January 17, 2020

Ms. Tina Hugg
Midpeninsula Regional Open Space District Company
330 Distel Circle
Los Altos, CA 94022

La Honda Creek Open Space Access Analysis

Dear Ms. Hugg;

As requested, W-Trans has developed a menu of potential highway improvement options to address traffic and circulation issues along State Route (SR) 84 in the vicinity of the La Honda Creek Open Space Preserve and conducted a preliminary evaluation of existing driveways to potentially serve as public access locations for the Preserve.

Background

The Midpeninsula Regional Open Space District owns and manages approximately 62,000 acres of open space in 26 preserves throughout the Santa Cruz Mountain Region in the San Francisco Bay Area. The La Honda Creek Open Space Master Plan will open up over 6,000 acres of rolling grassland and historic ranches. This preliminary analysis was undertaken to provide the La Honda Public Access Working Group additional information as they consider potential gateway locations to the central area of the Preserve and connections to the trail network for hikers, bicyclists, and equestrians. Public access could take a variety of forms, such as docent-led hikes or permit access, but a new parking lot would include elements such as a new access driveway, public restrooms, picnic areas, accessible pathways, and trail connections.

In 2016, the District contracted with Hexagon Transportation Consultants to conduct an access study of a proposed area at the Red Barn site, located along SR 84 just south of the intersection with Old La Honda Road. The study recommended a driveway location 55 to 165 feet north of the existing Red Barn driveway (measured in the eastbound direction of SR 84) to provide adequate sight distance based on criteria in the Caltrans *Highway Design Manual*. In 2017, W-Trans completed a study to update the existing conditions, collisions history, and site access.

This study was undertaken to conduct preliminary investigation of additional potential driveway access points based on adequacy of sight distance and to identify potential speed management treatments that may be appropriate to enhance safety on this section of SR 84. A review of existing gates LH06, LH07, LH12, and LH13 was conducted, and LH10 was also identified as a candidate access point (see location map).

Previous Studies of the SR 84 Corridor

For the current analysis, W-Trans sought to assemble all recent analyses that have been performed for the corridor. Discussions were held with staff from several transportation agencies, including Caltrans, the Metropolitan Transportation Commission, City/County Association of Governments, and San Mateo County Public Works. In addition, staff at several parks agencies were contacted to identify examples of similar projects that may have had similar access issues from the state highway system, including Golden Gate National Recreation Area, Peninsula Open Space Trust, Marin County Parks, and the East Bay Regional Parks District; however they were not able to identify any similar examples that would be instructive in addressing the issues for this project.

Aside from the previous Hexagon and W-Trans studies, the only relevant traffic analysis that was identified was Caltrans' *SR 84 Corridor System Management Plan*, completed in 2010. The report is no longer publicly available and Caltrans staff cautioned that the report is outdated. The San Mateo Office of Education conducted a Safe

Routes to School analysis for the area around the La Honda Elementary School; however, given the narrow focus of the study it did not yield relevant information in terms of the access analysis.

Existing Conditions

Study Area

SR 84 is one of only two state highways that connect the San Francisco Bay to SR 1 in San Mateo County. It runs in a generally east-west direction, intersecting SR 1 near San Gregorio and connecting to the Dumbarton Bridge. Between the intersections with SR 35 and SR 1, SR 84 consists of two 12-foot lanes. The roadway includes white edge line striping and a double yellow centerline stripe, which was installed on top of a rumble strip. The posted speed limit along SR 84 is 40 mph at the locations of gates LH06, the Red Barn site, and LH07. At LH12 the posted speed limit is 45 mph; at the location of LH13 there are no speed limits signs in proximity to the gate, so the 55-mph *prima facie* speed limit would apply (all roads have a *prima facie* speed limit that governs when the speed limit is not posted – in this context it is 55 mph). While there are no designated bicycle facilities along SR 84, the route is used by cyclists, and signs are posted in the vicinity of the project site to help make drivers aware that they may be present.

Caltrans data indicates that SR 84 in La Honda had an average annual daily traffic (AADT) of 2,300 in 2017. This is generally consistent with the weekday traffic volumes obtained by Hexagon in 2016, which found the average daily traffic to be 2,720. However, Hexagon found that weekend AADT was higher, at 4,850.

A map showing the study area and indicating where driveways are located is enclosed.

Vehicle Speeds

As determined in the 2016 W-Trans study, the 85th percentile (critical) speeds at the existing Red Barn driveway were determined to be 60 mph in the westbound direction and 45 mph in the eastbound direction. It should be noted that the westbound direction has a downhill grade. The 85th percentile speed (indicating that 85 percent of vehicles are traveling at this speed or slower) is used to evaluate vehicle speeds and set speed limits.

For the current analysis, limited sample spot speed surveys were taken at LH07 and LH13. The critical sampled speed (85th percentile speed for a small sample size) on SR 84 at gate LH07 was 48 mph in the eastbound direction and 51 mph in the westbound direction, both of which are above the 40-mph posted speed limit. At gate LH13, the critical sampled speed along SR 84 was 63 mph in the eastbound direction and 60 mph in the westbound direction.

Current Sight Distances

Sight distances along SR 84 at the potential access points were evaluated based on sight distance criteria contained in the *Highway Design Manual (HDM)* published by Caltrans. The recommended sight distances for minor street approaches that are driveways are based on "stopping sight distance" with the critical speed of the approaching vehicle used as the basis for determining the recommended sight distance. Table 1 summarizes the minimum sight distance requirements for various speeds.

Table 1 – Intersection Sight Distance Criteria	
Speed	**Private Road and Rural Driveway Stopping Sight Distance**
40 mph	300 feet
45 mph	360 feet
50 mph	430 feet
55 mph	500 feet
60 mph	580 feet

Source: *Highway Design Manual*, 6th Edition, California Department of Transportation, 2012

Sight distances at the existing entrances at gates LH06, LH07, LH12, and LH13 were field measured and evaluated in November 2019. The findings are described below, by location. The adequacy of sight distances reflects current conditions at the driveway entrances. As discussed later, there are potential items for further study that could identify strategies to achieve the minimum sight distance requirements.

- Gate LH06: Sight lines between drivers entering the roadway from LH06 and drivers approaching from both directions are primarily limited by the curvature of the roadway. While a speed survey was not conducted at this location, based on the posted speed limit, the stopping sight distance does not appear to be adequate. Based on the available space in proximity to the driveway, there appears to be limited potential to make modifications to achieve adequate sight distance.
- Gate LH07: Drivers entering the roadway from LH07 and drivers approaching from both directions have sight lines that are partially obstructed due to the curvature of the roadway and vegetation. Based on the sampled speeds recorded at this location, the stopping sight distance does not appear to be adequate in either direction. It is noted that there is a turnout at the driveway entrance and the gate is set back from the edge of the roadway. Due to the curvature of the roadway, sight lines were longer near the gate than they were at the location where vehicles would enter the roadway. Given the available space adjacent to the driveway area, further investigation could be conducted to determine if realignment of the roadway is feasible or a cost-effective option to meet minimum sight distance requirements.
- Gate LH12: Adequate sight distances are available between drivers entering the roadway from LH12 and eastbound drivers. Sight lines between the driveway and westbound drivers are partially obstructed by a hill due to the curvature of the roadway. While a speed survey was not conducted at this location, based on the posted speed limit, the stopping sight distance does not appear to be adequate. The presence of the hillside would preclude modifications to increase sight distance at this location.
- Gate LH13: Sight lines between drivers entering the roadway from LH13 and westbound drivers are adequate, but sight lines between the driveway and eastbound drivers are partially obstructed due to a grade change in the roadway. Based on the sampled speeds recorded, the stopping sight distance does not appear to be adequate in this direction. There is a turnout at the driveway entrance. Further investigation could determine if it is possible to relocate the driveway approach further east to achieve adequate sight distance.

Aside from measures to increase the available sight distance, another strategy for meeting the minimum requirements is to implement measures to reduce vehicle speeds, which could then reduce the sight distance requirements. At LH07, reducing the critical speed to 45 mph, which is still in excess of the posted speed limit, would mean that the minimum sight distance requirements would be met. At LH13, reduction in vehicle speeds would result in sight distances close to the minimum requirements, so modifications of the driveway entrance could potentially result in adequate sight distance. It should also be emphasized that to confirm the sight distance assessment in this analysis, formal speed surveys should be conducted, rather than relying on the small sample spot speed survey performed for this analysis. These results are summarized in Table 2.

Table 2 – Driveway Sight Distance Analysis Summary

Gate	Existing Sight Distance (Eastbound/Westbound)	Required Sight Distance (Eastbound/Westbound)	Vehicle Speed (Eastbound)	Vehicle Speed (Westbound)
Red Barn	>360′/>580′	360′/580′	45 mph	60 mph
LH06	250′/600′	300′/300′*	Not measured	Not measured
LH07	350′/350′	430′/430′	48 mph**	51 mph**
LH12	300′/>600′	430′/430′*	Not measured	Not measured
LH13	>700′/550′	>580′/580′	63 mph**	60 mph**

Notes: * Critical speed assumed to equal posted speed; ** Critical sampled speed is based on limited spot speed survey, requires additional verification

Collision History

Collision data for the project area was retrieved from the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) database from a five year period, February 1, 2014 through January 31, 2019. The study area that was analyzed was along SR 84 within one mile of both Gates LH07 and LH13. Collisions that were determined to be intersection-related were excluded from the analysis, as they would not impact conditions at the gate locations. As presented in Table 3, collision rates at both locations were lower than the statewide averages for comparable facilities, although injury rates were higher than the statewide rates. Collision records were reviewed in greater detail to assess factors related to the relatively high injury rates, however the data was inconclusive. It should be noted that given the relatively low traffic volumes along this segment of SR 84 and the low number of collisions, the occurrence of even a few collisions could have an outsized impact on the injury rates. To assess any specific problems associated with the gate locations, the collision records were reviewed in greater detail. It was determined that all of the collisions near Gate LH07 were more than 2,000 feet from the gate location. Of the eight collisions occurring within one mile of Gate LH13, only one was within 300 feet of the gate. Based on this data, the areas near Gate LH07 and LH13 do not appear to have any notable safety problems.

Table 3 – Summary of Collision Rates

Study Segment*	Number of Collisions	Number of Injuries	Collision Rate		Injury Rate	
Gate number			Study Segment	Statewide Average**	Study Segment	Statewide Average**
LH07	9	7	1.07	1.22	**77.8%**	46.6%
LH13	8	5	0.63	1.17	**62.5%**	46.6%

Notes: * Segment includes one mile east and west of gate location; ** Expected Statewide Average rate for similar facilities; Collision rates are in collisions per million vehicle miles; **Bold** = higher than the statewide average

Alternative Potential Access Locations

While the field reviews were conducted based on the existing locations of the four driveways as described above, two additional locations have been identified that could be considered as candidates for further analysis. Gate LH10 is currently used for access to the Event Center. This gate is located just east of LH12 on the south side of the road. This location is potentially a viable access point, as there is a tunnel under SR 84 which could provide a connection to the La Honda Preserve. The sight distances were not measured in the field, but generally appeared to be adequate based on the straight, flat roadway in both directions approaching the driveway.

An additional potential access point could be considered between the existing Gates LH12 and LH13. As noted above, sight distances were partially obstructed at both LH12 and LH13. However, by shifting the driveway location away from the existing gates, this could increase the sight distance compared to what is currently available. The feasibility of a new driveway in this area would need to be further investigated.

Strategies to Reduce Speeds and Enhance Circulation

The speeds of vehicles traveling along SR 84 also pose challenges for implementing access points to enter and exit the roadway. As posted speed limits range from 40 to 50 mph, and the unposted segment has a 55-mph limit, there is a large speed differential between through traffic and vehicles stopped at the edge of a roadway to merge with traffic, or vehicles slowing down to exit the roadway. Roadway modifications such as implementation of an acceleration lane or deceleration lane can help to reduce this speed differential and provide for easier merging of vehicles into and out of traffic. Similarly, periodic turnouts can enable faster moving vehicles to pass slower moving traffic.

The potential access points described above could be further investigated to determined if an acceleration or deceleration lane is appropriate and/or feasible as a strategy to facilitate traffic flow. As noted above, at both LH07 and LH13 the gates are set back from the edge of the roadway and there are existing turnouts at the gate approach. In conducting further review of these sites, the potential modification of the roadway should be considered if it has the potential to offer safety or circulation benefits. It is noted that at LH07, the potential use of an acceleration lane for vehicles turning left from a driveway onto SR 84 – which would require striping the lane between the two travel lanes – could be particularly challenging given the curvature of the existing roadway.

Caltrans has used a range of treatments in the corridor, primarily to prevent collisions associated with vehicles leaving the roadway. The corridor currently includes rumble strips and raised pavement markings along the centerline of much of SR 84. Similarly, edgeline striping has been used along the roadway to reduce incidence of vehicles leaving the roadway, while traffic delineator posts and guardrails have been used for this purpose at select locations.

Caltrans approves only limited speed reduction treatments for use on the state highway system. Treatments that are generally not permitted include not only traffic calming measures such as speed humps but raised medians, which present a risk of collisions where vehicles do not maintain lane position. Measures that have been applied in this corridor include signage, striping modifications, and flashing beacons.

Examples of treatments that can potentially be used on the SR 84 corridor are presented below. Photos of samples of these devices are enclosed.

- *Passing lanes* or *turnouts* could provide an option for faster moving traffic to pass slower traffic and reduce the likelihood of vehicles passing by crossing the double yellow striping along the centerline of the roadway. There are numerous locations with paved or unpaved areas along the shoulder; however, it is unclear if these are located in the public right-of-way. Signage can also be used to complement the use of passing lanes or turnouts.
- *Speed reduction markings* are transverse pavement markings deployed at spot locations or along a corridor to reduce speeding. Markings are located along the edges of the roadway or across travel lanes, placed with decreasing spacing in the direction of travel. These visual cues typically result in drivers perceiving that their speeds are faster than their actual speeds. (Source: *California Manual on Uniform Traffic Control Devices*, 2014, Section 3B.22).
- *Warning signs*, such as active driveway and speed warning signs, which help raise awareness for drivers of changes in the roadway conditions.
- *Radar speed feedback signs* are commonly used to make drivers aware of their speeds relative to the posted speed limit.

- *Pavement speed limit markings* indicating the posted speed limit can help to emphasize the speed limit. Outside California, a variation on this has employed colored pavement to further raise awareness for drivers.

Lighting and Visibility

One issue requiring further investigation is visibility based on lighting. While LH12 and LH13 are both located in areas where trees are at the edge or set back from the roadway, LH07 has large trees close to the edge of the roadway that cast shadows which could impact visibility. If LH07 remains under consideration, this should be analyzed further to account for potential visibility issues based on the sun's position throughout the day.

Recommendations

- Based on limited speed survey samples, sampled speeds are in excess of the posted speed limit and sight distance is currently inadequate at all of the four driveways studied. Formal speed surveys should be conducted at Gates LH07, LH10, and any other locations that continue to be under consideration for driveway access so that the required minimum sight distance requirements can be accurately assessed.

- If appropriate, based on the candidate driveway locations identified, investigate the feasibility of acceleration or deceleration lanes to facilitate traffic flow.

- For driveway locations given further consideration, the potential of trimming vegetation and trees to enhance sight distance should be evaluated.

- Potential application of speed reduction measures should be investigated to determine what measures are appropriate and the potential impact on minimum sight distance requirements.

- Potential use of the driveway at Gate LH10 should be evaluated in greater detail to verify sight distances and determine the preferred location for the path of travel for vehicles entering and exiting the roadway.

- Visibility could potentially be impacted at Gate LH07 and, to a lesser degree at Gate LH13, by the dappled light coming through the tree canopy onto the roadway. Should either of these locations undergo further consideration, additional field reviews should be conducted to assess these impacts.

- To help reduce the incidence of unsafe passing, locations could be identified where there is sufficient right-of-way for passing lanes or turnouts. Where sufficient space is available, these could be modified and highlighted with the appropriate signage to direct slower vehicles to pull over.

- Measures to improve access to and from the La Honda Preserve could potentially be re-evaluated in the future, particularly if the access points are in proximity to trail crossings, which may enable the implementation of traffic controls to aid pedestrians.

- Engineering solutions could be complemented by enforcement and education strategies. The most appropriate approaches should be developed in consultation with area stakeholders, including law enforcement and local property owners.

References

The references below include descriptions of speed reduction measures that may be appropriate for use along this segment of SR 84. Some of these treatments have previously been approved for use along Caltrans facilities, while others have been applied in other states or roadways that are not part of the state highway system.

California Manual on Uniform Traffic Control Devices, Caltrans, 2014
Complete Streets Elements Toolbox 2.0, Caltrans, 2018
Complete Streets Project Planning Guide, Caltrans District 4, 2018
Developing Safety Plans: A Manual for Local Rural Road Owners, FHWA, 2012
Innovative Safety Solutions with Pavement Markings and Delineation, American Traffic Safety Services Association, 2016
Intersection Safety: A Manual for Local Rural Road Owners, FHWA, 2011
Local Roadway Safety: A Manual for California's Local Road Owners, Caltrans/FHWA/SafeTREC, 2018
Pavement Markings for Speed Reduction, Science Applications International Corporation Turner-Fairbank Highway Research Center, 2004
Rural Intersection Safety Handbook, Transport Canada, 2006
Self-Enforcing Roadways: A Guidance Report, Institute of Transportation Engineers, 2018
Small Town Rural and Multimodal Networks, FHWA, 2016
Speed Management: A Manual for Local Rural Road Owners, FHWA, 2012
Speed Management Toolbox for Rural Communities, Iowa State University Institute of Transportation, 2012
Traffic Calming on Main Roads Through Rural Communities, FHWA, 2009

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

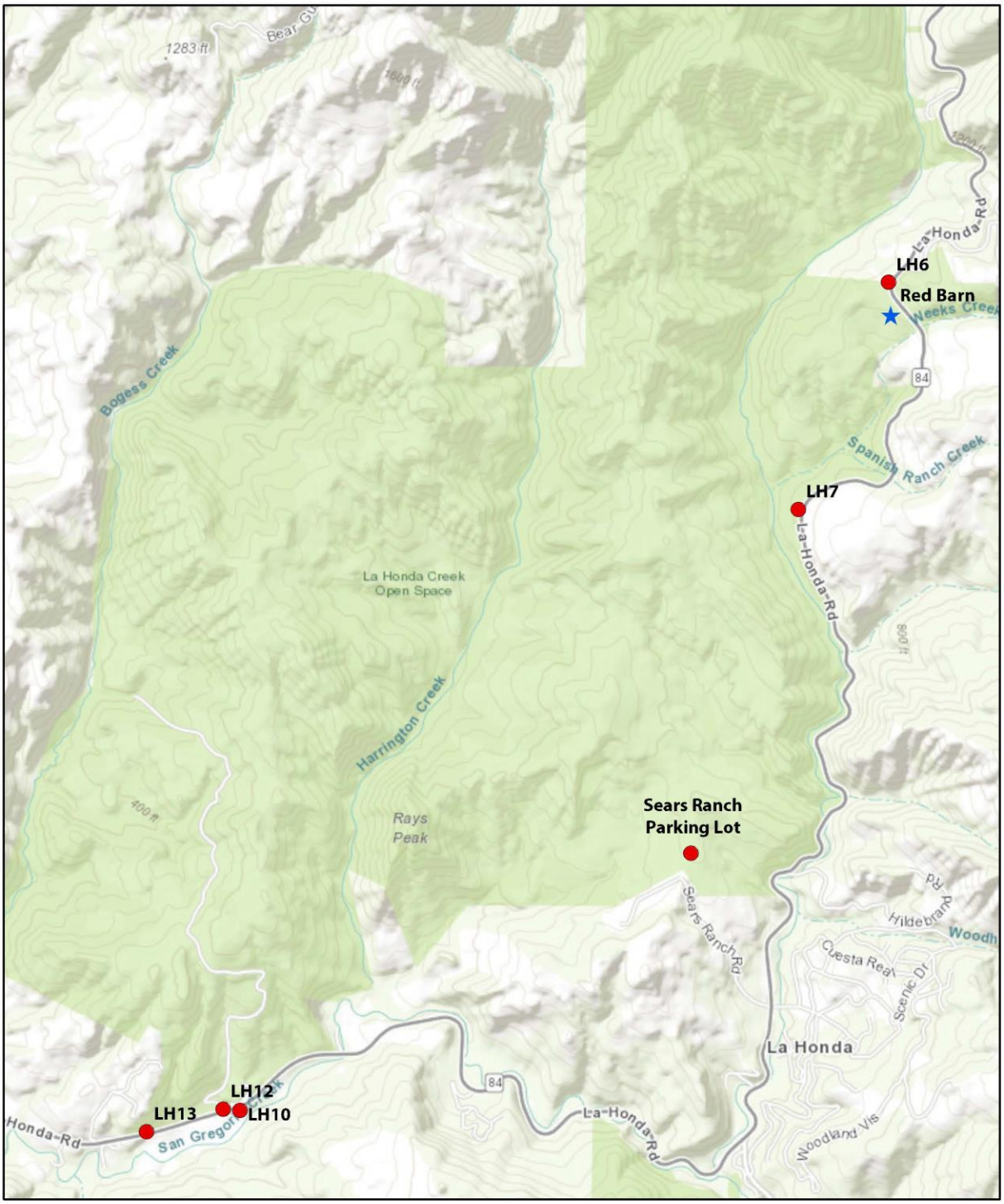
Sincerely,

Barry Bergman, AICP
Senior Planner

Mark Spencer, PE
Senior Principal

MES/bdb/SCX007-5.L1

Enclosures: Map of Study Area, Photos of Sample Traffic Control Devices



La Honda Public Access Project

Potential Driveway Access Locations

0 0.225 0.45 0.9 Miles

N

Speed Reduction Markings (Optical Speed Bars)

Active Driveway Warning Sign

Reduce Speed Warning Sign

Colored Pavement Speed Limit Markings

Sign Directing Slower Drivers to Pull Over