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MEMORANDUM

To: Preserve@pacifica, LLC
SWA Group

From: Nelson\Nygaard

Date: August 31, 2016

Subject: Pacifica Quarry Development Project Travel Demand Estimation and Traffic Analysis

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This technical transportation memorandum presents the estimated travel demand and traffic impact analysis associated with the proposed development project in Pacifica, California. A detailed methodology and series of assumptions are included to provide substantiated reasoning of the travel demand results. Other traffic analyses will be prepared in response to other needs; for example, the City of Pacifica will likely prepare its own analysis of traffic issues pursuant to its CEQA responsibilities. This analysis is, accordingly, the first in a series examining important traffic issues.

PROJECT DESCRIPTION

The development project is located in Pacifica, California, west of Highway 1 and north of San Marlo Way. The project would comprise:

- 35,000 square feet of retail use
- 181 residential units
    - 72, 1-bedroom units
    - 72, 2-bedrooom units
    - 37, 3-bedroom units
- 25 live-work residential units (which may include office/commercial/tech space)
- 35,000 square feet of office (above retail)
- 200-room hotel with 13,000 square feet for a conference center space, including 12 bungalows
- A new unsignalized intersection along southbound Highway 1 (about 525 feet north of San Marlo Way); this intersection will provide right-in/right-out ingress and egress vehicle turning movements.

Highway 1 is the main vehicular access route to the project site and this stretch of highway currently experiences a considerable amount of vehicle traffic on a daily basis. The following includes a detailed travel demand estimation to determine the anticipated number of daily and

weekday peak-hour vehicle trips generated by the project and also includes a comparative review of the project travel demand and the travel demand associated with the current zoning for the project site. A detailed traffic analysis to evaluate the potential effects to intersection operations along Highway 1 and within the Rockaway Beach Area is also included.

PROJECT TRAVEL DEMAND

Methodology

Traffic trip generation was estimated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (9th Edition) and traffic counts completed at the project site and elsewhere. The ITE manual provides guidance on estimating traffic generation for various land use developments based on observations conducted across the United States. Although the data generated by the ITE are necessarily national in character, the project site is located in a relatively suburban area with limited access to other existing roadways and alternative modes of transportation; conditions that are similar to those sampled by the ITE analyses. Accordingly, the conservative (that is, relatively higher traffic generation rates) estimate for auto trips resulting from these national rates are applicable to the potential auto traffic demand associated with the development project. The ITE trip generation metrics were applied to the proposed residential, retail and office land uses; the hotel results were derived from both the ITE Manual and actual counts completed in the region at similar hotels (see below for more information).

For the hotel/resort component of the project, the project travel demand estimation was validated by site-specific analyses conducted by Nelson\Nygaard at comparable land-use developments in the San Francisco Bay Area. For example, Nelson\Nygaard collected 24-hour driveway counts at three hotel/resort locations: Ritz-Carlton in Half Moon Bay, Asilomar in Pacific Grove, and Chaminade in Santa Cruz as these would be comparable to the proposed hotel/resort at the project site. All three locations are situated in a central California coastal setting with limited vehicular access in and out of the site (i.e., there are only one or two roadways that provide access; unlike a hotel/resort located in an urbanized area with a street grid network). The driveway counts were conducted on Thursday, June 9, 2016, and the data included the total number of inbound and outbound vehicles at each location in 15-minute increments over the 24-hour period. By dividing the total number of daily and weekday peak-hour vehicle trips by the number of hotel/resort rooms, a vehicle trip rate was identified (number of trips per room). Daily and peak-hour trip rates from all three locations were averaged and applied to the proposed hotel/resort land use. Figure 1 presents these findings.

Figure 1: Comparable & Project Hotel – Daily and Peak Hour Vehicle Trip Generation Rates

Hotel/Resort	No. of Rooms	Daily Vehicle Trips	Daily Trip Rate	AM Peak Hour Vehicle Trips (IN/OUT)	AM Peak Hour Trip Rate	PM Peak Hour Vehicle Trips (IN/OUT)	PM Peak Hour Trip Rate
Ritz-Carlton (Half Moon Bay, CA)	262	3,147	12.01	252 (84/168)	0.96	243 (146/97)	0.93
Chaminade (Santa Cruz, CA)	156	1,072	6.87	79 (58/21)	0.51	87 (29/58)	0.56
Asilomar (Pacific Grove, CA	356	921	2.94	69 (33/36)	0.22	84 (40/44)	0.27
Proposed Hotel[1]	188	1,368	7.28	106 (55/51)	0.56	110 (52/58)	0.58

Note: 1. Trip generation does not account for the proposed 12 bungalows; the temporal use of these units would likely be sporadic in nature and thus, would not regularly generate vehicle trips on a weekly basis, as opposed to standard hotel/resort rooms.
Source: Nelson/Nygaard, 2016.

Internal/External Trip Capture

Mixed-use developments, such as the proposed project, generally shorten trips and thus allow what might otherwise be car trips to external destinations to become internal walking, cycling, or transit trips. Thus, a mixed-use development that generates a given number of total trips creates less demand on the external roadway network than single-use developments generating the same number of trips. For example, the development would include approximately 35,000 square feet of retail located within close proximity to the residential units, therefore a certain percentage of the residents (and their guests) will opt to bike or walk to these stores instead of driving. As a result, a percent reduction in total vehicle trips generated is applicable.

Trip reductions were calculated using the MXD+ method developed by Fehr & Peers, which is a combination of quantifiable methods to more accurately assess trip generation estimation for mixed-use developments; these quantifiable methods that form the basis for the MXD+ method were developed and sponsored by the U.S. Environmental Protection Agency (EPA) and Transportation Research Board (TRB). The MXD+ method uses ITE trip generation rates and then adjusts those estimates to account for the mix of uses and environmental characteristics (e.g., geographic layout of the site, land use in surrounding area, socioeconomic data, proximity to land uses and transportation resources, etc.)

In taking into account the internalization of person trips as well as external walking, biking, and transit trips (all of which reduce vehicle demand generation), the estimated vehicle trips are reduced by 9% to 10% to reflect internal/external trip capture as described above. However, this is a conservative estimation. The residential composition of the development project includes about 20% affordable units (about 36 units) and 25 units would be dedicated live-work units.[1] Affordable and live-work residential units result in fewer daily and peak-hour vehicle trips compared to more conventional residential units (e.g., single-family homes). However, much of the data on this reduction is from relatively urban settings that contain a moderate to high amount of transportation resources, such as adjacent or nearby public transit facilities (e.g., buses, light rail, commuter rail stations, stops, routes, etc.), bicycle facilities (dedicated bike routes, paths), and pedestrian pathways that link to nearby amenities and transportation facilities.

Due to the location of the development project, it is not reasonable to assume that a considerable proportion of future residents would forego their private auto for taking other alternative modes, primarily because the amount of nearby local-serving amenities is limited and not within walking or biking distance (e.g., within 0.50-mile distance for walking and 1-mile distance for biking).

Figure 2 presents the vehicle trip generation estimation for the project. The project will generate 4,221 daily vehicle trips; approximately 243 weekday morning (AM) peak hour trips (113 inbound and 130 outbound trips) and approximately 361 weekday evening (PM) peak hour trips (184 inbound and 177 outbound), respectively.

[1] A live-work unit is a space that combines workspace with living quarters.

Figure 2: Project Trip Generation Estimation

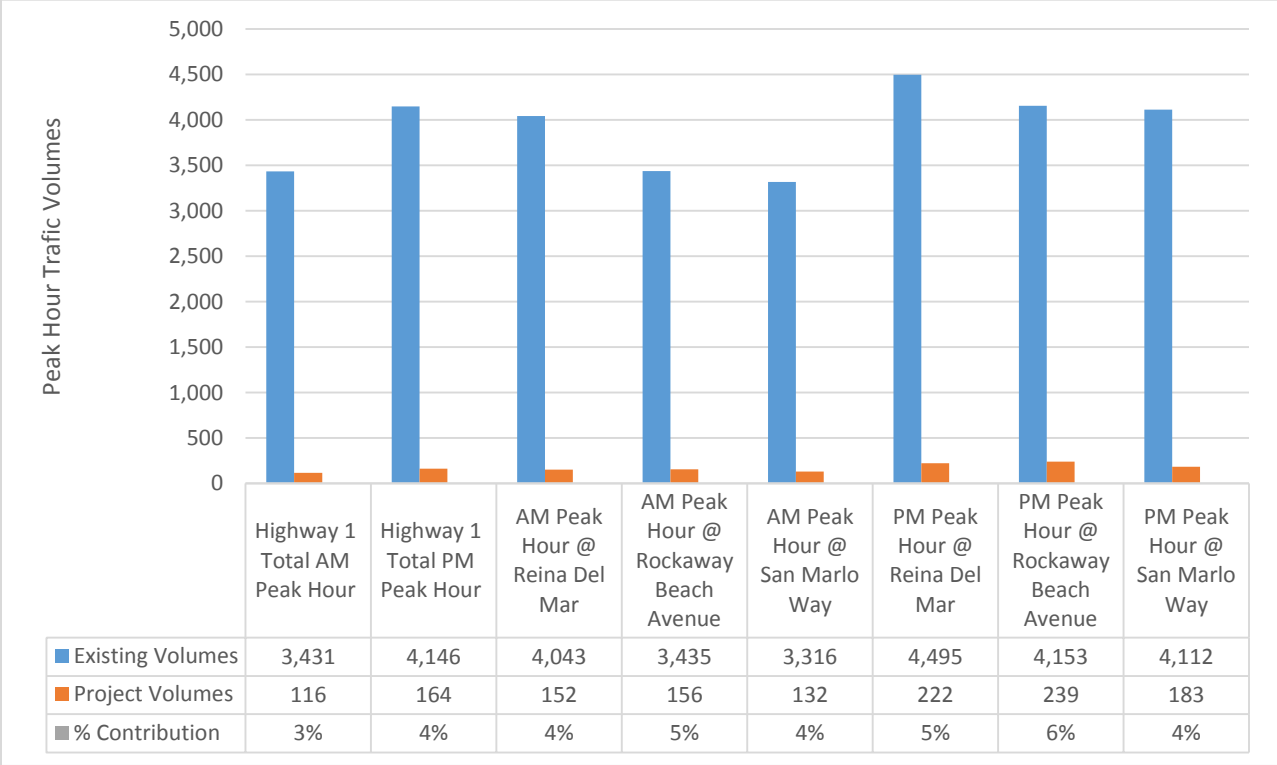
ITE Land Use Code & Rates[1]				Project	Project Trip Generation				
Use	Daily	AM	PM	Units/Rooms/ksf[3]	Daily	AM		PM	
						IN[1]	Out[1]	IN[1]	Out[1]
Low-Rise Apartment[5]	6.59	0.46	0.58	200 units	1,318	20	75	78	42
Resort Hotel[6]	7.28	0.56	0.58	188 rooms[2]	1,368	55	51	52	58
Retail[5]	42.70	0.96	3.71	35 ksf[3]	1,495	21	13	62	68
Office[5]	11.95	1.02	1.21	35 ksf[3]	418	30	6	13	29
Unadjusted Total Vehicle Trips					4,639	126	145	205	197
Internal/External Trip Capture Percentage (%)[4]					-9%	-10%		-9%	
Calculated Trip Reduction[4]					-418	-13	-15	-21	-20
Adjusted Total Vehicle Trips[4]					4,221	113	130	184	177

Notes:
1. Inbound/Outbound trip distribution based on ITE Trip Generation, 9th Edition and actual in/out counts at comparable hotel/resort locations.
2. Does not account for number of rooms occupied and does not include 12 bungalows (see footnote in Figure 1).
3. "ksf" = 1,000 gross square feet of development.
4. Trip Reduction based on MXD+ Model to account for internal/external trip capture.
5. Land Use and metrics based on ITE Trip Generation, 9th Edition.
6. Land Use and metrics based on aggregated daily/peak hour count data collected at comparable locations.

Project Travel Demand v. Current Traffic Loads

The following provides a quantitative review and comparative analysis of projected travel demand associated with the project relative to existing traffic levels along Highway 1 and specific intersections along Highway 1 that would be primary access points in/out of the project site. Figure 3 summarizes these findings.

Figure 3: Project Travel Demand v. Current Traffic Loads: Weekday AM & PM Peak Hours



	Highway 1 Total AM Peak Hour	Highway 1 Total PM Peak Hour	AM Peak Hour @ Reina Del Mar	AM Peak Hour @ Rockaway Beach Avenue	AM Peak Hour @ San Marlo Way	PM Peak Hour @ Reina Del Mar	PM Peak Hour @ Rockaway Beach Avenue	PM Peak Hour @ San Marlo Way
Existing Volumes	3,431	4,146	4,043	3,435	3,316	4,495	4,153	4,112
Project Volumes	116	164	152	156	132	222	239	183
% Contribution	3%	4%	4%	5%	4%	5%	6%	4%

Based on the findings above, the project would contribute about 3% - 6% to existing traffic volumes, which is within the daily fluctuation of typical daily traffic. Therefore, such an increase in traffic would not be noticeable and/or measurable to other drivers on Highway 1, or at specific intersections.

Comparative Analysis: Proposed Project v. Current Zoning

Site-specific analyses were also carried out at the Linda Mar Center, a local commercial development. The current zoning for the project site is for commercial uses, potentially up to 850,000 square feet of "Visitor Commercial" and as much as 1,275,000 square feet of "Business Commercial" for a total of 2,125,000 square feet, based on the *Rockaway Specific Plan*. The data from Linda Mar Center then allows a comparative review of travel demand associated with current zoning at the project site and the proposed project.

The Linda Mar Center is located 1.1 miles south of the project site and includes approximately 204,000 square feet of retail development (about 10% of the total potentially allowable on the project site). This suburban strip-mall is occupied by various retail stores, a bank, a fast-food restaurant (McDonald's) and a Safeway grocery store. Vehicle driveway counts were collected on Tuesday, June 14, 2016 over a 24-hour period at all four driveway locations. The number of inbound and outbound vehicles at the McDonald's driveway were discounted from the overall calculations, as these vehicles were in the drive-thru lane and are not representative of other vehicles trips traveling in and out of the retail area (i.e., vehicles associated with other uses in the strip-mall drove into the center, parked for a considerable amount of time, then exited the center;

whereas the majority of McDonald's patrons drove into the drive-thru and proceeded to exit within a few minutes).

Using this data, a daily and peak-hour vehicle trip generation rate was identified, which is calculated by dividing the number of daily/peak-hour trips by the total square footage of the development. As standard practice, the trip generation rate is represents the average number of vehicles per 1,000 gross square feet of development. These rates were then applied to the commercial/retail zoning for the project site to determine estimated travel demand. Figure 4 presents the daily vehicle travel demand at the Linda Mar Center.

Figure 4: Linda Mar Center – Daily and Peak Hour Vehicle Trip Generation Rates

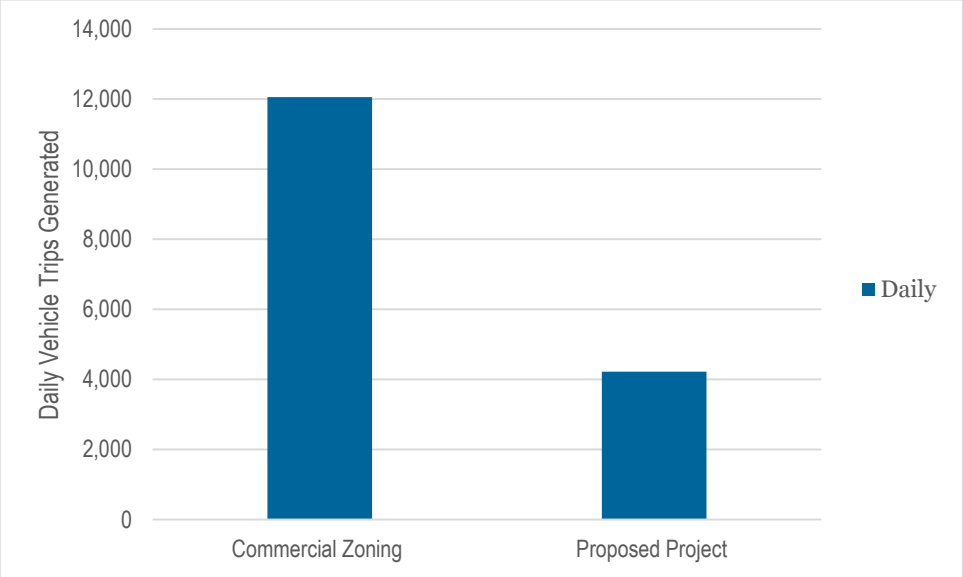
Land Use	Size (gross square feet)	Daily Vehicle Trips	Daily Trip Rate	AM Peak Hour Vehicle Trips (In/Out)	AM Peak Hour Trip Rate	PM Peak Hour Vehicle Trips (In/Out)	PM Peak Hour Trip Rate
Linda Mar Center	204,000	12,873	60.27	500 (327/173)	2.5	1,070 (550/520)	5.2

Source: Nelson/Nygaard, 2016.

As shown in Figure 4, above, the current Linda Mar Center generates a considerable amount of vehicle trips during a typical weekday, and assuming that the project site would include a larger amount of commercial/retail uses (up to 2,125,000 square feet), the site under current zoning and at full buildout would also generate a considerable amount of vehicle traffic, respectively.

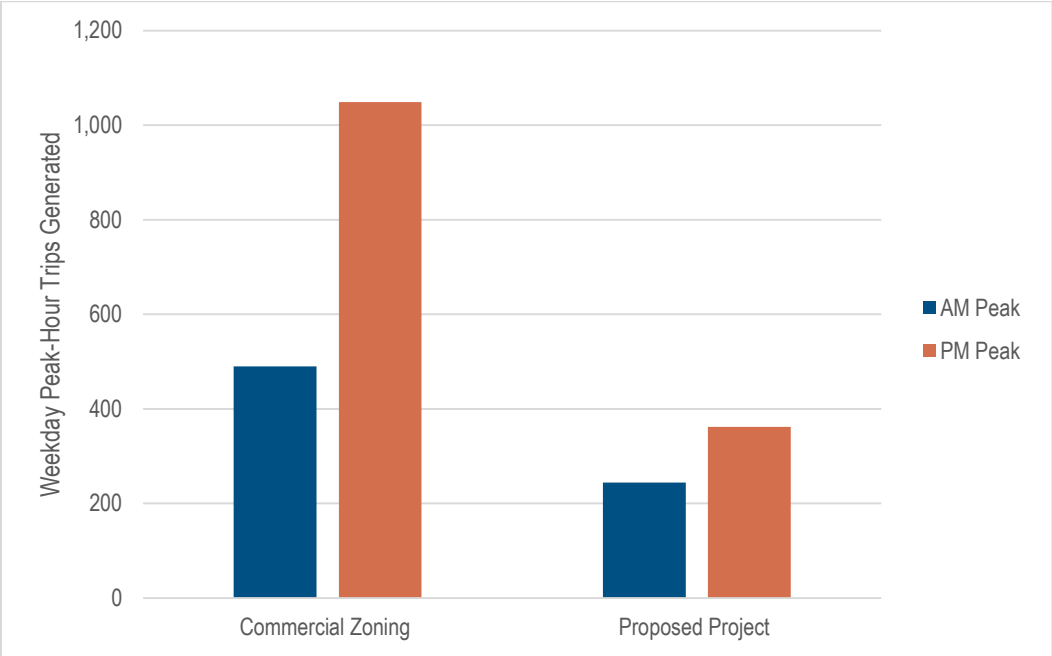
Figure 5 illustrates the daily trip generation between an alternative project of only 200,000 square feet of commercial/retail uses at the project site and the proposed project. As shown, if the project site were to continue to be zoned for commercial/retail, this area would generate much more vehicle traffic on a daily and peak-hour basis relative to the proposed project even for this relatively limited example.

Figure 5: Commercial Zoning w/200ksf v. Proposed Project: Weekday Daily Vehicle Trip Generation



As shown in Figure 6, the proposed project would generate 30% of the total daily vehicle trips (that is, traffic) generated under current zoning for a 200,000 square foot project; about 50% of total weekday AM peak hour traffic generated under current zoning; and about 40% of total weekday PM peak hour traffic under current zoning.

Figure 6: Commercial Zoning w 200ksf v. Proposed Project: Weekday Peak-Hour Vehicle Trip Generation



Based on these findings, the proposed project would not generate nearly as much daily and peak-hour vehicle trips as a project on the same site with 200,000 square feet of commercial/retail development. Therefore, it is reasonable to assume that the proposed project would generate much less traffic in the Rockaway Beach Area and along Highway 1 than a similarly-sized project consistent with current zoning. The following provides a detailed analysis of potential traffic effects related to the proposed project.

TRAFFIC ANALYSIS

This memorandum provides a comprehensive and concise evaluation of potential project-related traffic effects to the existing roadway network in Rockaway Beach, and its environs, including Highway 1. An assessment of current traffic conditions, including background information and analysis approach, methodology and assumptions is also included.

In order to assess traffic conditions within the project environs, vehicle trips were estimated based on the trip generation rates and vehicle distribution data from the *Institute of Transportation Engineers Trip Generation Manual*, 9th Edition (ITE, 2012) and actual vehicle trip count data, as previously described in this memorandum. Existing weekday morning (AM) and evening (PM) peak-hour traffic counts at the following 7 study intersections were collected on Thursday, June 9, 2016. No precipitation or otherwise inclement weather was recorded on the collection dates and it is noted that the traffic data was collected during a normal weekday, when

public schools were still in session; therefore, the data reflects existing conditions in and around the Rockaway Beach Area. The study intersections are below:

1. Highway 1 at Reina Del Mar Avenue
2. Highway 1 at San Marlo Way
3. Highway 1 at Rockaway Beach Avenue-Fassler Avenue
4. Old County Road at San Marlo Way
5. Dondee Street at San Marlo Way
6. Old County Road at Rockaway Beach Avenue
7. Dondee Street at Rockaway Beach

The majority of the above-listed study intersections are unsignalized and are STOP-controlled. The intersections of Highway 1 at Reina Del Mar and Rockaway Beach Avenue-Fassler Avenue are signalized. Current signal timing data sheets were provided by Caltrans District 4 staff.

Existing vehicle traffic conditions were evaluated along selected study intersections. Intersection conditions were evaluated for all intersection control types using methods documented in the Transportation Research Board (TRB) *Highway Capacity Manual* (HCM 2010). As well, note that there will be a new intersection located between San Marlo Way and Reina Del Mar Avenue.

Intersection delays are based on the observed "peak hour", which is typically defined as the one continuous hour of peak traffic flow counted within the two-hour period in the morning and afternoon during the weekday. Intersection delay is determined based on average vehicle delay (in seconds). Existing lane configurations and signal timings (as described) along with existing vehicle turning movement counts were included in the traffic analysis. The Synchro 9 (Trafficware) software suite was used to implement the HCM 2000/2010 intersection analysis methodologies. Analysis methodologies, standards and traffic impact thresholds established by the City of Pacifica and Caltrans was applied to the traffic analysis.

During the AM peak hour, the Highway 1/Reina Del Mar Avenue intersection would operate at delays approaching 2 minutes, primarily due to the substantial vehicle delays and queues along westbound right-turning movements along Reina Del Mar Avenue. Although few vehicles are traveling eastbound along Quarry Road, the current signal timing at this intersection does not allow adequate green time to allow these eastbound vehicles to clear the intersection and therefore, these vehicles are also experiencing a substantial amount of delay and this in combination with congestion in the westbound direction degrades intersection operation conditions to unacceptable levels.

Figure 7: Existing Weekday AM and PM Peak Hour – Intersection Conditions

Intersection	Control[1]	Peak Hour	Delay (sec)[2]
1. Highway 1 / Reina Del Mar Avenue	Signal	AM	114.5
		PM	57.9
2. Highway 1 / San Marlo Way	SSSC	AM	0.0
		PM	33.5
3. Highway 1 / Rockaway Beach Avenue-Fassler Avenue	Signal	AM	61.2
		PM	60.0
4. Old County Road / San Marlo Way	SSSC	AM	9.1 (EB)
		PM	9.5 (EB)
5. Dondee Street / San Marlo Way	SSSC	AM	8.9 (EB)
		PM	9.1 (EB)
6. Old County Road / Rockaway Beach Avenue	TWSC	AM	10.4 (WB)
		PM	11.6 (WB)
7. Dondee Street / Rockaway Beach Avenue	TWSC	AM	9.5 (WB)
		PM	10.7 (WB)

Notes:
1. Signal = Signalized intersection; TWSC = Two-Way STOP-Controlled intersection; SSSC = Side-Street STOP-Controlled intersection.
2. Intersection average vehicle delay for TWSC and SSSC intersections is only for the STOP-controlled movement (e.g., WB = Westbound, EB = Eastbound). The highest vehicle delay per STOP-controlled movement is presented in the table.
Source: Nelson\Nygaard, 2016.

Project Trip Distribution and Assignment

Project-generated vehicle trip distribution and assignment were based on existing travel patterns, roadway access and classification in proximity to the project site. Due to limited roadway and vehicular access locations to the project site, all inbound and outbound vehicle trips from the project site would enter/exit at four "gateway" intersections along Highway 1: Reina Del Mar Avenue, San Marlo Way, Rockaway Beach Avenue, and the new intersection located between San Marlo Way and Reina Del Mar Avenue. The analysis assumed an overall trip distribution of a 50%-50% split between vehicles traveling to and from the site and originating north of, and south of the project site along Highway 1 (that is, half of the project trips would be traveling to/from north of the project site and the other half would be traveling to/from south of the project site).

The analysis assumed that hotel and residential-generated vehicle trips would travel in and out of the intersection of Highway 1 and Reina Del Mar Avenue (Quarry Road), as vehicle access along Quarry Road would only be permitted by residents and hotel employees and guests. All vehicle trips from retail uses would access the project site via San Marlo Way and Rockaway Beach Avenue and then traverse along local streets in the Rockaway Beach area. The majority of residents traveling southbound along Highway 1 would utilize the new intersection along Highway 1; about 75% of the residents traveling northbound along Highway 1 would use

Rockaway Beach Avenue to access the project site and the remaining 25% would continue along Highway 1 and use Quarry Road, respectively.

Traffic Analysis

This section includes a detailed description of existing traffic conditions at area intersections and also provides an evaluation of traffic conditions with additional project-generated trips under existing conditions.

Figure 8 presents intersection conditions under existing conditions and under existing plus project conditions. Under existing plus project conditions, the intersection of Highway 1 at Reina Del Mar Avenue would continue to operate at high average vehicle delays during the AM peak hour. During the PM peak hour, the intersections of Highway 1 at Reina Del Mar Avenue, Highway 1 at San Marlo Way, Highway 1 at Rockaway Beach Avenue-Fassler Avenue, and the new project intersection along Highway 1 would operate at higher average vehicle delays .

Figure 8: Existing and Existing Plus Project Weekday AM and PM Peak Hour – Intersection Conditions

Intersection	Control[1]	Peak Hour	Existing	Existing+Project
			Delay (sec)[2]	Delay (sec)[2]
1. Highway 1 / Reina Del Mar Avenue	Signal	AM	114.5	181.0
		PM	57.9	110.2
2. Highway 1 / San Marlo Way	SSSC	AM	0.0	13.3
		PM	33.5	39.8
3. Highway 1 / Rockaway Beach Avenue-Fassler Avenue	Signal	AM	61.2	78.9
		PM	60.0	96.7
4. Old County Road / San Marlo Way	SSSC	AM	9.1 (EB)	10.0 (EB)
		PM	9.5 (EB)	11.6 (WB)
5. Dondee Street / San Marlo Way	SSSC	AM	8.9 (EB)	8.8 (EB)
		PM	9.1 (EB)	9.0 (EB)
6. Old County Road / Rockaway Beach Avenue	TWSC	AM	10.4 (WB)	11.0 (WB)
		PM	11.6 (WB)	13.5 (WB)
7. Dondee Street / Rockaway Beach Avenue	TWSC	AM	9.5 (WB)	9.5 (WB)
		PM	10.7 (WB)	10.7 (WB)
8. New Project Intersection @ Highway 1	SSSC	AM	n/a	14.3 (EB)
		PM	n/a	49.4

Notes:
1. Signal = Signalized intersection; TWSC = Two-Way STOP-Controlled intersection; SSSC = Side-Street STOP-Controlled intersection.
2. Intersection average vehicle delay for TWSC and SSSC intersections is only for the STOP-controlled movement (e.g., WB = Westbound, EB = Eastbound). The highest vehicle delay per STOP-controlled movement is presented in the table.
Shaded cell indicates a "significant traffic impact".
Source: Nelson\Nygaard, 2016.

Potential Traffic Improvement Measures

To reduce these potential traffic impacts, the following traffic improvement measures are recommended:

AM Peak Hour Conditions

- Highway 1 at Reina Del Mar Avenue: increasing the signal timing 140 seconds and optimizing the split-phasing for eastbound and westbound movements would reduce the average vehicle delay from 3.02 minutes to 1.25 minutes, a decrease in wait time from existing conditions of almost 40 seconds (about 0.65 minutes).

PM Peak Hour Conditions

- Highway 1 at Reina Del Mar Avenue: increasing the signal timing 140 seconds and optimizing the split-phasing for eastbound and westbound movements would reduce the average vehicle delay from nearly 2 minutes to less than 1 minute (56.8 seconds).
- Highway 1 at Rockaway Beach Avenue-Fassler Avenue: the eastbound leg of the intersection (Rockaway Beach Avenue) includes adequate capacity to include two eastbound traffic lanes. Striping these lanes to one, exclusive left-turn lane and one shared left-through-right turn lane would provide more capacity for vehicle queues. This striping of the eastbound leg combined with optimization of split-phasing for the eastbound and westbound movements would reduce average vehicle delay from 1.5 minutes to 41.5 seconds.

Traffic Mitigation Program. We recommended that the Owner consider additional traffic mitigation and monitoring methods and select from those to optimize future traffic conditions with the project. Specifically, addressing signalization with CalTrans and the City of Pacifica can provide immediate and long-term reduction of existing and future intersection delays. Additionally, analyses of ride-share, mass transit and other options should be addressed.