37 |
| Flex | 325,000 sf | 237 | 289 | 712 | 826 | 2064 | 310 | 241 | 551 |
| Police/Fire | 135,000 sf | 7 | 9 | 21 | 24 | 61 | 5 | 11 | 16 |
| School | | 90 | 90 | 138 | 211 | 529 | 53 | 71 | 124 |
| Total | | 1,316 | 1787 | 5,144 | 5,496 | 13,748 | 2,136 | 1,699 | 3,835 |

Note:

1. Walk and bicycle person trips will be internal to Treasure Island
2. Vehicle-trips includes passenger vehicles and vans
3. The marina use has already been approved and is not part of the proposed project (although the landside services associated with the Marina are included). The trip generation associated with the Marina is presented for informational purposes because it will be used to assess cumulative conditions.)

Source: *Treasure Island Transportation Plan*, Treasure Island Community Development, LLC, September 2006 and Fehr & Peers 2008

² A letter report to Bill Wycko, San Francisco Planning department "Proposed Trip Generation, Distribution, and Mode Split Forecasts for Treasure Island Transportation Impact Study", Fehr and Peers, December 8, 2008

3.2 Future Traffic Volumes on the Bay Bridge

Future traffic volumes for the Bay Bridge mainline were estimated using the MTC’s travel forecasting model (BAYCAST 2009 RTP) for the AM peak hour and using the SFCTA’s travel forecasting model (Champ 3.2) for the PM peak hour. The decision on using the model results from two different models is presented below.

- The MTC model was only validated for the AM peak period, not the PM peak period. Its AM peak hour data appears to be reasonably validated against the PeMS data plus observed unserved demand in both eastbound and westbound direction during the AM peak hour.
- The SFCTA model was validated for the PM peak period. Its PM peak hour data appears to be reasonably validated against the PeMS data plus observed unserved demand in both eastbound and westbound direction during the PM peak hour.

Table 3 presents a comparison of the two model results for the base year (2006) and 85 percentile traffic volume data obtained from PeMS data for 2006. It should be noted that SFCTA model’s base year is 2005, so the 2006 SFCTA model demand is estimated based on a interpolation of the model output data between 2005 and 2030.

Table 3 - Comparison of the MTC and SFCTA model results and PeMs data (2006)

| | MTC Model | SFCTA Model | PeMs Data (85 percentile) |
|--------------|-----------|-------------|------------------------------|
| AM Peak Hour | | | |
| Eastbound | 8,541 | 9,399 | 8,012 |
| Westbound | 12,375 | 11,364 | 9,571 |
| PM Peak Hour | | | |
| Eastbound | 13,703 | 10,402 | 9,777 |
| Westbound | 8,771 | 9,399 | 8,493 |

Both the MTC model and the SFCTA model use ABAG’s Projection 2007 data as the basis for the forecasts. The future year for the MTC model is 2035 and for the SFCTA model is 2030. Since the future year of SFCTA model is 2030, 2035 SFCTA model demand is estimated based on a straight line extrapolation of the model output data between 2005 and 2030.

In order to estimate I-80 mainline future traffic demand, the vehicle trips in the MTC and SFCTA model’s trip table for Treasure Island and Yerba Buena were replaced with the vehicle trips presented in Table 1 and then the updated trip table was re-assigned to the roadway network.

Figure 2 (baseline transit) presents the forecasted future traffic demand as well as estimated volumes for the Bay Bridge mainline and Yerba Buena Island ramps. Because the metering lights limit the number of vehicles in the westbound direction to no more than 9,600 vehicles per hour, the actual vehicular volumes on the Bay Bridge after the metering lights are reduced to 9,600 vehicles. Likewise, the actual vehicular volumes on the Bay Bridge in the eastbound

direction are reduced to 9,750 in the eastbound direction. The constrained volumes are marked by “*” in Figure 2 and these volumes will be used for the traffic operations analysis.

Table 4 presents a comparison of existing and future traffic demand and growth factors as well as constrained volumes and growth factors. It shows that traffic demand in the eastbound direction would grow by 2.5% in AM peak hour and 8.2% in PM peak hour and westbound direction would grow by 29.5% in AM peak hour and 15.1% in PM peak hour.

Table 4 – Approach Traffic Volumes and Future Growth Factors

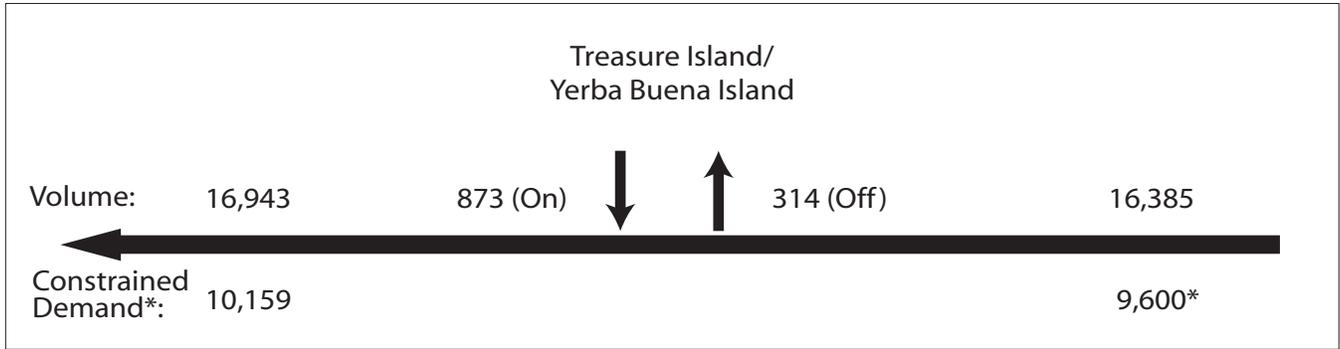
| | Existing (2008) | Future with Baseline Transit | |
|-------------------------------|-----------------|------------------------------|----------------------|
| | | Total Volumes (2035) | Future Demand (2035) |
| Eastbound (SF approach) | | | |
| AM Demand | 8,557 | | 8,769 |
| AM Volumes | 7,273 | 8,769 | |
| PM Demand | 10,402 | | 12,002 |
| PM Volumes | 9,011 | 9,750 | |
| Westbound (East Bay approach) | | | |
| AM Demand | 12,652 | | 16,385 |
| AM Volumes | 8,740 | 9,600 | |
| PM Demand | 9,087 | | 10,462 |
| PM Volumes | 7,340 | 9,600 | |

Note:

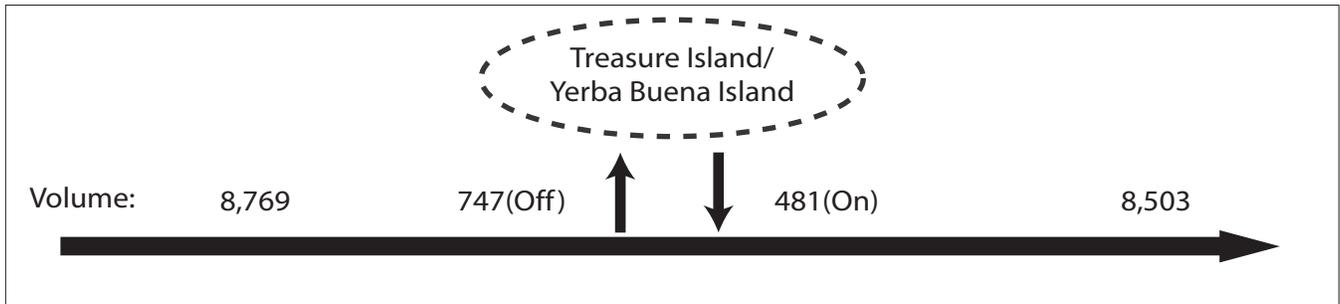
1. AM peak hour demands were based on the MTC model and PM peak hour demands were based on the SFCTA’s model.
2. 2008 volumes are 85 percentile volumes obtained from the PeMS database.

AM PEAK HOUR

Westbound

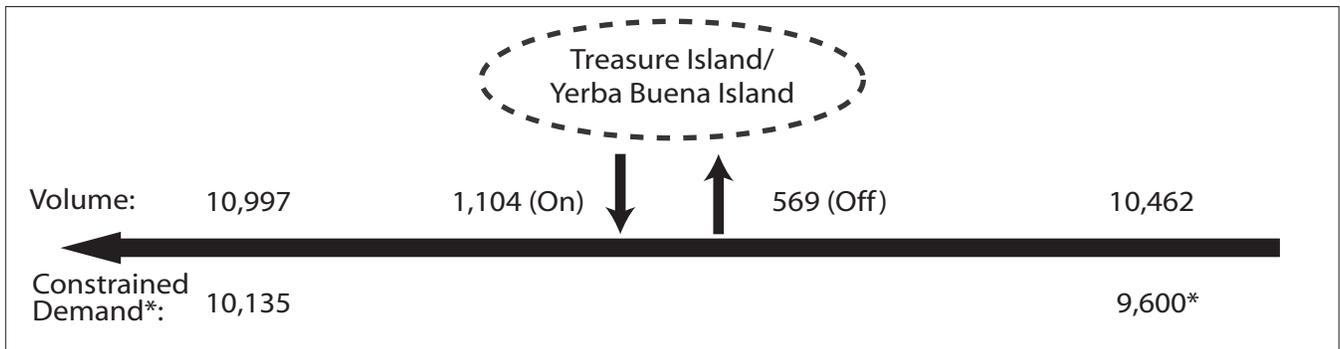


Eastbound

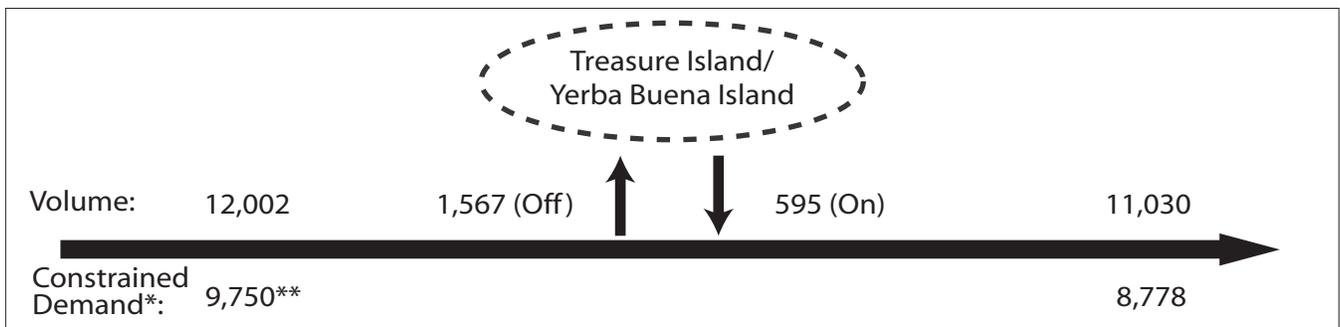


PM PEAK HOUR

Westbound



Eastbound



* Bay Bridge westbound traffic volumes are controlled by metering lights during both the AM and PM peak periods, and Caltrans sets a limit of 9,600 vehicles per hour onto the Bay Bridge.

** Bay Bridge eastbound capacity is constrained by the ramps and mainline configuration near 1st Street. The highest volume counted between 2005 and 2007 was approximately 9,750 vehicles per hour.



Appendix

Appendix A - Proposed 4-D Adjustments to Trip Generation Rates Treasure Island
Transportation Impact Analysis



December 8, 2008

Mr. Bill Wycko
San Francisco Planning Department
1650 Mission Street, 4th Floor
San Francisco, CA 94103

**Re: *Proposed Trip Generation, Distribution, and Mode Split Forecasts for
Treasure Island Transportation Impact Study***

Dear Bill:

This letter report presents the trip generation, trip distribution, and mode split forecasts that we propose to use for the Treasure Island Transportation Impact Study. The proposed trip generation forecasts were developed using methods developed by Fehr & Peers and others (known as the 4D's method) to estimate trip generation as a function of design variables, such as:

- Density
- Diversity of uses
- Design of the street network to accommodate pedestrian and bicycle travel
- Distance to robust transit service

A brief description of the proposed project and the resulting traffic generation forecasts follows.

TREASURE ISLAND DEVELOPMENT

The Treasure Island Development Authority (TIDA) is proposing a redevelopment plan for Treasure Island and Yerba Buena Island that would include redeveloping most existing development on the islands, which primarily consists of low-density residential and light industrial development, into a new mixed-use development that includes housing, retail/commercial, recreational open space, and community facilities.

Specifically, the proposed project would remove about 1,000 dwelling units (of which approximately 800 are available for occupancy) and about 100 non-residential buildings, some of which are currently occupied. The proposed project would replace these uses with the following:

- Up to 6,000 new dwelling units, broken down as follows:
 - 1,454 townhomes/condominium flats
 - 495 rental flats
 - 1,058 affordable units (including rental, for sale, and supportive housing)
 - 2,876 high- and mid-rise units
 - 117-room condominium hotel
- 270,000 square feet of retail uses, including neighborhood-serving, lifestyle, and entertainment

- 325,000 square feet of “flex space,” including new construction and adaptive reuse of office, PDR/industrial, and museum space.
- 135,000 square feet of institutional uses, including an elementary school, police/fire services, community facilities, and a sailing center.
- 500 hotel rooms, including a 50-room wellness spa, 70 timeshare units, and approximately 300-380 room full-service hotel
- 300 acres of public recreational open space
- Expansion of the existing 100-berth marina near Clipper Cove to provide up to 400 berths¹

TRIP GENERATION

The methods commonly used for forecasting trip generation of projects in San Francisco are based on person-trip generation rates, trip distribution information, and mode split data described in the *SF Guidelines*. These data are based on a number of detailed travel behavior surveys conducted within San Francisco. The data in the *SF Guidelines* are generally accepted as more appropriate for use in the complex environs of San Francisco than more conventional methods because of the relatively unique mix of uses, density, availability of transit, and cost of parking commonly found in San Francisco. However, the methods described in the *SF Guidelines* cannot be directly applied at Treasure Island because of its unique location and because the proposed project is expected to fundamentally change the character of the island, limiting the usefulness of any information about existing uses at the island.

Similarly, standard vehicle-traffic generation rates, such as those provided by *Trip Generation*, 7th Edition, 2003, Institute of Transportation Engineers (ITE), would not be suitable for Treasure Island, unless appropriate adjustments were made to account for the project size, mix, and availability of transit. This trip generation report describes an exercise conducted by Fehr & Peers to estimate traffic generation of the proposed project using state-of-the-practice methods for adjusting standard traffic generation rates. This method was originally developed by Fehr & Peers and others for the US Environmental Protection Agency (EPA) and has been endorsed for use in project-specific and planning-level analyses by a number of jurisdictions, including the California Department of Transportation (Caltrans). This method is commonly referred to as the “4D” method, and generally accounts for the following factors that may influence traffic generation:

- **Density of the project** – the higher the proposed project’s density, the less vehicular traffic generated per unit of development
- **Diversity of uses** – an appropriate mix of uses can lead to internalization of trips within a project

¹ Construction of the additional marina berths has already been approved, and they are not technically part of the proposed project. Landside services for the marina are part of this project. This trip generation report describes expected trip generation associated with the marina berths for informational purposes because the additional traffic associated with that already-approved project will be included in the cumulative analysis.

- **Design of project** – a walkable, pedestrian- and bicycle-oriented circulation system can help to reduce automobile dependence within a project site
- **Distance to transit** – locating uses near major transit facilities (typically within ½ mile), has been shown to increase transit use associated with trips to and from a project

A detailed description of how these factors can be used to adjust standard traffic generation rates was provided in a separate letter. That letter is attached as an appendix to this trip generation letter report. However, the general concept behind the 4D method is that projects that deviate from the base case (in this case, ITE methods) with respect to the four bulleted variables above exhibit different traffic generation patterns. Elasticities have been derived from travel behavior surveys to help estimate how traffic generation changes as a function of changes in the 4D's.

Internal Trips

The first step in the 4D method is to define the base case. In this case, the ITE trip generation methodology was selected as the base case, as it represents typical suburban, automobile-oriented development. The estimated project traffic generation using ITE methods is shown below in Tables 1 and 2 for the AM and PM peak hours, respectively.

The travel behavior surveys conducted by the City of San Francisco (summarized in the *SF Guidelines*) found that certain land uses, particularly retail uses, generate more person-trips than typical suburban developments. Specifically, assuming an automobile occupancy of 1.8 for retail trips, as documented in the 1995 *National Personal Transportation Survey*, the vehicle trip generation predicted by ITE for the project's retail uses can be converted to person trips. The number of peak hour person trips per unit of development, as summarized in the *SF Guidelines* for retail uses, is 70 percent higher than the ITE person trip prediction (again, when converting automobile trips to person-trips using a factor of 1.8).

There are a number of reasons why uses in a denser, more walkable area such as San Francisco might generate higher activity levels. However, as a conservative measure, for the base analysis, the retail vehicle trips predicted by ITE and shown in Tables 1 and 2 were adjusted upwards by 70 percent.

Once the base case is defined, the next step in the 4D process is to define the application area (i.e., the catchment area for trip internalization). For purposes of this analysis, we assumed the Treasure Island development would be contained within a single catchment area. This means that trips from anywhere within the development to anywhere else in the development could be internalized and that all uses are within reasonable walking or cycling distances from each other.

**Table 1
 Treasure Island Trip Generation Estimates (ITE Methodology¹)
 AM Peak Hour - Base Case**

| Land Use | Size | Units | ITE Land Use Code | Rate or Eqn. | AM Trip Generation | | |
|--|--------------|--------------|-------------------|--------------|--------------------|--------------|--------------|
| | | | | | AM Trips | In | Out |
| Retail¹ | | | | | | | |
| Neighborhood Serving | 115.0 | ksf | | | | | |
| Shopping Center | 87.0 | ksf | 820 | Eqn | 246 | 150 | 96 |
| Grocery Store | 28.0 | ksf | 850 | Rate | 156 | 95 | 61 |
| Lifestyle + Entertainment | 155.0 | ksf | | | | | |
| Restaurant | 54.0 | ksf | 932 | Rate | 529 | 275 | 254 |
| Shopping Center | 101.0 | ksf | 820 | Eqn | 269 | 164 | 105 |
| Commercial/Flex/Adaptive Reuse | | | | | | | |
| Buildings 1, 2, and 3 | 325.0 | ksf | | | | | |
| General Office | 85.0 | ksf | 710 | Eqn | 165 | 145 | 20 |
| Manufacturing | 80.0 | ksf | 140 | Rate | 59 | 45 | 14 |
| Multiplex Movie Theater | 160.0 | ksf | 445 | n/a | 0 | 0 | 0 |
| Residential | | | | | | | |
| All | 6,000 | Units | | | | | |
| Townhomes + Stacked Flats | 1,454 | Units | 230 | Rate | 641 | 109 | 532 |
| Rental Stacked Flats + TIDA/TIHDI Affordable Units | 1,553 | Units | 220 | Rate | 793 | 159 | 634 |
| High-Rise Units (10+ Stories) | 2,876 | Units | 222 | Rate | 864 | 216 | 648 |
| Condo Hotel | 117 | Units | 311 | Rate | 46 | 25 | 21 |
| Hotel | | | | | | | |
| 3 Hotel Facilities | 500 | Rooms | | | | | |
| Wellness Spa | 50 | Rooms | 331 | Rate | 17 | 12 | 5 |
| Timeshare | 70 | Rooms | 310 | Eqn | 86 | 52 | 34 |
| Full-Service Hotel | 380 | Rooms | 310 | Eqn | 470 | 287 | 183 |
| Institutional | | | | | | | |
| Miscellaneous Institutional Uses | 135.0 | Ksf | | | | | |
| Elementary School | 105.0 | Ksf | 520 | Rate | 493 | 266 | 227 |
| Police/Fire Station | 30.0 | ksf | 730 | Rate | 178 | 149 | 29 |
| Recreational Community Center | 13.5 | Ksf | 495 | Rate | 23 | 14 | 9 |
| Sailing Center/Marina | 15.0 | Ksf | 420 | Rate | 24 | 8 | 16 |
| Recreational Open Space | 300 | Acres | | Rate | 82 | 65 | 17 |
| Grand Total | | | | | 5,141 | 2,236 | 2,905 |

Notes:

1. Vehicle trip generation for retail uses increased by 70 percent from ITE methodology based on evidence that retail uses in San Francisco generate approximately 70 percent more person-trips than typical suburban uses. This is a conservative assumption because a higher portion of the additional person trips generated by San Francisco retail uses are likely walk trips due to land use proximity.

Source: Fehr & Peers, September 2008

**Table 2
 Treasure Island Trip Generation Estimates (ITE Methodology¹)
 PM Peak Hour - Base Case**

| Land Use | Size | Units | ITE Land Use Code | Rate or Eqn. | PM Trip Generation | | |
|--|--------------|--------------|-------------------|--------------|--------------------|--------------|--------------|
| | | | | | PM Trips | In | Out |
| Retail¹ | | | | | | | |
| Neighborhood Serving | 115.0 | ksf | | | | | |
| Shopping Center | 87.0 | ksf | 820 | Eqn | 971 | 466 | 505 |
| Grocery Store | 28.0 | ksf | 850 | Eqn | 581 | 296 | 285 |
| Lifestyle + Entertainment | 155.0 | ksf | | | | | |
| Restaurant | 54.0 | ksf | 932 | Rate | 1,003 | 612 | 391 |
| Shopping Center | 101.0 | ksf | 820 | Eqn | 1,073 | 515 | 558 |
| Commercial/Flex/Adaptive Reuse | | | | | | | |
| Buildings 1, 2, and 3 | 325.0 | ksf | | | | | |
| General Office | 85.0 | ksf | 710 | Eqn | 175 | 30 | 145 |
| Manufacturing | 80.0 | ksf | 140 | Rate | 60 | 22 | 38 |
| Multiplex Movie Theater | 160.0 | ksf | 445 | Eqn | 1,056 | 676 | 380 |
| Residential | | | | | | | |
| All | 6,000 | Units | | | | | |
| Townhomes + Stacked Flats | 1,454 | Units | 230 | Rate | 757 | 507 | 250 |
| Rental Stacked Flats + TIDA/TIHDI Affordable Units | 1,553 | Units | 220 | Rate | 964 | 626 | 338 |
| High-Rise Units (10+ Stories) | 2,876 | Units | 222 | Rate | 1,008 | 615 | 393 |
| Condo Hotel | 117 | Units | 311 | Rate | 48 | 22 | 26 |
| Hotel | | | | | | | |
| 3 Hotel Facilities | 500 | Rooms | | | | | |
| Wellness Spa | 50 | Rooms | 331 | Rate | 22 | 10 | 12 |
| Timeshare | 70 | Rooms | 310 | Rate | 42 | 22 | 20 |
| Full-Service Hotel | 380 | Rooms | 310 | Rate | 225 | 119 | 106 |
| Institutional | | | | | | | |
| Miscellaneous Institutional Uses | 135.0 | Ksf | | | | | |
| Elementary School | 105.0 | Ksf | 520 | Rate | 330 | 142 | 188 |
| Police/Fire Station | 30.0 | ksf | 730 | Rate | 38 | 12 | 26 |
| Recreational Community Center | 13.5 | Ksf | 495 | Rate | 23 | 7 | 16 |
| Sailing Center/Marina | 15.0 | Ksf | 420 | Rate | 55 | 33 | 22 |
| Recreational Open Space | 300 | Acres | | Rate | 160 | 66 | 94 |
| Grand Total | | | | | 8,591 | 4,798 | 3,793 |

Notes:

1. Vehicle trip generation for retail uses increased by 70 percent from ITE methodology based on evidence that retail uses in San Francisco generate approximately 70 percent more person-trips than typical suburban uses. This is a conservative assumption because a higher portion of the additional person trips generated by San Francisco retail uses are likely walk trips due to land use proximity.

Source: Fehr & Peers, September 2008

The third step in the 4D process is to determine the characteristics of the proposed project, as they relate to the 4D variables described above. This process was done by comparing the project with typical suburban development patterns. The proposed project's percentage differences from typical developments were applied against elasticities developed from travel behavior surveys conducted by the Contra Costa Transportation Authority (CCTA). The resulting output from the 4D analysis tool is provided in the Appendix. Generally, the 4D analysis found that approximately 44 percent of all AM peak hour trips and 46 percent of all PM peak hour trips would be internal to the island. However, some post-processing adjustments were made to ensure a worst-case scenario.

Sensitivity to Jobs/Housing Mix

As noted at the beginning of this letter, one of the factors affecting traffic generation in the 4D method is the diversity of uses. A mix of uses within a single development can reduce vehicle traffic generation in a number of ways, such as accommodating shopping trips, dining out, and allowing walking or cycling to work within a mixed-use development. However, there is some question as to whether the residents expected to live at Treasure Island would be a good match for the jobs expected, which are likely to be primarily retail and service jobs.

To determine the effect that the jobs-housing mix has on the final internalization rate predicted by the 4D method, a sensitivity test was conducted. Reducing the elasticity for home-based work trips associated with the jobs/household mix to zero results in a reduction in overall trip internalization in both the AM and PM peak hour analyses of seven percentage points. (The 4D spreadsheet analyses with a 50 and 100 percent reduction in the elasticities for jobs/household diversity for home-based work trips are included in the Appendix.)

To ensure that the project's traffic impact analysis is performed for a worst-case scenario, we recommend the trip generation analysis be based on the scenario in which the jobs/housing mix has no effect on home-based work trips (i.e., we will assume that nobody who lives on the island also works on the island). Therefore, the final trip internalization percentages we propose to use are:

- 37% of AM peak hour trips will be internal to the island
- 40% of PM peak hour trips will be internal to the island

Those percentages were applied to the vehicle trip generation estimates from ITE, described in Tables 1 and 2, and represent primarily walk and bicycle trips on Treasure Island. The remaining trips represent transit and auto trips onto and off of the island.

Comparison to Other High-Density, Mixed-Use Developments

The conclusion that between 37 and 40 percent of all peak hour person-trips made on Treasure Island would be internal to the island is relatively high compared to typical reductions taken to account for trip internalization. Therefore, in order to determine if this reduction is reasonable, a comparison was made to other high-density, mixed-use development projects around the United States. This comparison is summarized in Table 3.

**Table 3
 Predicted vs. Observed Internalization at Other Mixed-use Sites**

| Site | Project Description | Internal % Count | Internal % 4D Estimate | Error |
|--|--|-------------------------|-------------------------------|--------------|
| S Davis¹ | 791 Acre Site: <ul style="list-style-type: none"> • 550 ksf Office • 559 ksf Retail • 0 Hotel Rooms • 4,402 Residential Units | 45% | 50% | 5% |
| Moraga¹ | 6,109 Acre Site: <ul style="list-style-type: none"> • 1,720 ksf Office • 180 ksf Retail • 0 Hotel Rooms • 6,000 Residential Units | 47% | 36% | -11% |
| Galleria¹ | 165 Acre Site: <ul style="list-style-type: none"> • 137 ksf Office • 1,150 ksf Retail • 229 Hotel Rooms • 722 Residential Units | 38% | 17% | -21% |
| Village Commons² | 72 Acre Site: <ul style="list-style-type: none"> • 293 ksf Office • 231 ksf Retail • 0 Hotel Rooms • 317 Residential Units | 28% | 46% | 18% |
| Crocker² | 26 Acre Site: <ul style="list-style-type: none"> • 209 ksf Office • 87 ksf Retail • 256 Hotel Rooms • 0 Residential Units | 41% | 18% | -23% |
| Mizner² | 30 Acre Site: <ul style="list-style-type: none"> • 88 ksf Office • 163 ksf Retail • 0 Hotel Rooms • 136 Residential Units | 40% | 43% | 3% |
| Boca del Mar² | 253 Acre Site: <ul style="list-style-type: none"> • 303 ksf Office • 198 ksf Retail • 0 Hotel Rooms • 1,144 Residential Units | 33% | 38% | 5% |
| Country Isles² | 61 Acre Site: <ul style="list-style-type: none"> • 59 ksf Office • 193 ksf Retail • 0 Hotel Rooms • 368 Residential Units | 33% | 42% | 9% |
| Notes: 1. Cordon counts conducted by Fehr & Peers 2. From mixed-use trip generation estimation methodology, <i>ITE Handbook</i> , Appendix C Fehr & Peers, October 2008 | | | | |

As shown in Table 3, there are a number of sites with similar land use mixtures and densities where trip internalization rates between 35 and 45 percent have been observed. In addition, at the sample sites, application of the 4D method improved the accuracy of trip generation forecasting, with standard errors of +/- 25 percent, compared to typical standard errors of +/- 90 to +/- 140 percent for office and residential land uses, respectively, when estimated directly from the ITE *Trip Generation* manual.

In light of the above, the conclusion that approximately 37 to 40 percent of Treasure Island trips would be internal to the island appears reasonable.

Mode Split (Transit Usage)

Transit usage associated with development on Treasure Island is estimated based on data presented in *Characteristics of Rail and Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey*, Metropolitan Transportation Commission (MTC), September 2006, (BATS Study). That report describes a number of characteristics, including residential proximity to transit service, that influence transit ridership in the Bay Area.

According to the BATS Study, 34 percent of work trips and 17 percent of all non-work trips made by San Francisco residents living within ½ mile of a rail or ferry terminal are via transit². Further, the study notes that of work-related transit trips made by San Francisco residents living within ½ mile of a rail or ferry terminal, approximately 50 percent are made by ferry/rail and the remaining 50 percent are made by bus. Non-work trips are more likely to be made by bus, with 65 percent of transit trips made by bus and 35 percent made by rail/ferry. The transit mode shares for work and non-work trips from the BATS Study were applied to the proposed Treasure Island development to estimate bus and ferry ridership.

Given the disincentives to driving and incentives for transit use proposed by the project, it is reasonable to expect the proposed project to have a slightly higher transit mode share than the average San Francisco development. However, to be conservative, and because data on the effectiveness of such disincentives is limited, the Treasure Island project was treated as a typical San Francisco project (i.e., no additional transit ridership was assumed associated with the disincentives to driving).

Based on the portion of work vs. non-work trips associated with each land use described in the *Transfer and Reuse of Naval Station Treasure Island Final EIR* (Appendix E, San Francisco Planning Department, June 2006, State Clearinghouse #1996092073), the transit mode share for each land use was forecast. These transit mode share percentages were applied to the ITE trip generation forecasts described in Tables 1 and 2, with the appropriate conversion to person-trips. A more detailed calculation of external vehicle traffic generation using the ITE methodology, with 4D adjustments and transit ridership calculations is provided in Table A-1 in the Appendix.

² These observed percentages are of all trips, including walk and bicycle trips which are analogous to the internal trips described earlier for Treasure Island. Thus, although the transit mode shares taken as a percentage of only external trips are higher than 34 and 17 percent for work and non-work trips, respectively, application of these percentages to all trips generated by the Treasure Island project is consistent with the findings of the BATS Study. If taken as a percentage of external trips only, transit is expected to represent approximately 37 percent of all person-trips generated by the proposed project.

The resulting person-trip generation for all modes is summarized in Table 4, below.

| Table 4 Final Adjusted Trip Generation by Mode | | | | | |
|--|---------------------------|--------------|--------------|--------------|----------------------------|
| Land Use | Person-Trips ¹ | | | | Vehicle-Trips ² |
| | Ferry | Bus | Auto | Internal | |
| <i>Weekday AM Peak Hour</i> | | | | | |
| Residential | 431 | 526 | 1,405 | 1,387 | 878 |
| Hotel | 100 | 126 | 352 | 339 | 220 |
| Retail | 131 | 222 | 858 | 712 | 536 |
| Open Space | 9 | 15 | 59 | 48 | 37 |
| Marina ³ | 6 | 8 | 34 | 29 | 21 |
| Flex | 41 | 50 | 134 | 133 | 84 |
| Police/Fire | 33 | 40 | 107 | 106 | 67 |
| School | 91 | 111 | 296 | 291 | 185 |
| Total | 840 | 1,098 | 3,245 | 3,045 | 2,028 |
| <i>Weekday PM Peak Hour</i> | | | | | |
| Residential | 510 | 623 | 1,534 | 1,778 | 959 |
| Hotel | 50 | 63 | 165 | 186 | 103 |
| Retail | 397 | 669 | 2,418 | 2,320 | 1,511 |
| Open Space | 17 | 29 | 107 | 102 | 67 |
| Marina ³ | 9 | 14 | 53 | 50 | 33 |
| Flex | 237 | 289 | 712 | 826 | 445 |
| Police/Fire | 7 | 9 | 21 | 24 | 13 |
| School | 90 | 90 | 138 | 211 | 86 |
| Total | 1,316 | 1,787 | 5,144 | 5,496 | 3,215 |
| 1. Walk and bicycle person trips will be internal to Treasure Island 2. Vehicle-trips includes passenger vehicles and vans 3. The marina use has already been approved and is not part of the proposed project (although the landside services associated with the Marina are included). The trip generation associated with the Marina is presented for informational purposes because it will be used to assess cumulative conditions. | | | | | |
| Source: <i>Treasure Island Transportation Plan</i> , Treasure Island Community Development, LLC, September 2006 and Fehr & Peers 2008 | | | | | |

Base Transit Case

As proposed, the Treasure Island project would provide a high level of transit service during peak hours, including:

- New ferry service to San Francisco every 10 minutes
- New bus service to Downtown Oakland every 7 minutes
- Maintenance of the existing bus service to the Transbay Terminal (Muni Route 108-Treasure Island) in San Francisco every 5 minutes
- New bus service to the San Francisco Civic Center area every 12 minutes

Assuming a bus capacity of 55 passengers and a ferry capacity of 450 passengers, the total transit capacity in a single direction (on or off of the island) is 4,075 passengers per hour, including 2,700 passengers on ferries and 1,375 passengers on buses during the peak hours.

However, funding and/or operating details for all of this service has not yet been resolved. Therefore, the transportation analysis is also including a scenario in which ferry service would be provided every 50 minutes (corresponding to a single ferry operating at one of the existing docks in San Francisco), Route 108-Treasure Island would operate at its current 15-minute headway, and no new transit route between Treasure Island and San Francisco Civic Center would be provided. AC Transit service to the East Bay would be the same as in the base case. This would reduce the overall transit capacity to 1,200 person trips per hour, a reduction of 70 percent. Specifically, this would reduce ferry capacity by 80 percent, to 540 passengers per hour and bus capacity by 52 percent, to 660 passengers per hour.

Recent studies summarized by the Victoria Transport Policy Institute (VTPI) have shown a range of transit ridership elasticities with respect to service level of between 0.5 and 0.7³. Using the 0.5 elasticity, an 80 percent reduction in the supply of ferry transit and a 52 percent reduction to the supply of bus transit provided to Treasure Island is expected to yield 40 and 26 percent reductions to ferry and bus ridership, respectively. Therefore, for the base case, the ferry ridership is reduced by 40 percent and the bus ridership is reduced by 26 percent compared to the full project case, with the difference assumed to switch to automobile person trips.

Table A-2 in the Appendix provides a detailed calculation of vehicular traffic generation for the base transit case. The net result is an additional 388 AM peak hour vehicle trips and 620 PM peak hour trips.

TRIP DISTRIBUTION

The final component of this analysis is an estimation of the trip distribution of project-generated trips. The proposed project trip distribution was tested using two different travel demand forecasting models, the San Francisco CHAMP model, maintained by the San Francisco County Transportation Authority, and the Alameda County Congestion Management Agency (ACCMA) model. Table 5 provides a summary of geographic distribution of project traffic from the two travel demand forecasting models.

As shown in Table 5, the SF CHAMP model, which has a concentration of detail within San Francisco, tends to predict a higher amount of Treasure Island traffic would be destined for San Francisco than the ACCMA model. Similarly, the ACCMA, which has a higher amount of detail in the East Bay, tends to predict a higher amount of traffic with origins and destinations in the East Bay. Because having a higher amount of detail in a particular geographic region of a model can lead to over-prediction of traffic in that area, it is likely that the SF CHAMP and the ACCMA models each over-predict traffic within their specific focal regions. Table 5, therefore, presents an average of the trip distributions predicted by the two models. The average trip distribution between the SF CHAMP and ACCMA models corrects for over-prediction of trips to either San Francisco or the East Bay.

³ <http://www.vtpi.org/tranelas.pdf>

| Table 5 Treasure Island Development – Trip Distribution Patterns | | | | | |
|---|---|-----------------|------------------|------------------|-----------------|
| Source | Place of Trip Origin/Destination | | | | |
| | San Francisco | East Bay | North Bay | South Bay | Internal |
| SF CHAMP Model | 42% | 4% | 4% | 8% | 41% |
| ACCMA Model | 32% | 21% | 4% | 2% | 40% |
| Average of Forecasting Models | 37% | 13% | 4% | 5% | 41% |
| Source: Fehr & Peers, September 2008 | | | | | |

CONCLUSION

The vehicle trip generation forecasts developed using the 4D method are reasonable, and similar to other large, high-density, mixed use sites observed by Fehr & Peers and ITE. We therefore recommend using the person-trip generation summarized in Table 4 for identifying impacts associated with the Treasure Island development.

Prior to completing that analysis, we will provide you with draft cumulative conditions traffic forecasts for area freeways and an analysis of the effects of congestion pricing. We can complete the first draft of the Treasure Island Transportation Impact Analysis following your approval of the traffic forecasts and congestion pricing and the recommendations in this memo. We hope you have found the results of this trip generation study useful. We look forward to receiving your comments. Please feel free to call if you have any questions.

Sincerely,
 FEHR & PEERS



Chris Mitchell, PE
 Associate

SF07-0340

APPENDIX



August 4, 2008

Ms. Pat Siefers
San Francisco Planning Department
1650 Mission Street, 4th Floor
San Francisco, California 94103

**Re: *Proposed "4-D Adjustments" to Trip Generation Rates
Treasure Island Transportation Impact Analysis (Revised)***

Dear Pat:

The proposed development on Treasure Island will consist of a number of design features that will have a substantial influence on travel characteristics at the site, compared to more typical developments. This letter describes our proposed approach to quantifying the effects that these design features will have on the trip-making characteristics of the project. This approach has been developed and utilized by Fehr & Peers for several projects throughout the United States, and has been endorsed by the Environmental Protection Agency (EPA) (see attached document: *INDEX 4D Method*, October 2001), the California Department of Transportation (Caltrans), and others, as being an appropriate method for developing traffic forecasts that are sensitive to the types of local land use characteristics and TDM measures proposed by the Treasure Island project.

The unique nature of this site, in terms of its design, the transportation features it will offer, and its setting in the midst of San Francisco Bay, renders traditional methods of estimating vehicle traffic generation ineffective. Specific reasons traditional methods, which are based on national or even locally-derived average rates, may not be relevant to Treasure Island are as follows:

- The island location and congestion on the Bay Bridge will limit vehicular connectivity to off-island sites, thus encouraging on-island travel when possible; proposed congestion pricing will further reduce off-island vehicle trips (although the effects of congestion pricing will be addressed separately)
- Mixed land uses in close proximity will encourage on-island internalization of many trips
- High frequency transit service, both bus and ferry, will reduce auto trips during commute periods; additionally, transit-oriented residents are likely to self-select this transit-oriented development
- Substantial travel demand management (TDM) measures are proposed to reduce vehicle travel and vehicle ownership, including:
 - Bus and ferry service to San Francisco and bus service to Downtown Oakland¹
 - Signal-controlled metering of traffic volumes onto Bay Bridge
 - Car share
 - Bicycle share
 - On-island shuttle
 - Guaranteed ride home
 - Commuter checks
 - On-island travel coordinator
 - Unbundled parking (sold/rented separately from commercial and residential sites)

¹ If additional AC Transit service is recommended as a mitigation, we will include this in the analysis.

- Priced parking
- On-street residential permit parking
- Transit passes included in HOA dues/leases

These site and travel characteristics are essential elements of a walkable, livable community, but are often disregarded in environmental review. Outside of San Francisco, conventional practice conservatively analyzes the trip generation potential for new development in isolation, and under the assumption that such development is a typical suburban and generally auto-oriented project. In San Francisco, these elements are captured by using locally-calibrated person-trip generation rates and mode split percentages derived from surveys and observations. However, the extent and combination of high density development; a pedestrian, transit, and bicycle-oriented circulation network; mixing of uses; and the proximity of the project site and proposed transit service to major destinations; and the isolated nature of this project are unlike other parts of San Francisco. As a result, locally-derived information from other parts of San Francisco may still not predict the traffic-generating characteristics of the proposed project.

To more accurately model the travel characteristics of a proposed development, Fehr & Peers has developed a methodology for adjusting trip generation based on the unique characteristics of a project site. Adjustments for external vehicle trip length (and thus Vehicle Miles Traveled (VMT)) are also typically considered in the Fehr & Peers approach, as ultimately it is VMT rather than VT (vehicle trips) that congests roadways, produces greenhouse gases, uses non-renewable fossil fuels, etc. We will work with Turnstone Consulting and ESA to determine whether the VMT adjustment is a useful component for their studies.

We will provide a qualitative discussion of the differences between this method and the ITE and San Francisco guidelines for traffic analysis in our analysis memo. We will also review available and relevant data from comparable locations (such as Granville Island/ City of Vancouver) and consult with the MTC and SFCTA regarding reasonable mode splits and trip generation for travel to, from, and within Treasure Island.

The purpose of this memo is to summarize the theory and background for this methodology and outline the proposed adjustment steps and assumptions.

THEORY AND BACKGROUND

The origin of this methodology lies in the research of UC Berkeley professor Robert Cervero.² This research found that certain characteristics of the neighborhood a household lived in affected the number of vehicle trips generated and vehicle-miles traveled by that household. This effect was independent of the household characteristics (income, household size, number of workers, etc.) typically used in trip generation equations. Where study areas vary significantly in character from the conventional trip generation site (typically a suburban, low-density site), trip generation should therefore include an adjustment of household-based trip-generation rates to reflect the characteristics of the area surrounding the household. The ITE *Trip Generation Manual*, among others, has been recommending such an adjustment for its last three editions. The *ITE Trip Generation Manual*, 7th Edition, provides some guidance on adjustments for trip internalization (or interaction between uses) at multi-use sites, but adjustments are based on a small number of studies in Florida that may not be applicable to an urban setting such as Treasure Island.

² Cervero, R. and K. Kockelman (1997) "Travel Demand and the 3Ds: Density, Diversity, and Design," *Transportation Research D*, Vol. 2, pp. 199-219

To respond to a need for site-specific adjustment factors, Fehr & Peers developed a Smart Growth Trip Generation Adjustment tool to compare trip generation characteristics of a study location to the typical characteristics of the trip generation rate survey locations.

NEIGHBORHOOD CHARACTERISTICS INCLUDED IN THE ADJUSTMENT

The choice of which neighborhood characteristics to adjust for is evolving over time and may vary from place to place. The methodology described in this memo includes adjustments for up to seven neighborhood characteristics. These characteristics, often referred to as the “Ds,” are:

Net Residential and Employment Density – This variable is measured in units of dwelling units per acre for residential density and total jobs per acre for employment density. The acreage should include pocket parks and local streets, but exclude large parks, open space, lakes, etc. This matches the practice in general plans where areas designated for residential and commercial development typically show large non-residential and non-commercial features but typically do not include details of local streets and neighborhood amenities. Research suggests that, all else being equal, denser developments generate fewer vehicle-trips per dwelling unit and per job than less dense developments.

Jobs/Housing and JobMix Diversity – Research, including the previously-cited Cervero study and *INDEX 4D Method* (see attached), suggests that having residences and jobs in close proximity will reduce the vehicle-trips generated by each by allowing some trips to be made on foot or by bicycle. This variable measures how closely the neighborhood in question matches the “ideal” mix of jobs and households, which is assumed to be the ratio of jobs to households measured across the region as a whole. The equation for this is:

Jobs/Housing Diversity =

$$\{1 - [\text{ABS}(b * \text{households} - \text{employment}) / (b * \text{households} + \text{employment})]\}$$

where: $b = \text{regional employment} / \text{regional households}$

Research also suggests that having retail and non-retail jobs in close proximity will reduce the vehicle-trips generated by each by allowing some non-home-based trips, such as running errands or going to lunch, to be made on foot or by bicycle (see attached *INDEX 4D Method*). This variable measures how closely the neighborhood in question matches the “ideal” mix of retail and non-retail jobs, which is assumed to be the ratio of retail to non-retail jobs measured across the region as a whole. The equation for this is:

JobMix Diversity =

$$\{1 - [\text{ABS}(b * \text{retail jobs} - \text{non-retail jobs}) / (b * \text{retail jobs} + \text{non-retail jobs})]\}$$

where: $b = \text{regional retail jobs} / \text{regional non-retail jobs}$

Walkable Design – Many pedestrian and bicycle improvement projects are based on the assumption, supported by the attached research findings³, that improving the

³ Note that research also shows that these improvements are only effective in areas where the land uses are conducive to walking and bicycling. Otherwise, these improvements will have less benefit.

walking/biking environment will result in more non-auto trips and a reduction in auto travel. The difficulty with using this variable in an equation is that there are many factors in the pedestrian experience and it is difficult to come up with a single definition that captures them all. The current equation used to measure the design variable is:

$$\text{Design} = 0.0195 * \text{street density} + 1.18 * \text{sidewalk completeness} + 3.63 * \text{route directness}$$

where: 0.0195, 1.18, and 3.63 are coefficients expressing the weighting of each variable relative to the other variables in the Design formula,

street density = length of street in miles/area of neighborhood in square miles

sidewalk completeness = percent of street frontage with sidewalks

route directness = airline distance/distance along street routes for typical trips

The coefficients weighting the design variables were derived from regression analysis based on data provided by the Sacramento Area Council of Governments (SACOG). Test applications of the methodology have found that the data required for the design variable is often either not available or would be expensive and time-consuming to obtain. In such cases it may be better for the user to develop their own design variable based on whatever relevant information is available, or even to simply assume a certain percentage difference from the base case (i.e. "The proposed community is designed to be significantly more ped-friendly than the older areas around it, and so we are assuming a 20% improvement in the design variable"). Users should be conservative when deviating from the original equations. In any case, the design variable usually has the weakest influence on the overall adjustment, so it is unlikely to be a major source of error.

Distance from Transit (Residential): The Bay Area Transportation Survey (BATS) in 2000 demonstrated that the distance from a person's place of residence to a transit station has a significant effect on the number of vehicle miles traveled per day and on transportation mode choice (e.g., whether to drive or take transit) for both work and total trips. Recent research by UC Berkeley Professor Robert Cervero suggests this is partially explained by a self selection process, wherein transit riders select to live in transit-oriented locations.

Conventional trip generation rates do not account for proximity to transit. Even San Francisco's uniquely observed mode split data is not sensitive to the proximity of a use to a major transit facility (i.e., BART, LRT, or Caltrain station). So, modification to trip generation and mode split information are necessary to reflect expected patterns at Treasure Island in a way that is sensitive to the amount and type of transit to be provided.

The BATS 2000 data suggests the following reductions are appropriate for home-based work trips and total daily trips (generalized for the Bay Area):

Within 1/2 mile of a rail station or ferry terminal:

- 29.4% for work trips
- 19.2% for all trips

Within 1/2 to 1 mile of a rail station or ferry terminal:

- 16.5% for work trips
- 8.4% for all trips

Greater than 1 mile, the transit deduction varies based on residential density. For high density suburbs (an analogous use to the Treasure Island development if it were greater than 1 mile from a major transit facility), the following reductions apply:

- 7.1% for work trips
- 3.3% for all trips

These data show that across the Bay Area, residential developments within ½ mile of a rail station or ferry terminal have a transit mode share 22.3% higher than those developments that are greater than 1 mile from a major transit facility for home-based work trips.

Distance from Transit (Employment): Jennifer Dill (2000) conducted a survey of over 1,000 large employment sites in the San Francisco Bay Area to establish similar links between vehicle trips and distance from employment locations to transit. The study considered distance from BART, Caltrain, and Santa Clara Light Rail Stations. Depending on the frequency and cost of transit service to/from Treasure Island, transit deductions for employment on the island may be analogous (i.e., the increase from the background case to the case where a job is within ½ mile of transit). The deductions are summarized in the following table. For employment land uses, these deductions are generally applied to AM and PM peak hour trips. For daily trips, they may be applied at approximately one-half. As shown in the table, employment locations within ½ mile of a rail station have a transit mode share 8.6% higher than those employment locations that are greater than ½ mile from a major transit facility (11.1% for employment locations within ½ mile of a rail station compared to 2.5% for those locations greater than ½ mile from a major transit facility).

The list of variables is expected to evolve over time. As the preceding list shows, the methodology has proceeded beyond Cervero's original three D's and may ultimately include as many as ten variables.

| SUMMARY OF TRANSIT USE BY WORK SITE LOCATION | | | |
|---|--|--------------------------------------|------------------------------|
| Location of Work Site | Percent of Commute Trips by Transit (Trip Deductions) | Number of Work Sites Surveyed | Number of Respondents |
| All sites | 4.4% | 1,153 | 251,835 |
| BART Stations | | | |
| Up to 1/4 mile from BART | 33.6% | 44 | 12,813 |
| Up to 1/4 mile from non-downtown Oakland BART | 19.7% | 12 | 2,891 |
| Up to 1/4 mile from non-Oakland or Berkeley BART | 6.2% | 3 | 468 |
| 1/4 -1/2 mile from BART | 7.9% | 22 | 3,852 |
| 1/4 -1/2 mile from non-Oakland or Berkeley BART | 5.7% | 13 | 2,151 |
| CalTrain Stations¹ | | | |
| Up to 1/4 mile from CalTrain | 7.0% | 14 | 3,134 |
| 1/4 -1/2 mile from CalTrain | 4.1% | 39 | 9,905 |
| Santa Clara Light Rail Stations | | | |
| Up to 1/4 mile from Light Rail | 5.9% | 49 | 9,833 |
| 1/4 -1/2 mile from Light Rail | 3.1% | 56 | 16,633 |
| All Rail Stations | | | |
| Up to 1/4 mile from rail | 19.8% | 107 | 25,780 |
| 1/4 -1/2 mile from rail | 4.0% | 117 | 30,390 |
| Up to 1/2 mile from rail | 11.1% | 224 | 56,170 |
| Work Sites over 1/2 mile from rail | | | |
| All sites | 2.5% | 929 | 195,665 |
| ¹ Note that Caltrain ridership is significantly affected by employer shuttles to transit | | | |
| Source: Dill, Jennifer. "Transit Use and Proximity to Rail: Results from Large Employment Sites in the San Francisco Bay Area." TRB 2003 Annual Meeting CD-ROM. | | | |

APPLICATION

The above adjustment factors will be applied to standard, traditional traffic generation estimates for purposes of forecasting traffic generation for the Treasure Island development. The steps we propose to take are described below.

Step 1: Define the Base Case

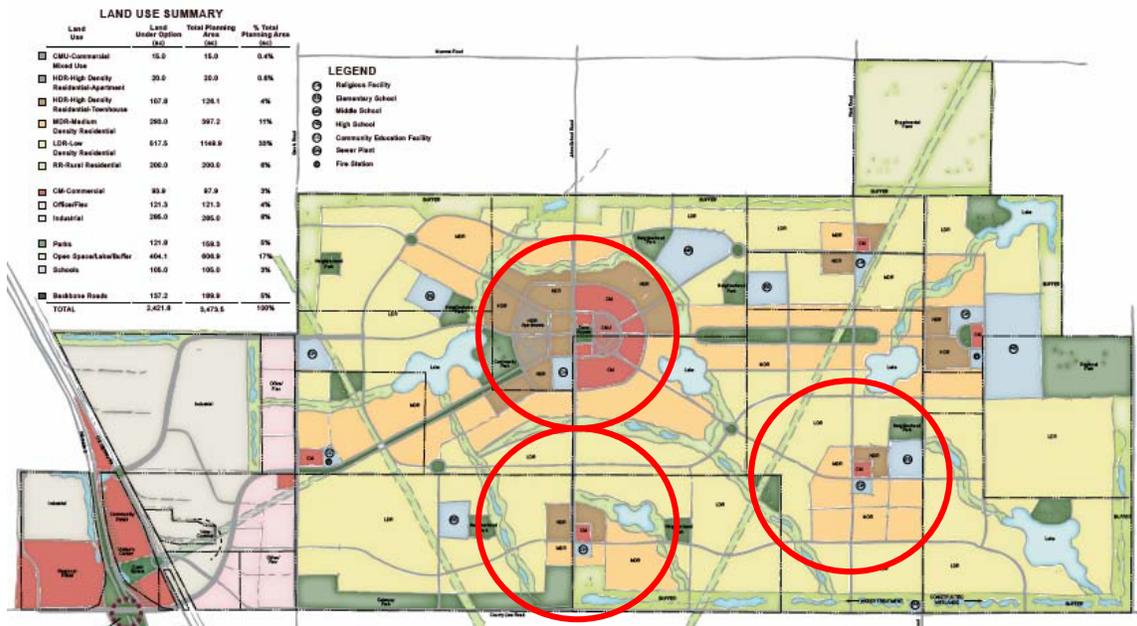
The outputs this methodology produces are percentage adjustments to vehicle-trips (VT) and vehicle-miles-traveled (VMT). Obviously, this methodology presumes that there is some default estimate of VT and VMT to which the adjustments can be applied; i.e. a base case. For most applications the base case should be taken from the original source of the trip-generation rates used for the project. For the Treasure Island project, we will define two base cases, and apply the appropriate adjustments. One base case will be application of City person-trip generation

rates, and weighted average mode split percentages for uses over the entire City. Other characteristics evaluated (e.g., density, design, diversity, etc.) will be based on the proposed project's deviation from citywide averages. The second base case will be the application of standard vehicle-trip generation rates based on nationwide surveys in primarily suburban locations from the Institute of Transportation Engineers (ITE) *Trip Generation*, 7th Edition. The adjustment factors applied to these rates will be based on the proposed project's deviation from typical suburban characteristics.

Step 2: Define the Application Area

The equations used in the methodology were derived from survey areas one-half mile in radius⁴ which corresponds roughly to a typical watershed. The user must therefore define the adjustment area to match this size. There are several possible cases (the Treasure Island project is similar to Case 3, but all cases are presented for informational purposes):

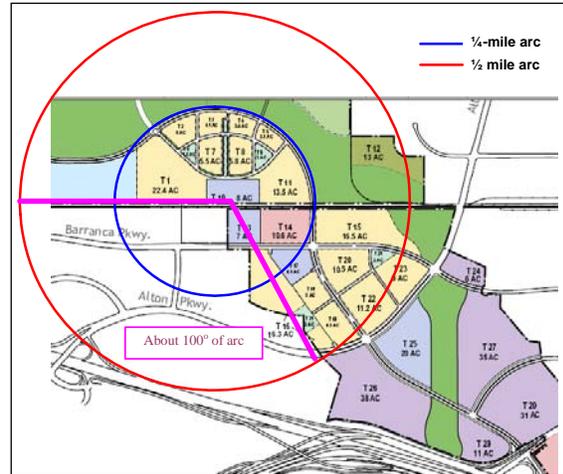
Case 1: The project is larger than the ½-mile radius. In such a case the user should define one or several non-overlapping areas and apply the methodology separately to each. In practice we have found that larger projects often include areas that are similar enough to the base case that no adjustment need be made.



Case 1: The site extends beyond the ½-mile radius used for analysis. Separate analyses should be done for different portions of the site. (Image created by Fehr & Peers for Heritage Fields Development, Irvine, CA)

⁴ Other area sizes were checked, including ¼ mile radius, 1-mile radius, and TAZs, were found to be less statistically valid than the ½ mile radius.

Case 2: The project is smaller than the ½-mile radius. In this case the area for adjustment will extend beyond the project into the surrounding area. The rationale is that future residents of the project make no distinctions between the project and other areas, and so such boundaries are irrelevant to the behavior we are trying to predict. In the figure shown below, the study site is shown in color while the ½-mile radius is shown in red. The white areas within the ½-mile radius southwest of the site are existing office buildings that would interact with the proposed residential development. In this case, application of this methodology will require obtaining estimates of the density, diversity, and design of the area beyond the boundaries of the study site but within the ½-mile radius.



Case 2: The ½-mile radius extends beyond the study site (Image created for Heritage Fields Development, Irvine, CA)

Case 3: The ½-mile radius includes significant barriers to pedestrian movement, such as rivers, freeways, and soundwalls. This is the case for Treasure Island, where walk trips to other uses outside of the Treasure Island development are precluded by the San Francisco Bay to the north, east, and west, and by steep inclines and the Bay Bridge to the south. In such a case the user should include in the analysis only the areas within ½ mile of the center along walkable paths. An example of this application can be seen in the figure below. The project included a dense, mixed-use village core area as well as a golf course, several lakes, and some low- and medium-density residential developments. The golf course and lakes act as barriers to pedestrian movement except across bridges. In this case the adjustment methodology was applied only to the area outlined in red in the figure, and the remaining portion of the project was treated as the conventional development it was. The adjustment area actually extended to the north outside the project but since this was an agricultural preserve it had no practical impact on the application.



Case 3: Barriers to pedestrian movement eliminate from consideration some areas that lie within the 1/2 mile radius. (Image created by Fehr & Peers for project in Sacramento region.)

Step 3: Input Base Case and Application Area Characteristics

Once the base case and the analysis area have been defined, the next step is to enter their data into the analysis tool. The tool then calculates the “Ds” characteristics for the two base cases (i.e., the San Francisco citywide averages and the national averages) and the test scenario (i.e., the proposed project) and computes the percentage difference between the proposed project and the two base cases. The analysis tool then applies the elasticities associated with the first three “D’s” (Density, Diversity, and Design) to develop initial estimates of reductions in VT associated with the site design characteristics. Ceiling and floor values can be applied to set a maximum allowable adjustment overall or for an individual “D.”

| 4-D VEHICLE TRIP ELASTICITY VALUES | | | | | | | |
|--|-------------------------|------------------------|-------------------|------------------------|--------|------------------------------|----------------------------------|
| Trip Purpose | Net Residential Density | Net Employment Density | Job Mix Diversity | Jobs/Housing Diversity | Design | Home-based Work Destinations | Non-Home-based Work Destinations |
| Vehicle Trip (VT) Elasticities | | | | | | | |
| Home-based Work (HBW) | -0.117 | N/A | N/A | -0.059 | 0.000 | -0.375 | N/A |
| Home-based Other (HBO) | -0.119 | N/A | N/A | -0.044 | -0.032 | N/A | -0.408 |
| Non-Home-based (NHB) | N/A | -0.339 | -0.462 | N/A | 0.000 | N/A | -0.822 |
| Vehicle Miles Traveled (VMT) Elasticities | | | | | | | |
| Home-based Work (HBW) | -0.238 | N/A | N/A | -0.260 | 0.000 | -1.234 | N/A |
| Home-based Other (HBO) | -0.133 | N/A | N/A | -0.160 | -0.030 | N/A | -1.405 |
| Non-Home-based (NHB) | N/A | -0.444 | -0.459 | N/A | 0.000 | N/A | -1.318 |
| Source: Sacramento County Association of Governments (SACOG) Household Surveys | | | | | | | |

Step 4: Internalization Results

The tool returns the following results:

- VT Internalization Reductions: Adjustments to trip generation rates if the rates are disaggregated by purpose; otherwise, an estimate for an overall trip generation reduction.
- VMT Internalization Reductions: VMT reduction estimates provide some indication of the overall reduction in the project’s impact on regional traffic. While we are not proposing to re-run the SFCTA travel demand model, a better estimate of project-related VMT reductions could be made by applying the VT reductions to the trips generated by project traffic analysis zones (TAZs), then running the model and checking how much VMT changed, compared to the proposed project generating traffic at the citywide average.

Step 5: Additional External Trip Reductions

In this final step we will take additional reductions for pass-by trips, diverted link trips, transit proximity, and TDM strategies. Adjustments for the fourth “D” (Distance from transit), will be applied to the national average base case directly from the tables presented earlier. We will apply the “distance from transit” adjustment factor to the San Francisco-specific base case based on the difference between the transit mode share for developments within ½ mile of a major transit station to those that farther than ½ mile (both residential and commercial). The quality and

frequency of transit service will also be considered in the transit adjustment. Service characteristics will be applied using ridership elasticities based on planned transit frequency and type (multiple scenarios) versus the baseline frequency and type inherent in the distance from transit adjustments in the BATS data and Dill research.⁵

External SOV to HOV, bicycle, or pedestrian mode shifts will also be applied in this final step. The results of the MEA TransBay Area employee data analysis and other relevant sources will be considered to validate the mode split if available.

By following the five steps listed above and using elasticities derived from previous analyses, we can estimate how the proposed project would differ from both the average development in San Francisco (Base Case 1) and the average development in the United States (Base Case 2), in terms of vehicle-trips generated and increases to vehicle-miles traveled. The result will be percentage reductions to standard vehicle-trip generation rates in San Francisco and to ITE trip generation rates. The 4Ds analysis output will be a quantification of mode shifts to non-SOV transportation for both internal trips and external trips.

Both internal and external reductions to auto shares will be treated as additions to other modes, with trip volumes not disappearing but rather being added to multi-modal volumes.

The mix of housing proposed at Treasure Island is 80% market rate and 20% affordable, consistent with requirements for most new housing developments in San Francisco. To be conservative, we are not proposing any reductions to vehicle trip generation for the affordable portion of the housing.

The vehicle-trip generation rates derived using this approach will be compared to those derived by Korve/DMJM Harris in the Treasure Island Transportation Plan to determine if those rates are reasonable.⁶ If so, we recommend using the estimates from the Plan. Otherwise, we will recommend adjustments to those estimates based on our analysis results.

⁵ Elasticities are available online at <http://www.vtpi.org/elasticities.pdf>. Local elasticities will also be requested from local transit service providers.

⁶ We will update the input numbers in the TIDA Transportation Plan to reflect the current proposed project (and associated improvements) to ensure an apples-to-apples comparison.

We hope this letter has provided sufficient detail describing our proposed approach, but are more than happy to provide additional detail or supporting documentation if requested.

Sincerely,

FEHR & PEERS



Chris Mitchell, PE
Associate



Meghan Mitman
Transportation Planner

SF07-0340

**TREASURE ISLAND AM PEAK
PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Full Elasticity**

Region 3 (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|---|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Residential Land Uses | | | | | | |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Mult-Family Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |
| Retail Employment | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 |
| Total | 540 | 19 | 0 | 0 | 540 | 19 |
| Non-Retail Employment | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 |
| Institutional - police, school, sailing, community center | 135 | 12 | 300 | 67 | 435 | 79 |
| Hotel | 449 | 7 | | | 449 | 7 |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 |
| Office | 340 | 10 | | | 340 | 10 |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
Blue-font cells are for regional data
Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | -21.37% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.55 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.55 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 42.4% | 0.55 | 0.35 |
| Home-Based Other (HBO) | 55.1% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 2.5% | 0.40 | 0.40 |
| Total | 100.0% | 0.56 | 0.35 |
| % VT Internalized | | 43.6% | |

Regional Retail/Non-Retail Ratio: 0.28
Regional Jobs/Housing Ratio: 1.07

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | -0.059 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4 Ds: 600%
Ceiling and Floor Values
Maximum allowable 4D adjustment for any individual trip purpose: 15% (Ceiling), -65% (Floor)
Maximum allow change from all factors combined = 65%

**TREASURE ISLAND AM PEAK
PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Half Elasticity**

Region 3 (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|---|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Residential Land Uses | | | | | | |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Mult-Family Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |
| Retail Employment | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 |
| Total | 540 | 19 | 0 | 0 | 540 | 19 |
| Non-Retail Employment | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 |
| Institutional - police, school, sailing, community center | 135 | 12 | 300 | 67 | 435 | 79 |
| Hotel | 449 | 7 | | | 449 | 7 |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 |
| Office | 340 | 10 | | | 340 | 10 |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
Blue-font cells are for regional data
Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | -10.68% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.62 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.62 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT* | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 42.4% | 0.62 | 0.35 |
| Home-Based Other (HBO) | 55.1% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 2.5% | 0.40 | 0.40 |
| Total | 100.0% | 0.60 | 0.35 |
| % VT Internalized | | 40.5% | |

Regional Retail/Non-Retail Ratio: 0.28
Regional Jobs/Housing Ratio: 1.07

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | -0.030 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4 Ds: 600%
Ceiling and Floor Values
Maximum allowable 4D adjustment for any individual trip purpose: -65%
Maximum allow change from all factors combined = 65%

**TREASURE ISLAND AM PEAK
PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Zero Elasticity**

Region 3 (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|---|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Residential Land Uses | | | | | | |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Mult-Family Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |
| Retail Employment | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 |
| Total | 540 | 19 | 0 | 0 | 540 | 19 |
| Non-Retail Employment | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 |
| Institutional - police, school, sailing, community center | 135 | 12 | 300 | 67 | 435 | 79 |
| Hotel | 449 | 7 | | | 449 | 7 |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 |
| Office | 340 | 10 | | | 340 | 10 |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
Blue-font cells are for regional data
Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | 0.00% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.70 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.70 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 42.4% | 0.70 | 0.35 |
| Home-Based Other (HBO) | 55.1% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 2.5% | 0.40 | 0.40 |
| Total | 100.0% | 0.63 | 0.35 |
| % VT Internalized | | 37.3% | |

Regional Retail/Non-Retail Ratio: 0.28
Regional Jobs/Housing Ratio: 1.07

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | 0.000 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4 Ds: 600%
Ceiling and Floor Values
Maximum allowable 4D adjustment for any individual trip purpose: 15% (Ceiling), -65% (Floor)
Maximum allow change from all factors combined = 65%

TREASURE ISLAND PM PEAK

PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Full Elasticity

Region **3** (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| Residential Land Uses | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|-------------------------|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Multifamily Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |

| Retail Employment | Jobs | | Acres | | Jobs | | Acres | |
|-----------------------|------------|-----------|----------|----------|------------|-----------|----------|--|
| | | | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 | | |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 | | |
| Total | 540 | 19 | 0 | 0 | 540 | 19 | 0 | |

| Non-Retail Employment | Jobs | | Acres | | Jobs | | Acres | |
|---------------------------------|--------------|-----------|------------|-----------|--------------|------------|----------|--|
| | | | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 | | |
| Institutional - police, school, | 135 | 12 | 300 | 67 | 435 | 79 | | |
| Hotel | 449 | 7 | | | 449 | 7 | | |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 | | |
| Office | 340 | 10 | | | 340 | 10 | | |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 | 0 | |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
 Blue-font cells are for regional data
 Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | -21.37% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.55 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.55 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT* | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 40.8% | 0.55 | 0.35 |
| Home-Based Other (HBO) | 42.4% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 16.8% | 0.40 | 0.40 |
| Total | 100.0% | 0.54 | 0.36 |
| % VT Internalized | | 46.2% | |

Regional Retail/Non-Retail Ratio **0.28**
 Regional Jobs/Housing Ratio **1.07**

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | -0.059 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4Ds **60%**
 Maximum allowable 4D adjustment for any individual trip purpose **15%**
 Maximum allow change from all factors combined = **65%**
-65%

TREASURE ISLAND PM PEAK

PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Half Elasticity

Region **3** (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| Residential Land Uses | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|-------------------------|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Mult-Family Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |

| Retail Employment | Jobs | | Acres | | Jobs | | Acres | |
|-----------------------|------------|-----------|----------|----------|------------|-----------|----------|----------|
| | | | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 | | |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 | | |
| Total | 540 | 19 | 0 | 0 | 540 | 19 | 0 | 0 |

| Non-Retail Employment | Jobs | | Acres | | Jobs | | Acres | |
|---------------------------------|--------------|-----------|------------|-----------|--------------|------------|-------|--|
| | | | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 | | |
| Institutional - police, school, | 135 | 12 | 300 | 67 | 435 | 79 | | |
| Hotel | 449 | 7 | | | 449 | 7 | | |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 | | |
| Office | 340 | 10 | | | 340 | 10 | | |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 | | |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
 Blue-font cells are for regional data
 Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | -10.68% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.62 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.62 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT* | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 40.8% | 0.62 | 0.35 |
| Home-Based Other (HBO) | 42.4% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 16.8% | 0.40 | 0.40 |
| Total | 100.0% | 0.57 | 0.36 |
| % VT Internalized | | 43.1% | |

Regional Retail/Non-Retail Ratio **0.28**
 Regional Jobs/Housing Ratio **1.07**

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | -0.030 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4Ds **60%**
 Maximum allowable 4D adjustment for any individual trip purpose **15%**
 Maximum allow change from all factors combined = **65%**
 Ceiling and Floor Values

**TREASURE ISLAND PM PEAK
PROJECT SCALE 4Ds ADJUSTMENT WORKSHEET - HBW Zero Elasticity**

Region 3 (Enter the number corresponding to your region in table to the right)

Region Table

- 1 Sacramento County
- 2 Contra Costa County
- 3 CCTA with sampling for S/W coverage; density correction
- 4 0
- 5 0
- 6 0
- 7 0
- 8 0
- 9 0
- 10 0

| | Project Site | | Other Uses Within 1/2 Mile | | Total Uses Within 1/2 Mile | |
|---------------------------------|--------------|------------|----------------------------|-----------|----------------------------|------------|
| | DUs | Acres | DUs | Acres | DUs | Acres |
| Residential Land Uses | | | | | | |
| Single-Family Dwellings | 0 | 0 | | | 0 | 0 |
| Hotel dwellings | 500 | 7 | | | 500 | 7 |
| Mult-Family Dwellings | 6,000 | 101 | 80 | 15 | 6,080 | 116 |
| Total | 6,500 | 108 | 80 | 15 | 6,580 | 123 |
| Retail Employment | | | | | | |
| Regional Commercial | 310 | 10 | | | 310 | 10 |
| Neighborhood Shopping | 230 | 9 | | | 230 | 9 |
| Total | 540 | 19 | 0 | 0 | 540 | 19 |
| Non-Retail Employment | | | | | | |
| Industrial-PDR | 160 | 11 | | | 160 | 11 |
| Institutional - police, school, | 135 | 12 | 300 | 67 | 435 | 79 |
| Hotel | 449 | 7 | | | 449 | 7 |
| Museum/Entertainment | 192 | 19 | | | 192 | 19 |
| Office | 340 | 10 | | | 340 | 10 |
| Total | 1,276 | 59 | 300 | 67 | 1,576 | 126 |

| Walkable Design | Project | Regional Average |
|---------------------------|---------|------------------|
| Sidewalk Coverage | 100% | 82% |
| Route Directness | 0.70 | 0.57 |
| Average Blockface (miles) | 0.11 | 0.17 |
| Street density | 18.18 | 11.76 |

Green-shaded cells are for inputs
Blue-font cells are for regional data
Purple-shaded cells are outputs

| Computation of 4Ds | Project Area | ITE Typical | Percent Difference | 4Ds Adjustment for HBW | | 4Ds Adjustment for HBO | | 4Ds Adjustment for NHB | |
|---|--------------|-------------|--------------------|------------------------|---------|------------------------|---------|------------------------|---------|
| | | | | VT | VMT | VT | VMT | VT | VMT |
| Net Residential Density | 53.50 | 15.00 | 256.64% | -30.03% | -61.08% | -30.54% | -34.13% | 0.00% | 0.00% |
| Net Employment Density | 14.59 | 25.00 | -41.63% | 0.00% | 0.00% | 0.00% | 0.00% | 14.11% | 15.00% |
| JobMix Diversity | 0.90 | 0.25 | 259.76% | 0.00% | 0.00% | 0.00% | 0.00% | -65.00% | -65.00% |
| Jobs/Housing Diversity | 0.46 | 0.10 | 362.18% | 0.00% | -65.00% | -15.94% | -57.95% | 0.00% | 0.00% |
| Design | 4.08 | 3.64 | 11.97% | 0.00% | 0.00% | -0.38% | -0.36% | 0.00% | 0.00% |
| HBW Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| All Other Destinations | 1,000 | 1,000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4D Adjustment BEFORE Ceiling & Floor | | | | 0.70 | 0.14 | 0.58 | 0.28 | 0.40 | 0.40 |
| 4D Adjustment AFTER Ceiling & Floor | | | | 0.70 | 0.35 | 0.58 | 0.35 | 0.40 | 0.40 |

| Trip Purpose | % of All VT* | Adjustment | |
|--------------------------|---------------|--------------|-------------|
| | | VT | VMT |
| Home-Based Work (HBW) | 40.8% | 0.70 | 0.35 |
| Home-Based Other (HBO) | 42.4% | 0.58 | 0.35 |
| Non-Home-Based (NHB) | 16.8% | 0.40 | 0.40 |
| Total | 100.0% | 0.60 | 0.36 |
| % VT Internalized | | 40.1% | |

Regional Retail/Non-Retail Ratio: 0.28
Regional Jobs/Housing Ratio: 1.07

Settings Used in this Scenario

| 4D Elasticities from SACOG household surveys | Net Res. Density | Net Emp. Density | Jobmix Diversity | Jobs/HH Diversity | Index Design | HBW Destinations | Non- HBW Destinations |
|--|------------------|------------------|------------------|-------------------|--------------|------------------|-----------------------|
| VT Elasticities | | | | | | | |
| HBW | -0.117 | | | 0.000 | 0.000 | -0.375 | |
| HBO | -0.119 | | | -0.044 | -0.032 | | -0.408 |
| NHB | | -0.339 | -0.462 | | 0.000 | | -0.822 |
| VMT Elasticities | | | | | | | |
| HBW | -0.238 | | | -0.260 | 0.000 | -1.234 | |
| HBO | -0.133 | | | -0.160 | -0.030 | | -1.405 |
| NHB | | -0.444 | -0.459 | | 0.000 | | -1.318 |

Maximum allowable percentage change for any of the individual 4 Ds: 600%
Maximum allowable 4D adjustment for any individual trip purpose: 15%
Maximum allow change from all factors combined = 65%
Ceiling and Floor Values: -65%

**Table A-1
Treasure Island Trip Generation: High Transit Service Scenario**

| Category | Total Use SF | Units | Land Use | ITE Land Use Code | AM ITE Trip Generation | | | | | | Work % | Non-work % | Internal Trip % | Internal Trip Reduction (VT) | External Trips (ITE less internalization, pass-by, and diverted) | | | Ferry % | Bus % | People Per Car | External Ferry Trips (Person Trips) | | | External Bus Trips (Person Trips) | | | Vehicle Trips Replaced by Transit | External Vehicle Trips | | | | | | | | | | | | | |
|------------------------------------|--------------------|-------|----------------------------------|-------------------|------------------------|---------------|-----|------|------------------|-------------------|--------|------------|-----------------|------------------------------|--|-------------|---------------|---------|-------|----------------|-------------------------------------|--------|----------|-----------------------------------|--------|----------|-----------------------------------|------------------------|--------|----------|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | Rate or Eqn | AM Trips (VT) | %In | %Out | AM Trips In (VT) | AM Trips Out (VT) | | | | | AM In (VT) | AM Out (VT) | AM Total (VT) | | | | AM In | AM Out | AM Total | AM In | AM Out | AM Total | | AM In | AM Out | AM Total | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AM Peak Period | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RETAIL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 115.0 | ksf | Neighborhood Serving + Ancillary | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 87.0 | ksf | Shopping Center | 820 | Eqn | 246 | 61% | 39% | 150 | 96 | 8% | 92% | 37% | 91 | 95 | 60 | 155 | 7% | 12% | 1.6 | 16 | 10 | 27 | 28 | 18 | 45 | 45 | 67 | 43 | 110 | | | | | | | | | | | |
| | 28.0 | ksf | Grocery Store | 850 | Rate | 156 | 61% | 39% | 95 | 61 | 8% | 92% | 37% | 58 | 60 | 38 | 98 | 7% | 12% | 1.6 | 10 | 7 | 17 | 18 | 11 | 29 | 29 | 42 | 27 | 70 | | | | | | | | | | | |
| | 155.0 | ksf | Lifestyle + Entertainment Retail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 54.0 | ksf | Restaurant | 932 | Rate | 529 | 52% | 48% | 275 | 254 | 8% | 92% | 37% | 196 | 173 | 160 | 333 | 7% | 12% | 1.6 | 30 | 28 | 58 | 51 | 47 | 98 | 97 | 123 | 113 | 236 | | | | | | | | | | | |
| | 101.0 | ksf | Shopping Center | 820 | Eqn | 269 | 61% | 39% | 164 | 105 | 8% | 92% | 37% | 100 | 103 | 66 | 169 | 7% | 12% | 1.6 | 18 | 11 | 29 | 30 | 19 | 50 | 49 | 73 | 47 | 120 | | | | | | | | | | | |
| COMMERCIAL / ADAPTIVE REUSE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 325.0 | ksf | Buildings 1, 2, and 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 85.0 | ksf | General Office | 710 | Eqn | 165 | 88% | 12% | 145 | 20 | 50% | 50% | 37% | 61 | 91 | 12 | 104 | 11% | 14% | 1.6 | 27 | 4 | 30 | 33 | 4 | 37 | 42 | 54 | 7 | 62 | | | | | | | | | | | |
| | 80.0 | ksf | Manufacturing | 140 | Rate | 59 | 77% | 23% | 45 | 14 | 50% | 50% | 37% | 22 | 29 | 9 | 37 | 11% | 14% | 1.6 | 8 | 2 | 11 | 10 | 3 | 13 | 15 | 17 | 5 | 22 | | | | | | | | | | | |
| | 160.0 | ksf | Multiplex Movie Theater | 445 | | 0 | | | | | 50% | 50% | 37% | 0 | 0 | 0 | 0 | 11% | 14% | 1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | |
| INSTITUTIONAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 135.0 | ksf | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 105.0 | ksf | Elementary School | 520 | Rate | 493 | 54% | 46% | 266 | 227 | 50% | 50% | 37% | 182 | 168 | 143 | 311 | 11% | 14% | 1.6 | 49 | 42 | 91 | 60 | 51 | 111 | 126 | 100 | 85 | 185 | | | | | | | | | | | |
| | 30.0 | ksf | Police/Fire Station | 730 | Rate | 178 | 84% | 16% | 149 | 29 | 50% | 50% | 37% | 66 | 94 | 18 | 112 | 11% | 14% | 1.6 | 27 | 5 | 33 | 34 | 6 | 40 | 45 | 56 | 11 | 67 | | | | | | | | | | | |
| | 13.5 | ksf | Recreational Comm Center | 495 | Rate | 23 | 61% | 39% | 14 | 9 | 8% | 92% | 37% | 9 | 9 | 6 | 14 | 7% | 12% | 1.6 | 2 | 1 | 3 | 3 | 2 | 4 | 4 | 6 | 4 | 10 | | | | | | | | | | | |
| | 15.0 | ksf | Sailing Center | 420 | rate | 24 | 33% | 67% | 8 | 16 | 8% | 92% | 37% | 9 | 5 | 10 | 15 | 7% | 12% | 1.6 | 1 | 2 | 3 | 1 | 3 | 4 | 4 | 4 | 7 | 11 | | | | | | | | | | | |
| | 300 | acres | Open Space | | rate | 82 | 80% | 20% | 65 | 17 | 5% | 95% | 37% | 30 | 41 | 10 | 52 | 7% | 11% | 1.6 | 7 | 2 | 9 | 12 | 3 | 15 | 15 | 30 | 7 | 37 | | | | | | | | | | | |
| HOTELS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 500.0 | rooms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 50.0 | rooms | Resort Hotel | 330 | Rate | 17 | 72% | 28% | 12 | 5 | 45% | 55% | 37% | 6 | 8 | 3 | 11 | 11% | 14% | 1.6 | 2 | 1 | 3 | 3 | 1 | 4 | 4 | 5 | 2 | 7 | | | | | | | | | | | |
| | 70.0 | rooms | Hotel | 310 | Eqn | 86 | 61% | 39% | 52 | 34 | 45% | 55% | 37% | 32 | 33 | 21 | 54 | 11% | 14% | 1.6 | 9 | 6 | 15 | 12 | 7 | 19 | 21 | 20 | 13 | 33 | | | | | | | | | | | |
| | 380.0 | rooms | Hotel | 310 | Eqn | 470 | 61% | 39% | 287 | 183 | 45% | 55% | 37% | 174 | 181 | 115 | 296 | 11% | 14% | 1.6 | 50 | 32 | 82 | 63 | 40 | 103 | 116 | 110 | 70 | 180 | | | | | | | | | | | |
| RESIDENTIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6000 | units | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1454.0 | units | Residential Townhouse | 230 | Rate | 641 | 17% | 83% | 109 | 532 | 50% | 50% | 37% | 237 | 69 | 335 | 404 | 11% | 14% | 1.6 | 20 | 98 | 118 | 24 | 119 | 144 | 163 | 41 | 200 | 240 | | | | | | | | | | | |
| | 1553.0 | units | Apartment | 220 | Rate | 793 | 20% | 80% | 159 | 634 | 50% | 50% | 37% | 293 | 100 | 400 | 500 | 11% | 14% | 1.6 | 29 | 116 | 146 | 36 | 142 | 178 | 202 | 59 | 238 | 297 | | | | | | | | | | | |
| | 2876.0 | units | High-Rise Apartment | 222 | Rate | 864 | 25% | 75% | 216 | 648 | 50% | 50% | 37% | 320 | 136 | 408 | 544 | 11% | 14% | 1.6 | 40 | 119 | 159 | 48 | 145 | 194 | 220 | 81 | 243 | 324 | | | | | | | | | | | |
| | 117.0 | units | All Suites Hotel | 311 | Rate | 46 | 55% | 45% | 25 | 21 | 50% | 50% | 37% | 17 | 16 | 13 | 29 | 11% | 14% | 1.6 | 5 | 4 | 8 | 6 | 5 | 10 | 12 | 9 | 8 | 17 | | | | | | | | | | | |
| | grand total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | 5,141 | 43% | 57% | 2,236 | 2,905 | | | 37% | 1,902 | 1,410 | 1,829 | 3,239 | | | | | | | | | | | | | | | | | | | | | | | | |
| PM Peak Period | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RETAIL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 115.0 | ksf | Neighborhood Serving + Ancillary | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 87.0 | ksf | Shopping Center | 820 | Eqn | 971 | 48% | 52% | 466 | 505 | 8% | 92% | 40% | 388 | 280 | 303 | 583 | 7% | 12% | 1.6 | 51 | 55 | 106 | 86 | 93 | 179 | 178 | 194 | 210 | 404 | | | | | | | | | | | |
| | 28.0 | ksf | Grocery Store | 850 | Eqn | 581 | 51% | 49% | 296 | 285 | 8% | 92% | 40% | 232 | 178 | 171 | 349 | 7% | 12% | 1.6 | 32 | 31 | 64 | 55 | 53 | 107 | 107 | 123 | 119 | 242 | | | | | | | | | | | |
| | 155.0 | ksf | Lifestyle + Entertainment Retail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 54.0 | ksf | Restaurant | 932 | Rate | 1,003 | 61% | 39% | 612 | 391 | 8% | 92% | 40% | 401 | 367 | 235 | 602 | 7% | 12% | 1.6 | 67 | 43 | 110 | 113 | 72 | 185 | 184 | 255 | 163 | 418 | | | | | | | | | | | |
| | 101.0 | ksf | Shopping Center | 820 | Eqn | 1,073 | 48% | 52% | 515 | 558 | 8% | 92% | 40% | 429 | 309 | 335 | 644 | 7% | 12% | 1.6 | 56 | 61 | 117 | 95 | 103 | 198 | 197 | 214 | 232 | 447 | | | | | | | | | | | |
| COMMERCIAL / ADAPTIVE REUSE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 325.0 | ksf | Buildings 1, 2, and 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 85.0 | ksf | General Office | 710 | Eqn | 175 | 17% | 83% | 30 | 145 | 50% | 50% | 40% | 70 | 18 | 87 | 105 | 11% | 14% | 1.6 | 5 | 27 | 32 | 7 | 33 | 39 | 45 | 10 | 50 | 60 | | | | | | | | | | | |
| | 80.0 | ksf | Manufacturing | 140 | Rate | 60 | 36% | 64% | 22 | 38 | 50% | 50% | 40% | 24 | 13 | 23 | 36 | 11% | 14% | 1.6 | 4 | 7 | 11 | 5 | 9 | 13 | 15 | 7 | 13 | 21 | | | | | | | | | | | |
| | 160.0 | ksf | Multiplex movie theater | 445 | eqn | 1,056 | 64% | 36% | 676 | 380 | 50% | 50% | 40% | 422 | 406 | 228 | 634 | 11% | 14% | 1.6 | 124 | 70 | 194 | 152 | 85 | 237 | 269 | 233 | 131 | 364 | | | | | | | | | | | |
| INSTITUTIONAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 135.0 | ksf | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 105.0 | ksf | Elementary School | 520 | Rate | 330 | 43% | 57% | 142 | 188 | 100% | 0% | 40% | 132 | 85 | 113 | 198 | 17% | 17% | 1.6 | 39 | 51 | 90 | 39 | 51 | 90 | 112 | 37 | 49 | 86 | | | | | | | | | | | |
| | 30.0 | ksf | Police/Fire Station | 730 | Rate | 38 | 31% | 69% | 12 | 26 | 50% | 50% | 40% | 15 | 7 | 16 | 23 | 11% | 14% | 1.6 | 2 | 5 | 7 | 3 | 6 | 9 | 10 | 4 | 9 | 13 | | | | | | | | | | | |
| | 13.5 | ksf | Recreational Comm Center | 495 | Rate | 23 | 29% | 71% | 7 | 16 | 8% | 92% | 40% | 9 | 4 | 10 | 14 | 7% | 12% | 1.6 | 1 | 2 | 3 | 1 | 3 | 4 | 4 | 3 | 7 | 10 | | | | | | | | | | | |
| | 15.0 | ksf | Sailing Center | 420 | rate | 55 | 60% | 40% | 33 | 22 | 8% | 92% | 40% | 22 | 20 | 13 | 33 | 7% | 12% | 1.6 | | | | | | | | | | | | | | | | | | | | | |

**Table A-2
Treasure Island Trip Generation: Low Transit Service Scenario**

| Category | Total Use SF | Units | Land Use | ITE Land Use Code | AM ITE Trip Generation | | | | | | Work % | Non-work % | Internal Trip % | Internal Trip Reduction (VT) | External Trips (ITE less internalization, pass-by, and diverted) | | | Full Project Transit % | | Base Case Project Transit % | | People Per Car | External Ferry Trips (Person Trips) | | | External Bus Trips (Person Trips) | | | Vehicle Trips Replaced by Transit | External Vehicle Trips | | | | | | |
|------------------------------------|--------------------|-------|----------------------------------|-------------------|------------------------|---------------|-------|------|------------------|-------------------|--------|------------|-----------------|------------------------------|--|-------------|---------------|------------------------|-------|-----------------------------|-------|----------------|-------------------------------------|--------|----------|-----------------------------------|--------|----------|-----------------------------------|------------------------|--------|----------|---|---|--|--|
| | | | | | Rate or Eqn | AM Trips (VT) | %In | %Out | AM Trips In (VT) | AM Trips Out (VT) | | | | | AM In (VT) | AM Out (VT) | AM Total (VT) | Ferry % | Bus % | Ferry % | Bus % | | AM In | AM Out | AM Total | AM In | AM Out | AM Total | | AM In | AM Out | AM Total | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AM Peak Period | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RETAIL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 115.0 | ksf | Neighborhood Serving + Ancillary | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 87.0 | ksf | Shopping Center | 820 | Eqn | 246 | 61% | 39% | 150 | 96 | 8% | 92% | 37% | 91 | 95 | 60 | 155 | 7% | 12% | 4% | 9% | 1.6 | 10 | 6 | 16 | 20 | 13 | 34 | 31 | 76 | 48 | 124 | | | | |
| | 28.0 | ksf | Grocery Store | 850 | Eqn | 156 | 61% | 39% | 95 | 61 | 8% | 92% | 37% | 58 | 60 | 38 | 98 | 7% | 12% | 4% | 9% | 1.6 | 6 | 4 | 10 | 13 | 8 | 21 | 20 | 48 | 31 | 79 | | | | |
| | 155.0 | ksf | Lifestyle + Entertainment Retail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 54.0 | ksf | Restaurant | 932 | Rate | 529 | 52% | 48% | 275 | 254 | 8% | 92% | 37% | 196 | 173 | 160 | 333 | 7% | 12% | 4% | 9% | 1.6 | 18 | 17 | 35 | 38 | 35 | 72 | 67 | 139 | 128 | 266 | | | | |
| | 101.0 | ksf | Shopping Center | 820 | Eqn | 269 | 61% | 39% | 164 | 105 | 8% | 92% | 37% | 100 | 103 | 66 | 169 | 7% | 12% | 4% | 9% | 1.6 | 11 | 7 | 18 | 22 | 14 | 37 | 34 | 83 | 53 | 135 | | | | |
| COMMERCIAL / ADAPTIVE REUSE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 325.0 | ksf | Buildings 1, 2, and 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 85.0 | ksf | General Office | 710 | Eqn | 165 | 88% | 12% | 145 | 20 | 50% | 50% | 37% | 61 | 91 | 12 | 104 | 11% | 14% | 7% | 10% | 1.6 | 16 | 2 | 18 | 24 | 3 | 27 | 28 | 66 | 9 | 75 | | | | |
| | 80.0 | ksf | Manufacturing | 140 | Rate | 59 | 77% | 23% | 45 | 14 | 50% | 50% | 37% | 22 | 29 | 9 | 37 | 11% | 14% | 7% | 10% | 1.6 | 5 | 1 | 6 | 8 | 2 | 10 | 10 | 21 | 6 | 27 | | | | |
| | 160.0 | ksf | Multiplex Movie Theater | 445 | | 0 | | | | | 50% | 50% | 37% | 0 | 0 | 0 | 0 | 11% | 14% | 7% | 10% | 1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| INSTITUTIONAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 135.0 | ksf | Elementary School | 520 | Rate | 493 | 54% | 46% | 266 | 227 | 50% | 50% | 37% | 182 | 168 | 143 | 311 | 11% | 14% | 7% | 10% | 1.6 | 29 | 25 | 54 | 44 | 38 | 82 | 85 | 122 | 104 | 225 | | | | |
| | 105.0 | ksf | Police/Fire Station | 730 | Rate | 178 | 84% | 16% | 149 | 29 | 50% | 50% | 37% | 66 | 94 | 18 | 112 | 11% | 14% | 7% | 10% | 1.6 | 16 | 3 | 20 | 25 | 5 | 30 | 31 | 68 | 13 | 81 | | | | |
| | 13.5 | ksf | Recreational Comm Center | 495 | Rate | 23 | 61% | 39% | 14 | 9 | 8% | 92% | 37% | 9 | 9 | 6 | 14 | 7% | 12% | 4% | 9% | 1.6 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 7 | 5 | 12 | | | | |
| | 15.0 | ksf | Sailing Center | 420 | rate | 24 | 33% | 67% | 8 | 16 | 8% | 92% | 37% | 9 | 5 | 10 | 15 | 7% | 12% | 4% | 9% | 1.6 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 4 | 8 | 12 | | | | |
| | 300 | acres | Open Space | | rate | 82 | 80% | 20% | 65 | 17 | 5% | 95% | 37% | 30 | 41 | 10 | 52 | 7% | 11% | 4% | 8% | 1.6 | 4 | 1 | 5 | 9 | 2 | 11 | 10 | 33 | 8 | 42 | | | | |
| HOTELS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 500.0 | rooms | Resort Hotel | 330 | Rate | 17 | 72% | 28% | 12 | 5 | 45% | 55% | 37% | 6 | 8 | 3 | 11 | 11% | 14% | 7% | 10% | 1.6 | 1 | 0 | 2 | 2 | 1 | 3 | 3 | 6 | 2 | 8 | | | | |
| | 50.0 | rooms | Hotel | 310 | Eqn | 86 | 61% | 39% | 52 | 34 | 45% | 55% | 37% | 32 | 33 | 21 | 54 | 11% | 14% | 7% | 10% | 1.6 | 6 | 4 | 9 | 9 | 5 | 14 | 14 | 24 | 16 | 40 | | | | |
| | 380.0 | rooms | Hotel | 310 | Eqn | 470 | 61% | 39% | 287 | 183 | 45% | 55% | 37% | 174 | 181 | 115 | 296 | 11% | 14% | 7% | 10% | 1.6 | 30 | 19 | 49 | 47 | 30 | 76 | 79 | 133 | 85 | 218 | | | | |
| RESIDENTIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6000 | units | Residential Townhouse | 230 | Rate | 641 | 17% | 83% | 109 | 532 | 50% | 50% | 37% | 237 | 69 | 335 | 404 | 11% | 14% | 7% | 10% | 1.6 | 12 | 59 | 71 | 18 | 88 | 106 | 111 | 50 | 243 | 293 | | | | |
| | 1553.0 | units | Apartment | 220 | Rate | 793 | 20% | 80% | 159 | 634 | 50% | 50% | 37% | 293 | 100 | 400 | 500 | 11% | 14% | 7% | 10% | 1.6 | 17 | 70 | 87 | 26 | 105 | 132 | 137 | 73 | 290 | 363 | | | | |
| | 2876.0 | units | High-Rise Apartment | 222 | Rate | 864 | 25% | 75% | 216 | 648 | 50% | 50% | 37% | 320 | 136 | 408 | 544 | 11% | 14% | 7% | 10% | 1.6 | 24 | 71 | 95 | 36 | 108 | 143 | 149 | 99 | 296 | 395 | | | | |
| | 117.0 | units | All Suites Hotel | 311 | Rate | 46 | 55% | 45% | 25 | 21 | 50% | 50% | 37% | 17 | 16 | 13 | 29 | 11% | 14% | 7% | 10% | 1.6 | 3 | 2 | 5 | 4 | 3 | 8 | 8 | 12 | 9 | 21 | | | | |
| | grand total | | | | | | 5,141 | 43% | 57% | 2,236 | 2,905 | | 37% | 1,902 | 1,410 | 1,829 | 3,239 | | | | | | 210 | 294 | 504 | 348 | 465 | 812 | 823 | 1,062 | 1,355 | 2,416 | | | | |
| PM Peak Period | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RETAIL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 115.0 | ksf | Neighborhood Serving + Ancillary | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 87.0 | ksf | Shopping Center | 820 | Eqn | 971 | 48% | 52% | 466 | 505 | 8% | 92% | 40% | 388 | 280 | 303 | 583 | 7% | 12% | 4% | 9% | 1.6 | 31 | 33 | 64 | 64 | 69 | 133 | 123 | 221 | 239 | 460 | | | | |
| | 28.0 | ksf | Grocery Store | 850 | Eqn | 581 | 51% | 49% | 296 | 285 | 8% | 92% | 40% | 232 | 178 | 171 | 349 | 7% | 12% | 4% | 9% | 1.6 | 19 | 19 | 38 | 40 | 39 | 79 | 73 | 140 | 135 | 275 | | | | |
| | 155.0 | ksf | Lifestyle + Entertainment Retail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 54.0 | ksf | Restaurant | 932 | Rate | 1,003 | 61% | 39% | 612 | 391 | 8% | 92% | 40% | 401 | 367 | 235 | 602 | 7% | 12% | 4% | 9% | 1.6 | 40 | 26 | 66 | 83 | 53 | 137 | 127 | 290 | 185 | 475 | | | | |
| | 101.0 | ksf | Shopping Center | 820 | Eqn | 1,073 | 48% | 52% | 515 | 558 | 8% | 92% | 40% | 429 | 309 | 335 | 644 | 7% | 12% | 4% | 9% | 1.6 | 34 | 37 | 70 | 70 | 76 | 146 | 136 | 244 | 264 | 508 | | | | |
| COMMERCIAL / ADAPTIVE REUSE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 325.0 | ksf | Buildings 1, 2, and 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 85.0 | ksf | General Office | 710 | Eqn | 175 | 17% | 83% | 30 | 145 | 50% | 50% | 40% | 70 | 18 | 87 | 105 | 11% | 14% | 7% | 10% | 1.6 | 3 | 16 | 19 | 5 | 24 | 29 | 30 | 13 | 62 | 75 | | | | |
| | 80.0 | ksf | Manufacturing | 140 | Rate | 60 | 36% | 64% | 22 | 38 | 50% | 50% | 40% | 24 | 13 | 23 | 36 | 11% | 14% | 7% | 10% | 1.6 | 2 | 4 | 7 | 4 | 6 | 10 | 10 | 9 | 16 | 26 | | | | |
| | 160.0 | ksf | Multiplex movie theater | 445 | eqn | 1,056 | 64% | 36% | 676 | 380 | 50% | 50% | 40% | 422 | 406 | 228 | 634 | 11% | 14% | 7% | 10% | 1.6 | 74 | 42 | 116 | 112 | 63 | 175 | 182 | 289 | 162 | 451 | | | | |
| INSTITUTIONAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 135.0 | ksf | Elementary School | 520 | Rate | 330 | 43% | 57% | 142 | 188 | 100% | 0% | 40% | 132 | 85 | 113 | 198 | 17% | 17% | 10% | 13% | 1.6 | 23 | 31 | 54 | 29 | 38 | 66 | 75 | 53 | 70 | 123 | | | | |
| | 105.0 | ksf | Police/Fire Station | 730 | Rate | 38 | 31% | 69% | 12 | 26 | 50% | 50% | 40% | 15 | 7 | 16 | 23 | 11% | 14% | 7% | 10% | 1.6 | 1 | 3 | 4 | 2 | 4 | 6 | 7 | 5 | 11 | 16 | | | | |
| | 13.5 | ksf | Recreational Comm Center | 495 | Rate | 23 | 29% | 71% | 7 | 16 | 8% | 92% | 40% | 9 | 4 | 10 | 14 | 7% | 12% | 4% | 9% | 1.6 | 0 | 1 | 2 | 1 | 2 | 3 | 3 | 3 | 8 | 11 | | | | |
| | 15.0 | ksf | Sailing Center | 420 | rate | 55 | 60% | 40% | 33 | 22 | 8% | 92% | 40% | 22 | 20 | 13 | 33 | 7% | 12% | 4% | 9% | 1.6 | 2 | 1 | 4 | 5 | 3 | 8 | 7 | 16 | 10 | 26 | | | | |
| | 300 | acres | Regional Park | | rate | 160 | 41% | 59% | 66 | 94 | 5% | 95% | 40% | 64 | 39 | 57 | 96 | 7% | 11% | 4% | 8% | 1.6 | 4 | 6 | 10 | 9 | 13 | 21 | 20 | 31 | 45 | 76 | | | | |
| HOTEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 500.0 | rooms | Resort Hotel | 330 | Rate | 22 | 43% | 57% | 10 | 12 | 45% | 55% | 40% | 9 | 6 | 8 | 13 | 11% | 14% | 7% | 10% | 1.6 | 1 | 1 | 2 | 2 | 2 | 4 | 4 | 4 | 5 | 10 | | | | |
| | 50.0 | rooms | Hotel | 310 | Rate | 42 | 53% | 47% | 22 | 20 | 45% | 55% | 40% | 17 | 13 | 12 | 25 | 11% | 14% | 7% | 10% | 1.6 | 2 | 2 | 4 | 4 | 3 | 7 | 7 | 10 | 9 | 18 | | | | |
| | 380.0 | rooms | Hotel | 310 | Rate | 225 | 53% | 47% | 119 | 106 | 45% | 55% | 40% | 90 | 72 | 63 | 135 | 11% | 14% | 7% | 10% | 1.6 | 13 | 11 | 24 | 19 | 17 | 37 | 38 | 52 | 46 | 97 | | | | |
| RESIDENTIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6000.0 | units | Residential Townhouse | 230 | Rate | 757 | 67% | 33% | 507 | 250 | 50% | 50% | 40% | 303 | 304 | 150 | 454 | 11% | 14% | 7% | 10% | 1.6 | 56 | 28 | 83 | 84 | 41 | 126 | 131 | 217 | 107 | 324 | | | | |
| | 1553.0 | units | Apartment | 220 | Rate | 964 | 65% | 35% | 626 | 338 | 50% | 50% | 40% | 386 | 376 | 202 | 578 | 11% | 14% | 7% | 10% | 1.6 | 69 | 37 | 106 | 104 | 56 | 160 | 166 | 288 | 144 | 412 | | | | |
| | 2876.0 | units | High-Rise Apartment | 222 | Rate | 1,008 | 61% | 39% | 615 | 39 | | | | | | | | | | | | | | | | | | | | | | | | | | |

Appendix B – Comparisons of Existing and Future Traffic Volumes Among the MTC, SFCTA,
and ACCMA Forecast Models

Comparison of Existing and Future Traffic Volumes for Bay Bridge (Peak 1 Hour)

| PeMS | | | | | | | | | | | | |
|------|--------|--------|--------|--------|--|--|--|--|--|--|--|--|
| 2008 | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | | | | | | | | |
| AM | 8,740 | | | 7,153 | | | | | | | | |
| PM | 7,340 | | | 9,013 | | | | | | | | |

| SFCTA (CHAMP 3.2) | | | | | | | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2005 | | | | | | | | | | | | |
| 2030 | | | | | | | | | | | | |
| Delta | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 11,161 | 11,332 | 9,080 | 8,672 | 12,852 | 13,791 | 11,742 | 10,961 | 1,691 | 2,459 | 2,662 | 2,289 |
| PM | 8,934 | 9,192 | 10,224 | 9,992 | 10,207 | 11,097 | 11,706 | 10,367 | 1,273 | 1,905 | 1,482 | 375 |

| ACCMA (2007) | | | | | | | | | | | | |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2005 | | | | | | | | | | | | |
| 2030 | | | | | | | | | | | | |
| Delta | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,140 | 12,242 | 6,970 | 6,856 | 17,978 | 17,901 | 8,320 | 7,388 | 5,838 | 5,659 | 1,350 | 532 |
| PM | 7,015 | 7,115 | 12,858 | 12,790 | 8,181 | 8,939 | 17,104 | 17,341 | 1,166 | 1,824 | 4,246 | 4,551 |

| MTC (2009 RTP) | | | | | | | | | | | | |
|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2006 | | | | | | | | | | | | |
| 2035 | | | | | | | | | | | | |
| Delta | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,385 | 12,536 | 8,561 | 8,456 | 16,401 | 16,730 | 9,269 | 8,613 | 4,016 | 4,194 | 708 | 157 |
| PM | 8,795 | 8,951 | 13,753 | 13,691 | 10,097 | 11,026 | 16,937 | 16,466 | 1,302 | 2,075 | 3,184 | 2,775 |

| Adjusted MTC Model Outputs | | | | | | | | | | | | |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2006 | | | | | | | | | | | | |
| 2035 | | | | | | | | | | | | |
| Delta | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,375 | 12,497 | 8,541 | 8,442 | 16,384 | 16,794 | 8,768 | 8,598 | 4,009 | 4,297 | 227 | 156 |
| PM | 8,771 | 8,918 | 13,703 | 13,599 | 10,100 | 10,572 | 17,084 | 16,520 | 1,329 | 1,654 | 3,381 | 2,921 |

Comparison of Existing and Future Growth Factors for Bay Bridge (Peak 1 Hour)

| PeMS | | | | | | | | | | | | |
|------|--------|--------|--------|--------|--|--|--|--|--|--|--|--|
| 2008 | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | | | | | | | | |
| AM | 8,740 | | | 7,153 | | | | | | | | |
| PM | 7,340 | | | 9,013 | | | | | | | | |

| SFCTA (CHAMP 3.2) | | | | | | | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2005 | | | | | | | | | | | | |
| 2030 | | | | | | | | | | | | |
| % Growth | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 11,161 | 11,332 | 9,080 | 8,672 | 12,852 | 13,791 | 11,742 | 10,961 | 15% | 22% | 29% | 26% |
| PM | 8,934 | 9,192 | 10,224 | 9,992 | 10,207 | 11,097 | 11,706 | 10,367 | 14% | 21% | 14% | 4% |

| ACCMA (2007) | | | | | | | | | | | | |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2005 | | | | | | | | | | | | |
| 2030 | | | | | | | | | | | | |
| % Growth | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,140 | 12,242 | 6,970 | 6,856 | 17,978 | 17,901 | 8,320 | 7,388 | 48% | 46% | 19% | 8% |
| PM | 7,015 | 7,115 | 12,858 | 12,790 | 8,181 | 8,939 | 17,104 | 17,341 | 17% | 26% | 33% | 36% |

| MTC (2009 RTP) | | | | | | | | | | | | |
|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2006 | | | | | | | | | | | | |
| 2035 | | | | | | | | | | | | |
| % Growth | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,385 | 12,536 | 8,561 | 8,456 | 16,401 | 16,730 | 9,269 | 8,613 | 32% | 33% | 8% | 2% |
| PM | 8,795 | 8,951 | 13,753 | 13,691 | 10,097 | 11,026 | 16,937 | 16,466 | 15% | 23% | 23% | 20% |

| Adjusted MTC Model Outputs | | | | | | | | | | | | |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2006 | | | | | | | | | | | | |
| 2035 | | | | | | | | | | | | |
| % Growth | | | | | | | | | | | | |
| | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP | WB APP | WB DEP | EB APP | EB DEP |
| AM | 12,375 | 12,497 | 8,541 | 8,442 | 16,384 | 16,794 | 8,768 | 8,598 | 32% | 34% | 3% | 2% |
| PM | 8,771 | 8,918 | 13,703 | 13,599 | 10,100 | 10,572 | 17,084 | 16,520 | 15% | 19% | 25% | 21% |

Yerba Buena Island Ramps Project Traffic Operations Report

1.0 INTRODUCTION

This report documents the traffic operations on the San Francisco Oakland Bay Bridge (SFOBB) and its six (6) on- and off-ramps to and from Yerba Buena Island (YBI) in the eastbound and westbound directions. This report also analyses the operational difference between the existing and projected Build and No Build Alternative in the year 2035. There are no operational differences between the two Build Alternatives, Alternative 2b and Alternative 4, so they are referred to in this document as the Build Alternative.

The current geometric design of the ramps has remained mostly unchanged since the 1930s. The ramps do not meet Caltrans' standards, the on-ramp merge lengths and off-ramp deceleration lengths for the six ramps, and the entrances and exits at the I-80 / YBI interchange are non-standard; all of these conditions create operational constraints.

The goal of this report is to illustrate the geometric and operational condition of the existing on- and off-ramps and the affect they have on the mainline of the SFOBB; therefore illustrating the result of the No Build Alternative. The proposed project using the Build Alternative will improve geometry and operations by reconstructing two new ramps on the east side of YBI.

2.0 EXISTING CONDITIONS ANALYSIS

2.1 Bay Bridge Travel Time

Travel time runs for the Bay Bridge were performed during the morning and evening peak periods on October 7, 2008. The morning peak period hours fell between 6:30 AM – 9:30 AM and the evening peak period hours fell between of 3:30 PM – 6:30 PM. The travel time data was collected using a test car method known as the floating car technique. The floating car technique employs a test vehicle that is driven along the study route, the driver floats with the traffic by passing as many vehicles as pass the test car. This technique is preferred for capturing the typical driver behavior and vehicular operation of the selected study roadway.

Test Car Study Sections

The beginning and end points of each test car run were consistent, however, the study sections for each period varied slightly. In the eastbound direction, the starting point for the data collection was the merge onto I-80/Bay Bridge, from the First Street/Harrison Street on-ramp location; the ending point was 4.6 miles from the start just prior to the turnaround location at the toll plaza. In the westbound direction, the starting point for the data collection was an overhead sign location west of the toll plaza; the ending point location was 5.1 miles from start at the intersection of Fremont Street/Howard Street. The interim data location points were typically mile markers, as well as the on- and off-ramp locations on Yerba Buena Island. The following tables show the study collection points for each peak period.

Table 1 – Travel Time Study Sections for Peak Period

| Westbound | | Eastbound | |
|-----------------------------|------------------------|-----------------------------|------------------------|
| <i>Location Description</i> | <i>Post Mile (Abs)</i> | <i>Location Description</i> | <i>Post Mile (Abs)</i> |
| Start | 6.69 | Start | 2.14 |
| 1 Mile | 5.69 | 1 Mile | 3.14 |
| 2 Mile | 4.69 | Off Ramp 1 | 4.14 |
| Off Ramp 1 | 4.33 | Off Ramp 2 | 4.39 |
| On Ramp 1 | 4.24 | On Ramp 1 | 4.51 |
| On Ramp 2 | 4.06 | 3 Miles | 5.14 |
| 3 Miles | 3.69 | 4 Miles | 6.14 |
| End | 2.69 | End | 6.69 |

Travel Time Results

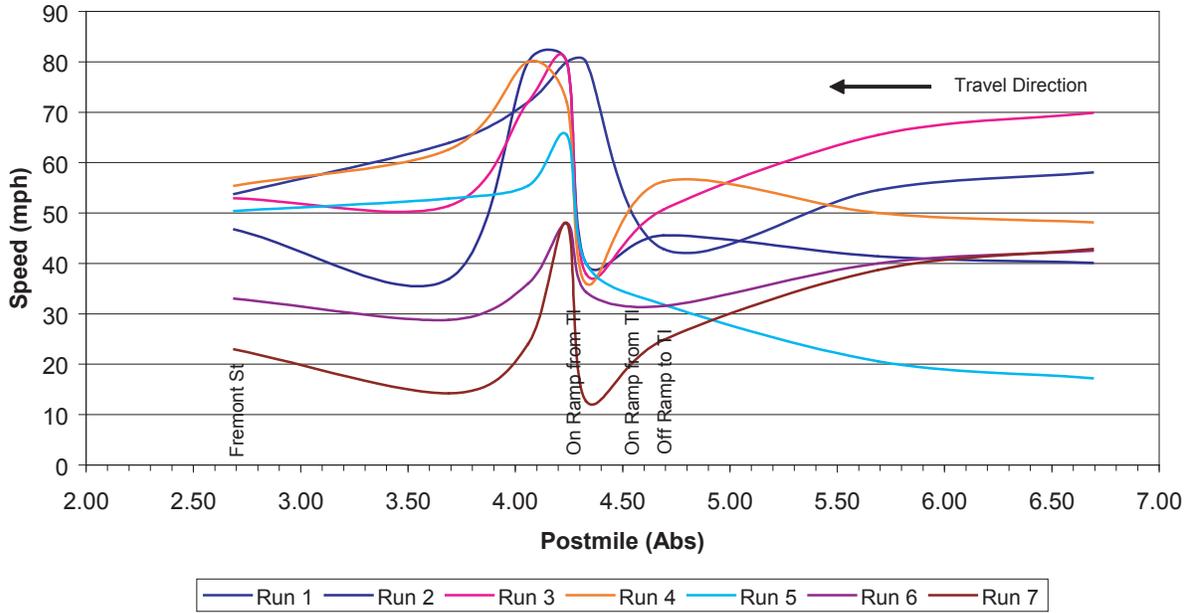
Figure 1 shows average travel speed calculated from the travel time study conducted on the Bay Bridge during morning and evening peak periods. Average travel speed was calculated from the recorded time at the post miles shown in Table 1. Each test car run is shown as an interpolation of the calculated travel speeds versus post mile.

During the morning and evening peak periods for the eastbound direction, speeds are fairly consistent between runs indicating minimal congestion and a low occurrence of reduced speed areas. Travel speeds for the morning peak period on average are greater than the evening peak period in the eastbound direction.

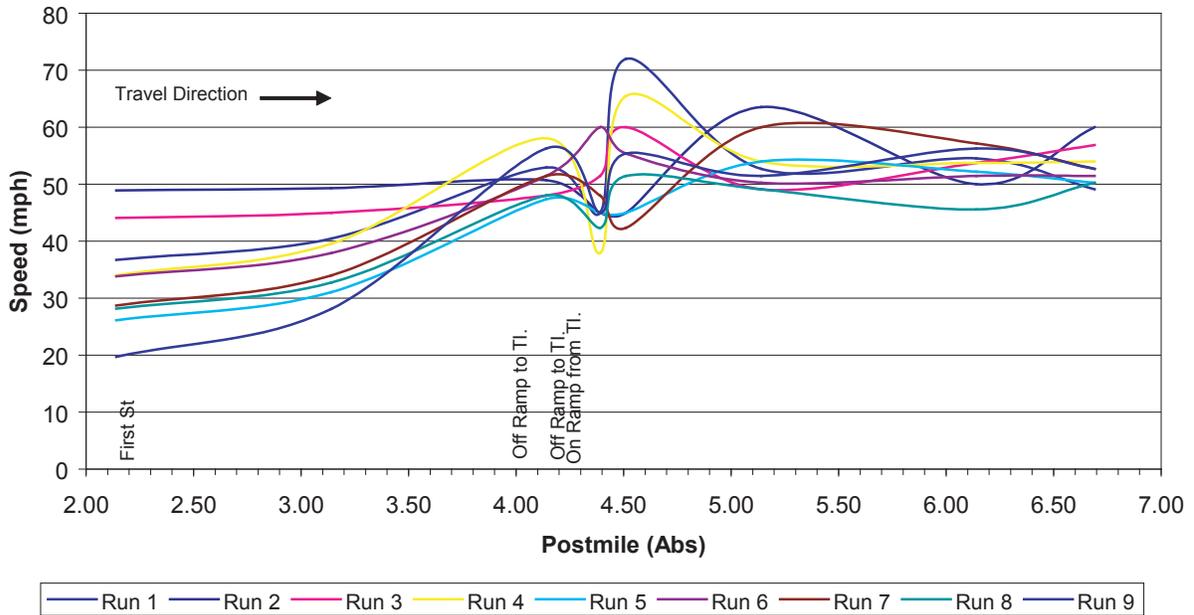
Heading westbound, the rightmost lanes 4 and 5 operate with slower speeds than leftmost lanes 1, 2, and 3 at the approaches to the Fremont Street off-ramp during the morning peak hours. The slower speeds of lanes 4 and 5 are caused by the queue of cars on the Fremont Street off-ramp, caused by the lack of capacity; which existed before the closure of the Harrison Street off-ramp. The slower speed operation typically begins at approximately mid-span. Occasionally, the slower speed traffic extends to the vicinity of the westbound on-ramp junction on the west side of the Bay Bridge. During other times, the retrofit construction activity further east, near 5th Street, causes traffic to slow down on the Bay Bridge.

Peak Hour Travel Speed

Westbound AM Peak Hour



Eastbound PM Peak Hour



Note: The peak hour travel speed is the average speed between two observed locations.



2.2 2008 Existing Condition HCM Analysis

The analysis of traffic operations of the existing ramp configuration were completed using the methodologies described in the Highway Capacity Manual (HCM 2000). Ramp analysis was completed using methods from Chapter 25, Ramps and Ramp Junctions, of the HCM.

Existing Traffic Volumes

The existing traffic conditions were evaluated by considering the highest ramp volume for each ramp within the peak periods of 7 AM – 9 AM for the morning peak hour and 4 PM – 6 PM for the evening peak hour. Existing ramp traffic volumes were collected for the Treasure Island Development Plan (TITP) EIR which was provided by Fehr & Peers Transportation Consultants. The ramp volumes were collected during week of May 4, 2008. At the time of the count, only one eastbound off-ramp and westbound on-ramp were available for use. The highest weekday ramp volumes were counted on Wednesday May 7, 2008 which is shown in Table 3 and graphically illustrated in Figure 2. The Bay Bridge mainline traffic volumes were obtained from the PeMS database for the same time period.

It should be noted, that Bay Bridge westbound traffic volumes are controlled by metering lights, during both the AM peak periods, and approximately half of the time during the PM peak periods. Although capacity of the Bay Bridge is 9,500 vehicles per hour (vph), it is Caltrans general practice to maintain acceptable operations on the Bay Bridge by limiting the traffic entering the bridge. This allowable traffic volume is determined by actual traffic volumes recorded at the monitoring station immediately west of the metering lights. Average weekday traffic volumes recorded at this monitoring station for the past three years (2006 – 2008) is approximately 8,600 vph in the morning.

Existing Levels of Service

Traffic operating characteristics of intersections are described by the concept of Level of Service (LOS). LOS is a qualitative description of a ramp segment or intersection performance based on the criteria outlined in the *2000 Highway Capacity Manual*. LOS ranges from A, which indicates free flow or excellent conditions with short delays, to F, which indicates congested or overloaded conditions with extremely long delays. Caltrans criteria are used to establish a goal of LOS C, when possible. A project resulting in LOS E or F is considered to have a significant, adverse impact. LOS results for the Bay Bridge on- and off-ramps were determined from methods described in Chapter 25 of the *2000 Highway Capacity Manual* for ramps and ramp junctions. The travel density, LOS and average speed for each existing ramp junctions is shown in Table 2.

Figure 2 presents the volumes and ramp configuration and their associated capacities in the westbound and eastbound directions during both the morning and evening peak hours. The capacity of the existing westbound on-ramps is assumed to be 330 vph. This value was developed based on a combination of the highest volume measured and gap analysis, as documented in the *Disposal and Reuse of Naval Station Treasure Island, Administrative Final Environmental Impact Statement, September 2002*. The capacity of the mainline was assumed to be 1900 vphpl (vehicles per hour per lane) based on measured data and methods for field conditions adjustments outlined in the *HCM 2000, Chapter 22, Basic Freeway Segments*. The

capacity of the existing eastbound off-ramps are assumed to be 1800 vph in accordance with *HCM 2000, chapter 25, Ramps and Ramp junctions, exhibit 25-3 Approximate Capacity of Ramp Roadways*. The capacity of the proposed diagonal on- and off-ramps was also assumed to be 1500 vph and 1800 vph, respectively, based on free-flow speed. The capacity of the proposed loop on-ramp is assumed to be 1200 vph based on free-flow speed.

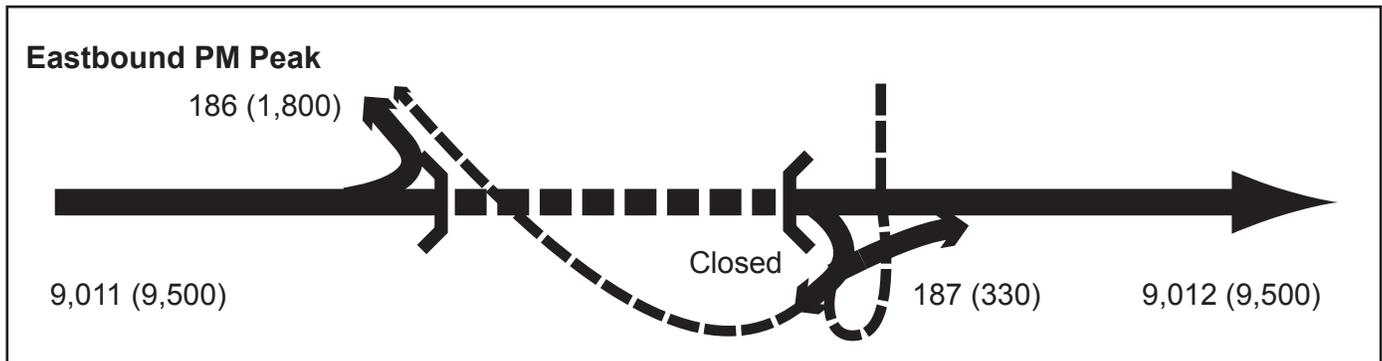
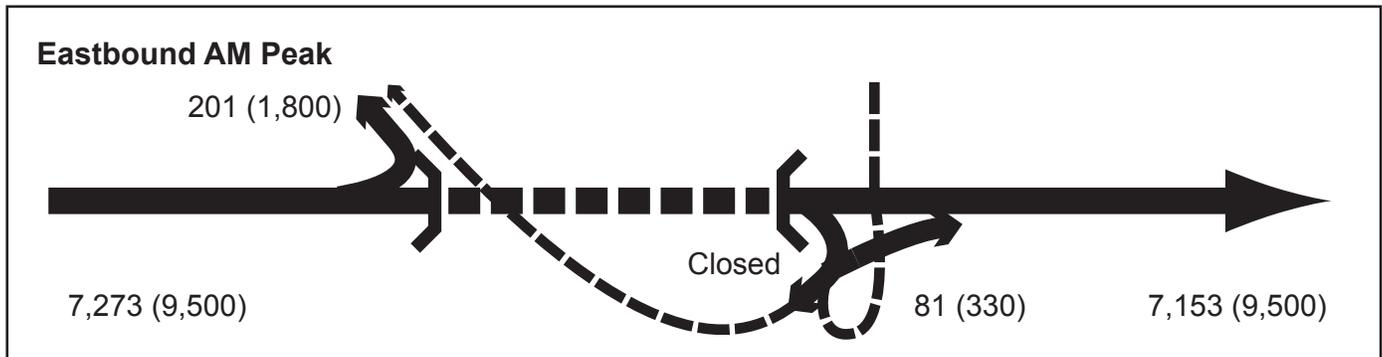
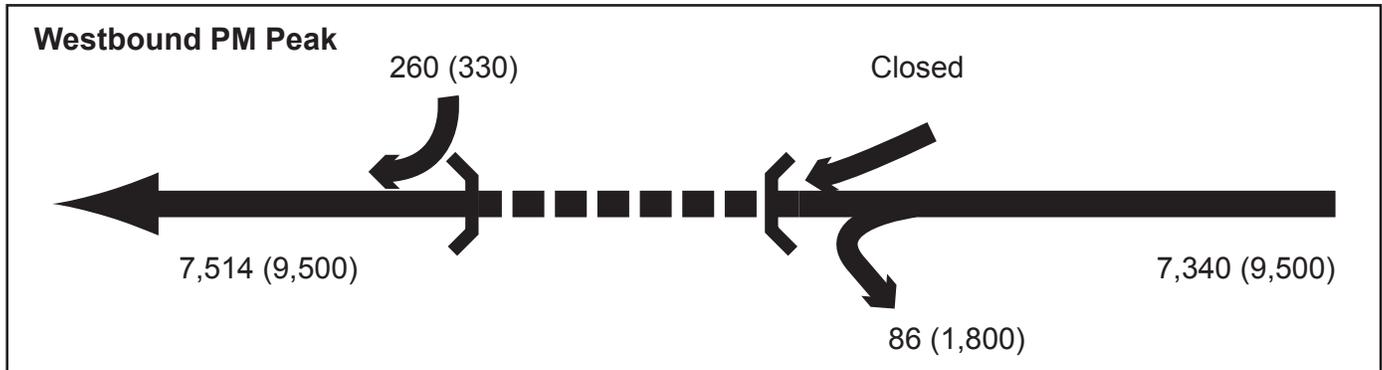
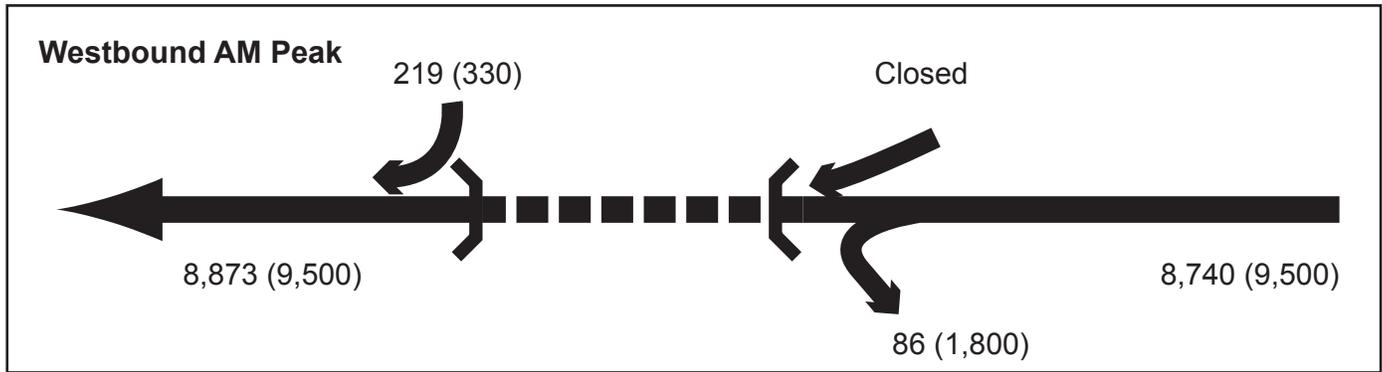
Table 2 – Existing Ramp Junction Analysis

| | Existing AM | | | Existing PM | | |
|--------------------|-------------|---------|-------|-------------|---------|-------|
| | LOS | Density | Speed | LOS | Density | Speed |
| Westbound | | | | | | |
| Off-Ramp to TI (L) | D | 28 | 65 | C | 25 | 65 |
| On-Ramp from TI | D | 31 | 56 | D | 27 | 59 |
| On-Ramp from TI | D | 31 | 58 | D | 28 | 61 |
| Eastbound | | | | | | |
| Off-Ramp to TI (L) | C | 25 | 65 | D | 31 | 65 |
| Off-Ramp to TI | C | 25 | 62 | D | 30 | 59 |
| On-Ramp from TI | D | 27 | 61 | D | 34 | 56 |

Note:

1. TI represents Treasure Island.
2. (L) represents the ramp is on the left-hand side of the freeway.
3. LOS calculation are from the HCM analysis

Existing (2008) Peak-Hour Volume



1. The volume and capacity are shown as xx (yy).
2. Bay Bridge westbound traffic volumes are controlled by metering lights during both the AM and PM peak periods, and Caltrans sets a limit of 9,600 vehicles per hour onto the Bay Bridge.
3. Bay Bridge eastbound capacity is constrained by the ramps and mainline configuration near First Street. The highest volume counted between 2005 and 2007 was approximately 9,500 vehicles per hour.



3.0 FUTURE 2035 CONDITION ANALYSIS

The future 2035 condition operation analysis considers the 20 year growth following the completion of the YBI Ramps project. The future traffic demand for the Bay Bridge was evaluated for the following scenarios:

- 2035 No Build Condition
- 2035 Build Condition
- 2035 Build Condition with Ramp Metering

Future traffic demand volumes for the Treasure Island project and the Bay Bridge were estimated using two different methods and then integrated to ensure consistency. Future demand volumes for the Treasure Island project were estimated based on the proposed land use program for the *Treasure Island and Yerba Buena Island Redevelopment Plan (TIYBIRP)* based on a full build-out of the Treasure Island baseline redevelopment project, but without its enhanced Travel Demand Management (TDM) measures or any of its proposed transit service improvements. The demand analysis also does not consider any of the constraining effects of the ramp metering. The redevelopment project proposes a number of TDM measures (including congestion pricing, residential transit subsidies, bicycle sharing, etc.) and a high level of transit service during peak hours, including:

- New ferry service to San Francisco every 10 minutes
- New bus service to Downtown Oakland every 7 minutes
- Maintenance of the existing bus service to the Transbay Terminal (Muni Route 108-Treasure Island) in San Francisco every 5 minutes
- New bus service to the San Francisco Civic Center area every 12 minutes

The level of transit supply and TDM measures are expected to result in a substantial shift from automobile transit to use of the new transit supply. However, funding and/or operating details for all of this service has not yet been resolved. Therefore, the transportation analysis for the Yerba Buena Island Ramps Project is based on a scenario with limited TDM measures (no congestion pricing, for example) and the following reduced transit service assumptions:

- New ferry service to San Francisco every 50 minutes
- New bus service to Downtown Oakland every 7 minutes
- Maintenance of the existing bus service to the Transbay Terminal (Muni Route 108-Treasure Island) in San Francisco every 15 minutes
- No new bus service to the San Francisco Civic Center area every 12 minutes

As a result, the Yerba Buena Island Ramps study is based on the assumption of a substantially reduced transit supply, from what is ultimately proposed by the full Treasure Island project with TDM measures. The analysis included in this study, represents a worst-case scenario in terms of peak hour vehicle trips, using the proposed ramps.

Future demand volumes for the Bay Bridge were based on the MTC's travel forecasting model for the morning peak hours and San Francisco County Transportation Authority's (SFCTA)

travel forecasting model for the evening peak hours. Two different travel demand models were used because the MTC model was not validated for the evening peak period. In the following sections, both forecasting methods and integration procedures for the future traffic demand, as well as future bay bridge volumes, are discussed. Also, the performance results of the base condition alternatives are described.

3.1 Future 2035 Traffic Volumes on the Bay Bridge

Future traffic volumes for the Bay Bridge mainline were estimated using the MTC’s travel forecasting model (BAYCAST 2009 RTP) for the morning peak hours and using the SFCTA’s travel forecasting model (Champ 3.2) for the evening peak hours. Table 3 summarizes existing mainline volumes as well as future demand for year 2035. These results were documented and approved in the traffic forecasting report dated December 2008. It was estimated that approximately 18% of total traffic will be High Occupancy Vehicles (HOV).

Table 3 – Approach Existing and Future Traffic Volumes

| | Existing (2008) | No Build |
|--------------------------------------|-----------------|-----------------------|
| | | Future Volumes (2035) |
| <i>Eastbound (SF approach)</i> | | |
| AM Demand | 8,557 | 8,769 |
| AM Volumes | 7,273 | 8,769 |
| PM Demand | 10,402 | 12,002 |
| PM Volumes | 9,011 | 9,500 |
| <i>Westbound (East Bay approach)</i> | | |
| AM Demand | 12,652 | 16,385 |
| AM Volumes | 8,740 | 9,500 |
| PM Demand | 9,087 | 10,462 |
| PM Volumes | 7,340 | 9,500 |

Note:

1. AM peak hour demands were based on the MTC model and PM peak hour demands were based on the SFCTA’s model.
2. 2008 volumes are 85 percentile volumes obtained from the PeMS database.

3.2 Future 2035 Condition Analysis

The 2035 No Build Condition consists of future 2035 traffic volumes with the TI/YBI development project, existing ramp configurations and their respective capacities. Figure 3 illustrates the future 2035 peak hour traffic demand volumes, in both directions of travel, ramp configurations, and capacities. During the morning peak hour period, the Bay Bridge mainline demand volumes will reach 10,054 and 8,769 vehicles per hour in the westbound and eastbound directions, respectively. The evening peak hour mainline demand volumes are expected to reach 10,030 and 9,750 vehicles per hour in the westbound and eastbound directions, respectively. However, these demand volumes will be constrained to 9,500 vph in both directions.

Table 4 summarizes results of the future No Build ramp junction analysis. The No Build condition yields a lower LOS as compared to the existing condition. In addition, the No Build condition will yield lower average speeds ranging from 38 mph – 50 mph as compared to 56 mph – 65 mph in the

existing condition. The capacity for both westbound on-ramps are 330 vph for this scenario. Since the demand volumes exceed this capacity, delays and queues will be expected on the island.

Table 4 – 2035 Future No Build Ramp Junction Analysis

| | Future 2035 No Build AM | | | Future 2035 No Build PM | | |
|--------------------|-------------------------|---------|-------|-------------------------|---------|-------|
| | LOS | Density | Speed | LOS | Density | Speed |
| Westbound | | | | | | |
| Off-Ramp to TI | F | 49 | 40 | F | 47 | 47 |
| On-Ramp to TI | F | 49 | 38 | F | 48 | 45 |
| On-Ramp from TI | E | 41 | 45 | E | 41 | 47 |
| Eastbound | | | | | | |
| Off-Ramp to TI (L) | D | 34 | 50 | E | 37 | 50 |
| Off-Ramp to TI | D | 33 | 49 | D | 33 | 48 |
| On-Ramp from TI | E | 40 | 48 | E | 40 | 48 |

Note:

1. TI represents Treasure Island.
2. (L) represents the ramp is on the left-hand side of the freeway.
3. Assumes no ramp metering

The 2035 Build Condition assuming no constraints (ramp metering) consists of the same 2035 traffic volumes used in the No Build scenario. The westbound off-ramp on the left side is replaced with an off-ramp on the right side and the on-ramp east of tunnel is modified to improve the geometry. Figure 4 illustrates the future 2035 Build condition peak hour traffic demand volumes, in both directions of travel, ramp configurations, and capacities. In addition to modifications of the ramps east of the tunnel, the westbound on-ramp west of tunnel will be reserved exclusively for buses and emergency vehicles. The existing configuration of the off-ramps in the eastbound direction will remain unchanged. Table 5 summarizes results the 2035 Build condition for the ramp junctions. Compared to the No Build condition, average operating speeds on the SFOBB are lower for the Build condition. This is due to the increased capacity of the new on-ramp on the east side compared to the old, 1200 vph versus 330 vph. Most of the westbound on-ramp traffic is allowed to enter the mainline unimpeded. Subsequently, there is no on-ramp queuing for this scenario.

Table 5 – Future 2035 Build Ramp Junction Analysis

| | Future 2035 Build AM | | | Future 2035 Build PM | | |
|--------------------|----------------------|---------|-------|----------------------|---------|-------|
| | LOS | Density | Speed | LOS | Density | Speed |
| Westbound | | | | | | |
| Off-Ramp to TI (R) | F | 53 | 36 | F | 49 | 46 |
| On-Ramp from TI | F | 45 | 42 | E | 45 | 47 |
| On-Ramp from TI | E | 40 | 47 | E | 40 | 47 |
| Eastbound | | | | | | |
| Off-Ramp | D | 34 | 50 | E | 37 | 50 |
| Off-Ramp to TI | D | 33 | 49 | D | 33 | 48 |
| On-Ramp from TI | E | 40 | 49 | E | 40 | 49 |

Note:

1. TI represents Treasure Island.
2. (L) represents the ramp is on the left-hand side of the freeway.
3. Assumes no ramp metering

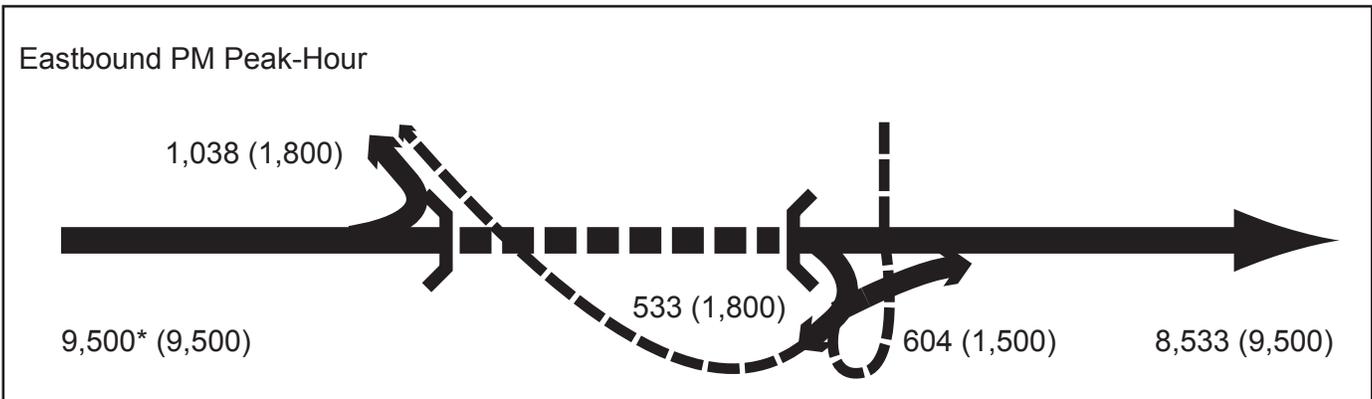
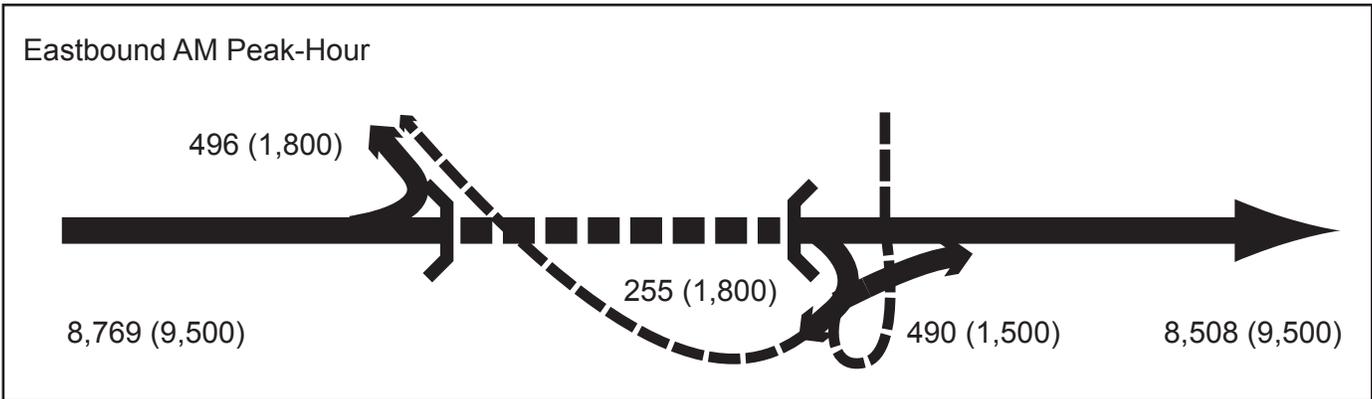
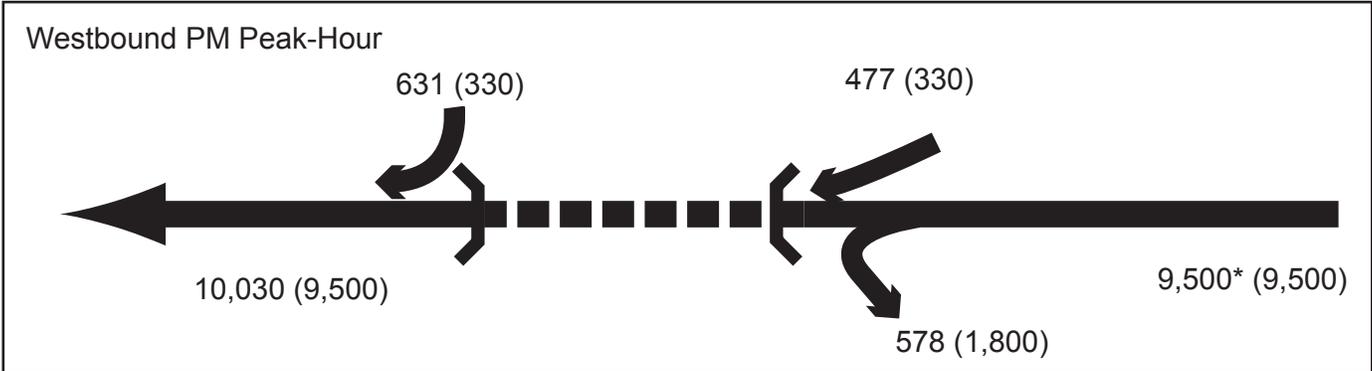
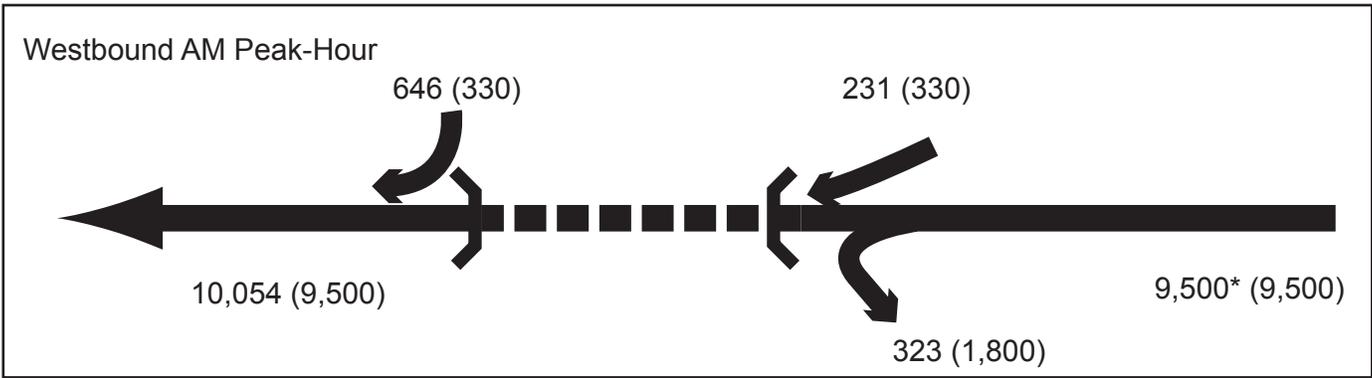
3.3 Ramp Metering

Caltrans will require ramp metering for the westbound on-ramp on the east side of the island. Based on extensive coordination and discussions with Caltrans staff, it was determined that the methodology used to set the metering rate for the westbound on ramp will be based on the amount of traffic exiting the Bay Bridge mainline at the off-ramp. Therefore, for the purpose of this study, the westbound on-ramp metering rate should be approximately 323 vph and 578 vhp in the AM and PM peak periods, respectively. It was also noted that ultimately, Caltrans Bay Bridge Operations will use a combination of mainline and ramp metering rates. In other words, there might be times when Caltrans deemed appropriate to lower the allowable limit entering the mainline to increase the metering rate of the ramps, and vice-versa. Under the 2035 Build Condition with ramp metering, long delays and queues will be expected on the island.

4.0 CONCLUSION

The main objective of this analysis is to evaluate the impact of the proposed westbound Yerba Buena Island ramps on the Bay Bridge in the design year. Based on the future 2035 traffic operational analysis of the Bay Bridge, it was determined that the YBI Ramps project with ramp metering will not adversely affect the operations of the Bay Bridge and the associated local road network on Treasure Island and Yerba Buena Island.

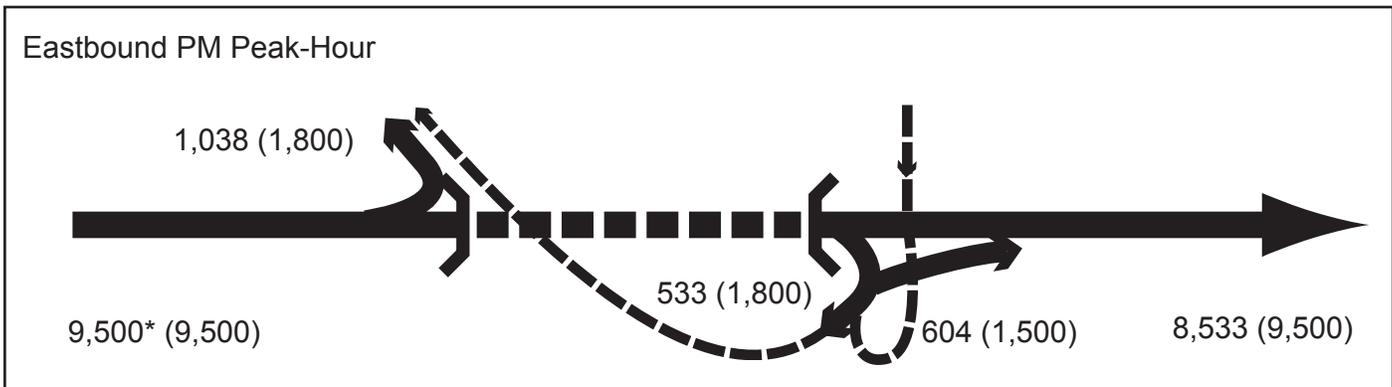
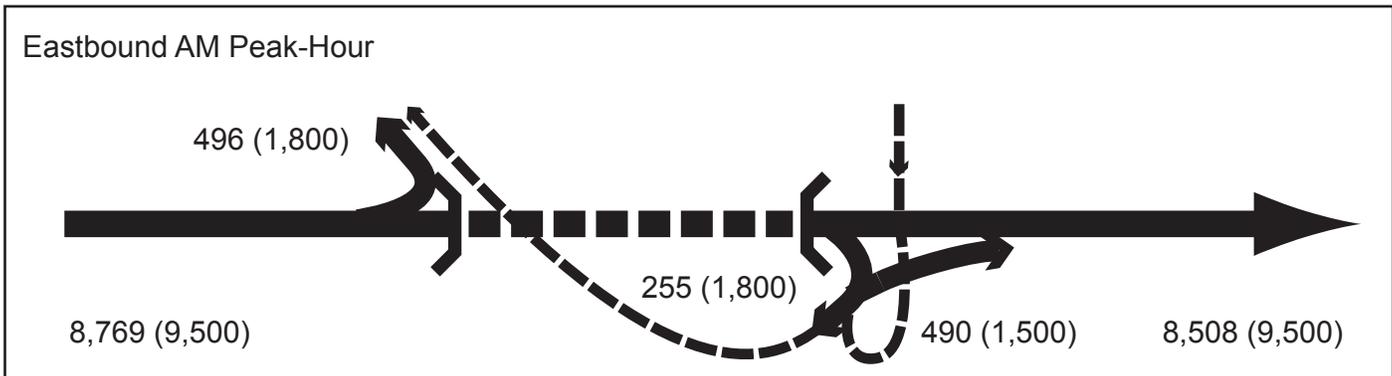
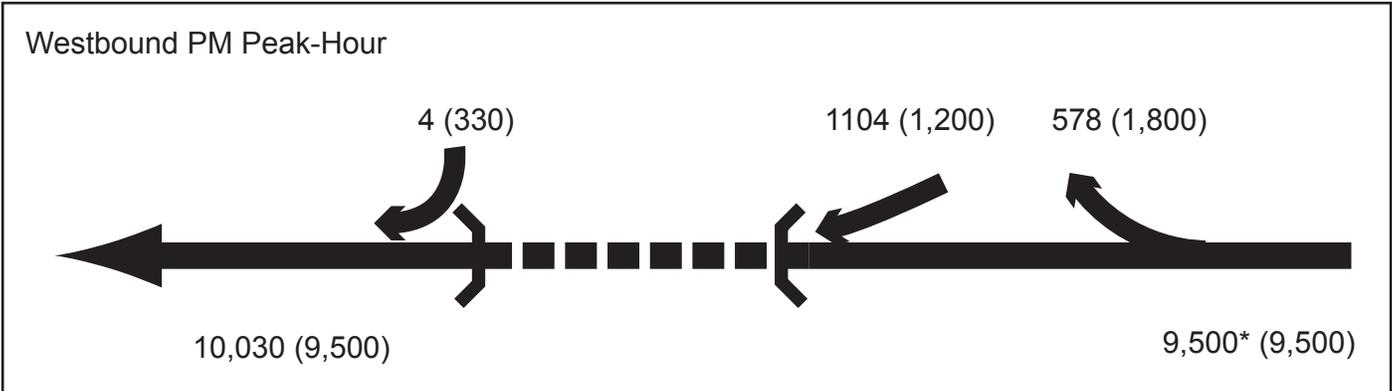
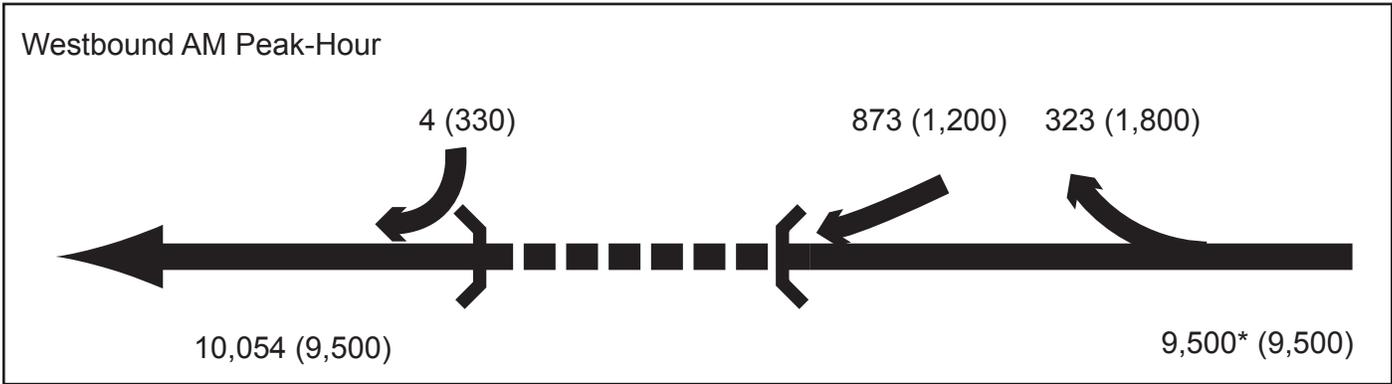
Future (2035) No Build



1. The demand volume and capacity are shown as xx (yy).
 2. In future scenario, there would be 4 bus trips to San Francisco and 9 bus trips from Oakland.
- * Constrained Volumes



Future (2035) Build



1. The demand volume and capacity are shown as xx (yy).
 2. In future scenario, there would be 4 bus trips to San Francisco and 9 bus trips from Oakland.
- * Constrained Volumes

