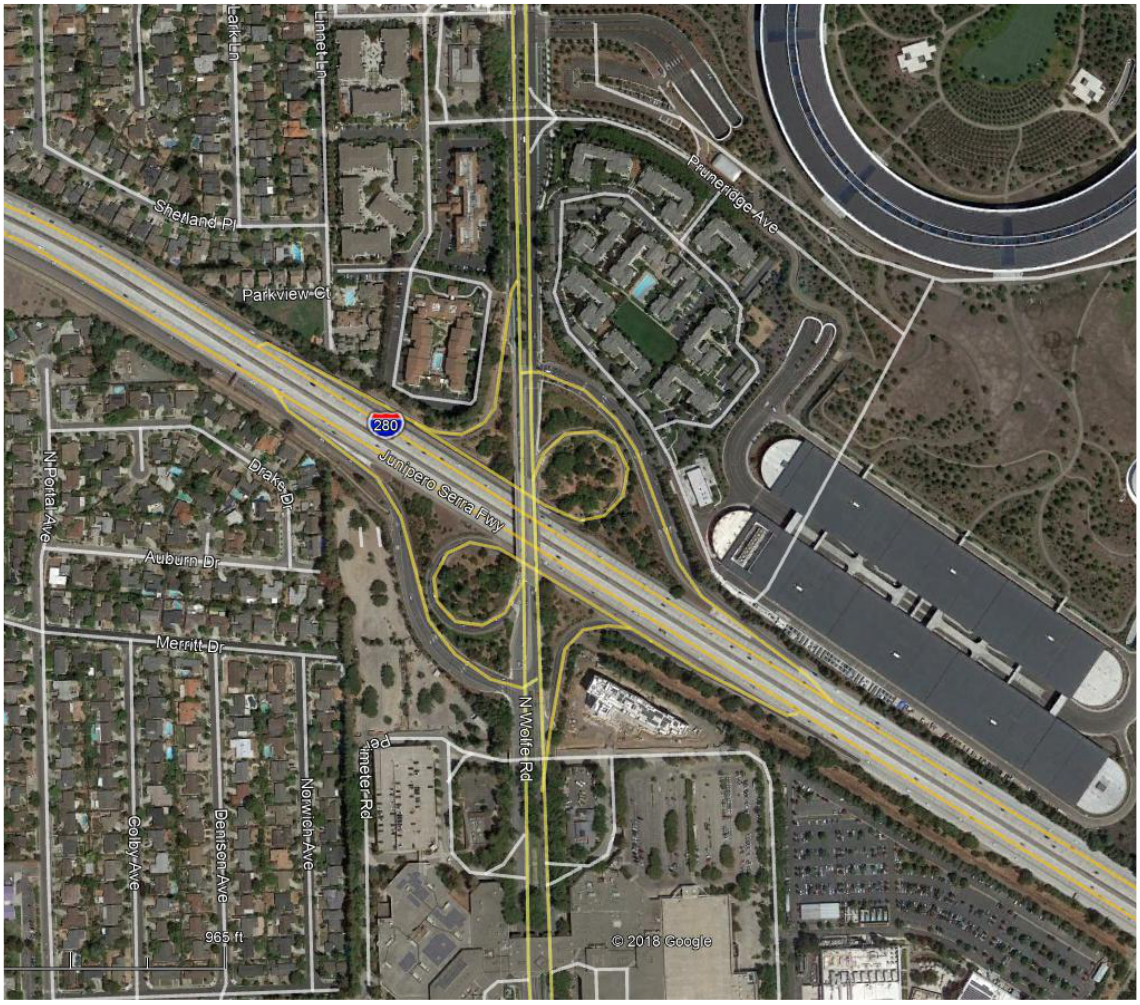
I-280 / Wolfe Road
Interchange Improvement Project **NADR**



Noise Abatement Decision Report

IN SUPPORT OF THE I-280/WOLFE INTERCHANGE IMPROVEMENTS
NOISE STUDY REPORT APPROVED OCTOBER 2019

CUPERTINO, CALIFORNIA

04-SCL-280-PM 8.1/8.6

EA 1K300 – ID 0416000226

June 2020

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CUPERTINO, CALIFORNIA

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June 2020

Prepared By: _____ Date: _____

Jon Cacciotti
Project Manager
HMH Engineers
(408) 487-2200

Approved By: _____ Date: _____

Kevin Krewson
Branch Chief Air & Noise
Office of Environmental Engineering
(510) 622-5409

List of Abbreviated Terms

Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Benefited receptor	A dwelling unit or other equivalent land use expected to receive a noise reduction of at least 5 dBA from the proposed abatement measure
Date of public knowledge	The date of approval of the project CE, FONSI, or ROD.
dBA	A-weighted sound pressure level
ED	Environmental Document
FHWA	Federal Highway Administration
HDM	Highway Design Manual
IL	Insertion Loss
Leq	Equivalent sound level (energy averaged sound level)
Leq[h]	A-weighted, energy average sound level during a 1-hour period
NSR	Noise study report
NADR	Noise Abatement Decision Report
NAC	Noise abatement criteria
Noise reduction design goal	7 dB of noise reduction at one or more benefited receptors.
Reasonable allowance	A single dollar value—a reasonable allowance per benefited receptor
Planned, designed, and programmed	A noise-sensitive land use is considered planned, designed, and programmed when it has received final development approval (generally the issuance of a building permit) from the local agency with jurisdiction
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects

1. Introduction

The Noise Abatement Decision Report (NADR) presents the preliminary noise abatement decision as defined in the Caltrans Traffic Noise Analysis Protocol (Protocol). This report has been appoved by a Calfornia licensed professional civil engineer. The project level Noise Study Report (NSR) *I-280/Wolfe Road Interchange Improvement Project Noise Study Report,* prepared for this project is hereby incorporated by reference.

1.1. Noise Abatement Assessment Requirements

Title 23, Code of Federal Regulations (CFR), Part 772 of the Federal Highway Administration (FHWA) standards (23 CFR 772) and the Caltrans Traffic Noise Analysis Protocol (Protocol) (2011, supplemented 2013) require that noise abatement be considered for projects that are predicted to result in traffic noise impacts. A traffic noise impact is considered to occur when future predicted design-year noise levels with the project "approach or exceed" Noise Abatement Criteria (NAC) defined in 23 CFR 772 or when the predicted design-year noise levels with the project substantially exceed existing noise levels. A predicted design-year noise level is considered to "approach" the NAC when it is within 1 dB of the NAC. A substantial increase is defined as being a 12-dB increase above existing conditions.

23 CFR 772 requires that noise abatement measures that are reasonable and feasible and are likely to be incorporated into the project be identified before adoption of the final environmental document (ED). The I-280/Wolfe is categorically exempt / categorically excluded and therefore will not have a final ED.

The Protocol establishes a process for assessing the reasonableness and feasibility of noise abatement. Before publication of the draft ED, a *preliminary noise abatement decision* is made. The preliminary noise abatement decision is based on the *feasibility* of evaluated abatement and the *preliminary reasonableness determination.* Noise abatement is considered to be acoustically feasible if it is predicted to provide noise reduction of at least 5 dBA at an impacted receptor. Other nonacoustical factors relating to geometric standards (e.g., sight distances), safety, maintenance, and security can also affect feasibility.

The overall reasonableness of noise abatement is determined by the following three factors:

- the viewpoints of benefited receptors,
- the cost of noise abatement, and

- the noise reduction design goal.

The preliminary reasonableness determination reported in this document is based on the noise reduction design goal and the cost of abatement. The viewpoints of benefited receptors were considered in the *I-280/Wolfe Interchange Improvement Project Visual Impact Assessment.*

Caltrans' noise reduction design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one or more benefited receptors. The cost reasonableness of abatement is determined by calculating a cost allowance that is considered to be a reasonable amount of money to spend on abatement. This *reasonble allowance* is then compared to the engineer's cost estimate for the abatement. If the engineer's cost estimate is less than the allowance and the abatement will provide at least 7 dB of noise reduction at one or more benefited receptors, then the preliminary determination is that the abatement is reasonable. If the cost estimate is higher than the allowance or if the design goal cannot be achieved, the preliminary determination is that abatement is not reasonable.

The NADR presents the preliminary noise abatement decision based on acoustical and nonacoustical feasibility factors, the design goal, and the relationship between noise abatement allowances and the engineer's cost estimate. The NADR does not present the final decision regarding noise abatement; rather, it presents key information on abatement to be considered throughout the environmental and design process, based on the best available information at the time the of environmental clearance. The final overall reasonableness decision will require discussion with property owners as part of right-of-way negotiations and will take place in the Plans, Specifications, and Estimates (PS&E) Phase.

If, as a result of right-of-way and noise abatement negotiations, the project definition changes, the environmental clearance will be modified and revalidated.

1.2. Purpose of the Noise Abatement Decision Report

The purpose of the NADR is to:

- summarize the conclusions of the NSR relating to acoustical feasibility, the design goal, and the reasonable allowances for abatement evaluated,
- present the engineer's cost estimate for evaluated abatement,
- present the engineer's evaluation of nonacoustical feasibility issues,
- present the preliminary noise abatement decision, and

- present preliminary information on secondary effects of abatement (impacts on cultural resources, scenic views, hazardous materials, biology, etc.).

The NADR does not evaluate the reasonability of noise barriers or other noise-reducing treatments required as mitigation for significant adverse environmental effects identified under the California Environmental Quality Act (CEQA).

1.3. Project Description

The purpose of the proposed project is to improve traffic operations and facilities for multimodal forms of transportation, including bicycle, pedestrian, and high occupancy vehicle (HOV) uses, at the I-280/Wolfe Road Interchange in the City of Cupertino.

Wolfe Road is a key connector between job locations and housing, commercial, and retail developments. The existing interchange at I-280 is congested with significant delays, which are projected to worsen due to planned growth in the area. Sidewalks and bike lanes are narrow and cross high-speed, at-grade ramp connections, which discourages use by pedestrians and bicyclists. The interchange configuration is not consistent with Caltrans' Complete Streets design guidelines or the City General Plan vision for a walkable, bikeable community.

Santa Clara Valley Transportation Authority (VTA), in partnership with California Department of Transportation (Caltrans) and the City of Cupertino (City), proposes to modify the existing partial cloverleaf interchange on Interstate 280 (I-280) at Wolfe Road in the City of Cupertino, Santa Clara County. In addition to the No Build Alternative, one Build Alternative is evaluated. The Build Alternative would construct improvements to the existing partial cloverleaf interchange at I-280/Wolfe Road and replace the Wolfe Road overcrossing structure.

1.3.1 No-Build Alternative

Under the No Build Alternative, none of the project features described under the project would be constructed.

1.3.2 Build Alternative (Formally Build Alternative B)

The Project would consist of the following improvements:

- The existing Wolfe Road bridge structure over I-280 would be removed and replaced with a new overcrossing structure. The new structure would accommodate three (3)

through lanes and one (1) right-turn lane northbound and three (3) through lanes and one (1) right-turn lane southbound.

- The existing collector-distributor roads that currently connect to the northbound and southbound loop on-ramps and merge with the northbound and southbound at-grade entrances to I-280 would be removed so that the new northbound and southbound loop on-ramps connect directly to the freeway. Retaining walls would be constructed beneath the Wolfe Road overcrossing structure at both the northbound and southbound loop on-ramps.

- The diagonal on-ramp to northbound I-280 would be realigned, squared up, and widened from one (1) mixed-flow lane to two (2) mixed-flow lanes and one (1) high occupancy vehicle (HOV) preferential lane with a new ramp meter.

- The diagonal on-ramp to southbound I-280 would be realigned, squared up, and widened from one (1) mixed-flow lane and one (1) HOV preferential lane to two (2) mixed-flow lanes and one (1) HOV preferential lane with a new ramp meter.

- The loop on-ramp to northbound I-280 would be realigned, squared up, and maintain its existing configuration of one (1) mixed-flow lane and one (1) HOV preferential lane with a new ramp meter.

- The loop on-ramp to southbound I-280 would be realigned, squared up, and maintain its existing configuration of one (1) mixed-flow lane and one (1) HOV preferential lane with a new ramp meter.

- The existing two-lane off-ramp from northbound I-280 that widens to four (4) lanes would be realigned, squared up, and widened to five (5) lanes. A new traffic signal would be installed at the off-ramp intersection with Wolfe Road.

- The existing two-lane off-ramp from southbound I-280 that widens to four (4) lanes would be realigned, squared up, and widened to five (5) lanes. A new traffic signal would be installed at the off-ramp intersection with Wolfe Road.

- Both the north and south Wolfe Road approaches to the Wolfe Road overcrossing would be raised by up to ten (10) feet to reduce the existing six (6) percent grade to four (4) percent.

- The height of Wolfe Road at the existing Perimeter Road undercrossing structure would be raised by placing approximately two and one-quarter (2.25) feet of fill and roadway pavement over it so that the roadway elevation would conform to the proposed raised Wolfe Road profile.

- Existing soundwalls along the north side of I-280, west of Wolfe Road, which would be removed to accommodate the improvements, would be replaced. In addition, new

soundwalls may be constructed at other locations if warranted per the requirements of Caltrans' Traffic Noise Abatement Protocol (TNAP).

- Class IV bicycle lanes and 10-foot wide sidewalks would be added on both northbound and southbound Wolfe Road within the project limits. A bicycle and pedestrian connection from Wolfe Road to Perimeter Road and/or the planned Junipero Serra Trail would be provided.

- A new bicycle and pedestrian connection would be included from Wolfe Road to Perimeter Road and the planned Junipero Serra Trail.

1.4. Affected Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Activity Category A land uses are lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. No Activity Category A land uses were identified in the project area. Category D land uses include schools and are measured from interior noise levels. No schools are within the vicinity of the project. The following noise-sensitive land uses were identified within the project limits:

- Activity Category B - Residential;
- Activity Category C – Sports Areas, Parks;
- Activity Category E – Restaurants, Hotels, Offices;

Activity Category F (airports, industrial, and agricultural) land uses located in the project area are not noise-sensitive. Although all developed land uses were evaluated, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, the NSR focused on locations with defined outdoor activity areas, such as residential backyards, common exterior use areas for multi-family development, sports areas, and outdoor hotel use areas. Noise measurement/modeling sites and barrier locations are indicated in Table 2-1 and Appendix A.

The NSR evalulated locations within the land-uses thought to benefit from a lowered noise level and documented the existing noise levels in those locations. Along southbound I-280, Catergory B receivers include single family residences, Catergory C includes a park, and category E includes a multi-story hotel. An existing 10 foot noise barrier (Barrier 3) shields the park. The existing worst-hour noise levels at outdoor activity areas of Category B, C, and E land uses range from 60 to 75 dBA $L_{eq(h)}$. Existing worst-hour noise levels at receivers within this segment primarily result from on-ramp traffic from Wolfe Road onto northbound I-280.

2. Results of the Noise Study Report

The NSR for this Project was prepared by Dana M. Lodico at Illingworth & Rodkin, Inc. on October 9, 2019 and approved by Kevin Krewson on October 9, 2019. Key conclusions of the NSR are summarized in Table 2-1 below.

Table 2-1. Summary of Barrier Evaluation from Noise Study Report

Barrier ID	Location [a]	Station	Barrier Height (feet)	Acoustically Feasible?	Number of Benefited Receptors	Design Goal Achieved?	Reasonable Allowance per Receptor	Total Reasonable Allowance
1	SB On Ramp to NB Wolfe Road	"B" 269+00 to "B" 275+50	12	No	n/a	No	$107,000	n/a
			14	No	n/a	No	$107,000	n/a
			16	Yes	4	No	$107,000	$428,000
2	US-101 NB from Wolfe Road NB On Ramp	"B" 272+00 to "B" 282+00	12	No	n/a	No	$107,000	n/a
			14	No	n/a	No	$107,000	n/a
			16	No	n/a	No	$107,000	n/a
3	NB On Ramp from SB Wolfe Road	"W" 60+00 to "B" 272+00	8	Yes	40	Yes	$107,000	$4,280,000
			10	Yes	47	Yes	$107,000	$5,029,000
			12 [b]	Yes	54	Yes	$107,000	$5,778,000
			14 [b]	Yes	62	Yes	$107,000	$6,634,000
			16 [b]	Yes	76	Yes	$107,000	$8,132,000

a Barrier lengths are based on linear approximations used for purposes of noise modeling in TNM 2.5. Actual lengths may differ slightly due to barrier curvature, etc.

b Barrier breaks line of sight between 11.5-foot high truck stack and 5-foot high receptor.

2.1. Noise Impacts

Noise impacts were identified at Category B, C, and E land uses. There were no Category A or F land uses identified within the project study area that would benefit from a lower noise level. Noise levels were determined for the existing condition, 2045 No-Build Alternative and 2045 Build Alternative. The difference between the 2045 No-Build Alternative and the 2045 Build Alternative is the direct result of the project improvements. Noise levels discussed in this section are loudest-case traffic conditions in terms of noise generation. The results of the traffic noise modeling efforts completed as part of the NSR are summarized in Table 2-2 and discussed below.

Category B land uses shielded by an existing 10-foot noise barrier, would approach or exceed the NAC. As shown in Table 2-1, the loudest-hour noise levels at Category B land uses range

from 50 to 69 dBA $L_{eq[h]}$ under Existing conditions, from 52 to 69 dBA $L_{eq[h]}$ under 2045 No-Build conditions, from 51 to 69 dBA $L_{eq[h]}$ under 2045 Build Alternative.

Category C land uses are partially shielded by an 10-foot existing sound wall. The loudest-hour noise levels calculated range from 61 to 74 dBA $L_{eq[h]}$ under Existing conditions, from 62 to 74 dBA $L_{eq[h]}$ under 2045 No-Build conditions, from 63 to 77 dBA $L_{eq[h]}$ under 2045 Build Alternative.

Nine short-term measurement positions and thirteen receptor locations were modeled. 2045 Build traffic noise levels are predicted to approach or exceed the Noise Abatement Criteria (NAC) at first row Category B and C receptors located to the north and south of I-280, west of Wolfe Road, which accounts for three of the short-term positions and six of the receptor locations.

The loudest-hour noise levels at Category E land uses range from 64 to 75 dBA $L_{eq[h]}$ under Existing conditions, from 64 to 76 dBA $L_{eq[h]}$ under 2045 No-Build conditions, from 63 to 76 dBA $L_{eq[h]}$ under 2045 Build Alternative. 2045 Build traffic noise levels are predicted to approach or exceed the NAC at the second and thrid floor patios of the Marriot Hotel. Noise levels would increase by up to 3 dBA over existing conditions under 2045 No-Build conditions and by up to 9 dBA under 2045 Build Alternative, due to the removal of the existing sound wall. This noise level increase is not considered substantial.

Table 2-2. Traffic Noise Impacts

Receptor ID	Loudest-Hour Noise Levels, $L_{eq[h]}$ dBA			Increase Over Existing, dBA		Increase Over No Build, dBA	Activity Category (NAC)	Impact
	Exist	2045 No Build	2045 Build Alt	2045 No Build	2045 Build Alt	2045 Alt B		2045 Build Alt
S4	64	64	64	0	0	0	B(67)	None
S5	66	66	67	0	1	1	B(67)	A/E
S7	68	68	68	0	0	0	B(67)	A/E
S8	64	64	63	0	-1	-1	E(72)	None
S9	74	74	70	0	-4	-4	C(67)	A/E
R1	66	66	66	0	0	0	B(67)	A/E
R2	68	68	68	0	0	0	B(67)	A/E
R3	63	63	63	0	0	0	B(67)	None
R4	69	69	69	0	0	0	B(67)	A/E
R5	63	63	63	0	0	0	B(67)	None
R6	60	60	67	0	7	7	B(67)	A/E

R7	67	67	75	0	8	8	C(67)	A/E
R11	62	63	63	0	0	0	E(72)	None
R12	61	61	66	0	5	5	B(67)	A/E
R13	55	55	55	0	0	0	B(67)	None
R15a[3]	72	72	64	0	-8	-8	E(72)	None
R15b[3]	74	74	72	0	-2	-2	E(72)	A/E
R15c[3]	75	76	76	0	0	0	E(72)	A/E
R16a[3]	68	68	61	1	-7	-7	E(72)	None
R16b[3]	70	71	66	1	-5	-6	E(72)	None
R16c[3]	71	72	70	1	-1	-2	E(72)	None
R17a[3]	64	66	63	2	0	-2	E(72)	None
R17b[3]	68	69	68	2	0	-1	E(72)	None
R17c[3]	68	70	70	1	1	0	E(72)	None

1 Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC, None = Increase is less than 12 decibels and noise levels do not approach or exceed the NAC.
2 As stated in the TeNS, modeling results are rounded to the nearest decibel before comparisons are made. In some cases, this can result in relative changes that may not appear intuitive.
3 These receptors are representative of Marriott Hotel balconies.
The hotel has three levels of balconies; 'a' designates first floor balconies, 'b' the second floor balconies, and 'c' the third floor balconies.

2.2. Evaluated Noise Abatement

Noise abatement must be predicted to provide at least 5 dB or 7 dB minimum reduction at an impacted receptor to be considered feasible by Caltrans or the Protocol, respectively. Noise barriers are the only form of noise abatement considered for this project. Section 1102.3(2) of the Highway Design Manual (HDM) states that noise barriers should not be higher than 14 feet above the pavement when located within 15 feet of the edge of traveled way and 16 feet above ground when located more than 15 feet from the edge of traveled way. Caltrans guidance to break the line-of-sight between an 11.5-foot-high truck exhaust stack and a 5-foot-high receiver in the first row of houses should be taken into account for the minimum height of barriers in order to reduce the visual and noise intrusiveness of the truck exhaust stacks. The line-of-sight is a straight line along which a standing observer has unobstructed vision of the truck exhaust stack.

Figure 1: Barrier Locations

2.2.1 Barrier 1

In the NSR, a height increase was analyzed for Barrier 1, the existing 10-foot tall sound wall along southbound I-280, west of the interchange. Increasing the height of Barrier 1 was found to not meet the 7 dB noise reduction goal.

2.2.2 Barrier 2

Barrier 2 is an existing 10-foot sound wall along northbound I-280, west of the interchange. Table 2-3 shows the Insertion Loss (IL) at various proposed barrier heights. Increasing the height of Barrier 2 would not meet the 7 dB noise reduction goal.

Table 2-3. Height Increase Barrier 2- Build Alternative

Receptor ID	Units Represented	Noise Level w/ Existing 10 ft Wall	With Wall H=12 feet		With Wall H=14 feet		With Wall H=16 feet	
			$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.
S4	9	64	63	1	62	2	62	2
S5	5	67	66	1	65	2	65	2
R1	6	66	65	1	64	2	63	3
R6	4	67	67	0	67	0	67	0

Barrier 2 will be removed due to conflicts with project improvements and is required to be replaced as part of the Project. The height of the proposed sound wall is discussed in section 3.3.1.

2.2.3 Barrier 3

The replacement of Barrier 3 was studied as potential noise abatement. Based on preliminary design data, the proposed barrier would reduce future build noise levels by 3-10 dBA at noise-impacted receivers. Table 2-4 shows the Build loudest-hour noise levels and IL provided by each barrier assuming various heights.

Table 2-4. Barrier 3 Insertion Loss

Receptor ID	Units Represented	Noise Level w/o Wall	With Wall H=8 feet		With Wall H=10 feet		With Wall H=12 feet		With Wall H=14 feet		With Wall H=16 feet	
			$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.	$L_{eq[h]}$	I.L.
S9	3	70	64	6	63	7	62	8	62	8	61	9
R6	4	67	62	5	61	6	61	6	61	6	60	7
R7	5	75	67	8	66	9	66	9	65	10	65	10
R12	8	66	63	3	62	4	62	4	61	5	61	5
R15a	7	64	61	3	61	3	60	4	60	4	59	5
R15b	7	72	66	6	65	7	64	8	63	9	62	10
R15c	7	76	73	3	71	5	69	7	67	9	66	10
R16a	7	61	58	3	58	3	57	4	57	4	56	5
R16b	7	66	61	5	60	6	59	7	59	7	58	8
R16c	7	70	64	6	62	8	61	9	60	10	60	10
R17a	7	63	60	3	60	3	59	4	59	4	59	4
R17b	7	68	63	5	63	5	62	6	62	6	62	6
R17c	7	70	67	3	66	4	64	6	63	7	63	7

Barrier 3 would be directly across I-280 from existing Barriers 1 and 4 which are both 10-feet in height. Heights greater than 16-feet are not proposed for Barrier 3; therefore, reflective noise is not anticipated to be a concern for Barrier 3.

The barrier would extend from station limit “W” 60+00 to station limit “B” 272+00 and result in a length of roughly 1,530 feet.

2.2.4 Barrier 4

Barrier 4 is an existing 10-foot tall sound wall along southbound I-280, west of the interchange. Noise levels at receptors behind Existing Barrier 4 would not approach or exceed the NAC under build conditions; therefore, this barrier is not addressed further in the NSR and this NADR.

3. Preliminary Noise Abatement Decision

3.1. Summary of Key Information

Table 3-1 provides a summary of the key information used in making the preliminary noise abatement decision. The key information included:

- an indication of acoustical feasibility,
- number of benefited residences,
- achievement of design goal,
- the total reasonableness allowance and engineer's cost estimate for each barrier and barrier height evaluated (if a barrier is evaluated), and
- a comparison of cost versus allowance.

3.2. Nonacoustical Factors Relating to Feasibility

The noise abatement barriers were evaluated for feasibility based on nonacoustical factors such as geometric standards, sight distance, safety, maintenance, security, geotechnical considerations, and utility relocations. Relevant issues are summarized as follows:

Along the southbound diagonal on-ramp to I-280, because Barrier 3 would reside atop a retaining wall, the barrier would be visually apparent and would obstruct views of and across the freeway from the Marriot Hotel. The barrier will achieve abatement of noise impacts for hotel receptors, but will have visual impacts to the hotel that may be offset through use of architectural details on the face of the sound wall.

The Marriott Hotel property is subject to a considerable right-of-way transaction in order to construct the project, as defined. This right-of-way transaction will occur in the PS&E Phase and may influence the preferences of the property owner with respect to the the presence and details of Barrier 3.

3.3 Preliminary Recommendation and Decision

3.3.1 Barrier 2

Although a height increase of Barrier 2 does not meet the feasibility criteria for benefits to receiving receptors, the sound wall requires replacement for project improvements. In order to determine the appropriate height of the reconstructed sound wall, the requirements of the HDM were considered.

Wall heights shorter than 12 feet would fail to meet the line-of-sight requirements for an 11.5-foot truck exhaust and walls taller than 14 foot are not recommended less than 15 feet from edge of travelled way. Therefore, two wall heights were considered, 12-foot and-14 foot.

The cost for a 12-foot height was estimated to be $750,000 and the cost for a 14-foot tall wall was estimated at $870,000. The proposed length for Barrier 2 is approximately 1,000 feet, extending from station limit “B” 272+00 to station limit “B” 282+000. A reasonability allowance was not determined for Barrier 2 in the NSR.

At Barrier 2, the preliminary recommendation is a 12-foot tall sound wall to replace the existing 10-foot tall sound wall. At 12 feet, the wall meets the line-of-sight requirement for truck stacks and the height requirement for a 15-foot distace from edge of travel way. The cost for a 12-foot tall wall is less than that of a 14-foot tall wall and is therefore preferred.

3.3.2 Barrier 3

Under the Build Alternative, Barrier 3 was concluded to feasibly abate traffic noise by meeting the Protocol’s 7-dBA noise reduction goal at a minimum height of 8 feet. As defined in Section 772.5 of the regulation, a reasonable allowance of the cost of noise abatement is set at $107,000 per benefited receptor. The reasonable allowance calculated for barrier heights of 8 to 16 feet ranges from $4,280,000 to $8,132,000, as shown on Table 3-1.

Table 3-1. Summary of Abatement Key Information

Barrier ID	Barrier Height (feet)	Acoustically Feasible?	Number of Benefited Receptors	Design Goal Achieved?	Total Reasonable Allowance	Estimated Construction Cost	Cost Less than Allowance
3	8	Yes	40	Yes	$4,280,000	$700,000	Yes
	10	Yes	47	Yes	$5,029,000	$790,000	Yes
	12 [b]	Yes	54	Yes	$5,778,000	$900,000	Yes
	14 [b]	Yes	62	Yes	$6,634,000	$1,010,000	Yes
	16 [b]	Yes	76	Yes	$8,132,000	$1,150,000	Yes

As demonstrated in Table 3-1, the estimated cost for barriers of 8-foot tall to 16-foot tall were below the resonable allowance. In order to determine the most beneficial wall height, a cost-benefit analysis was performed. Table 3-2 demonstrates the cost per Benefited Receptor IL.

Based on visual criteria for truck stacks and maximum height due to offsets from the travelled way, only 12-foot and 14-foot tall soundwalls were considered at Barrier 3.

As demonstrated in Table 3-2, a 12-foot tall barrier provides the best value in terms of cost per Benefited Receptor IL and is recommended for the Project.

Table 3-2. Cost of Barrier per Benefited Receptor and Insertion Loss

Receptor ID	Receptors	With Wall H=12 feet Cost of Wall $900,000		With Wall H=14 feet Cost of Wall $1,100,000	
		I.L.	Benefited Receptors X I.L.	I.L.	Benefited Receptors X I.L
S9	3	8	24	8	24
R6	4	6	24	6	24
R7	5	9	45	10	50
R12	8	4	32	5	40
R15a	7	4	28	4	28
R15b	7	8	56	9	63
R15c	7	7	49	9	63
R16a	7	4	28	4	28
R16b	7	7	49	7	49
R16c	7	9	63	10	70
R17a	7	4	28	4	28
R17b	7	6	42	6	42
R17c	7	6	42	7	49
Sum of Benefited Receptors X I.L.		510		558	
Cost Per Benefited Receptor X I.L.		$1,765		$1,971	

3.3.3 Estimated Construction Cost

The estimated construction cost for the barriers were calculated based on Caltrans unit cost database, as shown in Table 3-3.

For Barrier 2, the estimate includes costs for Cast-in-Drilled-Holes (CIDH) piles, safety barriers and sound wall.

For Barrier 3, the estimate included costs for CIDH piles, safety barriers, sound wall and additional structural costs for the underlying retaining wall, where present. See Appendix B for detailed cost estimates and assumptions.

Table 3-3. Barrier 2 and Barrier 3 Estimated Construction Costs

	Barrier 2 (1,000 ft)	Barrier 3 (1,530 ft)
Height (feet).	Approximate cost	Approximate cost
8	--	$700,000
10	$600,000	$790,000
12	$750,000	$900,000
14	$870,000	$1,010,000
16	$1,000,000	$1,150,000

The preliminary noise abatement decision presented in this report is based on preliminary project alignments and profiles, which may be subject to change. As such, the physical characteristics of noise abatement described herein also may be subject to change. If pertinent parameters change substantially during final project design, the preliminary noise abatement decision may be changed or eliminated from the final project design. A final decision to construct noise abatement will be made upon completion of the project design.

4. Secondary Effects of Abatement

The noise abatement recommended in the preliminary noise abatement decision may have the potential to result in secondary effects on cultural resources, scenic views, hazardous materials, biology, or other resources. The secondary effect of Barrier 3 is negative aestheic impacts. Along the southbound diagonal on-ramp to I-280, Barrier 3 would introduce a substantial vertical element and would obstruct views of and across the interstate from the Marriott Hotel. The barrier will be on top of a retaining wall which will vary from 0 to 20 feet tall along the property line. Addition of a 14-foot soundwall may obstruct or alter views substantially. Final determination for construction of Barrier 3 will require discussion with the property owner during the PS&E Phase.

5. References

Caltrans. 2013. Technical Noise Supplement. September. Sacramento, CA: Environmental Program, Noise, Air Quality, and Hazardous Waste Management Office. Sacramento, CA.

Caltrans. 2011. Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects. May. Sacramento, CA.

Federal Highway Administration. 2011. Highway Traffic Noise: Analysis and Abatement Guidance. December. Washington D.C. FHWA-HEP-10-025.

Federal Highway Administration. 2010. 23 CFR Part 772: Procedures for Abatement of Highway Noise and Construction Noise. Federal Registrar, Vol. 75, No. 133.

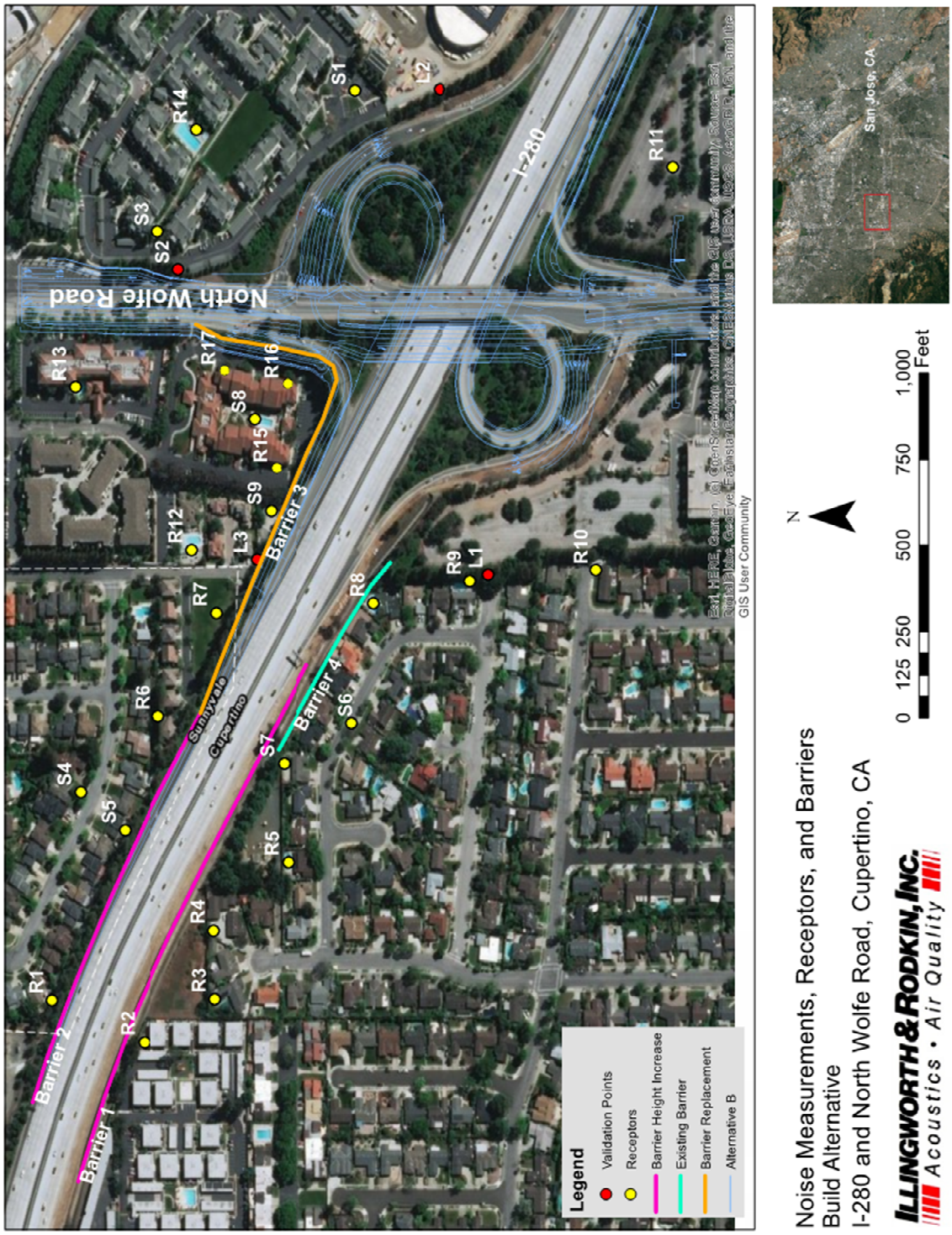
Illingworth & Rodkin, Inc., I-280/Wolfe Road Interchange Improvements Project Noise Study Report, October 2019.

Appendices:

Appendix A Noise Modeling Sites and Barrier Locations

Appendix B Construction Cost Estimate Assumptions

Appendix A Noise Modeling Sites and Barrier Locations



Appendix B Construction Cost Estimate Assumptions

		CIDH PILE			BARRIER 2						
Wall Length	Wall Height	Pile Spacing	Depth	Piles Needed	CIDH	CIDH COST	BARRIER	BARRIER COST	SOUND WALL	SW COST	Total Cost
L.F.	FT	Ft	FT		$/L.F.	$	$/L.F	$	$/SQ.FT.	$	$
1011	10	15	16	67	$ 200	$ 215,680	$ 120	$ 121,320	$ 30	$ 303,300	$ 640,300
	12	12	16	84	$ 200	$ 269,600	$ 120	$ 121,320	$ 30	$ 363,960	$ 754,880
	14	10	16	101	$ 200	$ 323,520	$ 120	$ 121,320	$ 30	$ 424,620	$ 869,460
	16	8	16	126	$ 200	$ 404,400	$ 120	$ 121,320	$ 30	$ 485,280	$ 1,011,000

		CIDH PILE			BARRIER 3						
Wall Length	Wall Height	Pile Spacing	Depth	Piles Needed	CIDH	CIDH COST	BARRIER	BARRIER COST	SOUND WALL	SW COST	Total Cost
L.F.	FT	Ft	FT		$/L.F.	$	$/L.F	$	$/SQ.FT.	$	$
345	8	16	14	22	$ 200	$ 60,375	$ 120	$ 41,400	$ 30	$ 82,800	$ 184,575
	10	15	16	23	$ 200	$ 73,600	$ 120	$ 41,400	$ 30	$ 103,500	$ 218,500
	12	12	16	29	$ 200	$ 92,000	$ 120	$ 41,400	$ 30	$ 124,200	$ 257,600
	14	10	16	35	$ 200	$ 110,400	$ 120	$ 41,400	$ 30	$ 144,900	$ 296,700
	16	8	16	43	$ 200	$ 138,000	$ 120	$ 41,400	$ 30	$ 165,600	$ 345,000

BARRIER 3 (With Retaining Wall)							
Wall Length	Wall Height	RW COST	BARRIER	BARRIER COST	SOUND WALL	SW COST	Total Cost
L.F.	FT	$	$/L.F.	$	$/SQ.FT.	$	$
1182	8	$ 72,000	$ 120	$ 141,840	$ 30	$ 283,680	$ 497,520
	10	$ 72,000	$ 120	$ 141,840	$ 30	$ 354,600	$ 568,440
	12	$ 72,000	$ 120	$ 141,840	$ 30	$ 425,520	$ 639,360
	14	$ 72,000	$ 120	$ 141,840	$ 30	$ 496,440	$ 710,280
	16	$ 72,000	$ 120	$ 141,840	$ 30	$ 567,360	$ 781,200

HEIGHT	Barrier 2 (936 ft)		Barrier 3 (1,527 ft)	
FT.	Total cost	Unit Cost	Total Cost	Unit Cost
8			$ 682,095	$ 447
10	$ 640,300	$ 633	$ 786,940	$ 515
12	$ 754,880	$ 747	$ 896,960	$ 587
14	$ 869,460	$ 860	$ 1,006,980	$ 659
16	$ 1,011,000	$ 1,000	$ 1,126,200	$ 738