Appendix K
Transportation

ESA

K-1 VMT Analysis

Kimley»Horn

Memorandum

To: Jamie Bax

From: Michael Schmitt, AICP CTP, PTP, RSP1
Chris Gregerson, PE, TE, PTOE, PTP

Re: VMT Analysis for the Castellina Development

Date: June 24, 2021

This memorandum documents VMT analysis completed for a proposed development in Madera County, CA, the Castellina development. The development is assumed to consist of several different types of residential housing types (including active adult housing), an office building, shopping center, elementary school, and recreational uses including neighborhood parks. With the introduction of the California Governor's Office of Planning and Research (OPR) *Technical Advisory*[1], Vehicle Miles Travelled (VMT) has become an important indicator for determining if a new development will result in a "significant transportation impact" under the California Environmental Quality Act (CEQA). This memorandum summarizes the VMT analysis and resultant findings for the proposed development.

Methodology and Assumptions

Based on the land use information provided[2], for the purposes of VMT analysis and the determination of transportation related significant impacts, the following land uses were analyzed:

- Residential (3,072 Units)
- Office (27,000 Square Feet)
- Retail (105,000 Square Feet)
- Elementary School (800 Students)
- Recreational (10,000 Square Feet Active Adult Center and 59 Acres of Neighborhood Parks)

As Madera County has not yet adopted SB 743 guidance and accompanying thresholds at the time this memorandum was compiled, the OPR *Technical Advisory* was used as the basis for the analysis contained within this memorandum. In accordance with the recommended practice on page 6 of the OPR *Technical Advisory*, land uses have been analyzed separately with an allowance made for taking any appropriate internal capture. For residential and office, the Madera County Travel Demand Model (MC TDM) was used as the principle tool to determine VMT. The MC TDM was updated in 2019 and the most recent version of the model includes an SB 743 tool to assess residential and work based VMT by and Traffic Analysis Zones (TAZ). Due to the addition of this tool, the most recent version of the model was used for this analysis.

Based on the nature of the land use descriptions of the proposed land uses, the retail, elementary school, and recreational uses were analyzed qualitatively.

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[1] *Technical Advisory on Evaluating Transportation Impacts in CEQA*. Governor's Office of Planning and Research, State of California. December 2018.

[2] Subsequent to receiving the land use information on which this analysis was completed, further refinements to the land use plan occurred. As shown in **Appendix A,** these refinements have been determined to not change the total quantity of units/square footage or affect the analysis.

Analysis

The following sections detail the analysis completed:

Residential and Office Land Uses

To determine the amount of VMT associated with proposed residential (3,072 Units) and the proposed office (27,000 square-feet) land uses, first the number of housing units for each of the housing types and the number of jobs for each non-residential land use type needed to be determined. The MC TDM contains ten possible land use types for residential land uses ranging from single family detached housing to boats and RVs. Three of the Castellina residential land use types were assigned to single family detached housing: very low to low density residential (1,114 units), medium density residential (976 units), and active adult (341 units). The MC TDM does not contain a residential land use type that reflects the trip generation characteristics of active adult housing. Therefore, as a part of this effort, the ratio of daily trip generation rates listed in the *Trip Generation Handbook, 10th Edition* published by the Institute of Transportation Engineers (ITE) between single family detached housing and active adult housing was used to determine the number of single family detached homes that would generate a similar number of trips as active adult housing.

For the remaining proposed residential land uses, the medium density residential described as residential condominiums/townhomes was split between two different land uses that represent single family attached units and low-rise apartment buildings on a 75%/25% ratio (129 units/43 units). The village center/mixed use apartments were represented by the 20-49 unit multi-family housing category in the model (205 units) and the high density residential (264 units) were placed in the 50+ unit multi-family housing category.

The three proposed non-residential land use types, general office building (27,000 square-feet), shopping center (105,000 square-feet), and school (800 Students), needed to be converted into the number of jobs each would provide to be represented in the MC TDM. In order to accomplish this, the Trip Generation Handbook was once again used. The number of trips produced by the size of each of the land use codes for office and retail was used to back calculate the number of employees based on each land use's equation for the number of trips that are produced by each employee. The number of jobs the proposed elementary school will produce was based on a student-to-job ratio of 1 employee for every 20 students. This methodology resulted in 341 retail employees, 191 office employees, and 40 elementary school employees added to the MC TDM.

Population and Employment Estimates

Exhibit 1, shown below, summarizes the land use conversions described above for the residential and non-residential units. For the residential land uses, the MC TDM contains internal population conversions based on land use type, which were applied to each residential land use category. Note that because the MC TDM does not contain an active adult land use category, it first needed to be converted into single family residential units using the conversion shown in Exhibit 1, and as described above. For the non-residential land uses, the factor developed from the Trip Generation Handbook and student-to-job ratio was applied to its respective land use category to determine the final employment used in the model for each non-residential land use category.

Exhibit 1 – Land Use Conversion

Land Use Category	Units/Sq-ft/ Students	Unit Conversion Factor*	Population Conversion	Employment Conversion	Population	Employment
Very Low to Low Density Residential	1,114	-	3.10	-	3,456	-
Medium Density Residential	976	-	3.10	-	3,028	-
Active Adult	341	0.45	3.10	-	478	-
Residential Condominiums	129	-	3.81	-	491	-
Residential Townhomes	43	-	2.95	-	127	-
Village Center/Mixed-Use Apartments	205	-	1.63	-	334	-
High Density Residential	264	-	1.98	-	524	-
Office Building	27,000	-	-	0.01	-	191
Shopping Center	105,000	-	-	0.003	-	341
School	800	-	-	0.05	-	40

*As Active Adult is not an available land use input in the model, it first had to be converted into single family residential units

Based on the analysis described and summarized in **Exhibit 1**, the Castellina development is forecasted to have a population of 8,438 and 572 jobs at buildout.

The MC TDM does not contain land use categories for the active adult center or the proposed parks within the development. The trips estimated to be related to these uses are estimated to comprise less than 2-percent of the total residential trips within the development. Based on this, and the fact that the land uses could not be properly represented within the MC TDM, it was assumed that the trips related to these uses were accounted for by internal capture within the MC TDM.

VMT Analysis

In order to calculate the VMT per capita and VMT per Employee produced by the residential and office land uses, the SB 743 tool within the MC TDM was used. The SB 743 tool was run by selecting the project's TAZ and then, in succession, selecting the residential and employment options to evaluate VMT for the project. As shown in **Exhibit 2**, the Castellina residential land uses produced 121,978 daily VMT and the Castellina employment land uses produced 2,005 daily VMT. When combined with the number of people estimated to live in the Castellina development (8,438 people) and the number of jobs expected to be produced by the employment land uses (572 jobs), the Castellina development is estimated to produce 14.5 VMT/Capita per day and 3.5 VMT/Employee per day, respectively. Per the OPR *Technical Advisory*, the threshold for residential and employment-based VMT uses is set at 15% below the regional average. Note that for the purposes of this analysis, the region is defined as Madera County. Based on the thresholds shown, the residential land uses are expected to be in excess of the regional threshold. Note that the regional threshold shown is representative of a threshold consistent with the OPR *Technical Advisory* which may not be the same as that ultimately adopted by Madera County. Similarly, based on the analysis completed, the office land uses are not anticipated to exceed the regional threshold.

Exhibit 2 – Vehicle Miles Traveled (VMT) by Land Use

Land Use Type[3]	Total Project VMT	Project VMT/Capita (Pop: 8,438)	Project VMT/Employee (Jobs: 572)	Regional Average	Regional Threshold[4]	Exceeds Regional Threshold?
Residential	121,978	14.5	-	10.0	8.5	Yes
Office	2,005	-	3.5	16.9	14.4	No

Retail, Elementary School, and Recreational Land Uses

As described previously, the retail, elementary school, and recreational land uses were analyzed qualitatively. Note that with the exception of the recreational uses (which are not a specific use in the MC TDM), the VMT effect of these uses is reflected in the residential VMT estimate.

Page 16 of the *Technical Advisory* specifically addresses some of the key issues surrounding how a local serving retail store should be evaluated in terms of its VMT impact. As described, the threshold for significance is "a net increase." This means that if a proposed retail use results in additional VMT, it would result in a finding of significance.

Local serving retail does not primarily generate new trips when introduced because the trip generation is a response to trips generated primarily by residential uses. Because of this, local-serving retail uses can be presumed to reduce trip lengths when a new store is proposed. Essentially, the assumption is that someone will travel to a newly constructed local serving store because of a its proximity, rather than the proposed retail store fulfilling an unmet need (i.e. the person had an existing need that was met by the retail located further away and is now traveling to the new retail use because it is closer to the person's origin location). This results in a trip on the roadway network becoming shorter, rather than a new trip being added to the roadway network, which would result in an impact to the overall transportation system. Conversely, residential and office land uses often drive new trips given that they introduce new participants to the transportation system. The *Technical Advisory* provides for a general threshold of 50,000 square-feet as an indicator as to whether a retail store can be considered local serving or not. Based on the project understanding, it is understood that no single store within the estimated 107,000 square-feet of retail uses will exceed 50,000 square-feet. Thus, this analysis concludes that the proposed retail uses will not result in a significant impact.

Although the *Technical Advisory* does not specifically discuss elementary schools, it does address the approach for analyzing land uses with the attributes of an elementary school:

> *For office projects that feature a customer component, such as a government office that serves the public, a lead agency can analyze the customer VMT component of the project using the methodology for retail development.*

The basic concept behind this analysis approach is that public elementary schools are similar to local retail uses in that they primarily serve pre-existing needs (i.e., they do not generate new trips, instead they meet

[3] Retail, Elementary School, and Recreational land uses associated with the Project would be "local serving" as described in the next section. These uses would not generate new trips and, instead, would serve to meet demand that will exist or result from the proposed Residential and/or Office land uses of the Project.

[4] Per the OPR *Technical Advisory*, the threshold for residential and employment-based VMT uses is set at 15% below the regional average. Note that for the purposes of this analysis, the region is defined as Madera County.

a demand that will exist irrespective of the elementary school's construction). Based on this, it can be presumed that the introduction of a new elementary school will result in trips being redistributed, potentially resulting in shorter trip lengths when the elementary school opens for service and is geographically located in-between existing elementary schools. Given that the relative number of trips is constant, shorter trip lengths result in a VMT reduction. Essentially, a typical school visit is assumed to occur regardless of the proximity of the facility, but the proximity of the facility will determine the length of that trip and the resultant impact to the overall transportation system. Based on this assessment, this analysis concludes that the elementary school does not have a significant transportation impact.

Based on the project description of the recreational uses, which are anticipated to include a 10,000 square-foot active adult center and 59 acres of neighborhood parks, it is similarly assumed that they function to meet the reactional needs of the residents and in their absence the need for recreational trips would be fulfilled by destinations further from the site. Accordingly, based on the same logic as has been applied for both retail and the elementary school, the project related recreational uses are determined to not result in a significant transportation impact.

VMT Reducing Project Design Elements

Based on information provided by the applicant, it has been determined that the mix of land uses, as well as other design specific attributes, contribute in part to an overall reduction in VMT. Design elements of the project that are VMT reducing include specific design elements related to Smart Growth, Sustainability, and Mixed-Use projects, all of which may reduce project VMT. Smart growth principles that reduce VMT and that are planned to be implemented as part of the project include:

- A mix of land uses including schools,
- A range of housing options,
- A walkable community,
- A variety of transportation methods available, including a potential future high-speed rail connection, and
- The provision of nearby recreational opportunities.

Mixed-Use projects combine two or more types of land uses into a building or set of buildings that are physically or functionally integrated. Mixed-Use developments seek to promote smart growth principles including:

- Diversity and appropriate mix of uses
- Pedestrian Orientation
- Community Focal Point
- Excellence in Design
- Coordination of development strategies
- Sustainability

As planned, the Castellina development will comprise more than 788 acres of residential and mixed-use development that will be based on a roadway system that support active transportation and walkability. As the MC TDM does not include specific functionality to reflect the impact of many of the design principles outlined and the exact nature, location, and timing of these VMT reducing considerations is not known, the additional impact of these design features is not fully addressed by this analysis. Based on what is known at this level of analysis, the following observations are made regarding VMT:

- Had this development been only planned to include residential uses, the residential VMT would be 27-percent higher (an approximately 4 VMT/capita increase). In real terms this equates to 121,978 VMT vs 154,700 VMT without the other uses planned for the project.
- The internal capture of trips for the entire sites (all uses) as calculated by the MC TDM accounts for 23-percent of all trips generated. For comparison, the internal capture of trips as calculated by ITE accounts for only 9-percent of all trips generated by the development. This suggests that ITE methodology is a conservative approach to estimating internal capture.
- The employment-based VMT/employee is only 24-percent of the allowable County-based threshold. In real terms, the employment could be nearly 6,200 VMT higher and still not trigger a significant impact.
- The Castellina development is located in the unincorporated part of the County, which has a higher residential VMT/capita and VMT/employee average compared to the County as a whole. When comparing to only the unincorporated parts of the County, the development's residential VMT/capita is only 3.6-percent higher and the development's VMT/employee is 86-percent lower than the average for the unincorporated County.

Note that these observations do not change the findings summarized below but provide additional context regarding the design of the project relative to the VMT calculations provided.

Findings

Based on the results of this analysis, the following findings are made:

- The **residential** land uses exceed the threshold of significance. **The project is determined to have a significant transportation impact for residential development.**
- The **office land** uses do not exceed the threshold and as a result **are determined to not have a significant transportation impact.**
- The proposed project's **retail uses**, based on guidance within the *Technical Advisory,* **are determined be local-serving and to therefore not have a significant impact.**
- The **elementary school**, based on guidance within the *Technical Advisory*, **is determined be local-serving and to therefore not have a significant impact.**
- The **recreational** land uses, based on guidance within the *Technical Advisory*, **are determined be local-serving and to therefore not have a significant impact.**

Based on these findings, only the residential land uses are determined to have a transportation significant impact. Note that although the introduction of additional VMT reducing design principles or mitigation may improve the results described within this document, it is unlikely to alter this finding given the percent they exceed the threshold by. However, as required by CEQA, feasible mitigation measures should be evaluated.

Kimley»Horn

Appendix A - Castellina Land Use Analysis

The initial land use provided as the transportation analysis basis ("Transportation Analysis Basis") of the Castellina development has been further refined during its specific plan preparation ("Land Use Update"). As shown in the table below, the two land use scenarios were compared for the purposes of determining if the Land Use Update would affect the VMT analysis carried out previously using the land use information included under the column "Transportation Analysis Basis". Specifically, the trip generation between the two land scenarios were compared, based on the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 9th Edition*, to make a determination. As shown in the table below, both land use scenarios total 3,072 residential units and 134,000 square-feet of commercial uses. Also, as shown in the Transportation Analysis Basis scenario, the land use mix results in a more a conservative analysis as it results in an approximately 183 more trips than those produced under the Land Use Update scenario. Based on this analysis, it is determined that the Transportation Analysis Basis scenario is still an appropriate basis for determining transportation impacts for the Castellina development.

Land Use Type	Unit Type	ITE Land Use Code	Transportation Analysis Basis		Land Use Update	
			Units/KSF	Daily Trips	Units/KSF	Daily Trips
Very Low to Low Density Residential	Single Family Detached Housing	210	1,114	9,174	1,194	9,842
Medium Density Residential	Single Family Detached Housing	210	976	8,038	872	7,188
	Residential Condominium/Townhome	230	172	1,000	154	895
High Density Residential	Apartment	220	264	1,756	248	1,650
Village Center/Mixed Use	Apartment	220	205	1,364	202	1,344
Active Adult	Senior Adult Housing - Detached	251	341	1,402	402	1,632
Residential Subtotal			**3,072**	**22,734**	**3,072**	**22,551**
Village Center/Mixed Use	General Office Building	710	27	486	27	486
	Shopping Center	820	107	7,098	107	7,098
Commercial Subtotal			**134**	**7,584**	**134**	**7,584**
Total			**-**	***30,318***	**-**	***30,135***

K-2 Sight Distance Review

TECHNICAL MEMORANDUM

From: Frederik Venter and Derek Wu, Kimley-Horn and Associates, Inc.

To: Phu Duong, Madera County

Date: May 13, 2019

Re: **Castellina Driveway / Road 27 / Avenue 18 /Sight Distance Review – Madera County**

Introduction

This technical memorandum describes sight distance conditions for the proposed Castellina Specific Plan development in Madera County, California. The project is bounded by Avenue 18 in the north, Road 28 1/2 in the east, Avenue 17 in the south, and Road 27 as well as the proposed high-speed rail line in the west. The project consists of constructing up to 3,070 dwelling units, 27,000 square feet of office, 107,000 square feet of retail, neighborhood parks, and a school on an existing field used for agriculture.

To provide access and circulation to the site, the project proposes to construct a new driveway entrance at the existing Avenue 18 and Road 27 intersection. The project driveway will create a new east leg to the intersection, and the driveway centerline is aligned approximately 43-feet south of Avenue 18. Under interim conditions, the project entry road will be stop-controlled, and the intersection is planned to be signalized under full buildout of the Castellina Specific Plan.

Road 27 is currently being reconstructed with an overpass for the future high-speed rail project. This improvement will change the roadway profile of Road 27 and impact the sight distance for the proposed Castellina driveway. The Road 27 Grade Separation Layout, prepared by the California High-Speed Rail Authority and dated 8/25/2017, is presented in the **Appendix**.

Driveway Sight Distance Analysis

A preliminary stopping sight distance and intersection sight distance analysis was conducted to determine the feasibility of the proposed project entry road location. The AASHTO methodology was used in this analysis. The sight distance needed under various assumptions of physical conditions and driver behavior is directly related to vehicle speeds and to the resultant distances traversed during perception-reaction time and braking.

Stopping sight distance is defined as the sum of reaction distance and braking distance. The reaction distance is based on the reaction time of the driver, and the braking distance is dependent upon the vehicle speed and the coefficient of friction between the tires and roadway as the vehicle decelerates to a complete stop. This sight distance analysis indicates the minimum visibility that is required for an approaching vehicle on Road 27 to stop safely if a vehicle from the project driveway enters or exits the approaching road. The exiting driver should also have an unobstructed view of the intersection, including any traffic control devices, and sufficient lengths along the intersecting road to permit the driver to anticipate and avoid potential collisions.

For vehicles entering Road 27 from the proposed project driveway, the AASHTO method evaluates sight distance from a vehicle exiting the intersection from the driveway to a vehicle approaching from either direction. The intersection sight distance is defined along intersection approach legs and across their included corners known as departure sight triangles. These specified areas should be clear of obstructions that might block a driver's view of potentially conflicting vehicles. Intersection sight distance is measured from a point 3.5-feet above the existing grade (driver's eye) along the potential driveway to a 3.5-foot object height in the center of the approaching lane. A vehicle setback in a stopped position behind the edge of travel way was assumed for determining intersection sight distance.

Minimum sight distance criteria for the potential driveway along Road 27 was determined from the AASHTO Geometric Design of Highways and Streets 7th Edition (Green Book). For the purposes of this analysis, a design speed of 60-mph was assumed along Road 27 based on California's 55-mph maximum speed limit law for two-lane undivided highways. AASHTO standard time gap variables for passenger cars stopped on the proposed project driveways were used. Based on the existing traffic control, minimum sight distance was calculated for the following scenarios:

1. Stopping Sight Distance for vehicles driving along Road 27
    - From Table 3-1 and 3-2 of the Green Book, the minimum stopping sight distance is 570-feet in the southbound direction at level grade and 638-feet in the northbound direction at a 6% downgrade.
2. Intersection Sight Distance Case B1 Left-turn and Case B2 Right-turn – Stop control at the proposed project entry road for vehicles exiting the Castellina site.
    - From Table 9-7 and 9-9, the intersection sight distance is 665 feet for Case B1 left turn and 575 feet for Case B2 right turn assuming minor street grades less than 3 percent.

Aerial images, street view photos, and the proposed Road 27 and Castellina site plans were used to estimate the available sight distance and departure sight triangles at the proposed driveway location. From a 14.5-foot setback from the edge of travel way, the measured available sight distance at the project driveway is over 800 feet north and south on Road 27.

The proposed project driveway location satisfies the minimum stopping sight distance required for all approaches on Road 27. Vehicles on Road 27 will have sufficient sight distance to react and stop safely if a vehicle from the project driveway enters or exits the road.

It should be noted that the high-speed rail overpass improvement will install a new Midwest Guardrail System (MGS) along Road 27 outside the paved shoulder. This MGS fixture is typically dimensioned 32-inches (2.67-feet) in height per Caltrans Standard Plan RSP A77L1 and is shorter than the 3.5-foot object height used for determining sight distance obstructions. Based on the estimated available sight distance and vertical profile of Road 27, it is anticipated that the MGS fixture will not obstruct the minimum sight distance requirements at the proposed Castellina driveway.

The proposed project driveway is aligned approximately 43-feet south of the existing Avenue 18 west leg. Due to this offset skew at the intersection, it is assumed that vehicles on Road 27 wanting to make a northbound left turn onto Avenue 18 will temporarily block vehicles from exiting the Castellina project road. Vehicles exiting the project site will need to yield to left-turning vehicles prior to completing their movement onto Road 27.

Conclusions and Recommendations

Overall, the proposed project driveway location is feasible and provides adequate minimum stopping sight distance for traffic conditions. To ensure that exiting vehicles can see oncoming vehicles traveling on the road, any landscaping should be restricted to low-level vegetation and setback away from the project driveway. Exhibits highlighting the design and measured available stopping and intersection sight distances are shown in the **Appendix**.

Appendix

- California High-Speed Rail Authority - Road 27 Grade Separation Layout
- Intersection Sight Distance at Castellina Specific Plan Project Driveway
- Stopping Sight Distance at Castellina Specific Plan Project Driveway

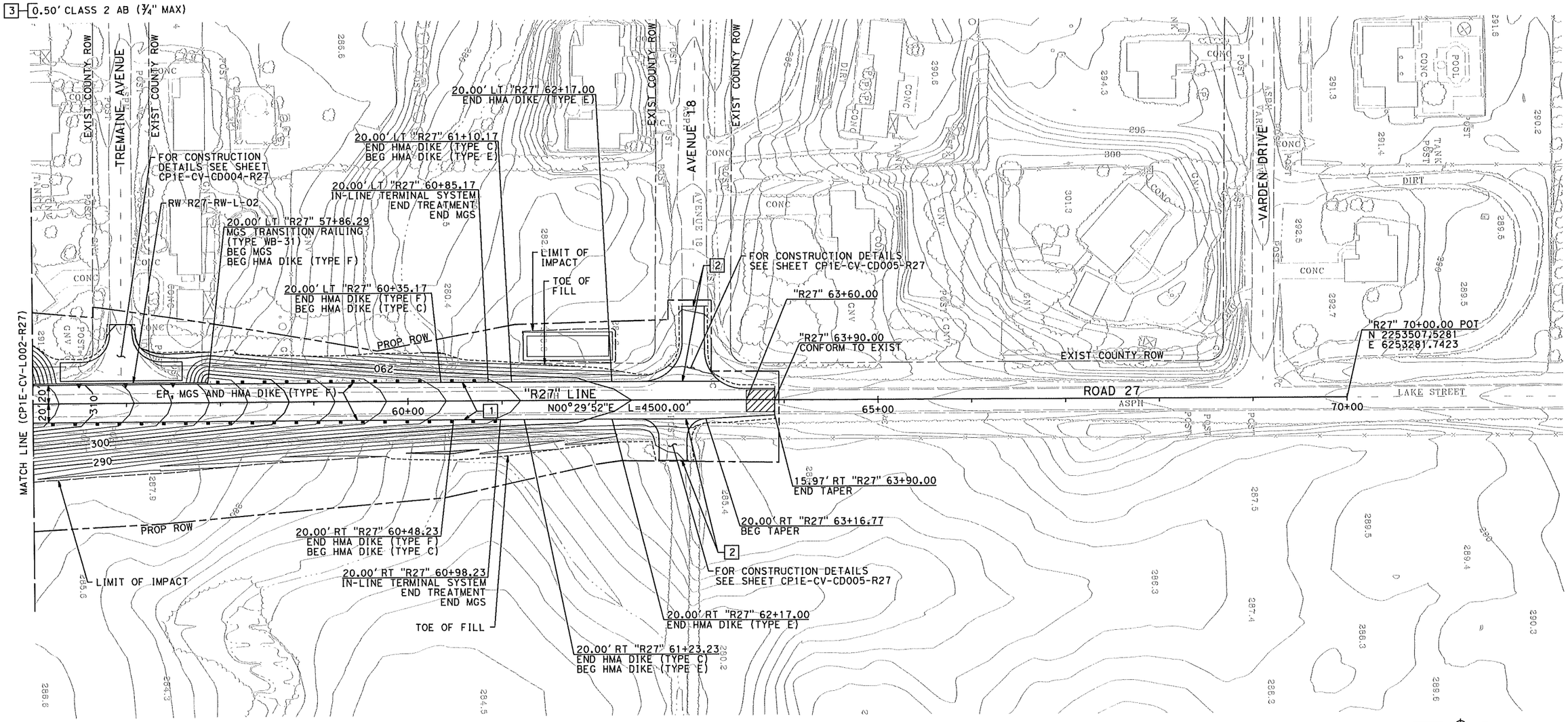
PAVEMENT SECTION

1 — 0.40' HMA-A
0.45' CLASS 2 AB

2 — 0.25' HMA-A
0.35' CLASS 2 AB

3 — 0.50' CLASS 2 AB (¾" MAX)

NOTE:
SEE SHEET CP1E-CV-L001-R27 FOR NOTES.



PLAN

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1"=50'
SCALE APPLICABLE FOR FULL SIZE ONLY

REV	DATE	BY	CHK	APP	DESCRIPTION
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DESIGNED BY L. WANG
DRAWN BY L. WANG
CHECKED BY M. HYNES
IN CHARGE M. HYNES
DATE 08/25/17

REGISTERED PROFESSIONAL ENGINEER — MICHAEL HYNES — No. C67872 — Exp. 6-30-19 — CIVIL — STATE OF CALIFORNIA

TutorPerini · ZACHRY · PARSONS — A joint venture

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
CONSTRUCTION PACKAGE 1 - EXTENSION

ROAD 27 GRADE SEPARATION
LAYOUT
SHEET 3 OF 3

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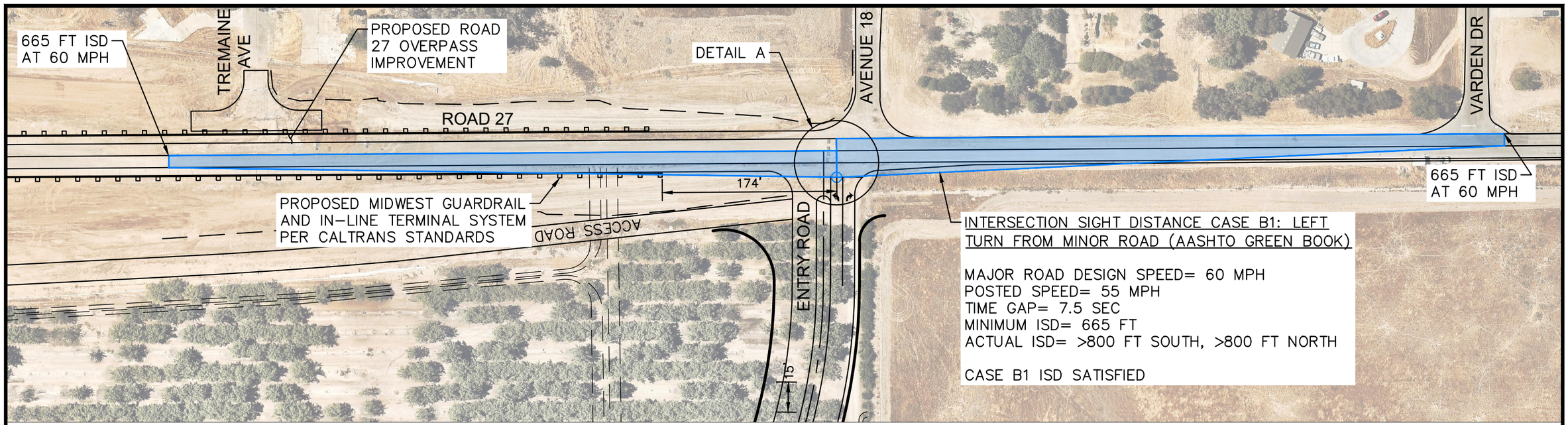
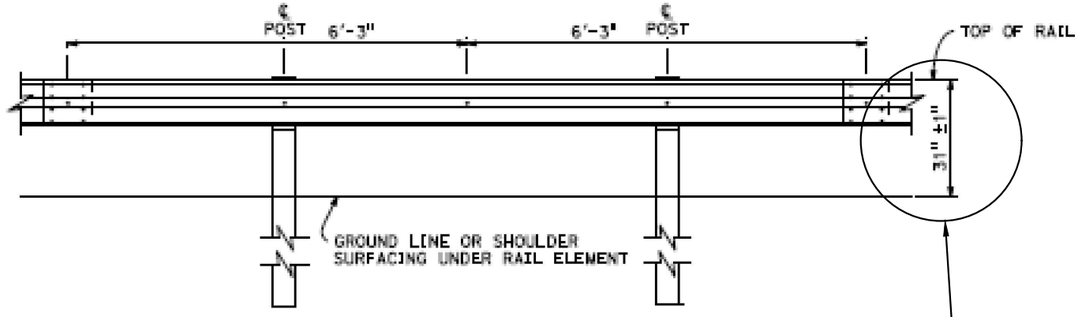
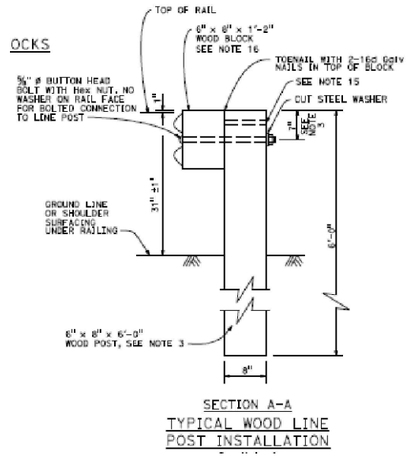
DRAWING NO. CP1E-CV-L003-R27
SCALE 1"=50'
SHEET NO. 8





ELEVATION

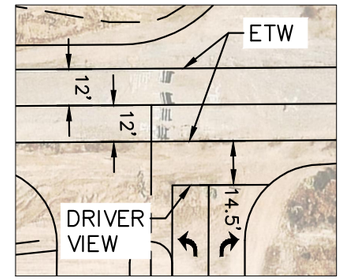
MIDWEST GUARDRAIL SYSTEM WITH WOOD POST AND BLOCKS



SECTION A-A
TYPICAL WOOD LINE
POST INSTALLATION

MGS FIXTURE HEIGHT DOES NOT EXCEED 3.5-FOOT OBJECT HEIGHT FOR DETERMINING SIGHT DISTANCE OBSTRUCTIONS

DETAIL A



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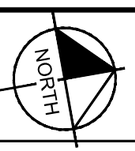

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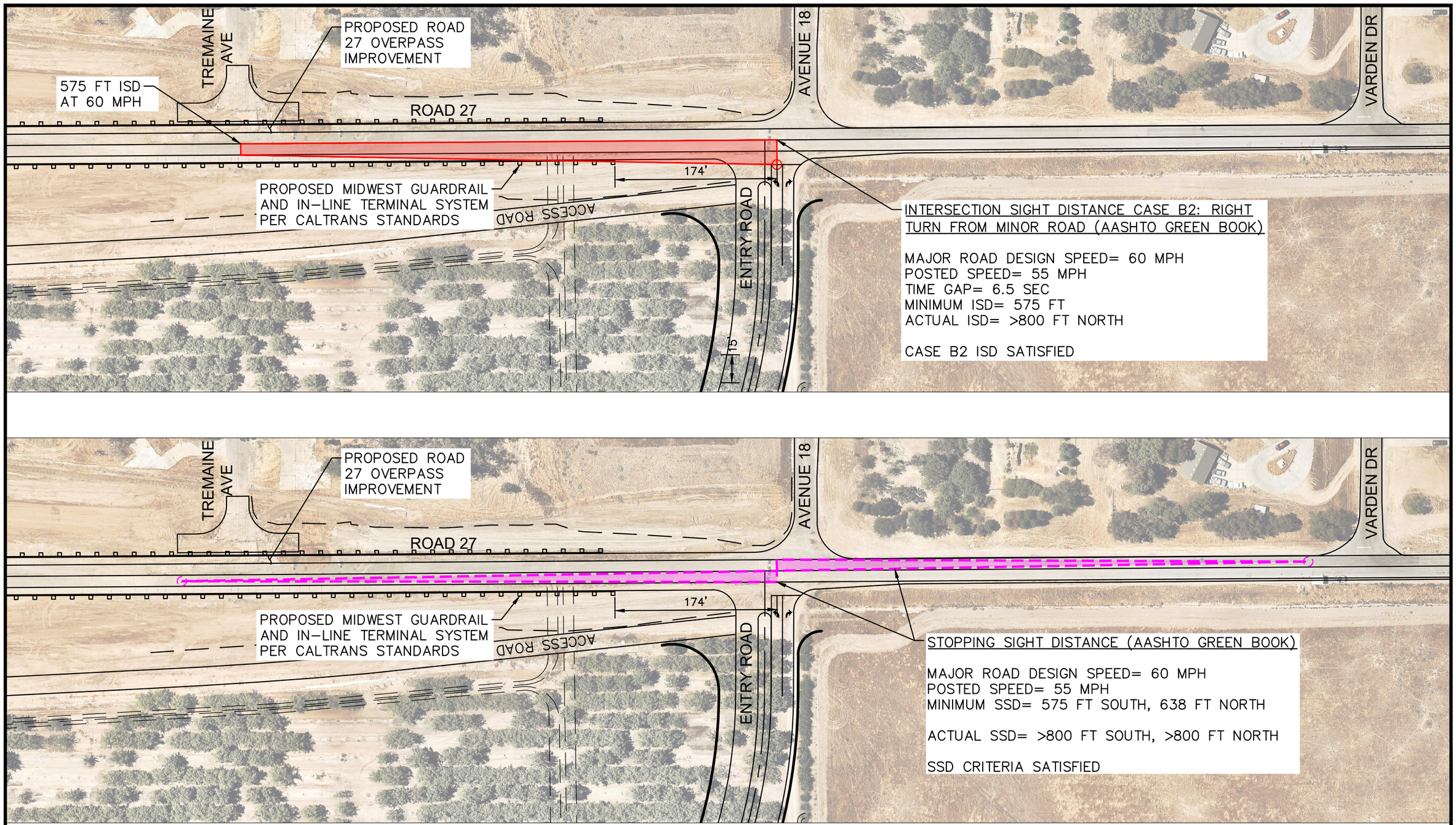
SV-097846000 MAY 2019

ROAD 27 / AVENUE 18 / PROJECT DRIVEWAY SIGHT DISTANCE

CASTELLINA - MADERA COUNTY



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NORTH

GRAPHIC SCALE IN FEET
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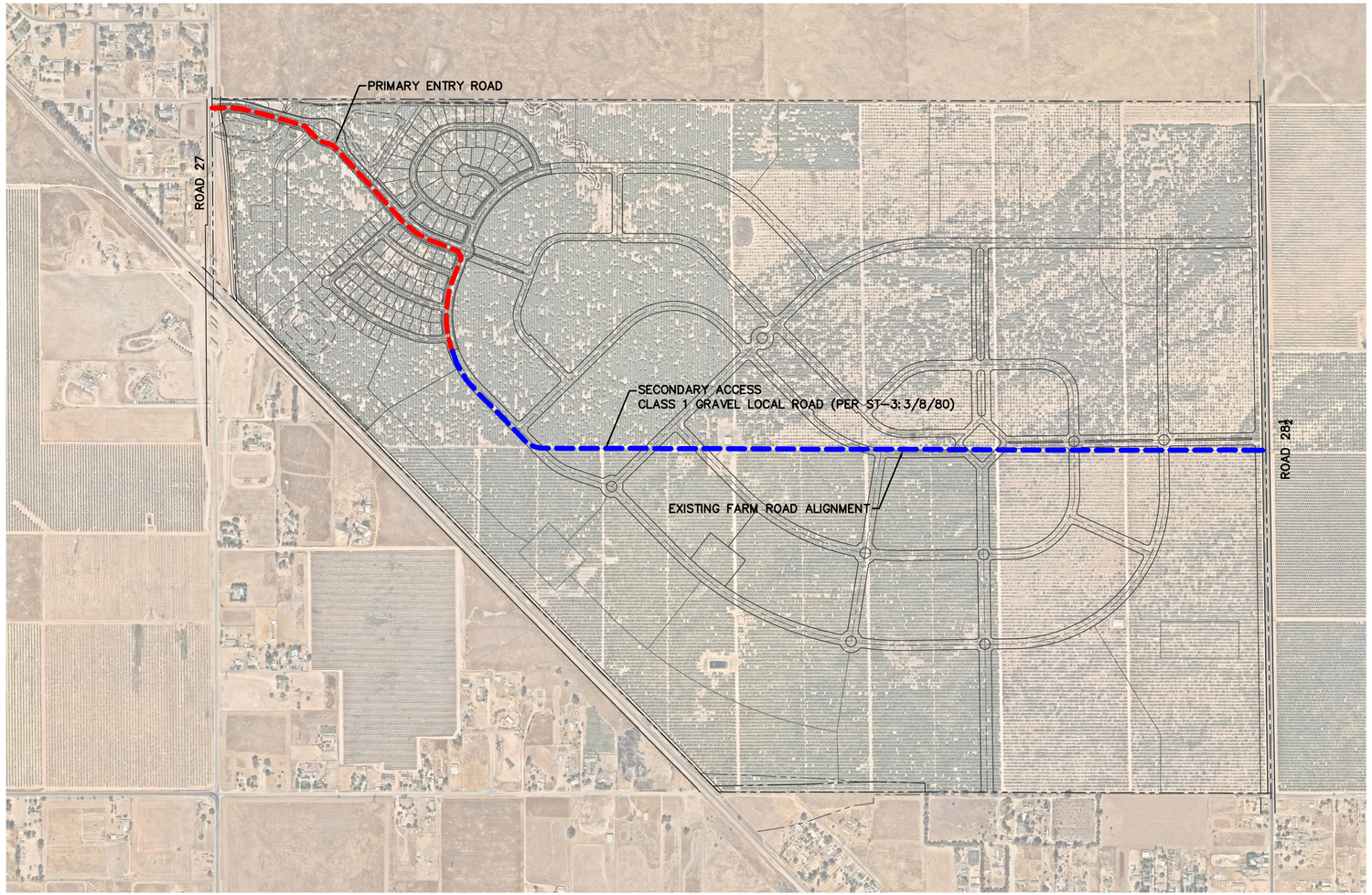
SV-097846000 MAY 2019

ROAD 27 / AVENUE 18 / PROJECT DRIVEWAY SIGHT DISTANCE

CASTELLINA - MADERA COUNTY

K-3 Secondary Access Plan



NORTH

GRAPHIC SCALE IN FEET
0 250 500 1000

No.	REVISIONS	DATE	BY

SCALE: AS SHOWN
DESIGNED BY
DRAWN BY
CHECKED BY

Kimley»Horn
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1300 CLAY STREET, STE 325 OAKLAND, CA 94612
PHONE: 510-625-0712
WWW.KIMLEY-HORN.COM

DATE: 7/3/2019
PROJECT: 097846000

CASTELLINA LAND PLAN
FOR
MADERA COUNTY

LICENSED PROFESSIONAL
DATE:

FIRE TRUCK ROUTE EXHIBIT

SHEET NUMBER