

# Quiet Zone Implementation Study

## Prepared for:

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**CITY OF MENLO PARK AND CITY OF PALO ALTO QUIET ZONE STUDY**

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## BACKGROUND

There are four at-grade vehicular railroad crossings within the City of Menlo Park, all along the Caltrain corridor, whose right of way is owned by the Peninsula Corridor Joint Powers Board (PCJPB). Per Federal Railroad Administration (FRA) requirements, locomotive engineers are required to sound their horns upon approach to at-grade crossings in a four-blast sequence, beginning either 20 seconds or ¼-mile upstream of the at-grade crossing. In Menlo Park, these four vehicular crossings span a half-mile – meaning that for each train passing through this city, the train horns sound sixteen times (exclusive of any train horns sounded on approach to the Caltrain station in Menlo Park). In addition, the northernmost at-grade crossing in Palo Alto is ¾-mile from the southernmost crossing in Menlo Park. With Caltrain being a transit agency boasting robust service, trains pass through Menlo Park and Palo Alto quite frequently; Union Pacific Railroad (UPRR) also maintains trackage rights, allowing them to use this corridor for freight operations, typically at night. These train movements force residents to hear train horns at all hours of the day and night, disrupting daily life and acting as more than a simple nuisance.

For the reasons listed above, the Cities of Menlo Park and Palo Alto (subsequently referred to as “Cities”) have undergone a study to determine the feasibility of implementing a quiet zone along this stretch of corridor.

## SCOPE OF WORK

The work accomplished under this agreement included analysis, conceptual designs, field diagnostic meetings, and public outreach for the five at-grade crossings. See Table 1, below, for a list of the five crossings investigated.

*Table 1: Crossings evaluated through quiet zone study*

Crossing DOT#	Crossing Roadway Name	City
754988Y	Encinal Ave	Menlo Park
754989F	Glenwood Ave	Menlo Park
754990A	Oak Grove Ave	Menlo Park
754991G	Ravenswood Ave	Menlo Park
754992N	Alma St	Palo Alto

Source: Caltrain Quiet Zone Implementation Plan (<https://menlopark.gov/Government/Departments/Public-Works/Capital-improvement-projects/Caltrain-Quiet-Zone-Implementation-Plan-development>)

Kimley-Horn performed the necessary analysis prescribed by the FRA, prepared draft conceptual designs of the improvements to each of the five at-grade crossings within the scope, scheduled and attended diagnostic field meetings with stakeholders, and assisted the Cities in public outreach efforts.

## DOCUMENT REVIEW AND INITIAL DATA COLLECTION

Kimley-Horn staff performed an initial site visit to evaluate the existing conditions of the at-grade crossings and assessed both the opportunities and constraints for the potential improvements. This

investigation involved taking photographs and discussing the site conditions internally and evaluating potential improvements.

Kimley-Horn staff also reviewed available documents from the FRA, including existing U.S. Department of Transportation (DOT) Inventory Forms and historical incident reports. The inventory reports detail the existing conditions of the crossing, and include vital information about the roadway infrastructure, railroad infrastructure, crossing geometry, railroad organization information, train information (including daily counts and timetable speeds), and general location information. The incident reports include collision details and provide insight into historic events at each crossing, including what, if any, safety measures were implemented at that time. The incident reports allowed Kimley-Horn staff to directly compare the data for each crossing and identify major safety differences among the crossings.

Since 2010, there have been 10 incidents along this five-crossing section of the corridor. Table 2 shows a breakdown of the incidents, including the year of incident and a summary of the incident. From Table 2, it is evident that Oak Grove Avenue is the crossing with the highest number of incidents, and Ravenswood Avenue has the two most recent incidents. Encinal Avenue and Glenwood Avenue have not had an incident in the ten years prior to this study.

Table 2: Incidents at Each Crossing from 2010 to present

Crossing DOT#	Crossing Roadway Name	City	Year(s) of Incident	Type of Incident
754988Y	Encinal Ave	Menlo Park	2013	Person, fatality
754989F	Glenwood Ave	Menlo Park	2010	Person, intentional fatality
754990A	Oak Grove Ave	Menlo Park	2019	Person, injury
			2020	Person, injury
754991G	Ravenswood Ave	Menlo Park	2012	Person, fatality
			2012	Vehicle, injury
			2014	Vehicle only
			2015	Vehicle, fatality
			2018	Vehicle, injury
754992N	Alma St	Palo Alto	2010	Vehicle only

Source: FRA Office of Safety Analysis (<https://safetydata.fra.dot.gov/officeofsafety/publicsite/crossing/crossing.aspx>)

Kimley-Horn collected traffic volumes in October 2022 at each crossing to determine the use-level for vehicles, bicycles, and pedestrians. The train counts are the same for all crossings, with an estimated 104

Caltrain commuter trains per day. Commuter service frequency is subject to change once Caltrain completes electrification. See Table 3 for a summary of the traffic counts collected.

Table 3: Summary of daily total traffic volumes at study locations

Crossing DOT#	Crossing Roadway Name	City	Pedestrian Count		Bicycle Count		Vehicle Count	
			EB	WB	EB	WB	EB	WB
754988Y	Encinal Ave	Menlo Park	60	74	62	54	2,119	2,774
754989F	Glenwood Ave	Menlo Park	84	81	111	101	2,459	3,008
754990A	Oak Grove Ave	Menlo Park	96	109	89	251	4,488	4,723
754991G	Ravenswood Ave	Menlo Park	296	350	322	299	9,657	7,136
754992N	Alma St	Palo Alto	190	199	379	291	5,858	7,621

Source: Data collected and analyzed by IDAX.

## QUIET ZONE ANALYSIS

Kimley-Horn used the FRA Quiet Zone calculator, an online tool provided by the FRA, to determine what upgrades would generate quiet zone approval. Based on the existing conditions, Kimley-Horn staff narrowed the potential upgrades to four-quadrant gates at all Menlo Park crossings, and either four-quadrant gates, medians, or both for the Palo Alto crossing.

There are three ways a section of railroad corridor can achieve quiet zone status as outlined below.

### SSM AT EACH CROSSING

The first method is to provide a Supplemental Safety Measure (SSM) at each crossing within the quiet zone. SSMs are defined by the FRA in 49 Code of Federal Regulations Appendix A to Part 222. It includes options such as “four-quadrant” (or “exit”) gates, non-traversable medians, one-way streets with entry gates, and temporary or full crossing closure.

A four-quadrant gate system prohibits vehicles from driving around gates in the down position and moving onto the tracks during a train event. The gates on the departure side of the crossing have a delayed lowering compared to the entry gates to ensure no vehicles are on the tracks and at risk of fouling the tracks. The exit gates would also remain up and not go down if a vehicle is sensed to be on the tracks. See Figure 1 for an example graphic of a four-quadrant gate system as depicted by the California High Speed Rail Authority (CAHSRA). It should be noted that vehicle presence detection is required at all crossings implementing a four-quadrant gate system in California per California Public Utilities Commission (CPUC) General Order No. 75-D.

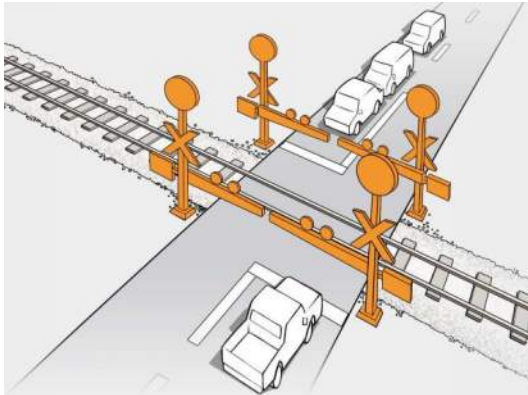


Figure 1: Four-quadrant gate system (CAHSRA)

Non-traversable medians are another measure to prevent gate go-arounds. With sufficient vertical height (8-inch minimum as specified by the FRA), most passenger vehicles will be deterred from driving over the median and traversing around the downed gates to move over the crossing.

### **SSM AT SOME CROSSINGS (QZRI LESS THAN RIWH)**

The second method to qualify for a quiet zone is establishment of SSMs or modified SSMs, referred to as Alternative Safety Measures (ASMs), at one or more crossings within the proposed quiet zone such that the Quiet Zone Risk Index (QZRI) is reduced to a level at or below the Risk Index with Horns (RIWH). The RIWH is the risk associated with all crossings included in the specified quiet zone when train horns are sounded per FRA requirements. Under this method of quiet zone qualification, SSMs (or ASMs) may not be required at all crossings (unlike the first method described above).

The quiet zone rule defines a rate of effectiveness for each SSM to formulaically assign risk reductions to each crossing. A modified SSM (for example use of a median on one side of the crossing with an exit gate on the opposite side) is considered an ASM by the FRA and the applicant is required to obtain FRA concurrence on the claimed effectiveness measure, and the quiet zone will be subject to more frequent re-validation. While ASMs could be implemented, they were not considered in the quiet zone study. This is due in part to the need for more frequent re-validation of the quiet zone, but also because gaining FRA concurrence on the effectiveness of the ASM itself can be subjective and/or difficult.

### **NO SSM (QZRI LESS THAN NSRT)**

The third and final method by which a quiet zone can be achieved is if the QZRI along the section of corridor is at or below the Nationwide Significant Risk Threshold (NSRT). The NSRT is defined as the

average of the risk indexes for all at-grade crossings in the country where train horns sound. The NSRT is currently equal to 15,488.00. Because the NSRT is representative of all at-grade crossings in the country, it includes at-grade crossings which may have undergone safety improvements and may have implemented the full range of crossing improvements or implemented significantly impactful SSMs or ASMs, like one-way streets or partial closure. If the QZRI with no improvements is at or below the NSRT, the specified crossings would automatically qualify for a quiet zone. Alternatively, if SSMs are implemented along the section of corridor such that the QZRI is at or below the NSRT, the corridor would then qualify as a quiet zone. This method exposes the quiet zone to risk in the event the NSRT, which is evaluated yearly by the FRA, drops below the quiet zone QZRI, which would invalidate the quiet zone status. Neither quiet zone would qualify for a quiet zone using NSRT without closure of a crossing. For this reason, the NSRT method was not considered for the study.

**QUIET ZONE EVALUATION**

Kimley-Horn staff used the FRA Quiet Zone calculator to determine the risk index of the existing conditions and investigated different improvement combinations to define the improvement strategy. Kimley-Horn staff identified quiet zone implementation as two separate quiet zones being pursued separately by the Cities.

The quiet zones are evaluated as separate because they would likely occur on different timelines. For the City of Palo Alto to pursue a quiet zone at Alma Street and provide an SSM at that location, the zone would qualify with that single improvement. On the other hand, not all of the Menlo Park crossings would need to be improved to meet the QZRI less than RIWH criteria identified in the second method. In the quiet zone for the City of Menlo Park, upgrades are required at Oak Grove Avenue and one other crossing in order to qualify for a quiet zone, due to Oak Grove Avenue being the crossing with the highest risk level by a significant margin over the other crossings. Choosing to upgrade Oak Grove Avenue and Ravenswood Avenue results in the most significant risk reduction. A summary of the preferred strategies is highlighted in Table 4, below. See the Recommendations section for a more detailed description for these preferred strategies, and how they were decided. Appendix A shows a full breakdown of every investigated set of improvements and presents which scenarios would grant quiet zone approval.

*Table 4: Summary of Quiet Zone preferred strategies and associated impacts to Risk Index and Quiet Zone Qualification*

Scenario	Existing Risk Index (Overall)	Proposed Risk Index (Overall)	Improvements Made	Quiet Zone Qualification?
Menlo Park QZ	152,476.09	58,943.99	4 quadrant gate systems at Oak Grove and Ravenswood	Yes
Palo Alto QZ	104,786.75	20,957.35	Non-traversable medians only	Yes

*Source: Kimley-Horn prepared this analysis using the FRA Quiet Zone Calculator.*

The two SSMs determined to be feasible by the project team were four-quadrant gates with vehicle presence detection, and medians. Full closure of the crossings was not evaluated as the implications for equity and access would likely exceed the cost for implementation of SSMs and temporary closure during peak periods would likewise be impractical. Conversion of roadways from two-way to one-way traffic is

another SSM that was not considered as part of this study due to the impracticality of converting residential roadways into one-way streets; similar concerns for equity and access arise when evaluating one-way traffic.

Per FRA rules, a median must be a minimum of 8-inch high and extend for a minimum of 100 feet and terminate 10 feet from the tracks to qualify as an SSM. For crossings with nearby driveways or intersections, special rules may apply. For a median to be considered as an SSM, any intersection of two or more streets, or a street and an alley, less than 60 feet from the gate arm must be closed. Driveways servicing residential properties of up to four units do not count as intersections. If an intersecting roadway is between 60 feet – 100 feet from the crossing, it need not be closed but the median must extend at least 60 feet from the gate arm. In Menlo Park, all four crossings are less than 60 feet from an adjacent roadway; because of this proximity, installation of medians would not qualify as an SSM. In Palo Alto, Alma Street and Palo Alto Avenue intersect roughly 75 feet from the crossing, meaning that medians are able to qualify as an SSM.

From a cost perspective, installation of medians would be the preferred SSM, however physical constraints at the Menlo Park crossings limit viable median lengths such that this treatment by itself would not be viable, so exit gates would be required.

## CONCEPTUAL DESIGN

Kimley-Horn staff prepared conceptual design plans for each of the five at-grade crossings to provide a complete evaluation of the impacts and potential needs for upgrades at each crossing. The four Menlo Park crossings were redesigned to accommodate a four-quadrant gate system; the Palo Alto crossing was proposed to receive upgraded and elongated medians. Both of these improvements reduce the opportunity for wrong-way driving to maneuver around downed gate arms as a train approaches.

Due to proximity to nearby driveways and intersections, the Menlo Park crossings were not able to implement medians as an SSM anywhere. For medians to be feasible in Menlo Park, Alma Street, Garwood Way, and Merrill Street would need to be closed entirely, which would create circulation challenges in most locations.

See Appendix B for the finalized conceptual layouts.

## FIELD DIAGNOSTIC MEETINGS

A preliminary field diagnostic meeting was performed in December of 2022 to evaluate the proposed improvements with relevant stakeholders to determine if the quiet zone is feasible. This field diagnostic included staff from the Cities, Kimley-Horn, Caltrain, CPUC, FRA, and Caltrans (due to proximity to El Camino Real and the possibility of signal interconnection being proposed). UPRR was invited to the meeting but did not attend.

The draft conceptual designs were provided to all invited to the field diagnostic meeting to allow for review ahead of the meeting. During the field diagnostic meeting, small design revisions were noted by stakeholders, and the conceptual layouts were then updated accordingly.



Kimley-Horn drafted field review minutes following the diagnostic meetings and sent them to stakeholders for review and input. The meeting minutes then incorporated City and stakeholder feedback and were finalized.

See Appendix C for the Field Diagnostic Meeting Minutes.

## COST ESTIMATES

Kimley-Horn staff drafted cost estimates for each crossing. These estimates detailed approximate infrastructure costs, as well as expected project delivery costs associated with the completion of the project.

The unit costs used were based on recent and similar at-grade crossing projects in northern California. When necessary, Kimley-Horn staff used the Caltrans unit price database.

Table 5 shows the rough order of magnitude costs determined by crossing for each of the five crossings in the study area.

*Table 5: Rough Order of Magnitude Costs for Each Crossing*

Crossing DOT#	Crossing Roadway Name	City	SSM	Cost
754988Y	Encinal Ave	Menlo Park	6	\$2,210,000
754989F	Glenwood Ave	Menlo Park	6	\$2,200,000
754990A	Oak Grove Ave	Menlo Park	6	\$2,210,000
754991G	Ravenswood Ave	Menlo Park	6	\$2,000,000
754992N	Alma St	Palo Alto	13	\$200,000

*Source: Kimley-Horn prepared the Rough Order of Magnitude cost estimate.*

## OUTREACH AND COORDINATION

The Caltrain corridor is located adjacent to existing residences, schools, businesses, and planned new developments. Due to its proximity to residents and the fact these improvements hinge on safety considerations, this project required public outreach and coordination. The Kimley-Horn team developed presentations for use at various City Council, subcommittee, and public meetings, as well as attended and presented at these meetings. Kimley-Horn presented to the City Councils of both Cities, the Complete Streets Commission for Menlo Park, the Planning and Transportation Commission (PTC) for Palo Alto, the City School Transportation Safety Committee (CSTSC) of Palo Alto, the Pedestrian and Bicycle Advisory Committee (PABAC) of Palo Alto, and the Palo Alto Rail Committee. At these meetings, Kimley-Horn fielded questions from the public and supported both Cities in highlighting the importance of a quiet zone for this area.

In these presentations, Kimley-Horn touched on the background of a quiet zone, the process by which a quiet zone can be achieved (including a rough timeline for implementation), what this quiet zone would

entail in terms of infrastructure upgrades, and the next steps for these Cities to implement a quiet zone. A recording of the public meeting for the project is available at <https://menlopark.gov/quietzone>.

## RECOMMENDATIONS

### CITY OF PALO ALTO

Kimley-Horn recommends the City of Palo Alto upgrade and lengthen the medians along Alma Street. The risk reduction associated with a four-quadrant gate system versus the risk reduction associated with median installation is negligible, and either SSM would qualify for a Quiet Zone; the recommendation set forth here is for a cost-savings measure for the City. For a four-quadrant system, the City would likely spend nearly \$2,000,000, given the new gates and any associated impacts with their placement, like sidewalk realignment and pedestrian gate realignment and relocations. Because the cost of 8-inch medians would likely be less than a quarter of the cost of installing a four-quadrant gate system, Kimley-Horn recommends the City pursue this option.

### CITY OF MENLO PARK

For the four crossings in the City of Menlo Park, Kimley-Horn recommends upgrading Oak Grove Avenue and Ravenswood Avenue. This determination is twofold: not only does this alternative have the lowest cost implication, at roughly \$4,200,000, it also has the greatest risk reduction for these four crossings. In the future, the City may wish to implement SSMs at the two remaining crossings, but there would not be a change to the quiet zone status if this were to occur. The City may desire the future engineering consultant prepare plans, specifications, and estimates (PS&E) for all four crossings, then only undergo construction on two of them.

## NEXT STEPS

Following the conclusion of this quiet zone study, the Cities may begin preparing for the implementation of a quiet zone. For this to occur, the Cities must still undergo several necessary steps, including developing final engineering plans, acquiring necessary permits, securing funding, undergoing construction, and certifying the quiet zone with necessary agencies.

## FINAL DESIGN

After securing board approval to pursue the remaining work for a quiet zone, the Cities would need to develop Request for Proposals (RFP) for engineering firms to submit a proposal to perform the engineering work associated with the design of the crossing(s).

Topographic survey would be needed at all crossings to ensure the engineers are designing the work appropriately and correctly. Typically, the engineer consultant would submit PS&E to the Cities and all stakeholder agencies at various levels of design completion, adding additional detail and information through each submittal. Comprehensive demolition, civil improvements, signage and striping, grading and drainage, lighting/traffic signal (if necessary) plans, along with traffic control plans and construction phasing plans would all be required at the culmination of the final 100% plan set.

Throughout the design process, not only would the engineer receive feedback from the Cities, but also Caltrain, CPUC, and other agencies that may hold stake in the project (e.g., if signal interconnection is deemed necessary for a crossing with the nearby intersection at El Camino Real, Caltrans would need to be involved to ensure the design appropriately reflects and manages the Caltrans traffic signals.).

There may also be discussions with the CAHSRA due to their plans to operate along the Caltrain corridor in the future. The FRA Grade Crossing Handbook indicates that trains operating at speeds above 125 miles per hour (mph) must always maintain a fully sealed corridor; this would require full closure or grade separation of every crossing. If CAHSRA pursues operating speeds above 125 mph, all improvements made for the respective quiet zones would no longer be sufficient from a safety perspective. However, if CAHSRA operates at a maximum speed of 79 mph, the four-quadrant gate system would be a sufficient safety measure.

## **PERMITTING**

Alongside the final design process, the engineering consultant may support the Cities with the permitting process. CPUC General Order 88-B (GO 88-B) is a permit required for any modifications to an existing rail crossing. Obtaining approval for this permit is paramount to the modification of any at-grade crossing, as it ensures the plans provided meet CPUC criteria and acts as government approval for safety upgrades. The GO 88-B permit is only valid for three years, so a second permit may be necessary if construction is completed beyond this timeframe. This could trigger modifications to the final design to meet the latest CPUC standards. Caltrain would likely require the Cities to obtain an encroachment permit for any work performed in the right of way owned by the PCJPB.

In addition to obtaining permits through CPUC, there may need to be a Construction and Maintenance (C&M) agreement between the Cities and Caltrain.

Environmental clearance would be required through the California Environmental Quality Act (CEQA); the level of environmental documentation required would be a function of the various resources impacted. If federal funding is secured, the crossings would also need to be cleared through the National Environmental Policy Act (NEPA).

## **FUNDING**

The Cities would also need to secure funding to support the design and construction associated with the quiet zone. Funding sources exist through federal, state, regional, and local levels, and the engineering consultant may be able to support the Cities with grant applications for some of these funding opportunities. On the federal level, the FRA offers the Consolidated Rail Infrastructure and Safety Improvements (CRISI) Grant, which is a program funding projects to improve safety, efficiency, and reliability of intercity passenger and freight rail. Municipalities in California have also been successful at obtaining funding through various state grants; the Cities could, in conjunction with their local and state representatives, investigate and lobby for additional funding.

The Cities may also pursue funding through the Cities' respective Transportation Funds.

## **CONSTRUCTION**

For the improvements to be constructed, the Cities should hire a firm familiar with performing construction work in and around railroad right-of-way. Depending on Caltrain regulations at the time of construction, construction crews may be required to be trained by Caltrain staff for safety while working near electrified tracks, or Caltrain themselves may install the railroad devices such as automatic gates. The engineering consultant may be tasked with providing construction support to the Cities, in the form of field visits and general oversight during the construction phase.

**CONTINUED OUTREACH**

Throughout the final design and construction phases, the engineering consultant should continue to attend public outreach meetings and hearings to support the Cities. A post-construction meeting will likely be held with the same attendees as the initial diagnostic meeting to secure final approval of the quiet zone.

**APPENDIX A**  
**Full Quiet Zone Analysis**

APPENDIX A  
Quiet Zone Scenario Calculations

Supplemental Safety Measure (SSM) Codes

- |    |   |
|----|---|
| 1  | Temporary Closure of a Public Highway-Rail Grade Crossing   |
| 2  | Permanent Closure of a Public Highway-Rail Grade Crossing   |
| 3  | Grade Separation of a Public Highway-Rail Grade Crossing  |
| 4  | Four-Quadrant Gates Upgrade from Two Quadrant gates, No Vehicle Presence Detection                  |
| 5  | Four-Quadrant Gates Upgrade from Two Quadrant gates, with medians and no Vehicle Presence Detection |
| 6  | Four-Quadrant Gates Upgrade from Two Quadrant gates, with Vehicle Presence Detection                |
| 7  | Four-Quadrant Gates Upgrade from Two Quadrant gates, with medians and Vehicle Presence Detection    |
| 8  | Four-Quadrant Gates New Installation, No Vehicle Presence Detection                                 |
| 9  | Four-Quadrant Gates New Installation with medians and no Vehicle Presence Detection                 |
| 10 | Four-Quadrant Gates New Installation with Vehicle Presence Detection                                |
| 11 | Four-Quadrant Gates New Installation with medians and Vehicle Presence Detection                    |
| 12 | Mountable medians with Reflective Traffic Channelization Devices                                    |
| 13 | Non-Traversable Curb Medians with or without Channelization Devices                                 |
| 14 | One-Way Streets with Gates  |

# Menlo Park Quiet Zone

## RISK INDEX WITH HORN: 91412.53

The following scenarios were analyzed using the FRA Quiet Zone calculator. The Supplemental Safety Measure (SSM) codes are listed below; the full description of SSMs are presented in page 1 of this appendix. To be eligible for a quiet zone, the total risk associated with the zone of interest cannot exceed the risk index with horn (RIWH). For this zone, the RIWH is 91412.53.

	DO NOTHING ALTERNATIVE			ADD SSM TO ALL CROSSINGS			
	Existing SSM	SSM	Risk	SSM	Risk	Δrisk	
Encinal	0	0	60440.76	6	13901.38	-46539.38	QZ does not qualify
Glenwood	0	0	63582.56	6	14623.99	-48958.57	QZ qualifies
Oak Grove	0	0	270486.96	6	62212	-208274.96	
Ravenswood	0	0	215394.09	6	49540.64	-165853.45	
<b>Total</b>			<b>152476.09</b>		<b>35069.5</b>		

### UPGRADE ONE CROSSING ONLY

	SSM	Risk	SSM	Risk	SSM	Risk	SSM	Risk
Encinal	6	13901.38	0	60440.76	0	60440.76	0	60440.76
Glenwood	0	63582.56	6	14623.99	0	63582.56	0	63582.56
Oak Grove	0	270486.96	0	270486.96	6	62212	0	270486.96
Ravenswood	0	215394.09	0	215394.09	0	215394.09	6	49540.64
<b>Total</b>		<b>140841.25</b>		<b>140236.45</b>		<b>100407.35</b>		<b>111012.73</b>

### SCENARIOS: Always upgrade Encinal Ave

	SSM	Risk	SSM	Risk	SSM	Risk	SSM	Risk
Encinal	6	13901.38	6	13901.38	6	13901.38	6	13901.38
Glenwood	6	14623.99	0	63582.56	0	63582.56	6	14623.99
Oak Grove	0	270486.96	6	62212	0	270486.96	6	62212
Ravenswood	0	215394.09	0	215394.09	6	49540.64	0	215394.09
<b>Total</b>		<b>128601.61</b>		<b>88772.51</b>		<b>99377.89</b>		<b>76532.87</b>

### SCENARIOS: Always upgrade Glenwood Ave

	SSM	Risk	SSM	Risk	SSM	Risk
Encinal	0	60440.76	0	60440.76	0	60440.76
Glenwood	6	14623.99	6	14623.99	6	14623.99
Oak Grove	6	62212	0	270486.96	6	62212
Ravenswood	0	215394.09	6	49540.64	6	49540.64
<b>Total</b>		<b>88167.71</b>		<b>98773.09</b>		<b>46704.35</b>

### SCENARIOS: Always upgrade Oak Grove Ave

	SSM	Risk	SSM	Risk
Encinal	0	60440.76	6	13901.38
Glenwood	0	63582.56	0	63582.56
Oak Grove	6	62212	6	62212
Ravenswood	6	49540.64	6	49540.64
<b>Total</b>		<b>58943.99</b>		<b>47309.15</b>

# Palo Alto Quiet Zone

## RISK INDEX WITH HORN: 62821.79

The following scenarios were analyzed using the FRA Quiet Zone calculator. The Supplemental Safety Measure (SSM) codes are listed below; the full description of SSMs are presented in page 1 of this appendix. To be eligible for a quiet zone, the total risk associated with the zone of interest cannot exceed the risk index with horn (RIWH). For this zone, the RIWH is 62821.79.

	DO NOTHING ALTERNATIVE			4 QUAD GATES, NO MEDIAN, VEHICLE PRESENCE DETECTION			
	Pre-SSM	SSM	Risk	SSM	Risk	Δrisk	
Palo Alto	0	0	104786.75	6	24100.95	-80685.8	OZ does not qualify
Total			104786.75		24100.95		OZ qualifies

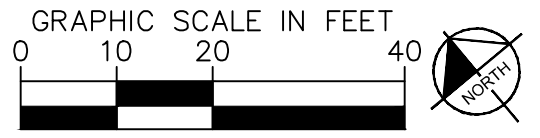
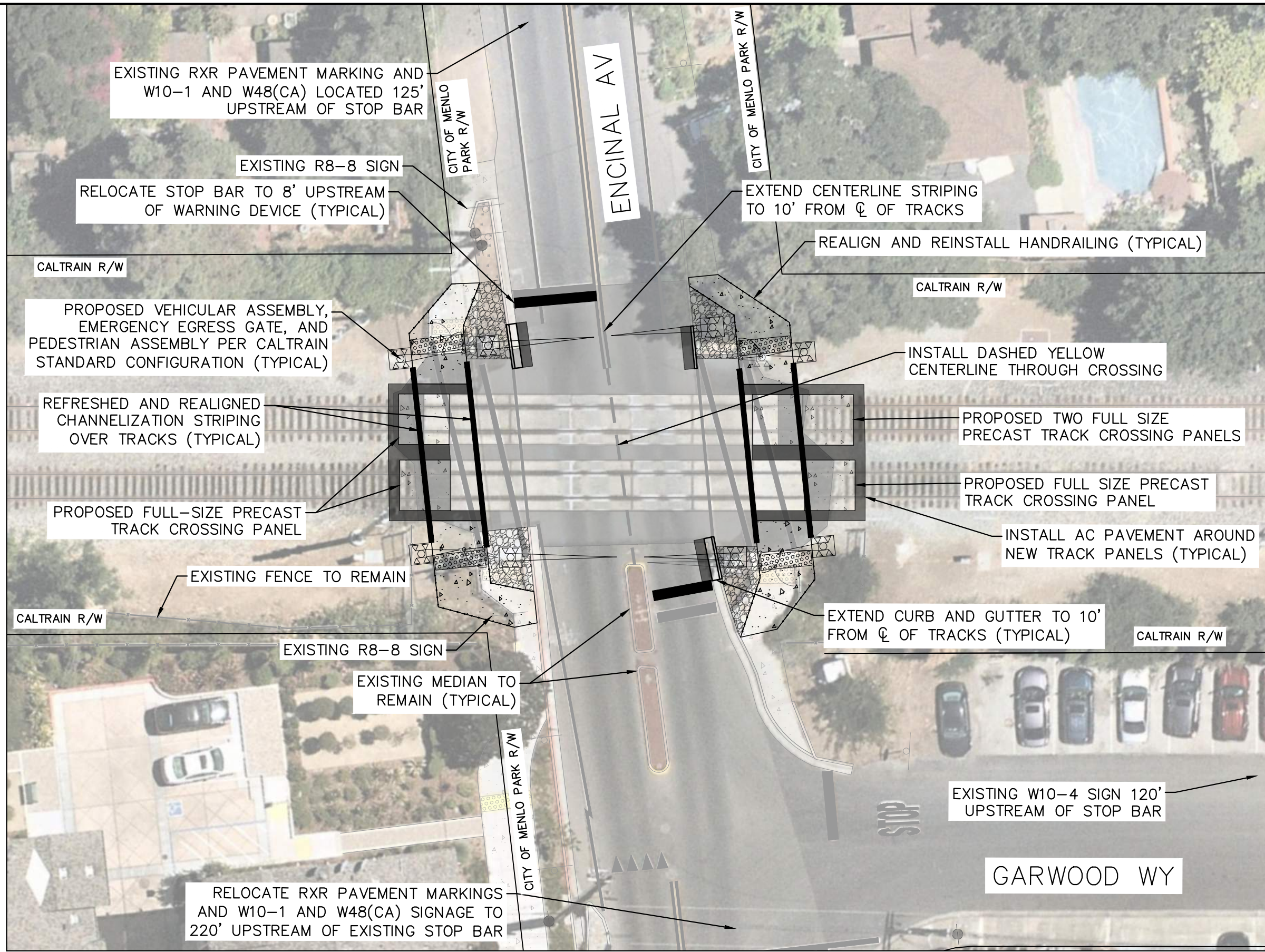
	DO NOTHING ALTERNATIVE			4 QUAD GATES, WITH MEDIAN AND VEHICLE PRESENCE DETECTION		
	Pre-SSM	SSM	Risk	SSM	Risk	Δrisk
Palo Alto	0	0	104786.75	7	8382.94	-96403.81
Total			104786.75		8382.94	

	DO NOTHING ALTERNATIVE			NON-TRAVERSABLE MEDIAN ONLY		
	Pre-SSM	SSM	Risk	SSM	Risk	Δrisk
Palo Alto	0	0	104786.75	13	20957.35	-83829.4
Total			104786.75		20957.35	



**APPENDIX B**  
Conceptual Designs

Taylor Brown Dec 19, 2022 - 12:20pm K:\S.C. TRANS\092020105 - Menlo Park Quiet Zone Study\Design\Exhibits\754988Y-Encinal-Av.dwg



- GENERAL NOTES:**
1. ALL EXISTING PAVEMENT MARKINGS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  2. ALL EXISTING SIGNS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  3. EXISTING COMBINED VEHICULAR AND PEDESTRIAN GATE ARM ASSEMBLIES TO BE UPGRADED TO TWO SEPARATE ASSEMBLIES. WORK TO BE PERFORMED BY CALTRAIN.
  4. FLASHING LIGHT PAIRS TO BE ORIENTED IN THE DIRECTION OF TRAVEL.

**SIGN LEGEND:**

W10-1

W10-4

W48(CA)

R8-8

**LEGEND**

- DETECTABLE WARNING SURFACE
- ASPHALT CONCRETE PAVEMENT
- CONCRETE SIDEWALK
- NON-TRAVERSABLE SURFACE
- HANDRAILING

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISIONS DESCRIPTION	NO.	BY	DATE	REVISIONS DESCRIPTION

**CITY OF MENLO PARK**

**Kimley Horn**

10 S. Almaden Blvd, Suite 1250  
San Jose, California 95113  
Tel. No. (669) 800-4130

DRAWN BY:

DESIGNED BY:

CHECKED BY:

APPROVED BY:

MENLO PARK QUIET ZONE STUDY

DOT# 754988Y

ENCINAL AV XING

CONCEPTUAL DESIGN LAYOUT

JOB NO.

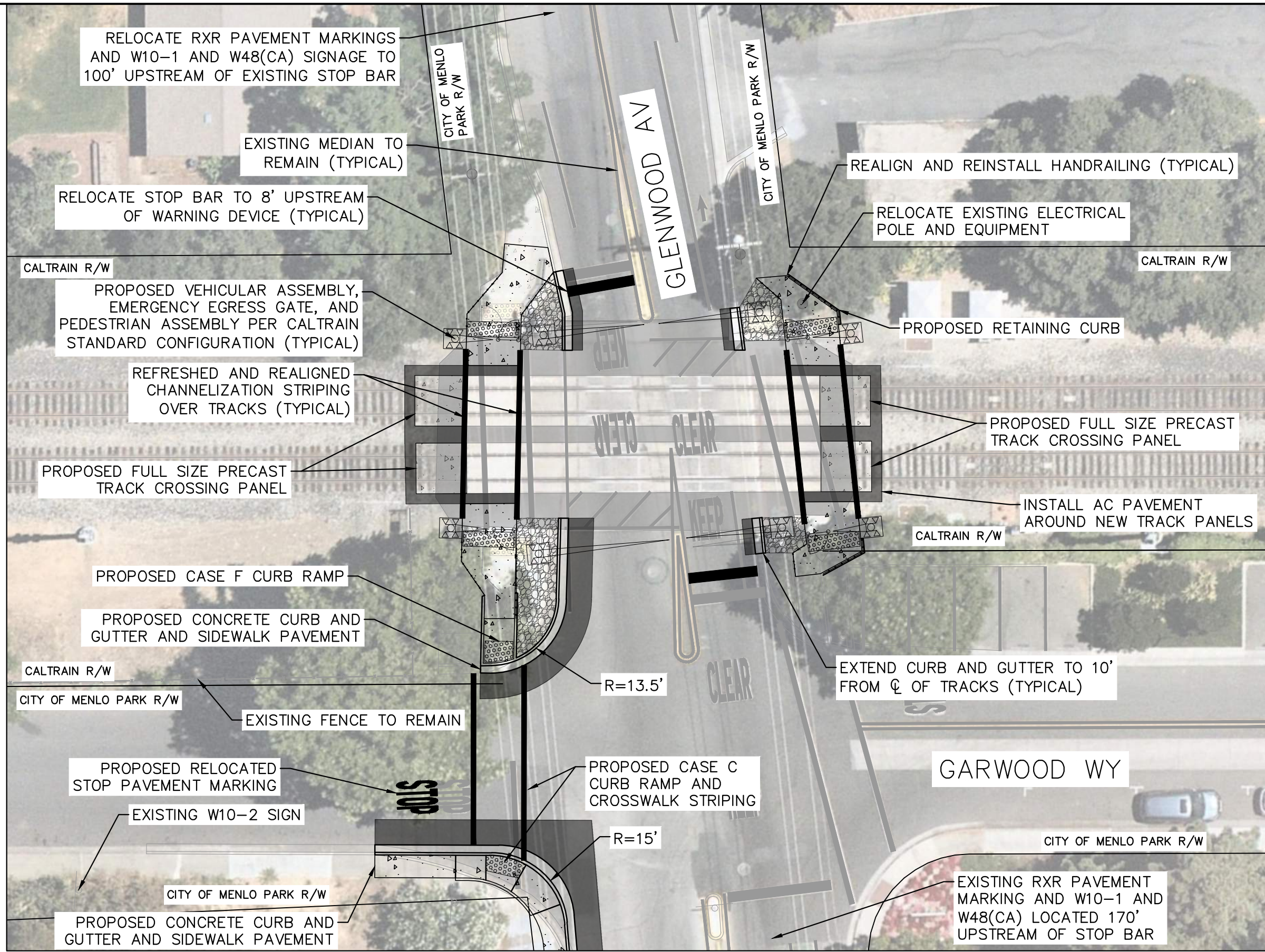
DATE: DECEMBER 2022

SCALE:

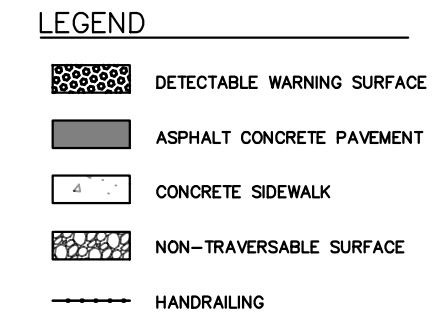
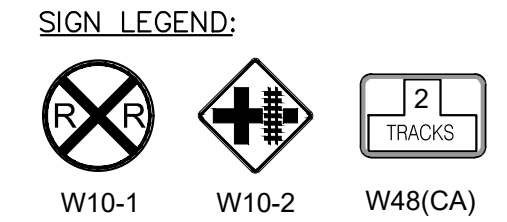
SHEET \_\_\_\_ OF \_\_\_\_ SHEETS

SHEET NO.

Taylor Brown Dec 19, 2022 - 12:22pm K:\S.C. TRANS\092020105 - Menlo Park Quiet Zone Study\Design\Exhibits\754989F - Glenwood-Av.dwg



- GENERAL NOTES:**
1. ALL EXISTING PAVEMENT MARKINGS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  2. ALL EXISTING SIGNS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  3. EXISTING COMBINED VEHICULAR AND PEDESTRIAN GATE ARM ASSEMBLIES TO BE UPGRADED TO TWO SEPARATE ASSEMBLIES. WORK TO BE PERFORMED BY CALTRAIN.
  4. FLASHING LIGHT PAIRS TO BE ORIENTED IN THE DIRECTION OF TRAVEL.

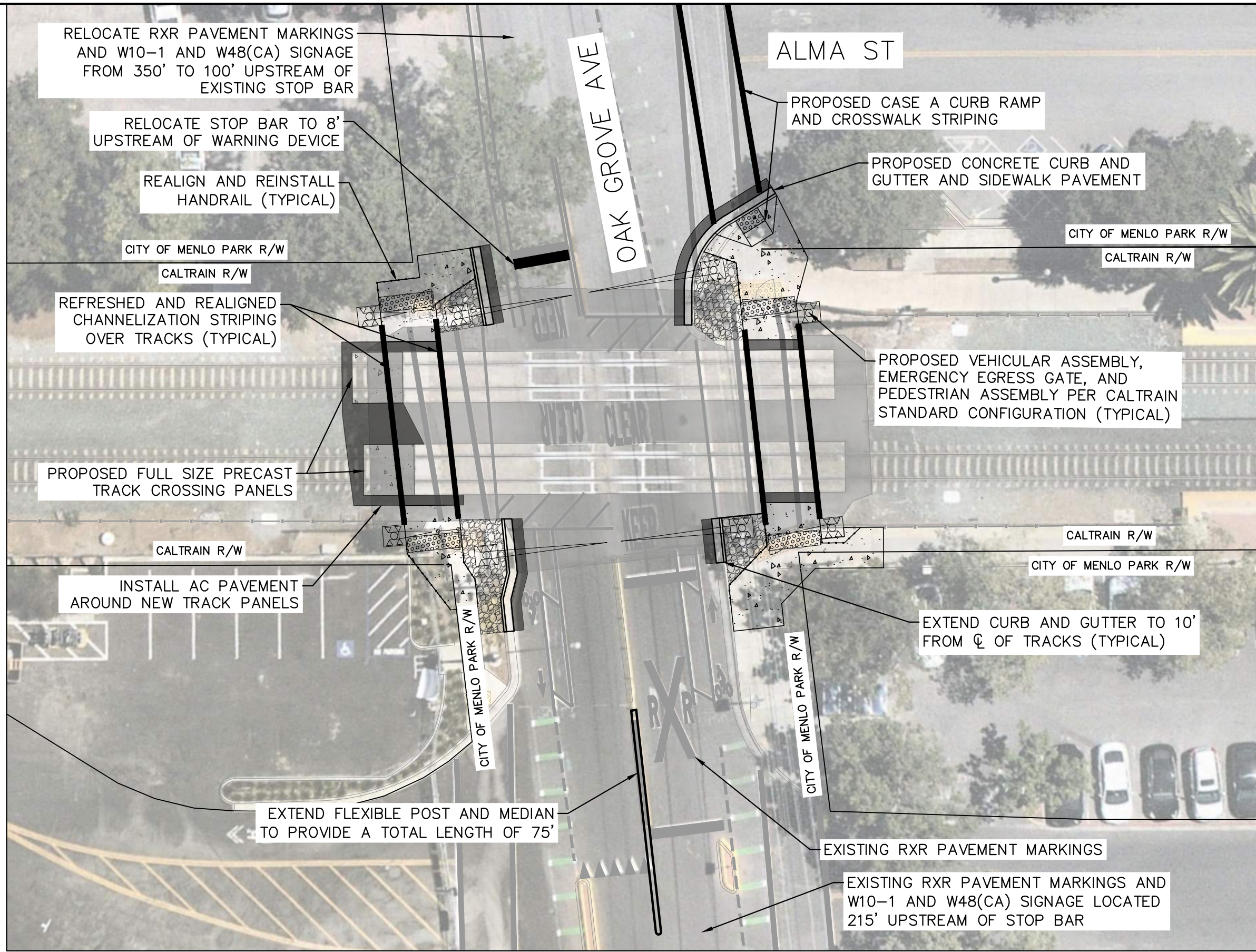


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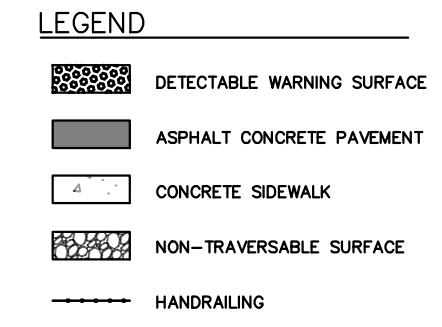
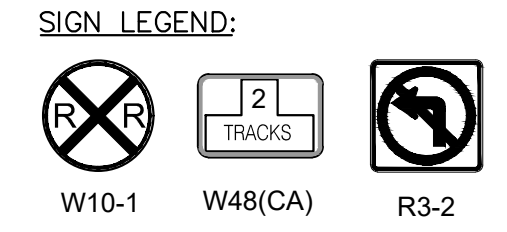
REVISIONS			REVISIONS				
NO.	BY	DATE	DESCRIPTION	NO.	BY	DATE	DESCRIPTION

	<p>10 S. Almaden Blvd, Suite 1250 San Jose, California 95113 Tel. No. (669) 800-4130</p>	DRAWN BY: _____ DESIGNED BY: _____ CHECKED BY: _____ APPROVED BY: _____	JOB NO. _____ DATE: DECEMBER 2022 SCALE: _____ SHEET _____ OF _____ SHEETS SHEET NO. _____
		MENLO PARK QUIET ZONE STUDY	
		DOT# 754989F GLENWOOD AV XING CONCEPTUAL DESIGN LAYOUT	
		CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION	

Menlo Park Quiet Zone Study Design Exhibits 754990A - Oak Grove - Av.xing  
 Dec 19, 2022 - 12:06pm K:\S&C-TRANS\097029105 - Menlo Park Quiet Zone Study Design Exhibits 754990A - Oak Grove - Av.xing



- GENERAL NOTES:**
1. ALL EXISTING PAVEMENT MARKINGS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  2. ALL EXISTING SIGNS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  3. EXISTING COMBINED VEHICULAR AND PEDESTRIAN GATE ARM ASSEMBLIES TO BE UPGRADED TO TWO SEPARATE ASSEMBLIES. WORK TO BE PERFORMED BY CALTRAIN.
  4. FLASHING LIGHT PAIRS TO BE ORIENTED IN THE DIRECTION OF TRAVEL.



CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISIONS DESCRIPTION

NO.	BY	DATE	REVISIONS DESCRIPTION



**Kimley Horn**  
 10 S. Almaden Blvd, Suite 1250  
 San Jose, California 95113  
 Tel. No. (669) 800-4130

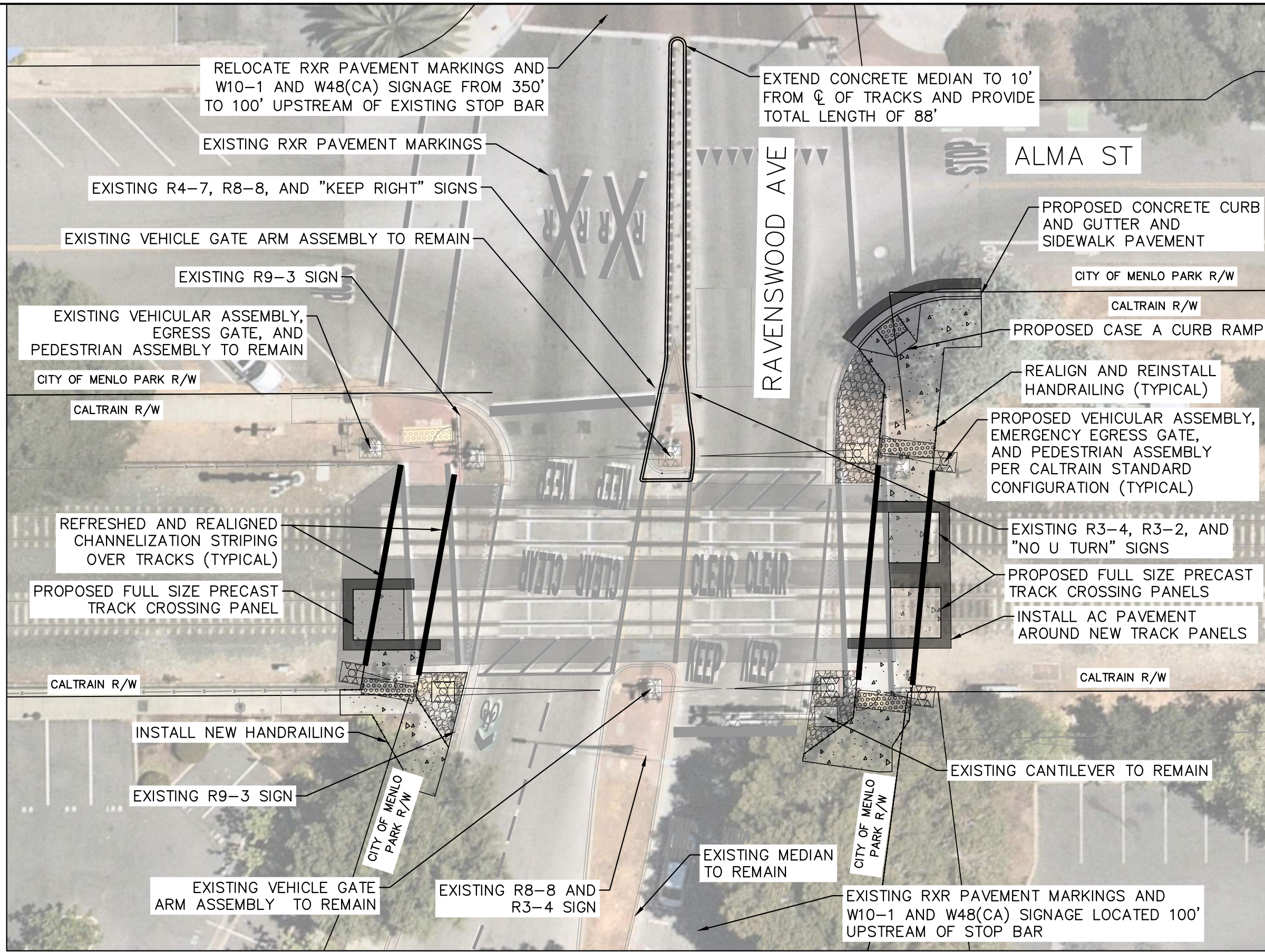
DRAWN BY:  
 DESIGNED BY:  
 CHECKED BY:  
 APPROVED BY:

MENLO PARK QUIET ZONE STUDY

DOT# 754990A  
 OAK GROVE AV XING  
 CONCEPTUAL DESIGN LAYOUT

JOB NO.	DATE	DECEMBER 2022
SCALE		
SHEET	OF	SHEETS
SHEET NO.		

Menlo Park  
 Dec 19, 2022 - 12:29pm K:\S&C-TRANS\097029105 - Menlo Park Quiet Zone Study\Design\Exhibits\754991G-Ravenswood-AvXing



- GENERAL NOTES:**
1. ALL EXISTING PAVEMENT MARKINGS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  2. ALL EXISTING SIGNS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  3. EXISTING COMBINED VEHICULAR AND PEDESTRIAN GATE ARM ASSEMBLIES TO BE UPGRADED TO TWO SEPARATE ASSEMBLIES. WORK TO BE PERFORMED BY CALTRAIN.
  4. FLASHING LIGHT PAIRS TO BE ORIENTED IN THE DIRECTION OF TRAVEL.

**SIGN LEGEND:**

W10-1	W48(CA)	R3-2
R3-4	R4-7	R8-8
R9-3		

**LEGEND**

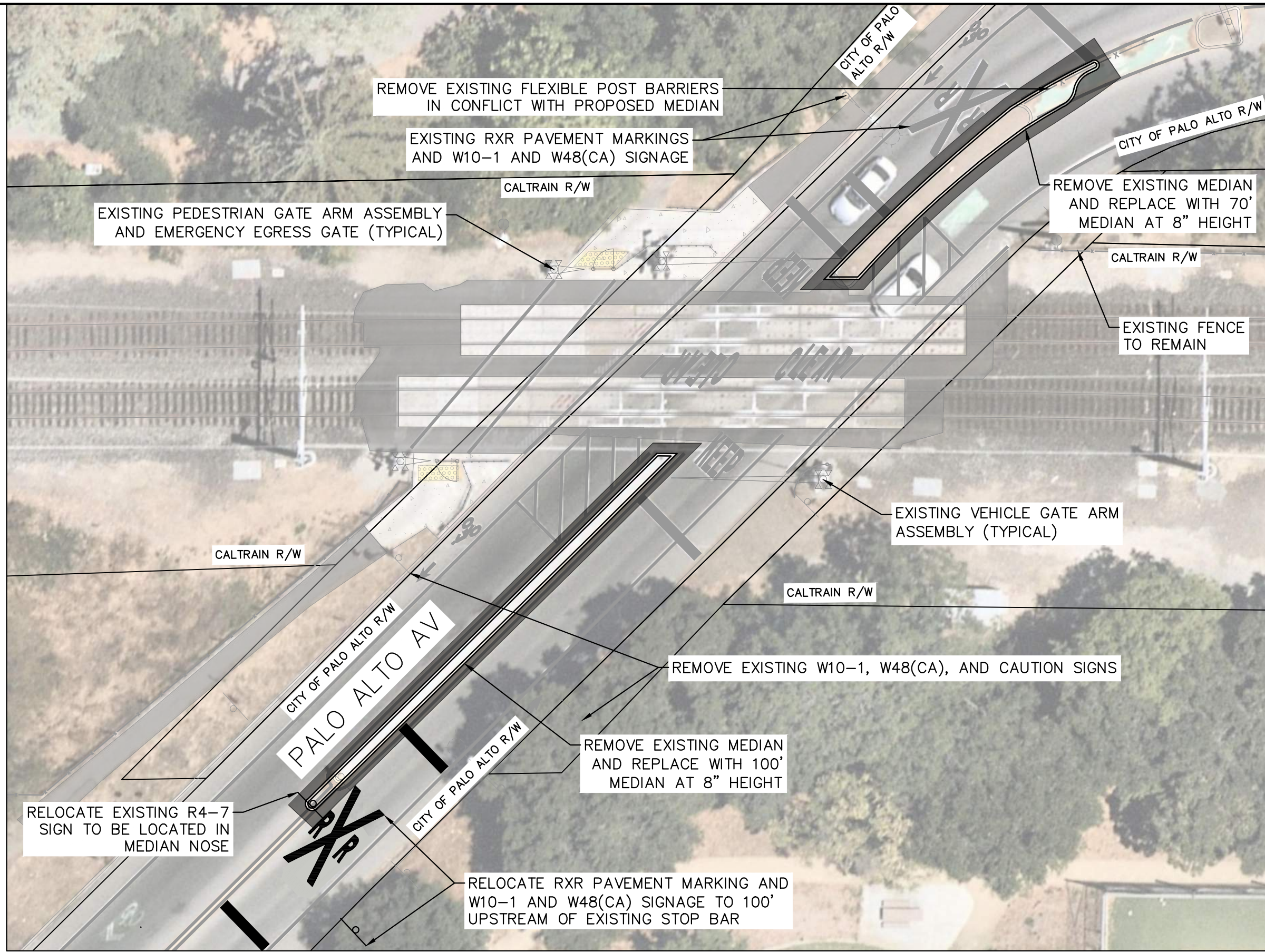
	DETECTABLE WARNING SURFACE
	ASPHALT CONCRETE PAVEMENT
	CONCRETE SIDEWALK
	NON-TRAVERSABLE SURFACE
	HANDRAILINGS

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

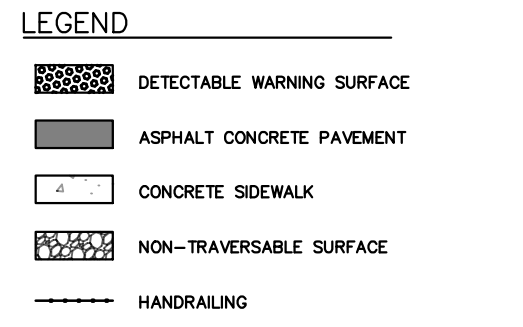
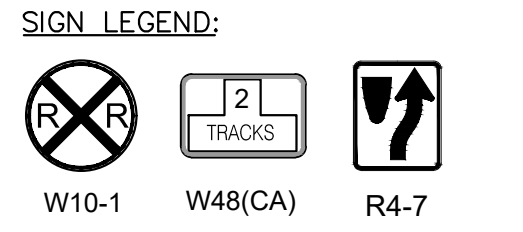
REVISIONS			REVISIONS				
NO.	BY	DATE	DESCRIPTION	NO.	BY	DATE	DESCRIPTION

		DRAWN BY: _____ DESIGNED BY: _____ CHECKED BY: _____ APPROVED BY: _____	JOB NO. _____ DATE: DECEMBER 2022 SCALE: _____ SHEET # _____ OF _____ SHEETS SHEET NO. _____
		MENLO PARK QUIET ZONE STUDY DOT# 754991G RAVENSWOOD AV XING CONCEPTUAL DESIGN LAYOUT	

Taylor Brown Dec 19, 2022 - 12:23pm K:\S.C. TRANS\092020105 - Menlo Park Quiet Zone Study\Design\Exhibits\754992N-PaloAlto-Av.dwg



- GENERAL NOTES:**
1. ALL EXISTING PAVEMENT MARKINGS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  2. ALL EXISTING SIGNS TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.



CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

REVISIONS			REVISIONS				
NO.	BY	DATE	DESCRIPTION	NO.	BY	DATE	DESCRIPTION

**CITY OF MENLO PARK**

**Kimley-Horn**  
 10 S. Almaden Blvd, Suite 1250  
 San Jose, California 95113  
 Tel. No. (669) 800-4130

DRAWN BY: \_\_\_\_\_

DESIGNED BY: \_\_\_\_\_

CHECKED BY: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**MENLO PARK QUIET ZONE STUDY**

DOT# 754992N  
 PALO ALTO AV XING  
 CONCEPTUAL DESIGN LAYOUT

JOB NO. \_\_\_\_\_

DATE: DECEMBER 2022

SCALE: \_\_\_\_\_

SHEET \_\_\_\_\_ OF \_\_\_\_\_ SHEETS

SHEET NO. \_\_\_\_\_

**APPENDIX C**

**Field Diagnostic Meeting Minutes**

**Grade Crossing Improvement Diagnostic Meeting for  
Encinal Av Crossing (DOT 754988Y) in Menlo Park, CA  
Tuesday, December 13, 2022**

**Attendees:**

<b>Name</b>	<b>Agency/Company</b>	<b>Pre-Meeting</b>	<b>Field Meeting</b>
Peter Meyerhofer	Kimley-Horn	Yes	Yes
Taylor Brown	Kimley-Horn	Yes	Yes
Hugh Louch	City of Menlo Park	Yes	Yes
Phong Vo	City of Menlo Park	Yes	Yes
Rick Bartholomew	Caltrain	Yes	Yes
Zohair Zulfiqar	CPUC	No	Yes
Eric Walker	FRA	Yes	Yes
Carlos Ruiz	Caltrans	Yes	Yes

**Definitions:**

- Diagnostic Team: Pursuant to CA MUTCD 8A.01.05a, the diagnostic team needs to include at a minimum, representatives of the highway agency or authority with jurisdiction over the roadway, the railroad with responsibility of the track and signals, and the California Public Utilities Commission (CPUC) with statutory authority over grade crossings.
- CPUC Standard No. 9: An automatic gate arm used in combination with a Standard 8. The gate mechanism may be mounted on the Standard 8 mast or separately on an adjacent pedestal.
- CPUC Standard No. 9-A: A Standard 9 with additional flashing light signals over the roadway on a cantilever arm.
- CPUC Standard No. 9-E: A Standard 9 installed on the departure side of the at-grade crossing (also known as an exit gate) in addition to the typical approach side of the at-grade crossing (also known as an entrance gate).
- CA MUTCD: California Manual of Traffic Control Devices
- FRA: Federal Railroad Administration
- RRTCD: Railroad Traffic Control Devices
- RIRO: Right-in Right-out

**Existing Conditions/General Crossing Comments:**

*Preliminary Discussion/Existing Conditions:*

- **Roadway Existing and Proposed Conditions**
  - Existing ADT is 4,893 vehicles, 134 pedestrians, and 116 bicycles.
  - Proposed improvements show improvements to all 4 quadrants, to include exit gates, separated vehicle and sidewalk gate assemblies, additional track crossing panels, and sidewalk reconfiguration. Other improvements include relocation of signage and striping, as well as signage upgrades for regulatory compliance.
- **Train Operations**
  - According to FRA data, there are 104 thru trains and 4 switching trains per day.
- **Signal Operations**
  - There is no current interconnection of the crossing with El Camino Real, roughly 725' from the crossing.
- **Pedestrians**
  - All quadrants have sidewalk and existing pedestrian facilities.

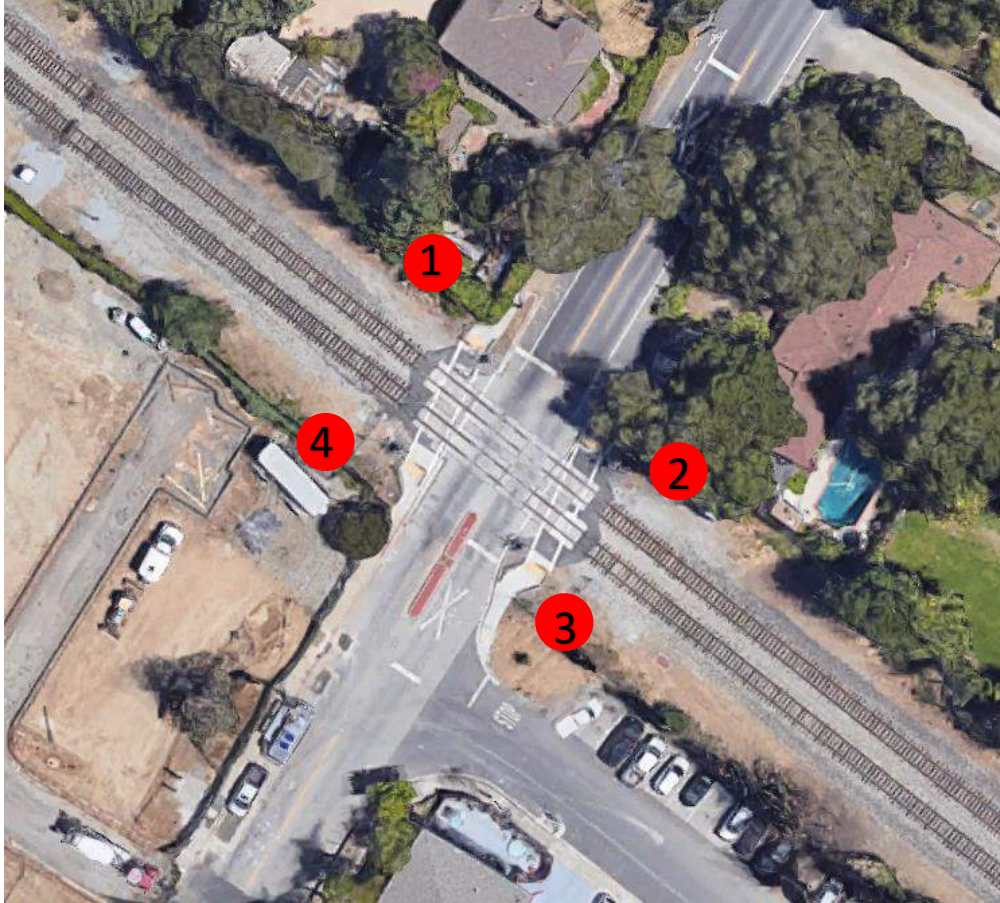


- **Lighting/Electrical**

- A general item to note with all crossings is to evaluate lighting conditions. At this crossing, there is no street lighting.

**Diagnostic Team Review and Recommendations:**

**Site Map and Quadrant Identification:**



**Location 1: Northwest (NW) Quadrant**

- The diagnostic team noted the sidewalk reconfiguration in this quadrant would necessitate vegetation trimming/removal.
- Caltrans noted the location of asphalt and sidewalk meeting is not flush and poses a tripping hazard.
  - Kimley-Horn indicated that the asphalt in front of the sidewalks would be replaced, as sidewalk is proposed to extend up to 2' from the crossing panels, and a note can be added to ensure the meeting point of concrete sidewalk and asphalt is flush in all locations.
  - Diagnostic team discussed potential of replacing existing rough asphalt all the way up to the crossing panels, rather than using rough aggregate asphalt currently in place.
- Diagnostic team noted this quadrant may be a candidate for streetlighting.

**Location 2: Northeast (NE) Quadrant**

- Diagnostic team discussed tie-in of proposed sidewalk and proximity to R/W. While close, it does not require any R/W acquisition.

**Location 3: Southeast (SE) Quadrant**

- Diagnostic team discussed existing medians and potential for upgrades; current design shows medians to be left as-is.
- Note existing W10-4 signage on Garwood Way is located adjacent to a large shrub that can block the visibility of the sign.
- CPUC noted the crosswalk (which connects pedestrians in Location 3 with Location 4) as an area of concern. Aside from it being installed without prior approval, its proximity to the crossing poses a potential queueing concern. CPUC would like a queue study to be performed at this location.
  - City of Menlo Park stated they will conduct a queueing study and are planning to undergo the process to obtain approval for the crosswalk.
  - City of Menlo Park indicated this crosswalk serves a relatively small population and may not be a queueing concern. Video traffic counts can be revisited to see if queueing due to the crosswalk can be seen.

Location 4: Southwest (SW) Quadrant

- Improvements would push infrastructure up to the maintenance access gate.
  - Caltrain believes current access is made by turning onto the tracks from the SB approach. With the upgrades Caltrain is undergoing currently, it is unclear if maintenance access will be needed or what that will require spatially.

Concluding Comments:

- Kimley-Horn will draft Diagnostic Notes and provide to the Diagnostic Team for review/concurrence.
- Kimley-Horn will update the concept design to upgrade signage and striping, as well as add “no train horn” signage for pedestrians.

**Grade Crossing Improvement Diagnostic Meeting for  
Glenwood Av Crossing (DOT 754989F) in Menlo Park, CA  
Tuesday, December 13, 2022**

**Attendees:**

<b>Name</b>	<b>Agency/Company</b>	<b>Pre-Meeting</b>	<b>Field Meeting</b>
Peter Meyerhofer	Kimley-Horn	Yes	Yes
Taylor Brown	Kimley-Horn	Yes	Yes
Hugh Louch	City of Menlo Park	Yes	Yes
Phong Vo	City of Menlo Park	Yes	Yes
Rick Bartholomew	Caltrain	Yes	Yes
Zohair Zulfiqar	CPUC	No	Yes
Eric Walker	FRA	Yes	Yes
Carlos Ruiz	Caltrans	Yes	Yes

**Definitions:**

- Diagnostic Team: Pursuant to CA MUTCD 8A.01.05a, the diagnostic team needs to include at a minimum, representatives of the highway agency or authority with jurisdiction over the roadway, the railroad with responsibility of the track and signals, and the California Public Utilities Commission (CPUC) with statutory authority over grade crossings.
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- CPUC Standard No. 9-E: A Standard 9 installed on the departure side of the at-grade crossing (also known as an exit gate) in addition to the typical approach side of the at-grade crossing (also known as an entrance gate).
- CA MUTCD: California Manual of Traffic Control Devices
- FRA: Federal Railroad Administration
- RRTCD: Railroad Traffic Control Devices
- RIRO: Right-in Right-out

**Existing Conditions/General Crossing Comments:**

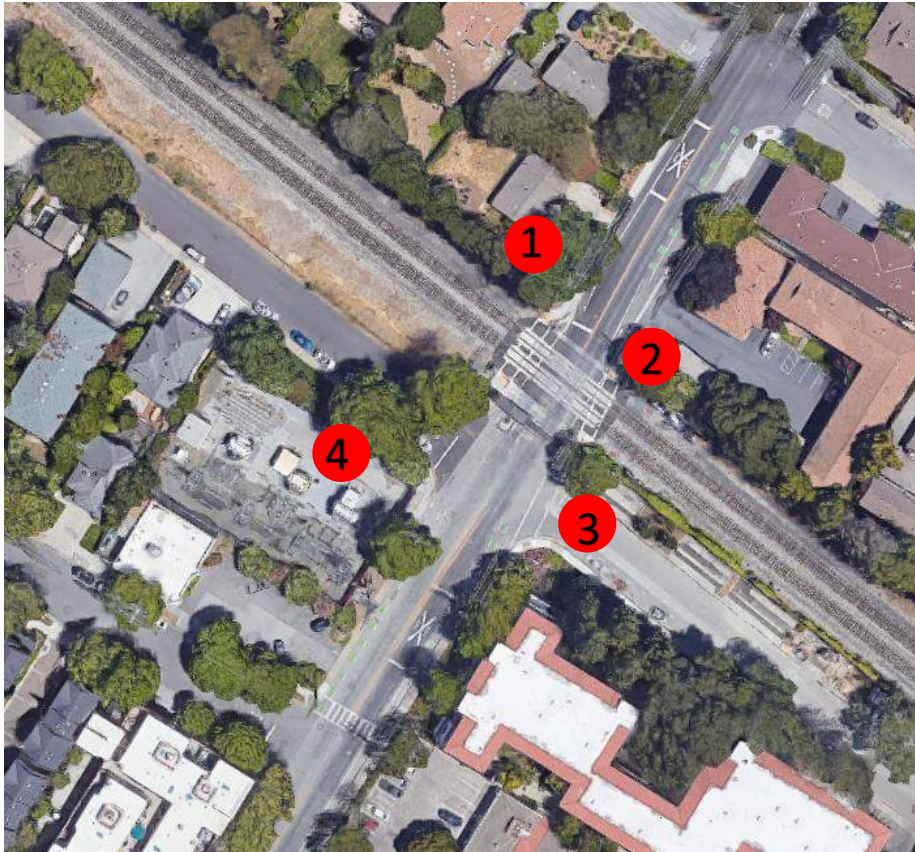
*Preliminary Discussion/Existing Conditions:*

- **Roadway Existing and Proposed Conditions**
  - Existing ADT is 5,467 vehicles, 165 pedestrians, and 212 bicycles.
  - Proposed improvements show improvements to all 4 quadrants, to include exit gates, separated vehicle and sidewalk gate assemblies, additional track crossing panels, and sidewalk reconfiguration. Other improvements include relocation of signage and striping, as well as signage upgrades for regulatory compliance, and curb ramp upgrades across Garwood Way.
- **Train Operations**
  - According to FRA data, there are 104 thru trains and 4 switching trains per day.
- **Signal Operations**
  - There is no current interconnection of the crossing with El Camino Real, located over 500' from the crossing.
- **Pedestrians**

- All quadrants have sidewalk and existing pedestrian facilities.
- **Lighting/Electrical**
  - A general item to note with all crossings is to evaluate lighting conditions. At this crossing, there is one streetlight on the NE quadrant.

**Diagnostic Team Review and Recommendations:**

**Site Map and Quadrant Identification:**



**Location 1: Northwest (NW) Quadrant**

- The diagnostic team noted the sidewalk reconfiguration in this quadrant would necessitate vegetation trimming/removal. At least one tree would require removal within Caltrain R/W, as well as shrubbery in the City R/W.

**Location 2: Northeast (NE) Quadrant**

- Diagnostic team discussed relocation of service meter on aboveground post, as it conflicts with proposed sidewalk reconfiguration.
  - Caltrain indicated that aboveground wires aren't used anymore, and the wires would instead be relocated and installed underground.

**Location 3: Southeast (SE) Quadrant**

- City of Menlo Park noticed the sidewalk relocation would require partial removal of the wall separating Caltrain R/W and the parking area for the Residence Inn. This area is within the public right-of-way.
- Diagnostic team noticed underground utility markers; potentially gas and/or cable, both of which will require coordination during infrastructure upgrades.

- Diagnostic team discussed lack of raised median between tracks and Garwood Way. Caltrain indicated this could be due to a lack of City permission at the time of installation, or due to access concerns.
- FRA measured distance from current stop bar to gate, which appears to be close to 10'. Proposed improvements show stop bar being relocated to 8' upstream of proposed warning devices.
- Diagnostic team noted W10-2 signage located on Garwood Way.

Location 4: Southwest (SW) Quadrant

- Diagnostic team noted W10-2 signage located on Garwood Way.

Concluding Comments:

- Kimley-Horn will draft Diagnostic Notes and provide to the Diagnostic Team for review/concurrence.
- Kimley-Horn will update the concept design to upgrade signage and striping, as well as add "no train horn" signage for pedestrians.

**Grade Crossing Improvement Diagnostic Meeting for  
Oak Grove Av Crossing (DOT 754990A) in Menlo Park, CA  
Tuesday, December 13, 2022**

**Attendees:**

<b>Name</b>	<b>Agency/Company</b>	<b>Pre-Meeting</b>	<b>Field Meeting</b>
Peter Meyerhofer	Kimley-Horn	Yes	Yes
Taylor Brown	Kimley-Horn	Yes	Yes
Hugh Louch	City of Menlo Park	Yes	Yes
Phong Vo	City of Menlo Park	Yes	Yes
Rick Bartholomew	Caltrain	Yes	Yes
Zohair Zulfiqar	CPUC	No	Yes
Eric Walker	FRA	Yes	Yes
Carlos Ruiz	Caltrans	Yes	Yes

**Definitions:**

- Diagnostic Team: Pursuant to CA MUTCD 8A.01.05a, the diagnostic team needs to include at a minimum, representatives of the highway agency or authority with jurisdiction over the roadway, the railroad with responsibility of the track and signals, and the California Public Utilities Commission (CPUC) with statutory authority over grade crossings.
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- CPUC Standard No. 9-A: A Standard 9 with additional flashing light signals over the roadway on a cantilever arm.
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- CA MUTCD: California Manual of Traffic Control Devices
- FRA: Federal Railroad Administration
- RRTCD: Railroad Traffic Control Devices
- RIRO: Right-in Right-out

**Existing Conditions/General Crossing Comments:**

*Preliminary Discussion/Existing Conditions:*

- **Roadway Existing and Proposed Conditions**
  - Existing ADT is 9,211 vehicles, 205 pedestrians, and 340 bicycles.
  - Proposed improvements show improvements to all 4 quadrants, to include exit gates, separated vehicle and sidewalk gate assemblies, additional track crossing panels, and sidewalk reconfiguration. Other improvements include relocation of signage and striping, as well as signage upgrades for regulatory compliance.
- **Train Operations**
  - According to FRA data, there are 104 thru trains and 4 switching trains per day.
- **Signal Operations**
  - Diagnostic team discussed potential interconnection of the crossing with El Camino Real, roughly 480' from the crossing.
  - CPUC noted during pre-diagnostic meeting that the crosswalk across Oak Grove (at Garwood/Merrill) may be a queueing concern. With a new development recently

completed/ in the final stages toward completion, pedestrian volumes are expected to increase. CPUC suggested signaling the intersection of Oak Grove Av and Merrill St/Garwood Way and adding advance preemption may be needed if the crosswalk creates additional queuing onto the tracks. The traffic signal would allow the left-turn movement from Oak Grove onto Merrill to be retained (no median necessary), while enhancing the safety. City would prefer to restrict left turns, especially in the short term as a signal is a major infrastructure project that could take multiple years to plan, design and fund.

- Kimley-Horn suggests performing pedestrian counts at the crosswalk itself once the residential development is fully built out (or allowing residents) to determine what kind of safety mitigation will be necessary.
- **Pedestrians**
  - All quadrants have sidewalk and existing pedestrian facilities. The sidewalks on the W side of the roadway do not have sidewalk gate arms, and instead have only emergency swing gates.
- **Lighting/Electrical**
  - A general item to note with all crossings is to evaluate lighting conditions. At this crossing, there are multiple streetlights and luminaires on the E side of the roadway on either side of the tracks.

**Diagnostic Team Review and Recommendations:**

**Site Map and Quadrant Identification:**



**Location 1: Northwest (NW) Quadrant**

- The diagnostic team noted the vegetation encroaches onto the existing sidewalk. The vegetation appears to be in private property.

- Diagnostic team noted proposed design does not conform to the existing sidewalk close to the curb line. Conceptual layouts to be revised to more accurately reflect the existing landscaping strip between sidewalk and roadway to show how the sidewalk would tie into existing conditions.

Location 2: Northeast (NE) Quadrant

- CPUC and Caltrain noted that there was no longer a need for the guardrail surrounding the pedestrian assembly. Caltrain agreed to remove guardrail. The proposed improvements involve pushing the sidewalk N and installing an exit gate, so this entire sidewalk gate assembly would need to be relocated.

No signage or striping to indicate a crossing upon left turns from Alma St onto Oak Grove Av. Diagnostic team may consider installing a W10-4 as an added safety measure.

Location 3: Southeast (SE) Quadrant

- Diagnostic team noticed several vehicles making left turns from Oak Grove onto Merrill, from Merrill onto Oak Grove (around the median), despite R3-5(R) signage present.
- Diagnostic team noted median extension S of the tracks would go up to the intersection with Merrill for the purpose of eliminating the ability for these left turns to take place.
- Diagnostic team discussed upgrading the sidewalk in this quadrant up to the intersection with Merrill St and adding an ADA-compliant ramp and corner radius.
  - Kimley-Horn will investigate this and verify any curb return radii against turning movements for transit buses, as those were seen making right turns from Merrill onto Oak Grove.
- Caltrain and City of Menlo Park noted that the left turn from Garwood Way onto Oak Grove is currently restricted due to a recently-installed median. Thus, the “no left turn” blank out sign and cantilevered flashers facing Garwood Way can both be removed. There is a combined meter for the signal and the no left turn blank out sign in the SW quadrant. Once the no left turn blank out sign is removed, this meter can be converted to Caltrain only.
  - Caltrain stated they are able to remove the cantilevered flashers on the combined vehicular/sidewalk gate assembly and the “no left turn” blank out sign.

Location 4: Southwest (SW) Quadrant

- Improvements would encroach into the landscaped area of the new development.
  - City of Menlo Park indicated this development is supportive of the Quiet Zone and would likely be amenable to the R/W acquisition, if necessary, though this area may already be in the public right of way
- Diagnostic team noted the service pedestal for the “No left turn” blank-out sign and rail signals would need to be relocated.
  - Caltrain agreed to remove the blank out sign, so the service pedestal would likely be changed to only accommodate the rail signals.

Concluding Comments:

- Kimley-Horn will draft Diagnostic Notes and provide to the Diagnostic Team for review/concurrence.
- Kimley-Horn will update the concept design to reflect the NW quadrant sidewalk more accurately, as well as “no train horn” signage for pedestrians.
- City will conduct a queueing study at the crosswalk S of the tracks, after the development in the SW quadrant reaches greater occupancy rates.
- City intends to install a temporary median extending through the intersection with Garwood Way/Merrill Street in the short term to address immediate queueing issues from left turning vehicles.



This could be removed in the future, depending on the queueing analysis and further coordination with CPUC and Caltrain.

**Grade Crossing Improvement Diagnostic Meeting for  
Ravenswood Av Crossing (DOT 754991G) in Menlo Park, CA  
Tuesday, December 13, 2022**

**Attendees:**

<b>Name</b>	<b>Agency/Company</b>	<b>Pre-Meeting</b>	<b>Field Meeting</b>
Peter Meyerhofer	Kimley-Horn	Yes	Yes
Taylor Brown	Kimley-Horn	Yes	Yes
Hugh Louch	City of Menlo Park	Yes	Yes
Phong Vo	City of Menlo Park	Yes	Yes
Rick Bartholomew	Caltrain	Yes	Yes
Zohair Zulfiqar	CPUC	No	Yes
Eric Walker	FRA	Yes	Yes
Carlos Ruiz	Caltrans	Yes	Yes

**Definitions:**

- Diagnostic Team: Pursuant to CA MUTCD 8A.01.05a, the diagnostic team needs to include at a minimum, representatives of the highway agency or authority with jurisdiction over the roadway, the railroad with responsibility of the track and signals, and the California Public Utilities Commission (CPUC) with statutory authority over grade crossings.
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- CPUC Standard No. 9-A: A Standard 9 with additional flashing light signals over the roadway on a cantilever arm.
- CPUC Standard No. 9-E: A Standard 9 installed on the departure side of the at-grade crossing (also known as an exit gate) in addition to the typical approach side of the at-grade crossing (also known as an entrance gate).
- CA MUTCD: California Manual of Traffic Control Devices
- FRA: Federal Railroad Administration
- RRTCD: Railroad Traffic Control Devices
- RIRO: Right-in Right-out

**Existing Conditions/General Crossing Comments:**

*Preliminary Discussion/Existing Conditions:*

- **Roadway Existing and Proposed Conditions**
  - Existing ADT is 16,793 vehicles, 646 pedestrians, and 621 bicycles.
  - Proposed improvements show improvements to 3 of 4 quadrants, to include exit gates, separated vehicle and sidewalk gate assemblies, additional track crossing panels, and sidewalk reconfiguration. Other improvements include relocation of signage and striping, as well as signage upgrades for regulatory compliance.
- **Train Operations**
  - According to FRA data, there are 104 thru trains and 4 switching trains per day.
- **Signal Operations**
  - Diagnostic team discussed potential interconnection of the crossing with nearby El Camino Real.
  - Distance from crossing to intersection is on the edge for interconnection. Queueing had historically been an issue, likely due to the allowance of left turns onto and from Alma St

onto Ravenswood Av; the existing temporary median has restricted that left turn and reduced the resultant queuing.

- Interconnection with El Camino Real would be in Caltrans domain, not the City's.

- **Pedestrians**

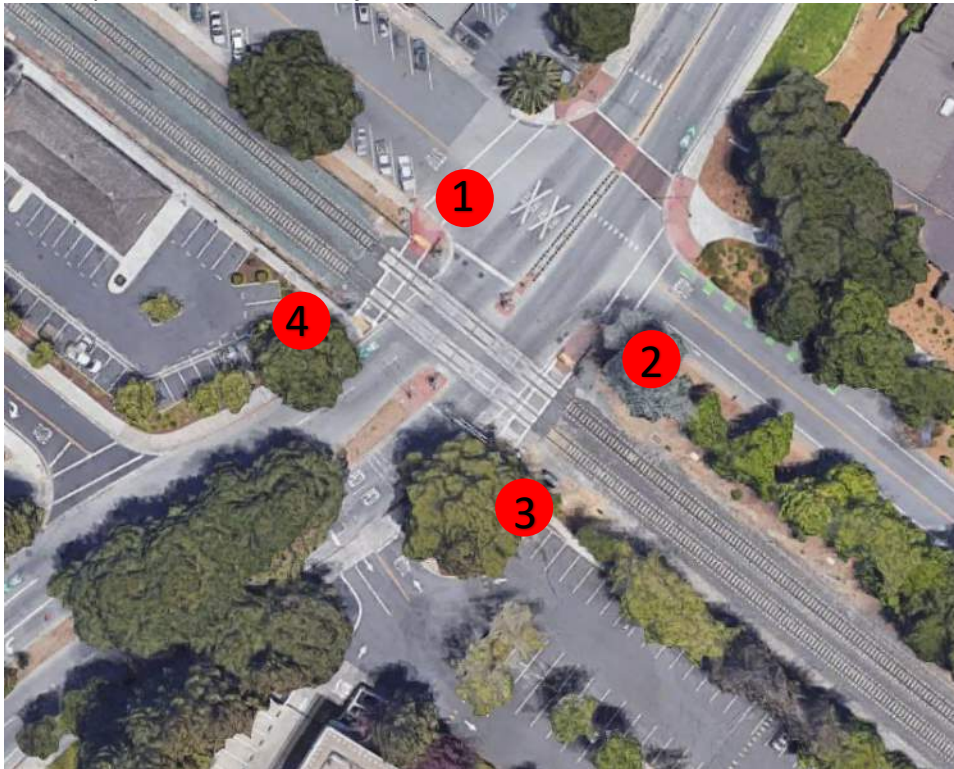
- All quadrants have sidewalk and existing pedestrian facilities.

- **Lighting/Electrical**

- A general item to note with all crossings is to evaluate lighting conditions. At this crossing, there is one streetlight with two luminaires placed on the S median.

**Diagnostic Team Review and Recommendations:**

**Site Map and Quadrant Identification:**



**Location 1: Northwest (NW) Quadrant**

- The diagnostic team noted the existing sidewalk gate assembly will need to be upgraded to having a full mast and flashers oriented in both sidewalk directions.
- FRA noted W10-2 signage along Alma St., as well as R3-5(R) signage to restrict left turns.

**Location 2: Northeast (NE) Quadrant**

- Diagnostic Team noted a substantial amount of NB traffic makes a right turn onto Alma St. The City of Menlo Park can obtain counts of turning movements versus through movements from previous projects.
- W10-2 signage seen on Alma St, as well as R3-5(R) signage.
- The median on the N side of the tracks will be extended to 10' from the centerline of the nearest rail to the S, and will be constructed to include the temporary median and extend to the crosswalk (roughly 90' from the tracks). The proposed median would be non-traversable and concrete; while not able to comply as an SSM, this will be a safety measure to further reduce queuing up to and over the tracks.

- Diagnostic team noted the desire to protect-in-place the existing median Std 9 and associated underground infrastructure for SB vehicles.
- CPUC stated the crosswalk across Ravenswood may pose a concern for queueing. CPUC would like queue studies to determine whether the crosswalk does pose a hazard.
  - Video from the traffic counts may shed some light on queueing potential of crosswalk.

Location 3: Southeast (SE) Quadrant

- Diagnostic team discussed placement of plastic bumpers in the roadway; perhaps acting as a speed reduction measure or a warning for the upcoming crossing? (See below image from Google Maps for reference)



- Diagnostic team noticed warning device activation without train operations; proximity to station may be a factor.

Location 4: Southwest (SW) Quadrant

- Improvements would encroach into the landscaped area of the Caltrain station parking.
- The diagnostic team noted the existing sidewalk gate assembly will need to be upgraded to having a full mast and flashers oriented in both sidewalk directions.
- Diagnostic team noted existing R8-8 signage on street light pole in advance of crossing.

Concluding Comments:

- Kimley-Horn will draft Diagnostic Notes and provide to the Diagnostic Team for review/concurrence.
- Kimley-Horn will update the concept design to include the two additional sidewalk gate assemblies being upgraded, as well as "no train horn" signage for pedestrians.
- Video for traffic counts will be revisited to determine if queueing due to crosswalk operations can be seen.

**Grade Crossing Improvement Diagnostic Meeting for  
Alma St / Palo Alto Av Crossing (DOT 754992N) in Palo Alto, CA  
Tuesday, December 13, 2022**

**Attendees:**

<b>Name</b>	<b>Agency/Company</b>	<b>Pre-Meeting</b>	<b>Field Meeting</b>
Peter Meyerhofer	Kimley-Horn	Yes	Yes
Taylor Brown	Kimley-Horn	Yes	Yes
Ripon Bhatia	City of Palo Alto	Yes	Yes
Phong Vo	City of Menlo Park	Yes	Yes
Lou Tolentino	Caltrain	No	Yes
Rick Bartholomew	Caltrain	Yes	Yes
Zohair Zulfiqar	CPUC	No	Yes
Eric Walker	FRA	Yes	Yes
Carlos Ruiz	Caltrans	Yes	Yes

**Definitions:**

- Diagnostic Team: Pursuant to CA MUTCD 8A.01.05a, the diagnostic team needs to include at a minimum, representatives of the highway agency or authority with jurisdiction over the roadway, the railroad with responsibility of the track and signals, and the California Public Utilities Commission (CPUC) with statutory authority over grade crossings.
- CPUC Standard No. 9: An automatic gate arm used in combination with a Standard 8. The gate mechanism may be mounted on the Standard 8 mast or separately on an adjacent pedestal.
- CPUC Standard No. 9-A: A Standard 9 with additional flashing light signals over the roadway on a cantilever arm.
- CPUC Standard No. 9-E: A Standard 9 installed on the departure side of the at-grade crossing (also known as an exit gate) in addition to the typical approach side of the at-grade crossing (also known as an entrance gate). CA MUTCD: California Manual of Traffic Control Devices
- FRA: Federal Railroad Administration
- RRTCD: Railroad Traffic Control Devices
- RIRO: Right-in Right-out

**Existing Conditions/General Crossing Comments:**

*Preliminary Discussion/Existing Conditions:*

- **Roadway Existing and Proposed Conditions**
  - Existing ADT is 13479 vehicles, 389 pedestrians, and 670 bicycles.
  - Proposed improvements show removal and replacement of existing medians on both sides of tracks. Proposed medians are to have a minimum height of 8" to comply with FRA requirements, as well as increased total lengths to comply with FRA measures. Other improvements include relocation of signage and striping as well as signage upgrades for regulatory compliance.
- **Train Operations**
  - According to FRA data, there are 104 thru trains and 4 switching trains per day.
- **Signal Operations**
  - Diagnostic team discussed potential interconnection of the crossing with nearby El Camino Real.

- Distance from crossing to intersection is large enough that interconnection is likely not needed, and queuing issues were not witnessed at the crossing during this meeting.
  - Interconnection with El Camino Real would be in Caltrans domain, not the City's.
- **Pedestrians**
  - The W side of the crossing roadway is the only side with pedestrian facilities. Existing conditions have two sidewalk gate assemblies.
- **Lighting/Electrical**
  - A general item to note with all crossings is to evaluate lighting conditions. At this crossing, there are two street lights; one street light placed 70-80' from the nearest rail in each direction.

**Diagnostic Team Review and Recommendations:**

Site Map and Quadrant Identification:



Location 1: Northeast (NE) Quadrant

- FRA asked if extension of the NE median can be increased to a total length of 100', changing the turning ability of vehicles from Palo Alto Av onto Alma St to RIRO.
  - To comply with FRA SSM for Quiet Zones, a crossing with an intersection within 100' of the gate, a median must extend at least 60' from the gate arm. The intersection of Alma St and Palo Alto Av is within 100' from the nearest gate arm, and the proposed median affords a total length of 70'.
  - City of Palo Alto voiced that because the left turn movement is not currently prohibited, restricting that turning ability may not be feasible.
  - City of Palo Alto indicated that left turning volumes from Palo Alto Avenue to Alma Street are very low at this location. The intersection collision history can be further reviewed for continued use of existing configuration of traffic movements.
- The diagnostic team discussed flexible post barriers being replenished in the areas between the edge of proposed median and the existing secondary median. Existing conditions will only maintain two flexible post barriers, which can be increased to enhance safety.
- FRA noted no W10-4 signage along Palo Alto Av to warn drivers turning right toward the crossing. While there are pavement markings, a sign could be added.

Location 2: Southeast (SE) Quadrant

- Diagnostic Team discussed need for duplicate W10-1/W48 signage on NW quadrant for NB approach vehicles. Potential reason behind additional signage is due to visibility constraints with road curvature.

Location 3: Southwest (SW) Quadrant

- CPUC stated the protective rail barriers in front of the Std. 9 in the SE quadrant should be removed. These barriers pose a hazard for vehicles and are no longer a standard practice.
  - Removal of this barrier may indicate the need for curb and gutter to be installed in front of this assembly for clearance requirements.

Location 4: Northwest (NW) Quadrant

- CPUC noted potential for sign clutter due to duplicate signs, with two R3-2 “except bikes” signs on the NB travel lane past the crossing.
  - Kimley-Horn will investigate potential regulatory reason for this sign installation and verify that potential need is due to site distance accommodation on the roadway curve.

Concluding Comments:

- Kimley-Horn will draft Diagnostic Notes and provide to the Diagnostic Team for review/concurrence.
- Kimley-Horn will update the concept design to include “no train horn” signage for pedestrians where applicable, and evaluate the median extension/RIRO of Palo Alto Av on the east side of the crossing.
- Investigations ongoing to determine quiet zone qualifications for the Alma St crossing on its own (which would likely be managed by City of Palo Alto; personnel TBD).