FEASIBILITY STUDY

for the

RIEGO ROAD GRADE SEPARATION PROJECT

JULY 2020

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SUTTER COUNTY

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Table of Contents

EXECUTIVE SUMMARY

This Feasibility Study evaluates alternatives for crossing improvements at Riego Road where it crosses the Union Pacific Railroad (UPRR) corridor in South Sutter County to determine a preferred alternative. The existing at-grade crossing is identified as California Public Utilities Commission (CPUC) Crossing Number 004-150.90 and US Department of Transportation (USDOT) Crossing Number 833698J and is located along the UPRR Sacramento Subdivision. The following three build alternatives were analyzed and are discussed herein.

No-Build Alternative

The No-Build alternative maintains the existing two-lane configuration of Riego Road and no improvements are proposed. The existing road consists of one lane in each direction.

Alternative 1: 4-Lane At-Grade Crossing (Interim)

Alternative 1 proposes to widen Riego Road to four lanes at grade. The existing two-lane road will be improved to include two lanes and a shoulder in each direction, a center median, and a 12-foot multi-use trail on the north side of the roadway. The existing at-grade crossing with the UPRR tracks will be reconfigured to the new roadway configuration and include the required crossing safety equipment. Natomas Road will maintain a direct connection to Riego Road; however, it will be changed to a right-in, right-out only configuration.

This alternative requires approval form the California Public Utilities Commission (CPUC) and the Union Pacific Railroad (UPRR). Per discussions with the CPUC on August 4th, 2020, a grade separation would be preferred but an improved (widened) crossing is feasible if all parties agree. The CPUC felt that this would qualify under the GO 88-B Modification to an Existing Crossing process, instead of the Formal Application process.

Alternative 2a: 4-Lane Grade Separation (Interim) (Attachment A)

Similar to Alternative 1, Alternative 2a proposes the same four-lane configuration; however, it also proposes to elevate Riego Road over the UPRR tracks. The grade separation improvements will include a bridge over the railroad corridor, a second bridge over Natomas Road and the adjacent Natomas East Main Drainage Canal, and Mechanically Stabilized Embankment (MSE) structures supporting the roadway approach and supporting the elevated roadway between the proposed bridges. The overhead structure will minimize or avoid impacts to railroad operations during construction since shoofly tracks will not be required. It has the added benefit that it eliminates an at-grade crossing. Natomas Road will continue south under one of the two Riego Road bridges, eliminating its direct connection to Riego Road. A new cul-de-sac road requiring a smaller low-level bridge across the canal is proposed to maintain local access to two parcels and minimize right-of-way acquisitions east of the canal.

Alternative 2b: 6-Lane Grade Separation (Widen)

Alternative 2b proposed to widen Alternative 2a to six lanes and consists of the same two roadway bridges on Riego Road and MSE structures. It is anticipated that there will be no additional impacts to Natomas Road and the local access road constructed in Alternative 2a, including the new low-level bridge.

Alternative 3: 6-Lane Grade Separation (Ultimate)

Alternative 3 utilizes the same alignment and profile layout as Alternative 2a except it proposes to construct a six-lane grade separation configuration without the interim four-lane configuration. The impacts to Natomas Road and the construction of the local access road with a low-level bridge are similar to Alternative 2a.

Alternatives Withdrawn from Consideration

The following alternatives were withdrawn from consideration due to their feasibility and significance of their impacts. These include:

- Raise the rail tracks over Riego Road

- Lower the rail tracks under Riego Road
- Underpass (Riego Road below tracks)

The following table summarizes each of these alternatives as well as providing estimate construction and right-of-way costs.

Table 1: Executive Summary Table

Alternative	Summary	Construction Cost	Added Right of Way Costs	Total Project Costs*
1 4-Lane At-Grade Crossing	Widens Riego Road to 4 lanes Improves existing at-grade crossing May require a future grade separation Consistent with proposed adjacent development Temporary impact to rail operations during construction No permanent impacts to rail operations Impacts no additional parcels	$12.3M	$0	$16.9M
2a 4-Lane Grade Separation (Interim)	Widens Riego Road to 4 lanes Eliminates existing at-grade crossing May require a future widening to 6 lanes Impacts proposed adjacent development No temporary or permanent impacts to rail operations Impacts two additional parcels	$44.9M	$0.4M	$62.1M
2b 6-Lane Grade Separation (Widen)	Widens Riego Road from the interim 4-lane configuration to 6 lanes Increases impact to proposed adjacent development No temporary or permanent impacts to rail operations	$22.9M	$0M	$36.8M
3 6-Lane Grade Separation (Ultimate)	Widens Riego Road to 6 lanes Eliminates existing at-grade crossing Assumes 6-lane grade separation construction Increases impact to proposed adjacent development No temporary or permanent impacts to rail operations Impacts two additional parcels	$56.0M	$0.4M	$77.5M

** Total cost includes design, soft costs, construction management costs and 4% escalation over 2 years. Escalation for Alternative 2b is 4% over 6 years.*

Project Costs Assumptions/Constraints/Risk Factors

The cost estimates (Attachment B) were developed using the current alignment of the Project Study Report Equivalent (PSR Equivalent) that is concurrently being developed. The following considerations and/or assumptions were used in estimating the project costs:

1. The OH construction will need to be staged with a portion of the structure being constructed while traffic remains on the existing roadway. The remaining portion of the structure will be constructed once traffic is shifted to the new structure.

2. The connection between Natomas Road and Riego Road will be severed with the grade separation. It will extend under one of the Riego Road bridges and continue south.

3. A total of three structures are included in this estimate: The OH grade separation, two high-level bridges over Natomas East Main Drainage Canal and Natomas Road, and a separate low-level bridge across the Natomas East Main Drainage Canal to accommodate local access to properties.

4. In order to minimize right of way takes north and south of Riego Road, minimize the bridge lengths, and provide a cost-effective alternative, long approach Mechanically Stabilized Embankment (MSE) walls will lead up to and away from each of the proposed structures.

5. Construction costs assume railroad flagging, 10% mobilization, 25% contingency, and 2 years escalation at 4%.

It is currently unknown what franchise agreements existing between PG&E (30" natural gas line) and the Department of Energy (OH Electric Lines). For the grade separation, the costs include $1,000,000 for raising the OH lines (these costs need to be verified). The recently constructed PG&E natural gas transmission line that runs longitudinally under the north side of the road will be protected in place with the widening of the road. For the grade separation alternatives, the additional load on gas line will need to be checked as we are raising the road up to 30 feet higher than existing elevations. Although utilizing MSE walls will avoid placing fill directly over the utility, the pressure distribution and loading on the line will need to be checked and approved by PG&E. Mitigation factors, other than relocating the line (such as paving a concrete cap over the line) need to be investigated in the preliminary design phases.

INTRODUCTION

The Sutter County Development Services Department, Engineering Division, is considering the feasibility of a grade separation of Riego Road over the Union Pacific Railroad (UPRR) tracks. The existing at-grade crossing (CPUC #004-150.90 / USDOT #833698J) is located approximately 2.5 miles east of State Route 99 (SR-99) and Riego Road interchange, and at milepost 150.87 on the UPRR Sacramento Subdivision.

The intent of this Feasibility Study is to provide Sutter County, Placer County, the City of Roseville and the Placer County Transportation Planning Agency (PCTPA) with the preliminary assessment of the needed improvements at the Riego Road at-grade crossing with the UPRR tracks. The joint agencies are looking to determine the requirements for the overall project that will widen the Riego Road / Baseline Road corridor in both Placer and Sutter Counties. This Feasibility Study focuses only on the area for the proposed grade crossing improvements, which is a limited portion of the overall Riego Road / Baseline Road Widening Project from SR-99 to Foothills Boulevard. The overall project is discussed in a separate document, the Project Study Report Equivalent (PSR EQUIVALENT), and not included herein. It is assumed that the findings of this document will be summarized in the PSR EQUIVALENT.

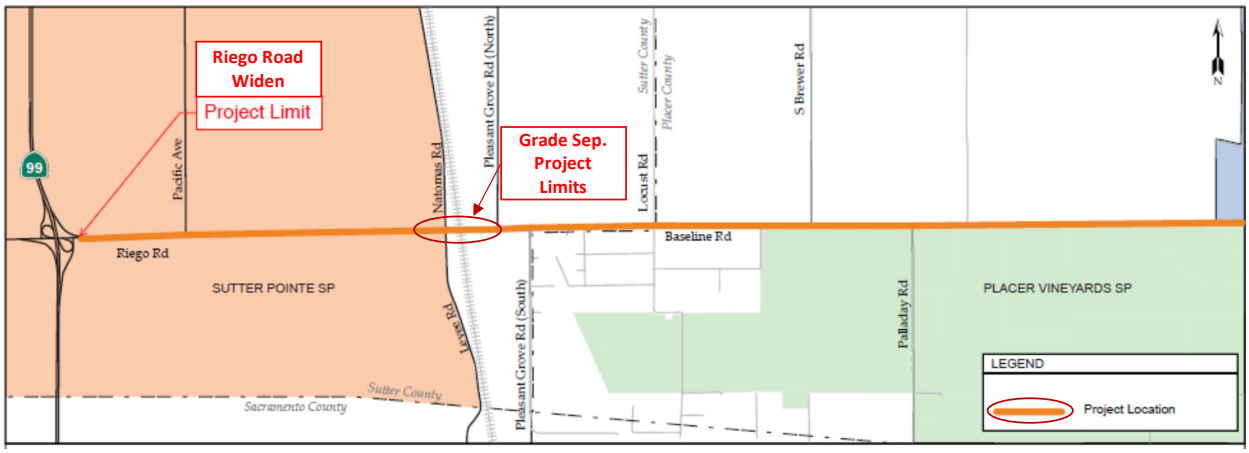


Figure 1: Location Map

As noted in the PSR EQUIVALENT, the economic growth and planned development along the Riego Road / Baseline Road corridor have transformed over the past decade and the two-lane road is experiencing traffic congestion. An estimated 20,000 vehicles per day currently travel on the road, and as more home construction occurs, the number is expected to double to 40,000. To accommodate the planned traffic growth, the overall project proposes to widen the road to four lanes in the interim condition and to the ultimate condition of six lanes when additional funding is available. This study will evaluate improvements at the crossing for both the interim and ultimate conditions.

BACKGROUND

The overall proposed widening project extends for the 12-mile segment of Riego Road / Baseline Road between SR-99 and Foothills Boulevard and includes three local jurisdictions – County of Sutter, County of Placer and the City of Roseville (within Placer County). The border between Sutter County and Placer County is located at Pleasant Grove Road (South) and Locust Road. The Riego Road portion of the overall project is in Sutter County, while the Baseline Road portion is in Placer County. The extents of the proposed crossing improvements of Riego Road discussed in this Study fall within Sutter County.

The overall project is developer driven. Each local jurisdiction has a specific plan along the Riego Road / Baseline Road corridor: Sutter Pointe, Placer Vineyards and Sierra Vista are in unincorporated Sutter County, unincorporated Placer County and City of Roseville, respectively. Of these developments, Sutter Pointe is the only one directly impacted by the proposed improvements of the Riego Road and UPRR at-grade crossing. The Sutter Pointe Specific Plan (SPSP) in Sutter County was adopted by the Board of Supervisors in 2009 and amended in 2014. Riego Road is the major east-west corridor in the master-planned mixed-use development that provides direct access to SR-99/70. Placer Vineyards Specific Plan (PVSP) and Sierra Vista Specific Plan (SVSP) have each been adopted within their respective jurisdictions; however, these two developments are not directly impacted by the proposed crossing improvements and are therefore not discussed herein.

Within the limits of the SPSP and PVSP (between Natomas Road and Pleasant Grove Road), Riego Road is a two-lane roadway with a bridge over Steelhead Creek (also known as the Natomas East Main Drainage Canal) and an at-grade crossing at the UPRR tracks just east of the canal. The envisioned Riego Road grade separation would eliminate the at-grade railroad crossing to improve mobility and safety; however, this feasibility study analyzes and compares a grade separation and an improved at-grade crossing alternative. Developers have begun design within their property frontage. In order to have a cohesive and coordinated four-lane arterial that can be widened for a future six-lane roadway, it is imperative that the preliminary assessment of needed improvements is completed as soon as possible.

PURPOSE AND NEED

The Riego Road / Baseline Road corridor is experiencing traffic congestion due to economic growth of the area and its direct connection to SR-99. The existing roadway is a two-lane facility that traverses Sutter County, Placer County and the City of Roseville. Each of these jurisdictions have adopted development plans that are currently in design; these include Sutter Pointe, Placer Vineyards and Sierra Vista. With this new development, the estimated number of vehicles is expected to double, exacerbating the existing traffic congestion.

PCTPA initiated the overall Riego Road / Baseline Road widening project in response to the need for coordinated roadway improvements to accommodate additional vehicular volumes to be generated by the future development within the corridor. The overall project proposes to widen the corridor to four lanes in the interim condition and six lanes in the ultimate condition. The area of Riego Road that is the focus of this study includes the at-grade crossing of the UPRR tracks (CPUC #004-150.90 / USDOT #833698J) and all-way stop controlled intersections at Natomas Road and Pleasant Grove Road (North) that contribute to the disruption of traffic flow along the corridor. Improvements to the existing at-grade crossing, as part of the overall corridor improvements, can help alleviate the traffic congestion issues.

The purpose of the overall Riego Road / Baseline Road widening project is to:

- Provide interim improvements to increase the roadway capacity to meet the design year (2040) volume demands from planned growth as anticipated in the General Plans and refined in the three adjacent specific plans.
- Provide acceptable level of service for design year (2040) traffic operations.
- Improve regional mobility consistent with the goals of PCTPA.
- Provide a cost-effective solution by maximizing the use of required developer dedicated right-of-way and improvements.

EXISTING CONDITIONS

Configuration

Riego Road is currently classified as a Rural Major Collector and consists of two lanes running east-west. It is a continuation of Baseline Road in Placer County and extends west intersecting SR-99 before terminating at Garden Highway. It also provides local access to the City of Roseville urban area in Placer County. Per the Sutter County General Plan, the future classification of Riego Road will be an Urban Minor Arterial consisting of six lanes. The UPRR corridor is running north-south and is at a slight skew to Riego Road. The nearby local roads include Natomas Road and Pleasant Grove Road (North) and both consist of two lanes and intersect with Riego Road. Adjacent to and parallel with Natomas Road is Steelhead Creek, also known as the Natomas East Main Drainage Canal. Riego Road stays at grade while it bridges over this canal. There are currently no pedestrian or active transportation facilities along Riego Road and the two local roads within the crossing improvement project area.

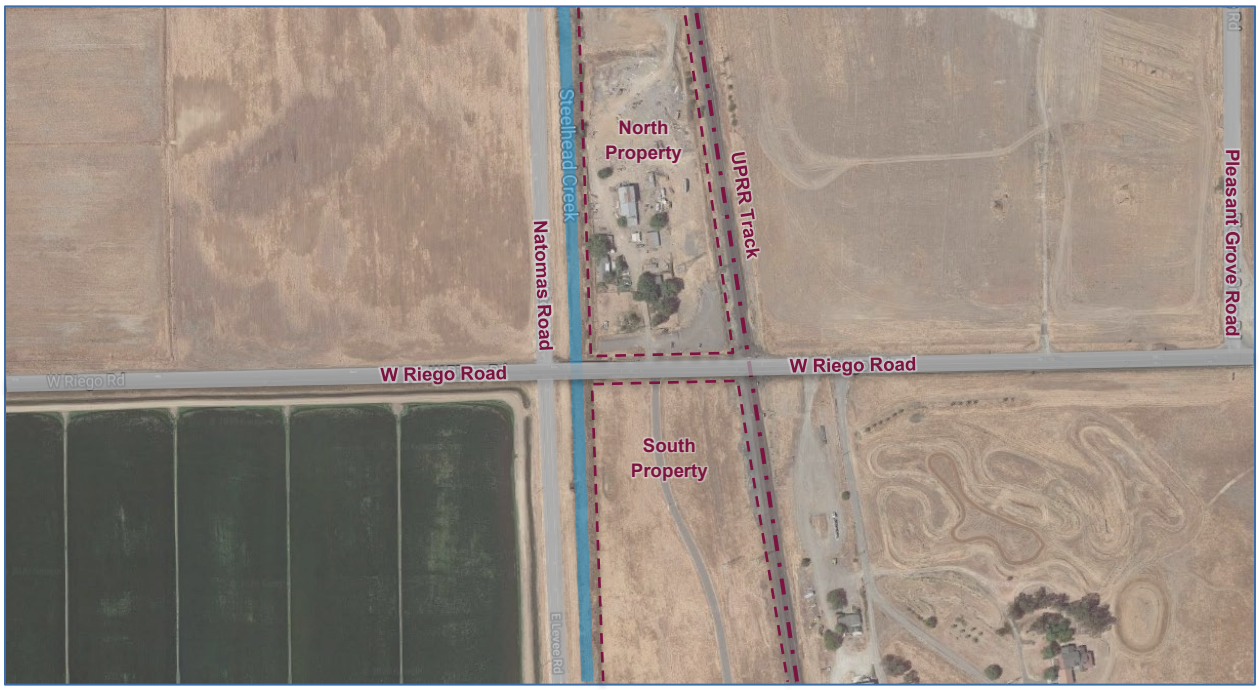


Figure 2: Project Area Map (Google Maps)

Land Use and Right-of-Way

The existing land use in the area of the grade crossing is classified in the Sutter County General Plan as agriculture (80-acre minimum). With the approval of the Sutter Pointe Specific Plan, the land use for the area west of Natomas Road on both sides of Riego Road have been classified as a Growth Area, which is defined as an area within Sutter County targeted for new growth and services. The Sutter Pointe development is expected to be multi-use including residential, recreational, industrial, and commercial land uses.

The existing street right-of-way width for Riego Road is 50 feet. The proposed right-of-way is planned to range from 110-feet to 145-feet in width depending on location along Riego Road. Whether the road is widened to the interim four lanes or the ultimate six lanes, the proposed right-of-way will accommodate either scenario.

Railroad Operations

The UPRR corridor is part of the Sacramento Subdivision running north-south and includes one existing mainline railroad track. North of Riego Road, the corridor right-of-way is 100-foot wide, while it is 150-foot wide south of Riego Road. Per the Federal Railroad Administration (FRA) Inventory Report for this crossing (USDOT #833698J), there are 10 daily trains that operate through the study area.

Any modifications to the existing at-grade crossing (including a grade separation) will require coordination with and approval by UPRR and the CPUC.

Utilities

There are a variety of existing utilities that are within the area of the proposed crossing improvements. These include overhead poles, underground fiber optic, and irrigation canals. The recently constructed PG&E natural gas transmission line that runs longitudinally under the north side of the road will be protected in place with the widening of the road. For the grade separation alternatives, this gas line may need to be relocated due to the loading of the fill needed to raise the road up to 30 feet higher than existing elevations. Although utilizing MSE walls will avoid placing fill directly over the utility, the pressure distribution and loading on the line will need to be checked and coordinated with PG&E. Mitigation factors, other than relocating the line (such as paving a concrete cap over the line) need to be investigated in the preliminary design phases. All other existing utilities in conflict with the proposed crossing improvements will need to be relocated.

ADJACENT PROJECTS

The evaluation of the alternatives has taken into consideration future adjacent projects. These projects include the Baseline Road widening, the closure of other at-grade crossings, and planned developments along the Riego Road / Baseline Road corridor. It is expected that alternatives for the overall project and the Riego Road at-grade crossing improvements should accommodate these adjacent projects to the fullest extent feasible.

Baseline Road Widening

As Riego Road extends east from the SR-99, it becomes Baseline Road at the Pleasant Grove Road (South) intersection. The widening of Riego Road and Baseline Road, as part of the overall project, falls within Sutter County and Placer County, respectively. Two of three planned developments mentioned earlier are adjacent to Baseline Road. The widening of the road is essential to accommodate the growth of the immediate surrounding area. Additionally, a critical connection to SR-99 from these developments utilizes Riego Road as an extension of Baseline Road. Therefore, the widening of both roads, as proposed by the overall project, should be coordinated to avoid a bottleneck situation at the intersection of Riego Road and Baseline Road.

Existing and Potential At-Grade Crossing Closures

In the event that UPRR requests existing at-grade closures in exchange for maintaining the existing at-grade crossing, Sutter County has identified potential locations for the closure other existing at-grade crossings. As part of Alternative 1 described in a later section, the crossing will be updated to align with the new widened roadway improvements. In Alternatives 2a, 2b and 3, a grade separation would be constructed raising Riego Road over the railroad corridor.

The following table summarizes the location and approximate closure cost of the other existing at-grade crossings being considered for closure. It is anticipated that only two of these existing at-grade crossings could be closed, possibly three; all which will require approval by the Board of Supervisors and an extensive public outreach process. For all potential closures, it was assumed that cost would include pavement removal, signage, grinding, and potential detour improvements (cape seal).

Table 2: Potential At-Grade Crossing Closure Locations

UPRR Crossing	Crossing Configuration	Milepost / Distance from Riego Road Crossing	Approximate Cost	County District
KEYS ROAD CPUC #004-153.90 USDOT #834917Y SACRAMENTO SUBDIVISION	Paved and Gravel Road (20 feet wide) Fatal accident 2 years ago Existing low water crossing No Crossing Arms, Railroad Sign Only UPRR proposing to add signals and lights 0.5 /0.7 mi to nearest crossroads (West/East)	MP 153.90 / 3 Miles	$0.5M	5
FIFIELD ROAD CPUC #004-154.90 USDOT #834918F SACRAMENTO SUBDIVISION	Paved and Gravel Road (20 feet wide) No Crossing Arms, Railroad Sign Only Access to Natomas Road 0.8 /1.1 mi to nearest crossroads (West/East)	MP 154.90 / 4 Miles	$0.6M	5
CORNELIUS AVENUE CPUC #004-163.00 USDOT #834929T SACRAMENTO SUBDIVISION	Two-lane Paved Road Warning Gates and Signs Crossing Adjacent to Pacific Avenue 0.5 /0.1 mi to nearest crossroads (West/East) Impacts several residents	MP 162. 96 / 12 Miles	$0.5M	5
CLARK ROAD CPUC #001C-148.60 USDOT #753296F VALLEY SUBDIVISION	Two-lane Paved Road Warning Gates and Signs Crossing Adjacent to Live Oak / SR 99 0.4/0.01 mi to nearest crossroads (West/East) Cannot close both Clark & Paseo Need to discuss with Sunset Moldings (adjacent business)	MP 148.58 / 34 Miles	$0.4M	1
PASEO ROAD CPUC #001C-149.80 USDOT #753298U VALLEY SUBDIVISION	Two-lane Paved Road Warning Gates and Signs Crossing Adjacent to Live Oak / SR 99 0.4/0.01 mi to nearest crossroads (West/East) Cannot close both Clark & Paseo	MP 149.79 / 35 Miles	$0.4M	1

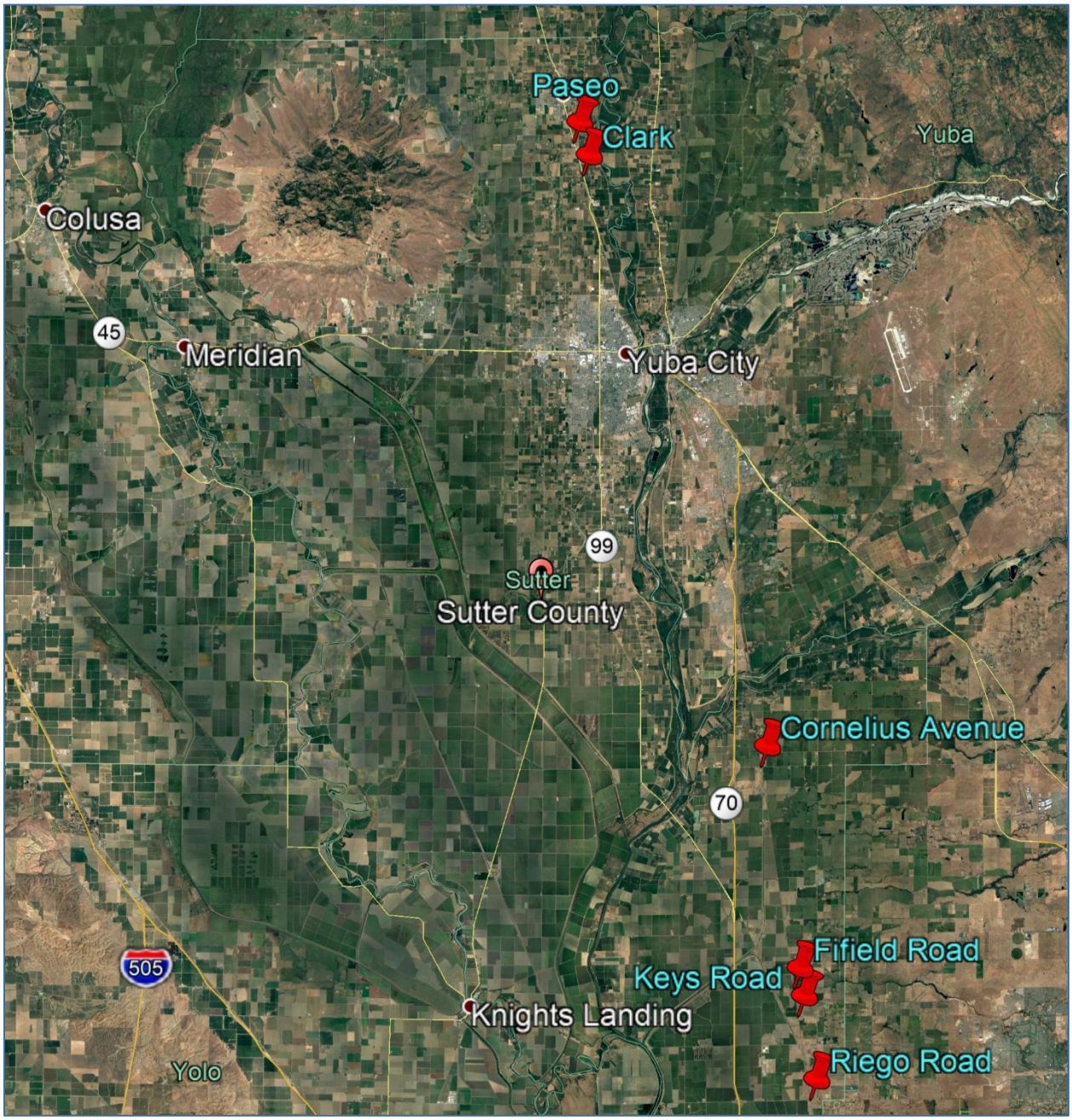


Figure 3: Crossing Locations Area Map (Google Maps)

Figure 4: Crossings (Top: Keys Road, Fifield Road. Middle: Cornelius Avenue. Bottom: Clark Road, Paseo Road.)

(Google Maps)

Developer Planned Projects

There are three planned developments adjacent to Riego Road and Baseline Road that have been approved by their local jurisdictions as part of the economic growth of the rural area. With existing traffic congestion issues, these developments will add to the existing traffic congestion, generating increased vehicle movements to and from the new residential and employment locations. The overall Riego Road / Baseline Road widening project will widen both roads within a wider roadway right-of-way of up to 145 to accommodate projected traffic growth. It will be important to coordinate roadway improvements with the developments, currently in design, that have Riego Road / Baseline Road frontages. These developments include:

- Sutter Pointe: Per the Sutter Pointe Specific Plan, this development encompasses approximately 7,528 acres of land in south Sutter County and proposes a diverse mix of land uses, including employment centers, different housing types, retail shopping areas, recreation amenities, schools, community services, supporting on- and off-site infrastructure, roadway improvements, open space and various public uses. This development is located along Riego Road between SR-99 and Natomas Road. It does not overlap the UPRR corridor; however, its southeast corner at the Natomas Road and Riego Road intersection will be impacted by a grade separation due to the proximity to the corridor.
- Placer Vineyards: Per the Placer Vineyards Specific Plan, this development is located in southwestern Placer County and contains approximately 5,230 acres. It is a mixed-use planned community including 14,132 residential units, 274 acres of commercial uses, 919 acres of park and open space land, and 851 acres of quasi-public uses (i.e., public facilities/services, schools, roadways, religious facilities). This development is not impacted by the proposed crossing improvements and will not be a factor in the alternative analysis.
- Sierra Vista: Per the Sierra Vista Specific Plan, this development includes 2,064 acres of land that was annexed into the City of Roseville from the unincorporated Placer County. The development includes 8,679 single and multi-family units and land uses such as commercial, parks, open space, schools, and Urban Reserve. This development is not impacted by the proposed crossing improvements and will not be a factor in the alternative analysis.

STAKEHOLDER AND PUBLIC INPUT

For this feasibility study, stakeholder and public outreach efforts are not anticipated and not discussed herein. However, future stakeholder and public outreach will take place in the next phase of the project.

ENVIRONMENTAL CONSIDERATIONS

Most of the project area has been previously evaluated and permitted as part of the four specific plan areas and the underground pipeline project. The project could leverage upon the previously completed technical studies, potential effects, and mitigation measures identified in the respective environmental documents. Coordination with the Placer County, Sutter County and the U.S. Army Corps of Engineers will be necessary to obtain technical studies and permitting information. For areas along the corridor which have not been previously studied additional field studies and analyses will be required.

The mapped resources most likely to be impacted by the Project are: agricultural (prime or important farmlands and lands with Williamson Act contracts), biological (giant garter snake, Central Valley steelhead, vernal pool fairy shrimp, vernal pool tadpole shrimp, burrowing owl, Swainson's hawk, black-crowned night heron, tricolored blackbird, western spadefoot white-tailed kite, California linderiella, andrenid bee, and some vernal pool plant species) and cultural and tribal. Additional environmental factors of "moderate" constraint level are traffic/transportation, hydrology and water quality, air quality, noise and vibration and energy and climate change. It is anticipated that the following studies will be required: Community Impact Assessment, AD-1066 Form (for impacts to farmland and consultation with the Natural Resources Conservation Service), Visual Impact Assessment, Historic Property Survey Report (HPSR), Archeological Survey Report (ASR), Historic Resources Evaluation Report (HRER), Water Quality Assessment

Report (WQAR), Geotechnical Report, Paleontological Evaluation Report (PER), Initial Site Assessment (ISA), Air Quality Assessment Report, Noise Study Report (NSR), Natural Environment Study (NES), Aquatic Resource Delineation Report, (ARDR) and two Biological Assessments (BA) (one for vernal pool fairy shrimp and the other for steelhead and giant garter snake). There is a low risk that Extended Phase I (XPI) surveys and Findings of Effect (FOE) will be needed if archeological resources are located within the Area of Potential Effect (APE) or historic resources are within the project area.

Federal funds will likely be required to fund a Grade Separation which then requires analysis and clearance under the National Environmental Policy Act (NEPA) in addition to certification under the California Environmental Quality Act (CEQA). The anticipated level of action under NEPA is a Categorical Exclusion and an Initial Study/Mitigated Negative Declaration under CEQA.

Additionally, the necessary permits, agreements and approvals for the project include a California Fish and Game Code Lake or Streambed Alteration Agreement, U.S. Army Corps Clean Water Act (CWA) Section 401 (Water Quality Certification), CWA Section 402 (NPDES) permits from the Regional Water Quality Board, CWA Section 404 (Nationwide Permit or Individual Permit), Rivers and Harbors Act Section 14 – Title 33 USC Section 408 Authorization (for crossing levee along Steelhead Creek) , Federal Endangered Species Act Biological Opinion(s), California Endangered Species Act 2081 Agreement and National Historic Preservation Act Section 106 State Historic Preservation Office (SHPO) Concurrence. Permits will need to be initiated concurrently with the environmental document to meet the project's construction schedule.

GEOTECHNICAL CONSIDERATIONS

Geology

The project site is located within the Great Valley Geomorphic Province of California. The geology of this region is typically characterized by ongoing alluvial sediment deposition since the Jurassic period. The province encompasses the San Joaquin and Sacramento Valleys and is bounded by the Sierra Nevada Mountains to the east, the Cascade and Coast Ranges to the west, the Transverse Range (Tehachapi Mountains) to the south, and the Klamath Mountains to the north.

The Sacramento Valley is a structural trough that covers approximately 5,000 square miles, which makes up the northern third of the Great Valley Geomorphic Province. The Sacramento Valley extends from the Stockton-Tracy area on the south to the Klamath Mountains on the north. The Sacramento Valley is underlain by sediments transported from the Sierra Nevada Mountains and Coast Ranges by the Sacramento River and its tributaries. The topography ranges from gentle hills to approximately flat. During the late Mesozoic and to the early and middle Cenozoic eras (approximately 20 to 100 million years before present), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to present) overlie these marine sediments.

Based upon the Preliminary Geologic Map of the Sacramento 30' x 60' Quadragle, California (Gutierrez 2011), the project is underlain by the Riverbank Formation Middle Unit (Qr2) which are typically Middle to Late Pleistocene aged Arkosic alluvium consisting of sand with and silt, forming alluvial terraces and dissected alluvial fans along streams on the southeast side of the Sacramento Valley. The upper, middle and lower units of the Riverbank Formation form terraces that increase in topographic position with age.

Subsurface Conditions

For this feasibility study, Sierra Geotech reviewed the Foundation Engineering Report for the Riego Road Bridge at Natomas Canal prepared by Lowry & Associates dated March 21, 1980. The Log of Test Borings shows the subsurface soils in general agreement with the published geology. The two borings performed for this study both identified approximately seven to eight (7 to 8) feet of loose dark brown clayey Sand (recent alluvium) with Riverbank Formation beneath. The Riverbank Formation soils consisted of light brown to brown, very dense, slightly to partially cemented clayey medium to fine Sand which discrete layers of hard cemented sandy Silt. All of the samples had blow

counts greater than 100 blows per foot with the majority of the sample recording refusal blow counts (unable to drive sampler 12 inches with 100 hammer blows).

Preliminary Seismic Recommendations

A preliminary site-specific seismic study was performed to develop seismic design parameters for the proposed bridge design. Following the Caltrans Seismic Design Criteria (SDC) Version 2.0, (Caltrans, 2019). Memos to Designer (MTD) Section 20, and design tools outlined in the Caltrans Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendation, November 2012, a seismic analysis was performed for this structure to develop seismic design parameters and to identify potential seismic hazards such as liquefaction or lateral spreading.

A preliminary estimated averaged shear wave velocity (VS 30) of 270 m/sec was used for the site-specific seismic analyses, using the available as-built subsurface information at the project site.

The design ARS curve was developed in accordance with the Caltrans SDC 2.0 which was adopted September 1, 2019. Following this guideline, ground shaking shall be characterized for design by the design spectrum and is based on the 2014 U.S. Geological Survey Seismic Hazard Maps with modifications due to fault near-source and deep soil basin amplification factors. Based upon the location of the project site with respect to both mapped fault sources and mapped basins, no deep soil basin amplification factors were applied.

Based on the analysis as described above, the Peak Ground Acceleration (PGA) for the site is estimated at 0.21g (“g” is the acceleration due to gravity) and the peak spectral acceleration at the site is estimated at about 0.58g at an approximately 0.30 second period.

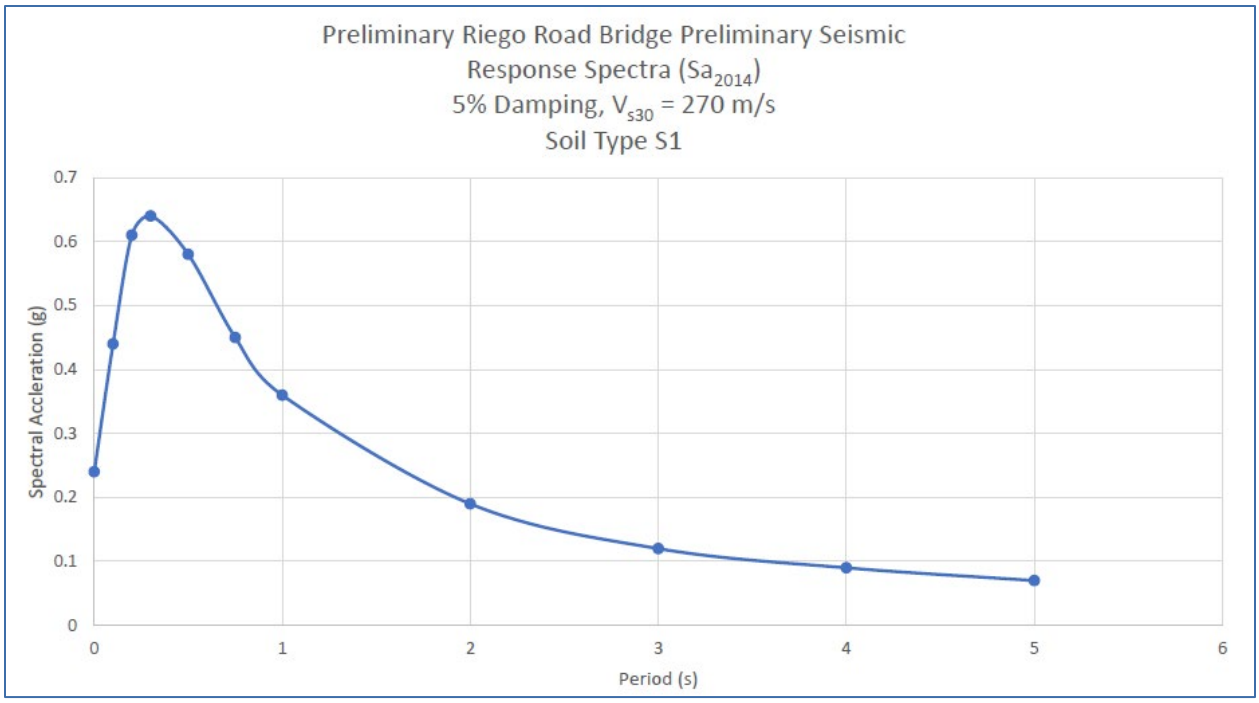


Figure 5: ARS Curve

Preliminary Foundation Recommendations

Based upon the available subsurface information for the project site, very competent soils are identified at depths approximately 7 to 8 feet below existing grade. The following are recommended foundation systems for the proposed abutments and bents for the bridge structures:

- Spread foundations bearing directly on these competent soils (Bottom of Footing 7 to 8 feet below existing grade). Preliminary allowable bearing pressures of 10 ksf for Service and 20 ksf for Strength Limit demands may be used to size the footings for cost estimating purposes;

- Large diameter CIDH piles at the bent as the soils identified at depth are considered “Intermediate Geomaterials” and can develop both side friction and end bearing to resist axial demands. The competent soils 7 to 8 feet below existing grade are anticipated to develop between 3 and 4 kips per square foot (ksf) ultimate side resistance and 20 ksf end bearing to develop preliminary pile length determination for cost estimating purposes.

- Standard Plan CIDH piles at the abutments and bents can develop side resistance to resist axial demands. For preliminary cost purposes, we estimate the length of these piles to be between 40 and 50 feet, as measured from existing ground, for cost estimating purposes.

- At the abutments, drilled and grouted in steel H-piles extending up through the MSE fill to support a short seat type abutment is a cost-effective option. Lateral forces can be resisted by attaching metallic soil reinforcement to the back of the abutment face and developing tension resistance in the MSE fill.

- Appreciable lateral resistance to resist lateral demands may be developed in soils 7 to 8 feet below existing grade.

- Driven pile foundations are not recommended do the hard/very dense/cemented nature of the site soils.

The following are recommended foundation systems for the proposed Mechanically Stabilized Embankments:

- Over excavate the unsuitable materials to Elevation 55 feet and replace material with select material placed at 95 percent relative density per ASTM D1557.

- Place the MSE wall on the loose layer of soil and allow the MSE wall to settle. Preliminary estimates of total settlements of between 4 and 9 inches. A settlement period should be included to allow the clayey potions to complete any time dependent settlement.

- For the above option, a two-stage wall (build a fabric or mesh faced wall and allow it to settle then attach the final panels) would be feasible and then a tall concrete cast-in-place abutment could be constructed with short wing walls to tie the two systems together. As there would be a thin column of fill, the active earth would be computed as a “silo fill” computed utilizing the equation published in the Montana Department of Transportation (MDT) Geotechnical Manual, Chapter 17, Earth Retaining Systems significantly reducing the earth pressure loading on the abutments

Construction Considerations

Within the limits of the proposed MSE approach fill footprints, there are existing asphalt pavements, native grassland on the east side, and agricultural fields (rice) on the west. All of the existing asphalt pavements, vegetation, and organic soils should be completely removed within and five feet beyond the limits of the fill footprint. Select granular fill, placed at 95 percent relative density, should be used to fill any voids left from the clearing operations and brought up to a uniform level surface in a condition to start placing the MSE approach fills.

Real time, full time embankment settlement and fill placement monitoring should be performed at the start of construction the MSE approaches if built on the shallow weaker soils. Settlement monitoring plates should be installed and measured at the start and finish of every work shift and have continued readings of at least once a day during both the interim and final embankment construction stages until the measured settlements approach zero settlement, as determined by the Geotechnical Engineer.

Difficulties in cast-in-drilled-hole foundation excavations may be present due to the following:

- Presence of dense granular soils;
- Potential presence of artesian groundwater conditions;
- Potential presence of caving granular soils in the upper 8 feet;
- Presence of utilities, potentially disturbed/contaminated soil and/or construction debris from railroad activities.

If the CIDH piles are installed using wet methods (i.e., using drilling slurry to maintain excavation stability), we recommend that inspection tubes be installed within each of the CIDH piles to facilitate gamma-gamma and cross-hole sonic logging at completion of the pile. The contractor should also prevent the slurry from “setting up”, control the sand content of the slurry to less than 4 percent by volume at any point in the excavation and maintain the slurry level a minimum of 10 feet above the highest expected piezometric head surface or tremie bottom, whichever is greater. At no time shall a CIDH pile excavation be left open or with slurry overnight. All piles excavated within one 8-hour work shift shall have concrete placed within that same 8-hour work shift.

If a full length segmental temporary casing is used, the bottom of the casing should have a minimum of 10 feet of concrete head at all times when removing the temporary segmental casing to help prevent the formation of a soil intrusion or other defect in the CIDH pile concrete.

TRAFFIC EVALUATIONS

As part of the overall Riego Road / Baseline Road widening project, a traffic engineering performance assessment (TEPA) was prepared to provide a technical foundation for subsequent traffic analyses and is discussed in detail in the PSR Equivalent. The alternatives for the Riego Road crossing improvements discussed herein will not have a significant impact on the overall project traffic analysis. For all three Riego Road crossing improvement alternatives, the existing all-way stop controlled intersections at Natomas Road and Pleasant Grove Road (North) will be removed or modified. Pleasant Grove Road (North) will be signalized in all three alternatives and will not change the results of the traffic assessment. Natomas Road intersection will be removed in Alternatives 2 and 3 and will be changed to a right-in, right out only configuration in Alternative 1, again not adversely impacting traffic along Riego Road. With 10 daily trains, five of which are at nighttime, Alternative 1 will not have a significant impact on traffic when trains traverse the crossing and stop traffic.

DESIGN PARAMETERS

The portion of Riego Road within the limits of the grade separation is located within the jurisdiction of Sutter County. Riego Road along with the two impacted local roads, Natomas Road and Pleasant Grove Road (North), are all posted at a 55 mile per hour (mph) speed limit. The railroad corridor is owned and maintained by the Union Pacific Railroad (UPRR).

Roadway

The governing design standards for the horizontal and vertical roadway alignment are the Sutter County standards, Caltrans Highway Design Manual, AASHTO Policy of Geometric Design of Highways and Streets, and the Union Pacific Railroad - BNSF Railway Guidelines for Railroad Grade Separation Projects. All alternatives comply with Americans with Disabilities Act (ADA) requirements. The specific design parameters incorporated into this alternative analysis include the following:

- Design Speed

Riego Road	V = 65 mph
Local Roads	V = 45 mph

- Horizontal Alignment

Transition & Curves	Caltrans minimum requirement for design speed
Sight Distance	Caltrans minimum corner sight distance

- Vertical Alignment

Crest Curves	AASHTO Stopping Sight Distance
Sag Curves	AASHTO Comfortable Speed for Well-Lit Roadways

- Vertical Clearance

Roadway	16’-0”
UPRR	23’-4”

- Cross-Section

Riego Road	77’ section across bridge
(Interim)	4’ median, 11’ lanes, 6’ shoulders
	Two lanes each direction with 12’ Class I path on north side
Riego Road	107’ section across bridge
(Ultimate)	4’ median, 11’ lanes, 6’ shoulders
	Three lanes each direction with 12’ Class I path on north side
Local Roads	20’ to 25’ EP to EP
	One lane each direction

Bridge

The structural design will follow the AASHTO LRFD Bridge Design Specifications 8th Edition (dated 2017) with California Amendments (preface dated April 2019). Live loads will include pedestrian loading on the pedestrian path, and design and permit vehicle loading for the travel way. The proposed structures will also follow the Ordinary Standard Bridge performance criteria, as well as meet the Standard Bridge Features shown below per the Caltrans Seismic Design Criteria:

- Each span length less than 300 feet,
- Either box girder, slab on girder, or slab superstructures,
- Either solid column-type or pile-bent substructures,
- Fundamental period of the bridge system is greater than or equal to 0.7 seconds in the transverse and longitudinal directions of the bridge.
- Bridge site is more than 300 feet away from a fault.

The structures will also be designed to meet the SDC Balanced Stiffness and Balanced Frame Geometry requirements outlined in Sections 7.1.2 and 7.1.3 of Caltrans Seismic Design Criteria, respectively.

Railroad

The UPRR/BNSF Guidelines for Railroad Grade Separation Projects require the following for overhead structures:

- A minimum permanent vertical clearance, per the Code of Federal Regulations, of 23’-4” measured from the top of the highest rail to the lowest obstruction under the structure.
- A minimum temporary vertical construction clearance of 21’-6” from the top of highest rail to the lowest obstruction under the structure. However, standard minimum clearance required by the California Public Utilities Commission (CPUC) is 22’-6”. The CPUC may consider granting a waiver for temporary vertical clearances during construction of less than 22’-6”, if needed.
- A minimum temporary horizontal construction clearance of 15’-0” measured perpendicular from the centerline of the nearest track to all physical obstructions.
- Fence and barrier rail on the overpass structure that extends to the limits of the railroad right-of-way, or a minimum of 25’-0” beyond the centerline of the outermost existing track, future track or access road, whichever is greater. The minimum combined barrier and fencing height shall be 8’-0” for curved fence and 10’-0” for straight fence.

For the overhead structure, construction activities should not interfere with railroad operations. Although the UPRR/BNSF Guidelines recommend the use of an overhead structure to avoid interruption to railroad operations, due to excessive cost, the County will be pursuing a 4-lane at grade crossing with the overhead structure to be constructed in a subsequent phase.

ALTERNATIVE EVALUATION

The No-Build Alternative does not provide additional capacity or multi-modal infrastructure and will not meet the Purpose and Need. The three build alternatives were developed for consideration and are discussed herein.

The preferred alternative would be to construct a 4-lane at grade crossing due to funding limitations. This is entirely dependent on UPRR and the CPUC approving this alternative. Based on discussions with the CPUC, while an Overhead grade separation would be preferred an improved widened at grade crossing is feasible as long as all parties agree. The CPUC indicated that would likely qualify under the GO-88 Modification to an Existing Grade Crossing process and the formal application process would not be needed. UPRR indicated that they will discuss this possibility with the agency when the online application is submitted. It is likely that an at grade crossing would only be approved with concessions such as an agreement to construct the overhead structure by a specific date (Phase 2) and/or closure(s) of existing at grade crossings along this corridor.

Alternative 1: 4-Lane At-Grade Crossing (Interim)

Alternative 1 proposes to widen Riego Road to four lanes and to maintain an at-grade crossing with the UPRR tracks. The existing Riego Road bridge over the Natomas East Main Drainage Canal will be widened.

Geometry

The proposed horizontal alignment of Riego Road will be maintained; however, the proposed centerline of the new wider roadway section will be shifted northerly from the existing centerline. There are no horizontal curves expected in Riego Road within the area of the crossing improvements. The adjacent local streets include Natomas Road and Pleasant Grove Road (North), which are currently all-way stop controlled intersections. Both roads will maintain their connectivity to Riego Road. It is proposed to convert Natomas Road to a right in, right out only configuration on both sides of Riego Road using a raised median. Pleasant Grove Road (North) will be converted to a signalized intersection.

In the vicinity of the at-grade crossing, the Riego Road widening will include four 11-foot lanes, a 14-foot raised center median beyond the tracks, 6-foot shoulder/bike lanes and a 12-foot multi-use trail on the north side. Sidewalks are not included in this interim phase.

The profile of Riego Road will not change and will follow the existing topography of the adjacent land. The proposed widened roadway will also meet the existing railroad track elevations.

Structures

For this alternative, the existing Riego Road Bridge will be widened over the existing drainage canal (Natomas East Main Drainage Canal). The existing bridge is a 32-foot wide, 3-span, cast-in-place, slab bridge. This bridge will be widened in kind with a 1-foot 9-inch cast-in-place slab to a total width of 85 feet and incorporate the lane configuration noted above along with a raised median. The substructure will consist of 24-inch diameter cast-in-drilled hole pile extensions and the abutments will be cantilever seat type abutments supported on pile foundations.

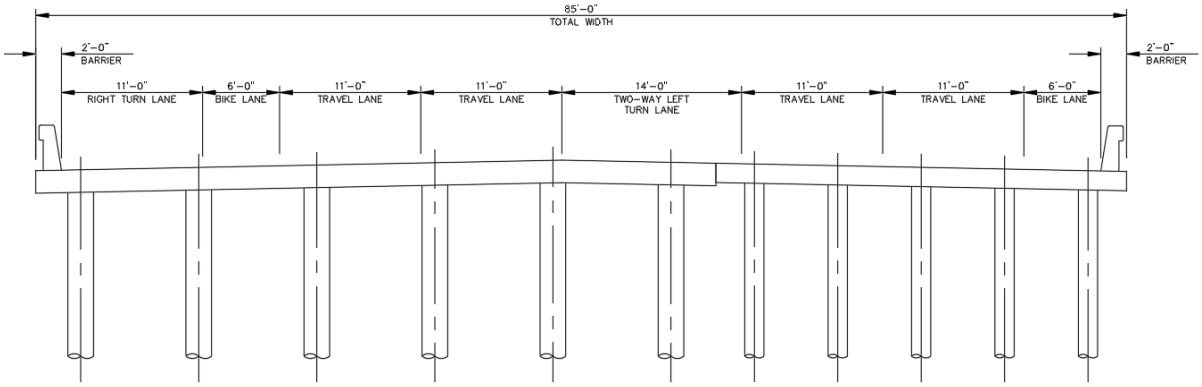


Figure 6: Proposed Riego Road Bridge Widening Typical Section

UPRR/Rail

The existing at-grade crossing will be reconfigured to accommodate the widening of Riego Road, including new traffic control devices and additional concrete panels for the widened portion of Riego Road. Coordination with UPRR and CPUC will be required for new grade crossing approval.

Right-of-Way

The right-of-way impacts are part of the overall Riego Road / Baseline Road widening project and this report will only address any additional right-of-way impacts not included in the widening of the road. With this alternative keeping Riego Road at its existing grade, there are no additional impacts anticipated since access to local roads and adjacent properties can be maintained.

Rough Order of Magnitude Costs

The construction cost for this alternative is estimated at $12.3 million. These costs are preliminary and include minor items, mobilization, and contingency. Right-of-way costs are included in the overall Riego Road / Baseline Road widening project and are not factored into these costs. Temporary Construction Easements have not been included at this stage of the project. The bridge structure is a large factor of construction costs as shown in the following table:

Structural Probable Construction Cost	
Riego Road Bridge (Widen)	$5,290,000
TOTAL STRUCTURES COST	**$5,290,000**
TOTAL CONSTRUCTION COST	**$12,270,000**

Structural costs represent "base costs" and do not include costs for architectural treatment and aesthetic features. 10% for mobilization, 25% contingencies and 2 years at 4% of escalation included. Construction cost includes structures and roadway items.

Alternative 2a: 4-Lane Grade Separation (Interim)

Alternative 2a proposes to widen Riego Road to four lanes and to raise Riego Road over the UPRR tracks. A new local connector road is also proposed coming off Natomas Road on the south side of Riego Road to maintain access to parcels located east of Natomas East Main Drainage Canal. Three new bridge structures will be required – two

along Riego Road and one on the new local connector road.

Geometry

The proposed horizontal alignment of Riego Road is consistent with Alternative 1 (Attachment A). Similarly, Pleasant Grove Road (North) will be converted to a signalized intersection and maintain access to Riego Road. The connection between Natomas Road and Riego Road will be severed with the grade separation. It will extend under one of the Riego Road bridges and continue south. A new local road is proposed to connect to Natomas Road and extend east over the canal on a bridge and end in a cul-de-sac adjacent to the railroad corridor. This cul-de-sac will extend under the three-span bridge in Riego Road and provide access to two parcels, the railroad corridor, and the PG&E overhead line corridor (Figure 7).

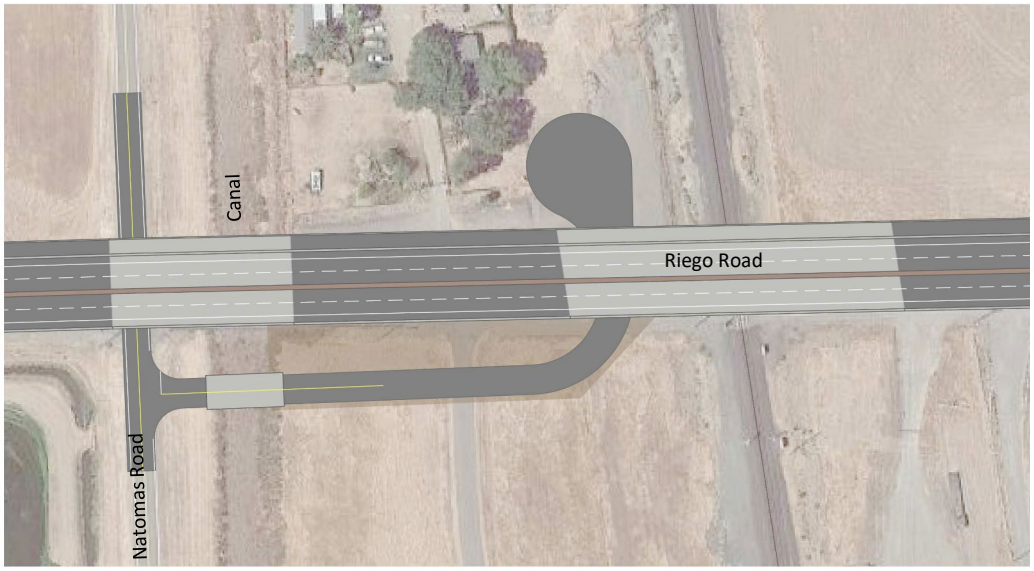


Figure 7: Local Road Connection

For the extent of the grade separation bridges, the Riego Road widening will include four 11-foot lanes, a 4-foot raised center median, 6-foot shoulder/bike lanes and a 12-foot multi-use trail on the north side. Sidewalks are not included in this interim phase.

Profile

As shown below, the profile of Riego Road will be raised approximately 30 feet to accommodate the bridge structure depth and the required vertical clearance over the railroad corridor. Due to the length of the crest vertical curve required for a 65-mph design speed, there is sufficient vertical clearance for Natomas Road to cross under Riego Road. There will be no changes to the elevation of the UPRR tracks or Natomas Road.

It should be noted that with the 65-mph design speed the overhead touchdown affects the Pleasant Grove intersection, which could add additional costs if the grade separation is constructed after the widening project is completed. Although it is not recommended to increase the profile grade greater than 5% (due to ADA requirements and the adjacent walkway), a small reduction in the design speed to 60mph allows the conform to touch down before the intersection.

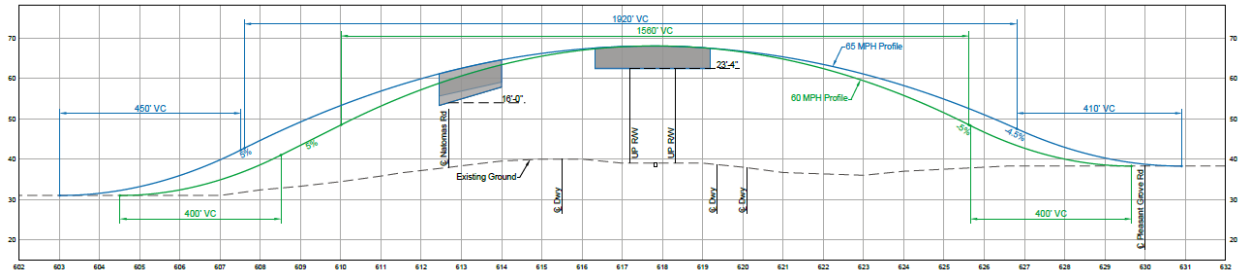


Figure 8: 60 mph and 65 mph Design Speed Profiles (Attachment A)

Bridge Structures

At a 65-mph design speed with a maximum 5% grade, multiple structures and retaining walls are required to clear span both UPRR corridor and the existing drainage canal (Natomas East Main Drainage Canal), as well as provide a new access road for the property owners on the north and south side of Riego Road. The first proposed structure is the Riego Road Bridge which will cross Natomas Road / E Levee Road and the drainage canal. This structure will be a 2-span, precast (PC) prestressed (PS) California Wide Flange girder bridge with span lengths of 70 feet and 85 feet for an overall length of 155 feet. This structure type will utilize 4-foot 6-inch precast girders and a total structure depth of 5 feet 5 inches (including girder, haunch, and deck). The deck width will be 77 feet to incorporate the lane configuration noted above. The substructure will consist of 60-inch diameter circular columns founded 96-inch cast-in-drilled hole piles. Abutments will be tall cantilever seat type abutments supported on pile foundations. Additionally, construction of the proposed structure will require removal of the existing Riego Road Bridge that currently crosses the drainage canal.

The second proposed structure is the Riego Road Overhead which will cross UPRR right-of-way and the proposed access road for the northern and southern properties. In its existing condition, UPRR right-of-way is wider on the south side of Riego Road (150'-0") than the north side (100'-0"). As a result, the proposed structure will clear span the northern right-of-way given that future UPRR tracks will be constrained by this narrower parcel. The resulting structure will be a 3-span, precast (PC) prestressed (PS) California Wide Flange girder bridge with span lengths varying between 86 feet and 114 feet for an overall length of 286 feet. Like the Riego Road Bridge, this structure type will utilize 4-foot 6-inch precast girders and a total structure depth of 5 feet 5 inches (including girder, haunch, and deck). The deck width will also be 77 feet to incorporate the same lane configuration noted. The substructure will consist of 60-inch diameter circular columns founded 96-inch cast-in-drilled hole piles. Abutments will be tall cantilever seat type abutments supported on pile foundations.

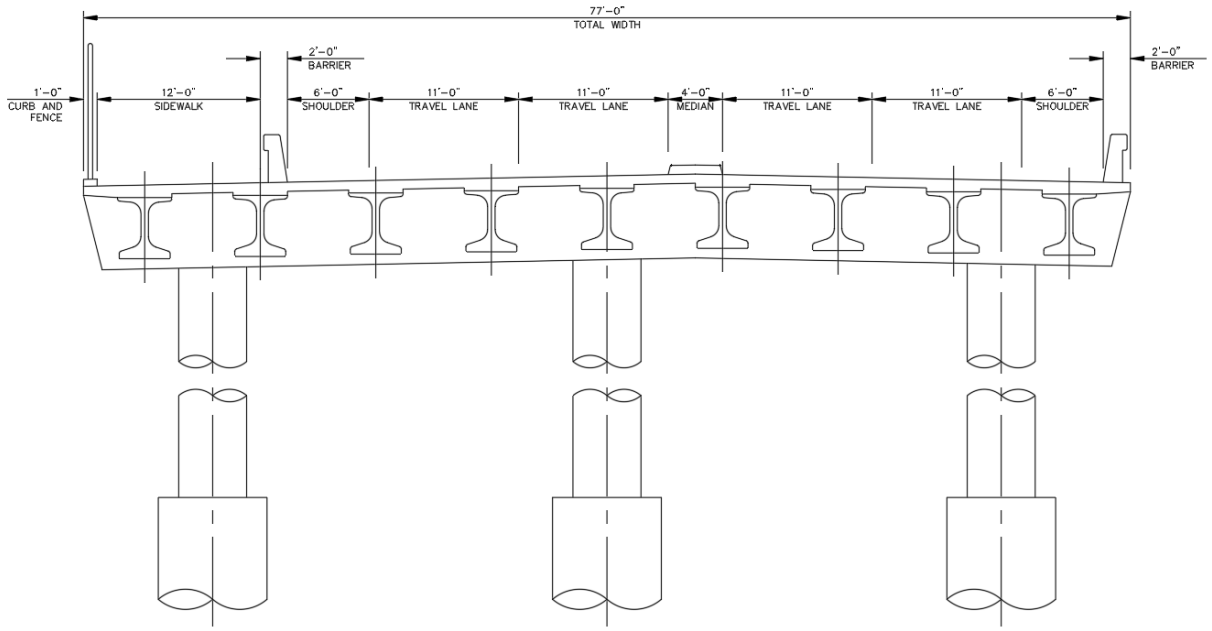


Figure 9: Proposed Riego Road Bridge and Riego Road Overhead Typical Section

As mentioned, a new access road will be required since the driveways for the northern and southern properties will no longer be reachable once Riego Road is raised to provide adequate vertical clearance over UPRR tracks. The proposed access road bridge crossing the drainage canal will be a single span, precast (PC) prestressed (PS) Concrete Slab Girder bridge with a total length of 66 feet. This structure type will utilize 1-foot 9-inch deep concrete slab girders topped with a 6-inch concrete slab. The deck width will be 29 feet to incorporate a 25-foot travel way and two solid concrete barriers. The abutments will be seat type abutments founded on piles due to potential scour issues given its proximity to the drainage canal. A hydraulic analysis will be required to confirm that the bridge does not affect the anticipated canal flows and verify the potential for scour.

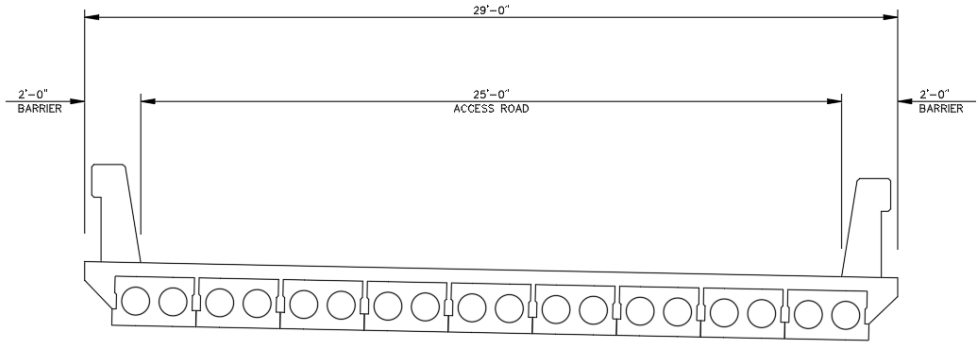


Figure 10: Proposed Access Road Bridge over the Drainage Canal Typical Section

Embankment – Fill versus Mechanically Stabilized Embankment Walls

To minimize the bridge lengths and provide a cost-effective alternative, portions of the elevated roadway could be located on either embankment fill or Mechanically Stabilized Embankment (MSE) Walls. As indicated above, the change in the roadway profile at the UPRR crossing is on the order of 30' to accommodate the required clearance

and the structure depth of the overhead structure. Utilizing an embankment slope of 2 (horizontal) to 1 (vertical) would result in a large footprint, on the order of 65' beyond the limits of the roadway as shown below.

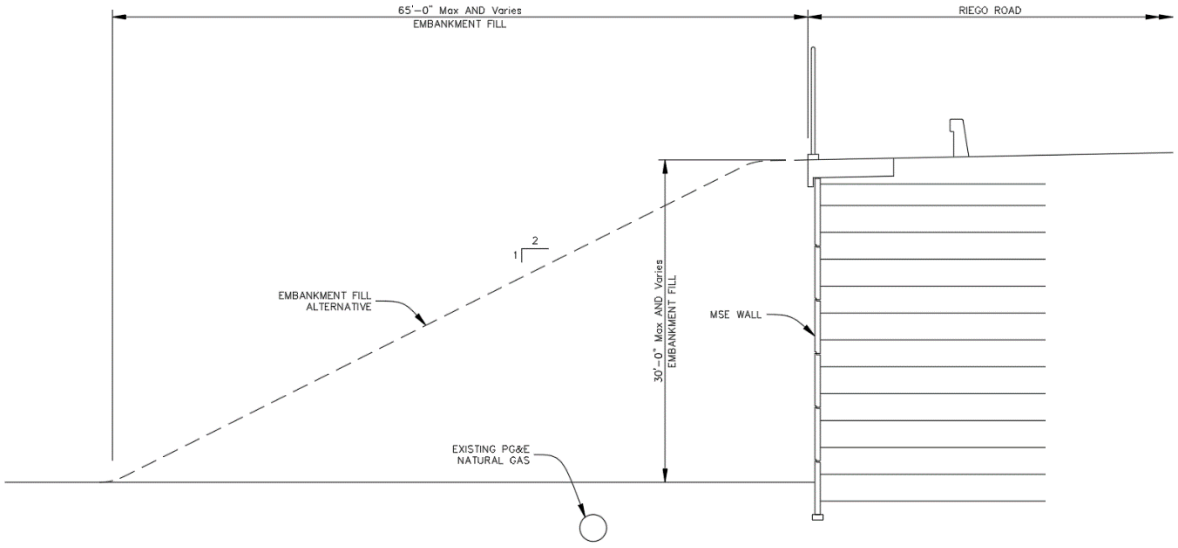


Figure 11: Embankment Fill Alternative versus Mechanically Stabilized Embankment Wall

The increased footprint associated with the embankment fill would impact the right-of-way requirements along the entire elevated roadway section. South of Riego Road the embankment fill would impact farmland to the west of Natomas Road, require relocation of the local access road further south, and impact the private property east of the UPRR corridor. North of Riego Road the embankment fill would have similar right-of-way impacts in addition to placing fill over the recently constructed PG&E natural gas line. The gas line would likely need to be relocated or additional protection would need to be constructed to mitigate the additional load from the embankment fill.

To minimize the project footprint, long approach Mechanically Stabilized Embankment (MSE) walls could be utilized up to and away from each of the proposed bridge structures. Utilizing MSE walls will minimize the right-of-way requirements and eliminate embankment fill over the PG&E natural gas line. Utilizing MSE walls eliminates approximately 60,000 cubic yards of imported earth material for the embankment fill alternative. The construction cost of the MSE wall is approximately equivalent to the construction cost of the embankment fill alternative not accounting for the additional right-of-way cost and relocation or protection of the PG&E natural gas line. When also considering the additional cost for the right-of-way and the cost to relocate or protect the PG&E natural gas line, the recommendation is to utilize MSE walls to support the elevated roadway.

Three back-to-back MSE walls are proposed at the project site: walls to the west that lead up to the proposed Riego Road Bridge (MSE Walls 1 & 2), walls between the proposed Riego Road Bridge and Riego Road Overhead (MSE Walls 3 & 4), and walls to the east that lead away from the Riego Road Overhead (MSE Walls 5 & 6). MSE Walls 1 & 2 are approximately 713 feet long and vary in height from 6 feet to 28 feet. MSE Walls 3 & 4 are approximately 217 feet long and vary in height from 29 feet to 31 feet. MSE Walls 5 & 6 are approximately 925 feet long and vary in height from 31 feet to 6 feet. The walls will transition to Type 60MC barriers once the retained height of the approach embankments is 3 feet or less. Given the maximum MSE wall heights and the proposed roadway widths, overlapping MSE wall straps are not anticipated.

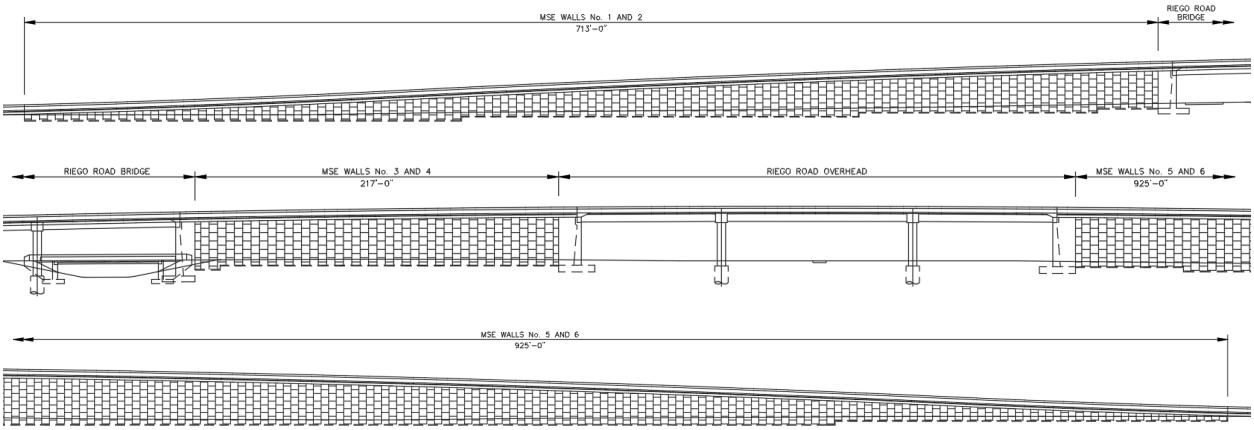


Figure 12: Proposed MSE Wall Elevation

UPRR/Rail

The benefit of this alternative is that the existing UPRR corridor will not be impacted and the existing at-grade crossing will be eliminated. Construction of the new overhead structure will require coordination with and approval by UPRR and CPUC to ensure that all vertical clearance requirements are met. It is anticipated that a construction and maintenance agreement with UPRR will be required.

Right-of-Way

The right-of-way impacts of this alternative extend beyond the impacts of the overall Riego Road / Baseline Road widening project. It is assumed that any full parcel acquisitions will not be required. However, partial acquisitions will be required to maintain access to two parcels along Riego Road and to construct a local access road. Temporary Construction Easements are not included at this stage of the project.

Rough Order of Magnitude Costs

The construction cost for this alternative is estimated at $44.9 million. These costs are preliminary and include minor items, mobilization, and contingency. The structures are the highest factor of construction costs and have been broken down by structure type in the following table:

Structural Probable Construction Cost	
Riego Road Bridge	$9,890,000
Riego Road Overhead	$13,380,000
Residential Access Road	$1,800,000
Mechanically Stabilized Embankments	$8,910,000
TOTAL STRUCTURES COST	**$34,000,000**
TOTAL CONSTRUCTION COST	**$44,900,000**

Structural costs represent "base costs" and do not include costs for architectural treatment and aesthetic features. 10% for mobilization, 25% contingencies and 2 years at 4% of escalation included. Construction cost includes structures and roadway items.

Alternative 2b: 6-Lane Grade Separation (Widen)

Assuming the Alternative 2a 4-lane grade separation has been constructed, Alternative 2b proposes to widen the north side of this grade separation to the ultimate six-lane configuration. It is anticipated that there will be no additional impacts to Natomas Road and the local access road constructed in Alternative 2a.

Geometry

The proposed horizontal alignment of Riego Road is consistent with Alternatives 1 and 2a. Improvements are required at the signalized intersection with Pleasant Grove Road (North) to accommodate the additional two lanes along Riego Road. Natomas Road and the local access road are not impacted by the widening.

For the extent of the grade separation bridges, the Riego Road widening will include six 12-foot lanes, a 4-foot raised center median, 7-foot shoulder/bike lanes and a 12-foot multi-use trail on the north side. Sidewalks are not included in this phase. The profile of Riego Road is consistent with that in Alternative 2a.

Structures

Based on the geometry of the interim condition, it is recommended Riego Road is widened to the north. Widening both sides would result in sliver widenings, providing insufficient room for MSE wall construction (MSE straps would conflict with existing wall) and bridge cross section incorporating only two girders (no girder redundancy). Type 1 walls could be utilized for the approach embankments instead, though the tall Type 1 wall heights (31'-0") are inefficient and costly. Widening at the north provides enough room for MSE wall construction and additional girders creating a redundant bridge cross section for the widening.

The proposed widening for both the Riego Road Bridge and the Riego Road Overhead will add an additional 30 feet of bridge width and will utilize 4-foot 6-inch precast girders and a total structure depth of 5 feet 5 inches (including girder, haunch, and deck). The widened deck width will be 107 feet wide and incorporate the lane configuration noted above. A polyester concrete overlay will be utilized to avoid a grade break within a lane since the crowned point of the widened condition will be at a different location than the interim condition. The substructure will consist of 60-inch diameter circular columns founded 96-inch cast-in-drilled hole piles, and the abutments will be tall cantilever seat type abutments supported on pile foundations, like the interim condition. During construction, the northern overhangs of the existing bridges will be removed to provide space for closure pours.

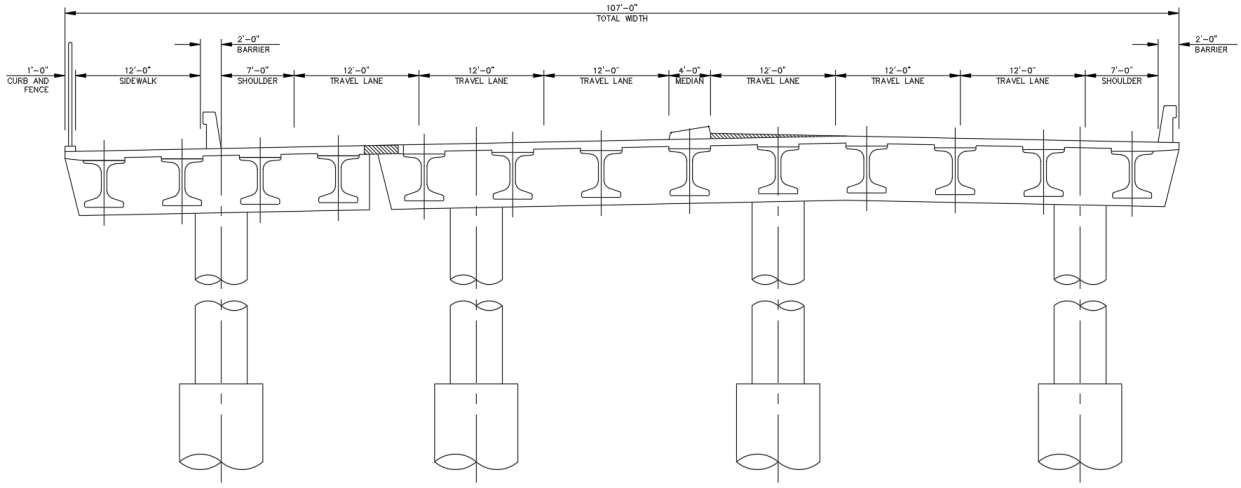


Figure 13: Proposed Riego Road Bridge (Widen) and Riego Road Overhead (Widen) Typical Section

Construction Staging form a 4-lane OH structure to a 6-lane OH Structure

If MSE wall approaches were constructed in the interim condition (Alternative 2a), then the widened embankments could utilize either embankment fill or MSE walls. Similar to Alternative 2a, an embankment fill slope of 2 (horizontal) to 1 (vertical) would result in a large footprint, on the order of 65' beyond the limits of the widened roadway. The increased footprint of the widening and embankment fill would further increase the right-of-way impacts and require removal of a portion of the housing located on the property on the north side of Riego Road. To minimize these right-of-way impacts, three additional MSE walls could be constructed at the ultimate right of way to the North. The width of the proposed widen provides sufficient room for MSE wall construction since MSE strap lengths are limited to 70% of the wall height (strap would vary in length to a maximum of 21'). The proposed walls will be similar in height to the interim conditions. The barrier slabs of the northern interim walls will be removed and replaced with a concrete or HMA overlay.

It should be noted that if approach fill embankments were constructed in the interim condition (Alternative 2a), then the existing fill embankments would have to be shored in order to construct MSE walls for the widened condition, which could be costly given the height of the required shoring. Alternatively, the existing embankment fill could be extended to support the widened roadway but would increase the right-of-way impacts and require removal of a portion of the housing located on the property on the north side of Riego Road.

UPRR/Rail

Similar to Alternative 2a, the existing UPRR corridor will not be impacted and the existing at-grade crossing will be eliminated. Coordination will occur due to the construction of the bridge over the corridor to ensure that all vertical clearance requirements are met.

Right-of-Way

There is no additional right-of-way acquisition needed for Alternative 2b. It is assumed the right-of-way acquisitions required for the six-lane configuration have been acquired as part of the overall Riego Road / Baseline Road widening project. Temporary Construction Easements are not included at this stage of the project.

Rough Order of Magnitude Costs

The construction cost for this alternative is estimated at $22.9 million. These costs are preliminary and include minor items, mobilization, and contingency. There are no additional right-of-way acquisition costs anticipated for this alternative. The structures are the highest factor of construction costs and have been broken down by structure type in the following table:

Structural Probable Construction Cost	
Riego Road Bridge	$5,050,000 (widen cost)
Riego Road Overhead	$6,970,000 (widen cost)
Mechanically Stabilized Embankments	$6,080,000
TOTAL STRUCTURES COST	**$18,100,000**
TOTAL CONSTRUCTION COST	**$22,870,000**

Structural costs represent "base costs" and do not include costs for architectural treatment and aesthetic features. 10% for mobilization, 25% contingencies and 6 years at 4% of escalation included. Construction cost includes structures and roadway items.

Alternative 3: 6-Lane Grade Separation (Ultimate)

Alternative 3 proposes to construct the ultimate project by widening Riego Road from two to six lanes and to raise Riego Road over the UPRR tracks. Similar to Alternative 2a, a new local access road is also proposed coming off Natomas Road on the south side of Riego Road to maintain access to parcels located east of Natomas East Main

Drainage Canal. Three new bridge structures will be required – two along Riego Road and one on the new local access road.

Geometry

The proposed horizontal alignment of Riego Road is consistent with Alternative 1 and 2a. The improvements at Pleasant Grove Road (North), Natomas Road and the new local road are consistent with that in Alternative 2a.

For the extent of the grade separation bridges, the Riego Road widening will include six 12-foot lanes, a 4-foot raised center median, 7-foot shoulder/bike lanes and a 12-foot multi-use trail on the north side similar to Alternative 2b. Sidewalks are not included in this phase.

The profile of Riego Road is consistent with that in Alternative 2a.

Structures

At a 65-mph design speed and a maximum 5% grade, multiple structures and retaining walls are required to clear span both UPRR corridor and the existing drainage canal (Natomas East Main Drainage Canal), as well as provide a new access road for the property owners on the north and south side of Riego Road. The Riego Road structures proposed are similar to Alternative 2a with increased width to accommodate the wider roadway section. The local access road bridge would be identical to the structure discussed in Alternative 2a.

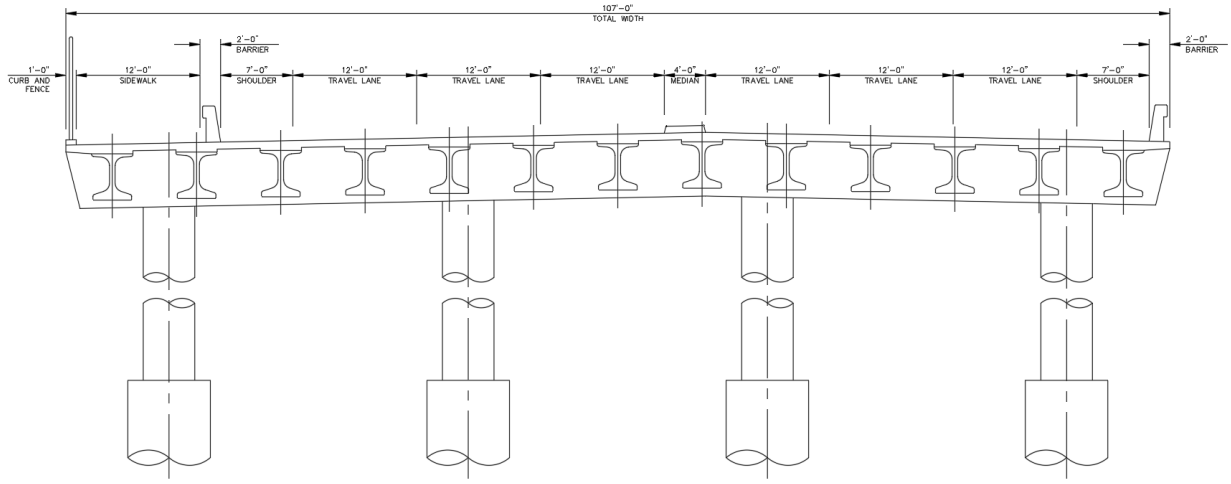


Figure 14: Proposed Riego Road Bridge and Riego Road Overhead Typical Section

Similar to Alternative 2a, to minimize the bridge lengths and provide a cost-effective alternative, long approach Mechanically Stabilized Embankment (MSE) walls will lead up to and away from each of the proposed structures. The lengths and heights of the MSE are equal to those in Alternative 2a.

UPRR/Rail

The benefit of this alternative is that the existing UPRR corridor will not be impacted and the existing at-grade crossing will be eliminated. Construction of the new overhead structure will require coordination with and approval by UPRR and CPUC to ensure that all vertical clearance requirements are met. It is anticipated that a construction and maintenance agreement with UPRR will be required.

Right-of-Way

Similar to Alternative 2a, the right-of-way impacts of this alternative extend beyond the impacts of the overall Riego Road / Baseline Road widening project. It is assumed that any full parcel acquisitions will not be required. However, partial acquisitions will be required to maintain access to two parcels along Riego Road and to construct a local access road. Temporary Construction Easements are not included at this stage of the project.

Rough Order of Magnitude Costs

The construction cost for this alternative is estimated at $59.0 million. These costs are preliminary and include minor items, mobilization, and contingency. The structures are the highest factor of construction costs and have been broken down by structure type in the following table:

Structural Probable Construction Cost	
Riego Road Bridge	$13,830,000
Riego Road Overhead	$18,750,000
Residential Access Road	$1,800,000
Mechanically Stabilized Embankments	$8,910,000
TOTAL STRUCTURES COST	**$43,300,000**
TOTAL CONSTRUCTION COST	**$56,000,000**

Structural costs represent "base costs" and do not include costs for architectural treatment and aesthetic features. 10% for mobilization, 25% contingencies and 2 years at 4% of escalation included. Construction cost includes structures and roadway items.

Comparison Summary

For each alternative, the estimated project cost is outlined below. Alternative 2b is the ultimate condition and assumes that Alternative 2a is constructed first as an interim improvement. Therefore, the costs for Alternative 2b would be added to the costs for Alternative 2a.

Table 3: Alternative Cost Summary

Project Costs	Alternative 1 4-Lane At-Grade Crossing	Alternative 2a 4-Lane Grade Separation (Interim)	Alternative 2b 6-Lane Grade Separation (Widen)	Alternative 3 6-Lane Grade Separation (Ultimate)
Roadway Items	$6,980,000	$10,910,000	$4,770,000	$12,710,000
Structure Items	$5,290,000	$34,000,000	$18,100,000	$43,290,000
Subtotal Construction Items	$12,270,000	$44,900,000	$22,870,000	$56,000,000
Right-of-Way Additional Costs	$0	$400,000	$0	$400,000
Design & Environmental Services (12%)	$1,472,000	$5,390,000	$2,744,000	$6,720,000
Construction Management & Administration (15%)	$1,841,000	$6,735,000	$3,431,000	$8,400,000
TOTAL PROJECT COST	**$15,583,000**	**$57,425,000**	**$29,045,000**	**$71,520,000**
TOTAL PROJECT COST *(WITH 4% ESCALATION OVER 2 YEARS)*	**$16,855,000**	**$62,100,000**	N/A	**$77,500,000**
TOTAL PROJECT COST *(WITH 4% ESCALATION OVER 6 YEARS)*	N/A	N/A	**$36,800,000**	N/A

Bridge Structures Summary

Table 4: Riego Road Bridge Summary

Riego Road Bridge	
Structure Type	2-span precast prestressed California Wide Flange girder bridge with a cast-in-place deck slab
Spans	70'-0", 85'-0"
Structure Depth	5'-5"
Abutments	Cantilever seat type abutments supported on pile foundations
Bents	60" diameter circular columns
Foundations	96" cast-in-drilled hole concrete piling (Type 2 shaft)
Vertical Clearance	17'-8" over Natomas Road/E Levee Road
Temporary Vertical Clearance	17'-8" over Natomas Road/E Levee Road
Barriers	Concrete Barrier Type 842
Slope Paving	Not required
Approaches	Structure Approach Type N (30)
Environmental Area	Non-Freeze-Thaw Area
Deck Drains	Deck Drains Type D-2 (anticipated; will verify deck drains during design)
Temperature Range	Moderate: 10°F to 80°F (ΔT = 70°F) (35°F Temp. Fall, 35°F Temp. Rise)
Joint Types	Joint Seal Type B, MR = 1" at Abutment 1 Joint Seal Type B, MR = 1" at Abutment 3
Utilities	N/A
Future Widening (Alternative 2b)	30'-0" widening on the north side with similar superstructure and substructure type

Table 5: Riego Road Overhead Summary

Riego Road Overhead	
Structure Type	2-span precast prestressed California Wide Flange girder bridge with a cast-in-place deck slab
Spans	86'-0", 114'-0", 86'-0"
Structure Depth	5'-5"
Abutments	Cantilever seat type abutments supported on pile foundations
Bents	60" diameter circular columns
Foundations	96" cast-in-drilled hole concrete piling (Type 2 shaft)
Vertical Clearance	23'-4" over UPRR right-of-way
Temporary Vertical Clearance	23'-4" over UPRR right-of-way
Barriers	Concrete Barrier Type 842
Slope Paving	Not required
Approaches	Structure Approach Type N (30)
Environmental Area	Non-Freeze-Thaw Area
Deck Drains	Deck Drains Type D-2 (anticipated; will verify deck drains during design)
Temperature Range	Moderate: 10°F to 80°F (ΔT = 70°F) (35°F Temp. Fall, 35°F Temp. Rise)
Joint Types	Joint Seal Type B, MR = 1½" at Abutment 1 Joint Seal Type B, MR = 1½" at Abutment 4
Utilities	N/A
Future Widening (Alternative 2b)	30'-0" widening on the north side with similar superstructure and substructure type

Table 6: Residential Access Road Bridge Summary

Residential Access Road	
Structure Type	1-span precast prestressed concrete slab girder bridge with a 6" cast-in-place topping slab
Spans	66'-0"
Structure Depth	2'-3"
Abutments	Cantilever seat type abutments supported on pile foundations
Bents	N/A
Foundations	N/A
Vertical Clearance	N/A
Temporary Vertical Clearance	N/A
Barriers	Concrete Barrier Type 842
Slope Paving	Not required (rock slope protection may be required pending hydraulic investigation during the design phase)
Approaches	Not required
Environmental Area	Non-Freeze-Thaw Area
Deck Drains	Not required
Temperature Range	Moderate: 10°F to 80°F (ΔT = 70°F) (35°F Temp. Fall, 35°F Temp. Rise)
Joint Types	Joint Seal Type B, MR = 1½" at Abutment 1 Joint Seal Type B, MR = 1½" at Abutment 4
Utilities	N/A
Future Widening	N/A

PROJECT FUNDING OPPORTUNITIES

A separate Funding Strategy for the overall Riego Road / Baseline Road widening is being prepared for the project that includes the grade separation. The funding strategy will provide an analysis of project costs and potential funding sources, and a strategy on which funding / financing sources the County and the Placer County Transportation Planning Agency (PCTPA) should pursue. This will include information on project background, description, estimate, funding, cashflow, scheduling and other relevant project data. This document will be intended to provide guidance to staff, decision makers and interested stakeholders on the potential funding sources, how the project will compete, the likelihood in obtaining the funds, financing, and the best strategy to fully fund the project.

For the grade separation, it is anticipated that the County and sponsoring agencies for the widening (PCTPA, County of Placer, and City of Roseville) will pursue funding from the Railroad Highway Grade Crossing Program (RHGCP).

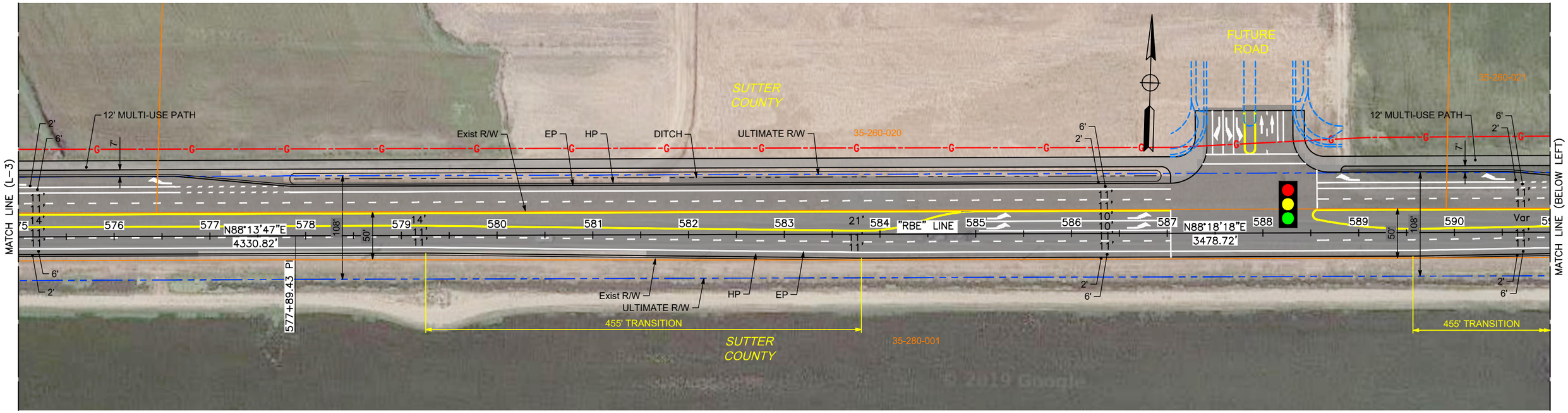
Recommendations:

1. The County submit an application for funding (GSN-1 form) to the Public Utilities Commission to nominate the project for Separation of Existing At-Grade Crossing. The project will then be placed on a list for funding when the final design (PS&E) is complete. The call for projects occurs every two years, with the next call for projects in July 2021 and due in October 2021. Since the application cannot be submitted until the railroad agreement is fully executed, the next opportunity to submit the project will be in 2023.
2. The County should submit an Initiation Letter to UPRR as soon as possible in order to open up a project with UPRR to discuss the at grade crossing.

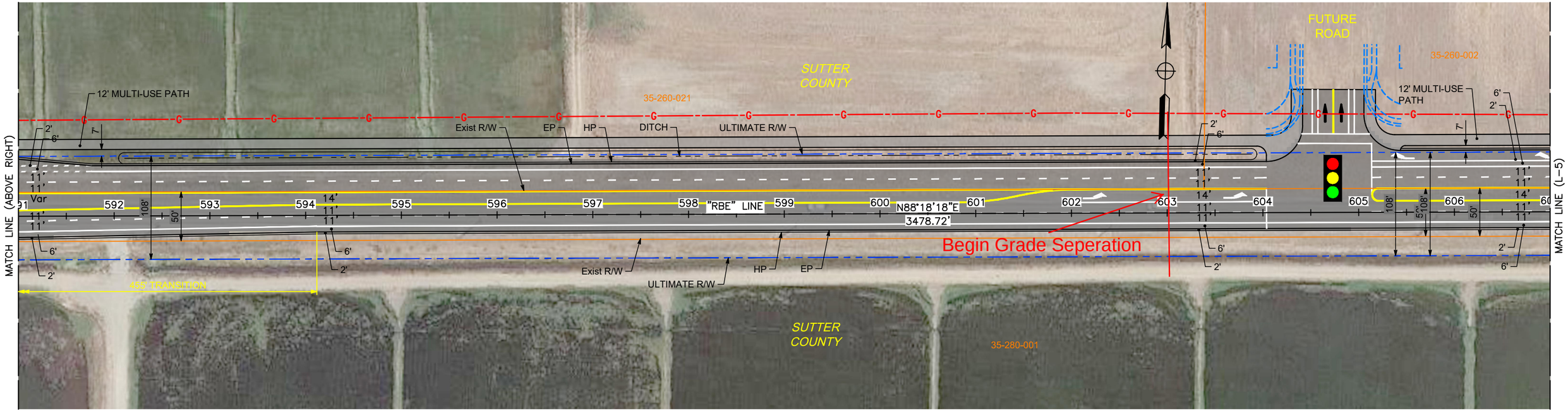
Section 190 Grade Separation Funds - The state of California Section 190 Grade Separation Program is a state funding program to grade separate crossings between roadways and railroad tracks. The program typically provides approximately $15 million distributed among 3 or 4 projects each fiscal year. Grade-separated crossings can replace existing at-grade crossings thereby eliminating potential conflict between trains and highway users. The California Public Utilities Commission (CPUC or Commission) has jurisdiction over the safety of highway-rail crossings in California. The Section 190 Grade Separation Program helps local agencies finance the high costs of grade separating highway-rail crossings, thereby improving public safety and convenience throughout California. In 2018, the CPUC awarded all $15M to three grade separation projects along the Alameda freight corridor in the Los Angeles / Long Beach area.

ATTACHMENTS

Attachment A. Plan & Profile



RIEGO ROAD



RIEGO ROAD

Placer County Transportation Planning Agency

Dewberry | drakehaglan

RIEGO ROAD / BASELINE ROAD WIDENING

INTERIM IMPROVEMENTS (4 LANE)

JUNE 2020 SCALE: 1"=50'

LAYOUT ALTERNATIVE 2

4 OF 21

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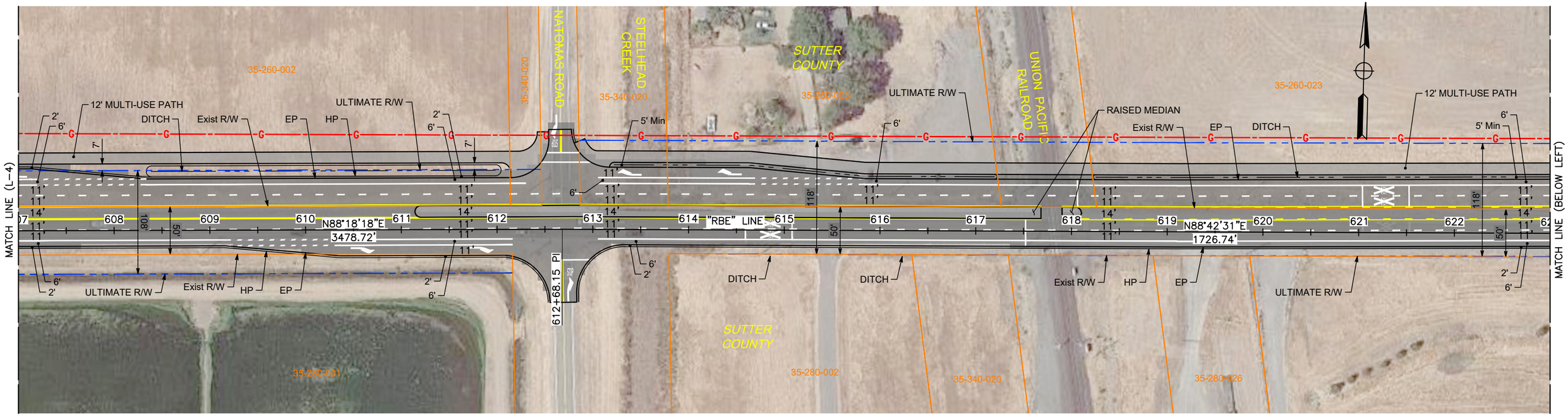
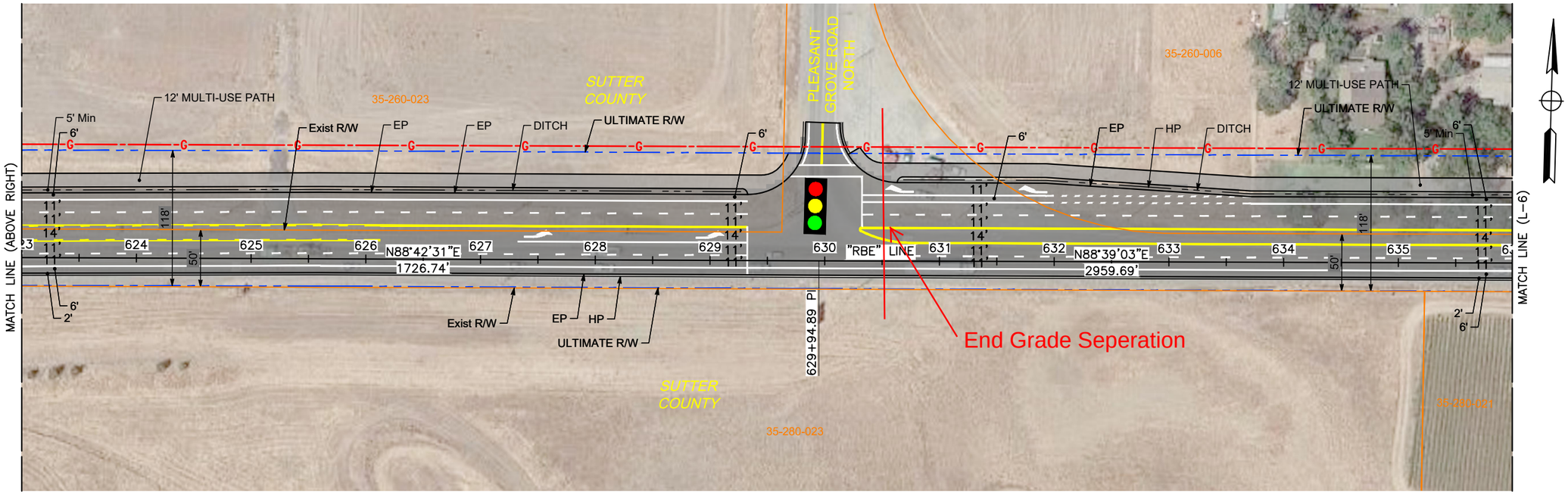


RIEGO ROAD



RIEGO ROAD

RIGHT OF WAY TAKE

Placer County Transportation Planning Agency

Dewberry | drakehaglan

RIEGO ROAD / BASELINE ROAD WIDENING

INTERIM IMPROVEMENTS (4 LANE)

JUNE 2020 SCALE: 1"=50'

LAYOUT ALTERNATIVE 2

5 OF 21

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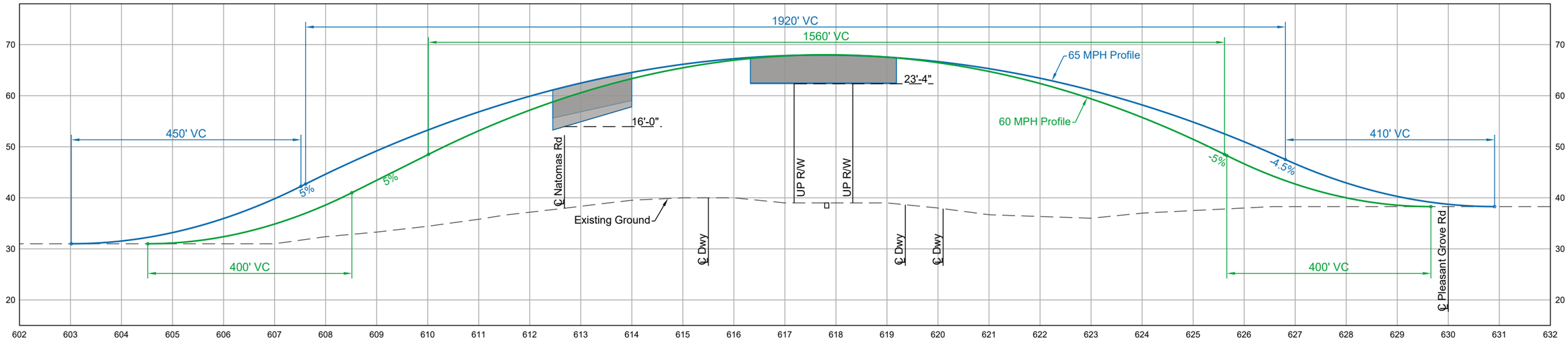
1920' VC
1560' VC
65 MPH Profile
60 MPH Profile
23'-4"
16'-0"
450' VC
410' VC
400' VC
400' VC
5%
5%
-5%
-4.5%
℄ Natomas Rd
UP R/W
UP R/W
℄ Dwy
℄ Dwy
℄ Dwy
Existing Ground
℄ Pleasant Grove Rd
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Attachment B. Estimates

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane
At-Grade Crossing Improvements
(Concept Alternative 1)

PROJECT DESCRIPTION

Limits Riego Road from Station 603 to Station 631

Proposed Improvement (Scope) Widen road to four lanes and upgrade at-grade crossing. Work includes street improvements, new at-grade crossing safety and signaling equipment, widening of existing bridge over channel, and two traffic signals.

Alternative Four-Lane At-Grade Crossing Improvements and Road Widening

ROADWAY ITEMS		**$**	**6,980,000**
STRUCTURE ITEMS		**$**	**5,290,000**
SUBTOTAL CONSTRUCTION COSTS		**$**	**12,270,000**
RIGHT OF WAY		**$**	**-**
SUBTOTAL CONSTRUCTION & RIGHT OF WAY COSTS		**$**	**12,270,000**
AGENCY MANAGEMENT & ADMINISTRATION	***0%***	**$**	**-**
DESIGN & ENVIRONMENTAL SERVICES	***12%***	**$**	**1,472,000**
CONST MANAGEMENT & ADMINISTRATION	***15%***	**$**	**1,841,000**
TOTAL PROJECT COST		**$**	**15,583,000**
TOTAL PROJECT COST (WITH 4% ESCALATION OVER 2 YEARS)		**$**	**16,855,000**

Approved by: _____ Date _____

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane
At-Grade Crossing Improvements
(Concept Alternative 1)

I. ROADWAY ITEMS

Section I - Earthwork	Quantity	Unit		Unit Price		Cost	Section Cost	
Clearing and Grubbing (Removals)	1	LS	$	500,000	$	500,000		
Remove Roadway Pavement (Removals)	84,000	SF	$	3	$	252,000		2800'x30'
Remove PCC Sidewalk (Removals)	-	SF	$	10	$	-		
Unclassified Excavation	-	CY	$	25	$	-		
Unclassified Fill	-	CY	$	20	$	-		
					Total Earthwork		**$**	**752,000**

Section 2 - Structural Section	Quantity	Unit		Unit Price		Cost	Section Cost	
Crushed Aggregate Base	12,800	CY	$	50	$	640,000		
AC Pavement	10,200	TON	$	100	$	1,020,000		
PCC Curb and Gutter	5,200	LF	$	25	$	130,000		
Raised Median Pavement	19,600	SF	$	15	$	294,000		
Concrete Barrier	2,600	LF	$	100	$	260,000		
Chain Link Fence	-	LF	$	30	$	-		
	-		$	-	$	-		
	-		$	-	$	-		
	-		$	-	$	-		
	-		$	-	$	-		
					Total Structural Section		**$**	**2,344,000**

Section 3 - Railroad Related Items	Quantity	Unit		Unit Price		Cost	Section Cost	
Railroad Flagger	1	LS	$	50,000	$	50,000		
Signal Materials and Installation	1	LS	$	650,000	$	650,000		
Inspection	1	LS	$	150,000	$	150,000		
	-	LS	$	-	$	-		
					Total Railroad Items		**$**	**850,000**

Section 4 - Drainage/Utilities	Quantity	Unit		Unit Price		Cost	Section Cost	
OH Transmission	-	LS	$	1,000,000	$	-		
	-	LF	$	-	$	-		
	-	EA	$	-	$	-		
	-	LS	$	-	$	-		

Note: It is assumed that gas, telephone, and OH distribution utilities are in franchise and no project costs are included.

Total Drainage/Utilities	**$**	**-**	

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane
At-Grade Crossing Improvements
(Concept Alternative 1)

Section 5 - Specialty Items	Quantity	Unit		Unit Price		Cost	Section Cost
Landscaping & Irrigation - new	-	SF	$	10	$	-	
Landscaping & Irrigation - replacement	-	LS	$	20,000	$	-	
Trees	-	EA	$	500	$	-	
SWPPP & Implementation	1	LS	$	150,000	$	150,000	
	-	LS	$	100,000	$	-	
					Total Specialty Items	**$**	**150,000**

Section 6 - Traffic & Lighting Items	Quantity	Unit		Unit Price		Cost	Section Cost
New Traffic Signal -	-	LS	$	350,000	$	-	
Temp Lighting	-	LS	$	125,000	$	-	
Permanent Street Lighting	-	LS	$	240,000	$	-	
Signing & Striping	1	LS	$	30,000	$	30,000	
Traffic Control	1	LS	$	250,000	$	250,000	
					Total Traffic & Lighting Items	**$**	**280,000**

					SUBTOTAL SECTIONS 1 - 6	**$**	**4,376,000**

Section 7 - Minor Items							
10% of Subtotal Sections 1 - 6						Cost	Section Cost
	$ 4,376,000	X		10%	$	437,600	
					Total Minor Items	**$**	**437,600**

Section 8 - Roadway Mobilization							
Subtotal Sections 1-5	$ 4,376,000						
Minor Items	$ 437,600						
Sum	$ 4,813,600	X		10%	$	481,360	
					Total Mobilization	**$**	**481,360**

Section 9 - Roadway Additions							
Supplemental							
Subtotal Sections 1-5	$ 4,376,000						
Minor Items	$ 437,600						
Sum	$ 4,813,600	X		5%	$	240,680	
Contingencies							
Subtotal Sections 1-5	$ 4,376,000						
Minor Items	$ 437,600						
Sum	$ 4,813,600	X		30%	$	1,444,080	
					Total Roadway Additions	**$**	**1,684,760**

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane
At-Grade Crossing Improvements
(Concept Alternative 1)

TOTAL ROADWAY ITEMS , SECTIONS 1 - 9 **$ 6,979,720**

II. STRUCTURE ITEMS	Quantity	Unit		Unit Price		Cost	Section Cost
Bridge - Riego Road Bridge	1	EA	$	5,290,000	$	5,290,000	
Bridge - Riego Road Overhead	-	EA	$	-	$	-	
Bridge - Residential Access Road Bridge	-	EA	$	-	$	-	
Walls - MSE	-	EA	$	-	$	-	

Note: Assumes 10% for mobilization, 25% contingencies, and 2 years at 4% escalation.

Subtotal Structures Items **$ 5,290,000**

Mobilization

Subtotal Structural Sections					
Sum	$ 5,290,000	X	0%	$	-

Total Mobilization **$ -**

Contingencies

Subtotal Structural Sections					
Sum	$ 5,290,000	X	0%	$	-

Total Contingency **$ -**

Total Structures Items **$ 5,290,000**

III. RIGHT OF WAY

	Quantity	Unit		Unit Price		Cost	Section Cost
Fee Acquisition - Land, Full	N/A	SF	N/A		$		
Fee Acquisition - Land, Partial	0	SF	$	25	$	-	
Aerial Easement		SF	$	25	$	-	
Temporary Construction Easements		SF		2.50	$	-	

Total R/W **$ -**

Note: R/W acquisition costs include estimated values for land, improvements, damages, and escrow fees.

Contingencies

Subtotal R/W Sections					
Sum	$ -	X	30%	$	-

Total Contingency **$ -**

Total R/W Items **$ -**

	GENERAL PLAN ESTIMATE		X	ADVANCED PLANNING ESTIMATE
BRIDGE NAME	SUMMARY SHEET		**DISTRICT**	03
BRIDGE NUMBER			**CO**	SUT
STRUCTURE TYPE			**RTE**	CR
EA			**PM**	
			DEPTH	
PRICES BY	A. Prince		**LENGTH**	
PRICES CHECKED BY	B. Hansen		**WIDTH**	
QUANTITIES BY	A. Prince		**AREA**	
DATE	05/31/2020		**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	700	CY	$160.00	$112,000
2	STRUCTURE BACKFILL (BRIDGE)	700	CY	$160.00	$112,000
3	24″ CAST-IN-DRILLED-HOLE CONCRETE PILING	2,960	LF	$400.00	$1,184,000
4	PRESTRESSING CAST-IN-PLACE CONCRETE	1	LS	$70,000.00	$70,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	200	CY	$650.00	$130,000
6	STRUCTURAL CONCRETE, BRIDGE	300	CY	$1,650.00	$495,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	600	CY	$1,100.00	$660,000
8	JOINT SEAL (MR 1 1/2″)	170	LF	$100.00	$17,000
9	BAR REINFORCING STEEL (BRIDGE)	500,000	LB	$1.35	$675,000
10	MISCELLANEOUS METAL (BRIDGE)	200	LB	$15.00	$3,000
11	CONCRETE BARRIER (TYPE 842)	420	LF	$150.00	$63,000
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30					

SUBTOTAL	$3,521,000
MOBILIZATION	$391,222
SUBTOTAL	$3,912,222
CONTINGENCIES (25%)	$978,056
SUBTOTAL	$4,890,278
ESCALATION	$399,047
TOTAL	$5,289,324
TOTAL COST FOR BUDGETING	**$5,290,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane Grade Separation (Interim)
(Concept Alternative 2a)

PROJECT DESCRIPTION

Limits Riego Road from Station 603 to Station 631

Proposed Improvement (Scope) Construction of a grade separation to raise Riego Road over the UPRR tracks and close the at-grade crossing. Work includes street improvements, roadway bridge over the tracks, roadway bridge over Natomas Road and the channel, local road bridge over the channel, retaining walls, and OH utilities.

Alternative Overpass of Riego Road

ROADWAY ITEMS		**$**	**10,910,000**
STRUCTURE ITEMS		**$**	**33,980,000**
SUBTOTAL CONSTRUCTION COSTS		**$**	**44,890,000**
RIGHT OF WAY		**$**	**400,000**
SUBTOTAL CONSTRUCTION & RIGHT OF WAY COSTS		**$**	**45,290,000**
AGENCY MANAGEMENT & ADMINISTRATION	***0%***	**$**	**-**
DESIGN & ENVIRONMENTAL SERVICES	***12%***	**$**	**5,387,000**
CONST MANAGEMENT & ADMINISTRATION	***15%***	**$**	**6,734,000**
TOTAL PROJECT COST		**$**	**57,411,000**
TOTAL PROJECT COST (WITH 4% ESCALATION OVER 2 YEARS)		**$**	**62,096,000**

Approved by: _____ Date _____

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane Grade Separation (Interim)
(Concept Alternative 2a)

I. ROADWAY ITEMS

Section I - Earthwork	Quantity	Unit		Unit Price		Cost	Section Cost
Clearing and Grubbing (Removals)	1	LS	$	500,000	$	500,000	
Remove Roadway Pavement (Removals)	84,000	SF	$	3	$	252,000	
Unclassified Excavation	1,000	CY	$	25	$	25,000	
Unclassified Fill	78,800	CY	$	20	$	1,576,000	
					Total Earthwork		**$ 2,353,000**

Section 2 - Structural Section	Quantity	Unit		Unit Price		Cost	Section Cost
Crushed Aggregate Base	10,700	CY	$	50	$	535,000	
AC Pavement	8,700	TON	$	100	$	870,000	
PCC Curb and Gutter	4,718	LF	$	25	$	117,950	
Raised Median Pavement	10,800	SF	$	15	$	162,000	
Concrete Barrier	1,850	LF	$	100	$	185,000	
Chain Link Fence	1,000	LF	$	30	$	30,000	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
					Total Structural Section		**$ 1,899,950**

Section 3 - Railroad Related Items	Quantity	Unit		Unit Price		Cost	Section Cost
Railroad Flagger	1	LS	$	400,000	$	400,000	
Trackwork and Panel Removal	1	LS	$	250,000	$	250,000	
Signal Work	1	LS	$	200,000	$	200,000	
Inspection	1	LS	$	50,000	$	50,000	
					Total Railroad Items		**$ 900,000**

Section 4 - Drainage/Utilities	Quantity	Unit		Unit Price		Cost	Section Cost
OH Transmission	1	LS	$	1,000,000	$	1,000,000	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	

Note: It is assumed that gas, telephone, and OH distribution utilities are in franchise and no project costs are included.

Total Drainage/Utilities **$ 1,000,000**

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane Grade Separation (Interim)
(Concept Alternative 2a)

Section 5 - Specialty Items	Quantity	Unit		Unit Price		Cost	Section Cost
Landscaping & Irrigation - new	-	SF	$	10	$	-	
Landscaping & Irrigation - replacement	-	LS	$	20,000	$	-	
Trees	-	EA	$	500	$	-	
Prepare SWPPP	1	LS	$	10,000	$	10,000	
Implement SWPPP	1	LS	$	400,000	$	400,000	
					Total Specialty Items		**$ 410,000**

Section 6 - Traffic & Lighting Items	Quantity	Unit		Unit Price		Cost	Section Cost
New Traffic Signal -	-	LS	$	350,000	$	-	
Temp Lighting	-	LS	$	125,000	$	-	
Permanent Street Lighting	-	LS	$	240,000	$	-	
Signing & Striping	1	LS	$	30,000	$	30,000	
Traffic Control	1	LS	$	250,000	$	250,000	
					Total Traffic & Lighting Items		**$ 280,000**

				SUBTOTAL SECTIONS 1 - 6		**$ 6,842,950**

Section 7 - Minor Items						
10% of Subtotal Sections 1 - 6					Cost	Section Cost
	$ 6,842,950	X		10%	$ 684,295	
				Total Minor Items		**$ 684,295**

Section 8 - Roadway Mobilization						
Subtotal Sections 1-5	$ 6,842,950					
Minor Items	$ 684,295					
Sum	$ 7,527,245	X		10%	$ 752,725	
				Total Mobilization		**$ 752,725**

Section 9 - Roadway Additions						
Supplemental						
Subtotal Sections 1-5	$ 6,842,950					
Minor Items	$ 684,295					
Sum	$ 7,527,245	X		5%	$ 376,362	
Contingencies						
Subtotal Sections 1-5	$ 6,842,950					
Minor Items	$ 684,295					
Sum	$ 7,527,245	X		30%	$ 2,258,174	
				Total Roadway Additions		**$ 2,634,536**

Preliminary Project Cost Estimate Summary
Riego Road 4-Lane Grade Separation (Interim)
(Concept Alternative 2a)

TOTAL ROADWAY ITEMS , SECTIONS 1 - 9 **$ 10,914,505**

II. STRUCTURE ITEMS	Quantity	Unit		Unit Price		Cost	Section Cost
Bridge - Riego Road Bridge	1	LS	$	9,890,000	$	9,890,000	
Bridge - Riego Road Overhead	1	LS	$	13,380,000	$	13,380,000	
Bridge - Residential Access Road Bridge	1	LS	$	1,800,000	$	1,800,000	
Walls - MSE	1	LS	$	8,910,000	$	8,910,000	
	-				$	-	

Note: Assumes 10% for mobilization, 25% contingencies, and 2 years at 4% escalation.

Subtotal Structures Items **$ 33,980,000**

Mobilization

Subtotal Structural Sections					
Sum	$ 33,980,000	X	0%	$ -	

Total Mobilization **$ -**

Contingencies

Subtotal Structural Sections					
Sum	$ 33,980,000	X	0%	$ -	

Total Contingency **$ -**

Total Structures Items **$ 33,980,000**

III. RIGHT OF WAY

	Quantity	Unit		Unit Price		Cost	Section Cost
Fee Acquisition - Land, Full	N/A	SF	N/A		$		
Fee Acquisition - Land, Partial	12,300	SF	$	25	$	307,500	
Aerial Easement		SF	$	25	$	-	
Temporary Construction Easements		SF		2.50	$	-	

Total R/W **$ 307,500**

Note: R/W acquisition costs include estimated values for land, improvements, damages, and escrow fees.

Contingencies

Subtotal R/W Sections					
Sum	$ 307,500	X	30%	$ 92,250	

Total Contingency **$ 92,250**

Total R/W Items **$ 399,750**

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Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Riego Road Bridge	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder	**RTE**	CR
EA		**PM**	
		DEPTH	5′-4″
PRICES BY	A. Prince	**LENGTH**	155′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	77′-0″
QUANTITIES BY	A. Prince	**AREA**	11,935-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	1,300	CY	$120.00	$156,000
2	STRUCTURE BACKFILL (BRIDGE)	2,200	CY	$150.00	$330,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	3,140	LF	$260.00	$816,400
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	300	LF	$2,400.00	$720,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	500	CY	$650.00	$325,000
6	STRUCTURAL CONCRETE, BRIDGE	1,000	CY	$1,450.00	$1,450,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	400	CY	$1,000.00	$400,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	300	CY	$850.00	$255,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	18	EA	$5,000.00	$90,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (60′-70′)	9	EA	$30,000.00	$270,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	9	EA	$40,000.00	$360,000
12	JOINT SEAL (MR 1 1/2″)	160	LF	$100.00	$16,000
13	BAR REINFORCING STEEL (BRIDGE)	850,000	LB	$1.15	$977,500
14	BRIDGE REMOVAL	1	LS	$190,000.00	$190,000
15	MINOR CONCRETE (MEDIAN)	30	CY	$1,000.00	$30,000
16	MISCELLANEOUS METAL (BRIDGE)	400	LB	$15.00	$6,000
17	BRIDGE DECK DRAINAGE SYSTEM	10,000	LB	$10.00	$100,000
18	PEDESTRIAN RAILING	220	LF	$120.00	$26,400
19	CONCRETE BARRIER (TYPE 842)	430	LF	$150.00	$64,500
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SUBTOTAL	$6,582,800
MOBILIZATION	$731,422
SUBTOTAL	$7,314,222
CONTINGENCIES (25%)	$1,828,556
SUBTOTAL	$9,142,778
ESCALATION	$746,051
TOTAL	$9,888,828
TOTAL COST FOR BUDGETING	**$9,890,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

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Project No. 50128054

	GENERAL PLAN ESTIMATE		X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Riego Road Overhead	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder	**RTE**	CR
EA		**PM**	
		DEPTH	5′-4″
PRICES BY	A. Prince	**LENGTH**	286′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	77′-0″
QUANTITIES BY	A. Prince	**AREA**	22,022-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	1,300	CY	$120.00	$156,000
2	STRUCTURE BACKFILL (BRIDGE)	2,500	CY	$150.00	$375,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	3,140	LF	$260.00	$816,400
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	600	LF	$2,400.00	$1,440,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	700	CY	$650.00	$455,000
6	STRUCTURAL CONCRETE, BRIDGE	1,100	CY	$1,450.00	$1,595,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	700	CY	$1,000.00	$700,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	300	CY	$850.00	$255,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	27	EA	$5,000.00	$135,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	18	EA	$40,000.00	$720,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (110′-120′)	9	EA	$55,000.00	$495,000
12	JOINT SEAL (MR 1 1/2″)	160	LF	$100.00	$16,000
13	BAR REINFORCING STEEL (BRIDGE)	1,190,000	LB	$1.15	$1,368,500
14	MINOR CONCRETE (MEDIAN)	40	CY	$1,000.00	$40,000
15	MISCELLANEOUS METAL (BRIDGE)	600	LB	$15.00	$9,000
16	BRIDGE DECK DRAINAGE SYSTEM	18,000	LB	$10.00	$180,000
17	PEDESTRIAN RAILING	350	LF	$120.00	$42,000
18	CONCRETE BARRIER (TYPE 842)	700	LF	$150.00	$105,000
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SUBTOTAL	$8,902,900
MOBILIZATION	$989,211
SUBTOTAL	$9,892,111
CONTINGENCIES (25%)	$2,473,028
SUBTOTAL	$12,365,139
ESCALATION	$1,008,995
TOTAL	$13,374,134
TOTAL COST FOR BUDGETING	**$13,380,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

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Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Residential Bridge	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	PC PS Slab Span	**RTE**	CR
EA		**PM**	
		DEPTH	2′-0″
PRICES BY	A. Prince	**LENGTH**	66′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	29′-0″
QUANTITIES BY	A. Prince	**AREA**	1,914-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	400	CY	$120.00	$48,000
2	STRUCTURE BACKFILL (BRIDGE)	400	CY	$150.00	$60,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	830	LF	$260.00	$215,800
4	STRUCTURAL CONCRETE, BRIDGE FOOTING	100	CY	$650.00	$65,000
5	STRUCTURAL CONCRETE, BRIDGE	200	CY	$1,450.00	$290,000
6	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	100	CY	$1,000.00	$100,000
7	ERECT PRECAST PRESTRESSED CONCRETE DECK UNIT	7	EA	$5,000.00	$35,000
8	FURNISH PRECAST PRESTRESSED CONCRETE DECK UNIT (60′-70′)	2,000	SQFT	$60.00	$120,000
9	JOINT SEAL (MR 1″)	60	LF	$100.00	$6,000
10	BAR REINFORCING STEEL (BRIDGE)	130,000	LB	$1.15	$149,500
11	CONCRETE BARRIER (TYPE 842)	700	LF	$150.00	$105,000
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SUBTOTAL	$1,194,300
MOBILIZATION	$132,700
SUBTOTAL	$1,327,000
CONTINGENCIES (25%)	$331,750
SUBTOTAL	$1,658,750
ESCALATION	$135,354
TOTAL	$1,794,104
TOTAL COST FOR BUDGETING	**$1,800,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

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Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Retaining Walls	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	MSE Wall	**RTE**	CR
EA		**PM**	
		DEPTH	Varies
PRICES BY	A. Prince	**LENGTH**	1,855′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	N/A
QUANTITIES BY	A. Prince	**AREA**	71,444-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	MECHANICALLY STABILIZED EMBANKMENT, LOCATION A	11,100	SQFT	$50.00	$555,000
2	MECHANICALLY STABILIZED EMBANKMENT, LOCATION B	11,100	SQFT	$50.00	$555,000
3	MECHANICALLY STABILIZED EMBANKMENT, LOCATION C	6,000	SQFT	$50.00	$300,000
4	MECHANICALLY STABILIZED EMBANKMENT, LOCATION D	6,000	SQFT	$50.00	$300,000
5	MECHANICALLY STABILIZED EMBANKMENT, LOCATION E	18,800	SQFT	$50.00	$940,000
6	MECHANICALLY STABILIZED EMBANKMENT, LOCATION F	18,800	SQFT	$50.00	$940,000
7	STRUCTURAL CONCRETE, BARRIER SLAB	2,000	CY	$800.00	$1,600,000
8	PEDESTRIAN RAILING	1,750	LF	$120.00	$210,000
9	CONCRETE BARRIER (TYPE 842)	3,500	LF	$150.00	$525,000
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SUBTOTAL	$5,925,000
MOBILIZATION	$658,333
SUBTOTAL	$6,583,333
CONTINGENCIES (25%)	$1,645,833
SUBTOTAL	$8,229,167
ESCALATION	$671,500
TOTAL	$8,900,667
TOTAL COST FOR BUDGETING	**$8,910,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Widen)
(Concept Alternative 2b)

PROJECT DESCRIPTION

Limits Riego Road from Station 603 to Station 631

Proposed Improvement (Scope) Widening of a 4-lane grade separation to 6 lanes. Work includes street improvements, roadway bridge widening over the tracks, roadway bridge widening over Natomas Road and the channel, and retaining walls.

Alternative Widen to a 6-lane Overpass of Riego Road

ROADWAY ITEMS		**$**	**4,770,000**
STRUCTURE ITEMS		**$**	**18,100,000**
SUBTOTAL CONSTRUCTION COSTS		**$**	**22,870,000**
RIGHT OF WAY		**$**	**-**
SUBTOTAL CONSTRUCTION & RIGHT OF WAY COSTS		**$**	**22,870,000**
AGENCY MANAGEMENT & ADMINISTRATION	***0%***	**$**	**-**
DESIGN & ENVIRONMENTAL SERVICES	***12%***	**$**	**2,744,000**
CONST MANAGEMENT & ADMINISTRATION	***15%***	**$**	**3,431,000**
TOTAL PROJECT COST		**$**	**29,045,000**
TOTAL PROJECT COST (WITH 4% ESCALATION OVER 6 YEARS)		**$**	**36,751,000**

Approved by: _____ Date _____

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Widen)
(Concept Alternative 2b)

I. ROADWAY ITEMS

Section I - Earthwork	Quantity	Unit		Unit Price		Cost	Section Cost
Clearing and Grubbing (Removals)	1	LS	$	500,000	$	500,000	
Remove Roadway Pavement (Removals)	-	SF	$	3	$	-	
Unclassified Excavation	-	CY	$	25	$	-	
Unclassified Fill	30,700	CY	$	20	$	614,000	
					Total Earthwork	**$**	**1,114,000**

Section 2 - Structural Section	Quantity	Unit		Unit Price		Cost	Section Cost
Crushed Aggregate Base	3,950	CY	$	50	$	197,500	
AC Pavement	3,150	TON	$	100	$	315,000	
PCC Curb and Gutter	2,359	LF	$	25	$	58,975	
Raised Median Pavement	10,800	SF	$	15	$	162,000	
Concrete Barrier	-	LF	$	100	$	-	
Chain Link Fence	-	LF	$	30	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
					Total Structural Section	**$**	**733,475**

Section 3 - Railroad Related Items	Quantity	Unit		Unit Price		Cost	Section Cost
Railroad Flagger	1	LS	$	400,000	$	400,000	
Trackwork and Panel Removal	-	LS	$	250,000	$	-	
Signal Work	-	LS	$	200,000	$	-	
Inspection	1	LS	$	50,000	$	50,000	
					Total Railroad Items	**$**	**450,000**

Section 4 - Drainage/Utilities	Quantity	Unit		Unit Price		Cost	Section Cost
OH Transmission	-	LS	$	1,000,000	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	

Note: It is assumed that gas, telephone, and OH distribution utilities are in franchise and no project costs are included.

Total Drainage/Utilities **$** **-**

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Widen)
(Concept Alternative 2b)

Section 5 - Specialty Items	Quantity	Unit		Unit Price		Cost	Section Cost
Landscaping & Irrigation - new	-	SF	$	10	$	-	
Landscaping & Irrigation - replacement	-	LS	$	20,000	$	-	
Trees	-	EA	$	500	$	-	
Prepare SWPPP	1	LS	$	10,000	$	10,000	
Implement SWPPP	1	LS	$	400,000	$	400,000	
					Total Specialty Items		**$ 410,000**

Section 6 - Traffic & Lighting Items	Quantity	Unit		Unit Price		Cost	Section Cost
New Traffic Signal -	-	LS	$	350,000	$	-	
Temp Lighting	-	LS	$	125,000	$	-	
Permanent Street Lighting	-	LS	$	240,000	$	-	
Signing & Striping	1	LS	$	30,000	$	30,000	
Traffic Control	1	LS	$	250,000	$	250,000	
					Total Traffic & Lighting Items		**$ 280,000**

					SUBTOTAL SECTIONS 1 - 6		**$ 2,987,475**

Section 7 - Minor Items							
10% of Subtotal Sections 1 - 6						Cost	Section Cost
	$ 2,987,475	X		10%	$	298,748	
					Total Minor Items		**$ 298,748**

Section 8 - Roadway Mobilization							
Subtotal Sections 1-5	$ 2,987,475						
Minor Items	$ 298,748						
Sum	$ 3,286,223	X		10%	$	328,622	
					Total Mobilization		**$ 328,622**

Section 9 - Roadway Additions							
Supplemental							
Subtotal Sections 1-5	$ 2,987,475						
Minor Items	$ 298,748						
Sum	$ 3,286,223	X		5%	$	164,311	
Contingencies							
Subtotal Sections 1-5	$ 2,987,475						
Minor Items	$ 298,748						
Sum	$ 3,286,223	X		30%	$	985,867	
					Total Roadway Additions		**$ 1,150,178**

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Widen)
(Concept Alternative 2b)

TOTAL ROADWAY ITEMS , SECTIONS 1 - 9 **$ 4,765,023**

II. STRUCTURE ITEMS	Quantity	Unit		Unit Price		Cost	Section Cost
Bridge - Riego Road Bridge Widening	1	LS	$	5,050,000	$	5,050,000	
Bridge - Riego Road Overhead Widening	1	LS	$	6,970,000	$	6,970,000	
Bridge - Residential Access Road Bridge	-	LS			$	-	
Walls - MSE	1	LS	$	6,080,000	$	6,080,000	
	-				$	-	

Note: Assumes 10% for mobilization, 25% contingencies, and 2 years at 4% escalation.

Subtotal Structures Items **$ 18,100,000**

Mobilization

Subtotal Structural Sections					
Sum	$ 18,100,000	X	0%	$ -	

Total Mobilization **$ -**

Contingencies

Subtotal Structural Sections					
Sum	$ 18,100,000	X	0%	$ -	

Total Contingency **$ -**

Total Structures Items **$ 18,100,000**

III. RIGHT OF WAY

	Quantity	Unit		Unit Price		Cost	Section Cost
Fee Acquisition - Land, Full	N/A	SF	N/A		$		
Fee Acquisition - Land, Partial	0	SF	$	25	$	-	
Aerial Easement		SF	$	25	$	-	
Temporary Construction Easements		SF		2.50	$	-	

Total R/W **$ -**

Note: R/W acquisition costs include estimated values for land, improvements, damages, and escrow fees.

Contingencies

Subtotal R/W Sections					
Sum	$ -	X	30%	$ -	

Total Contingency **$ -**

Total R/W Items **$ -**

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Project No. 50128054

	GENERAL PLAN ESTIMATE		X	ADVANCED PLANNING ESTIMATE
BRIDGE NAME	Riego Road Bridge		**DISTRICT**	03
BRIDGE NUMBER	TBD		**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder		**RTE**	CR
EA			**PM**	
			DEPTH	5′-4″
PRICES BY	A. Prince		**LENGTH**	155′-0″
PRICES CHECKED BY	B. Hansen		**WIDTH**	33′-0″
QUANTITIES BY	A. Prince		**AREA**	5,115-FT^2
DATE	05/31/2020		**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	600	CY	$120.00	$72,000
2	STRUCTURE BACKFILL (BRIDGE)	1,000	CY	$150.00	$150,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	1,360	LF	$260.00	$353,600
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	100	LF	$2,400.00	$240,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	300	CY	$650.00	$195,000
6	STRUCTURAL CONCRETE, BRIDGE	400	CY	$1,450.00	$580,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	200	CY	$1,000.00	$200,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	100	CY	$850.00	$85,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	8	EA	$5,000.00	$40,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (60′-70′)	4	EA	$30,000.00	$120,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	4	EA	$40,000.00	$160,000
12	JOINT SEAL (MR 1 1/2″)	220	LF	$100.00	$22,000
13	BAR REINFORCING STEEL (BRIDGE)	340,000	LB	$1.15	$391,000
14	BRIDGE REMOVAL (PORTION)	1	LS	$70,000.00	$70,000
15	MINOR CONCRETE (MEDIAN)	30	CY	$1,000.00	$30,000
16	MISCELLANEOUS METAL (BRIDGE)	200	LB	$15.00	$3,000
17	BRIDGE DECK DRAINAGE SYSTEM	10,000	LB	$10.00	$100,000
18	PEDESTRIAN RAILING	220	LF	$120.00	$26,400
19	CONCRETE BARRIER (TYPE 842)	220	LF	$150.00	$33,000
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SUBTOTAL	$2,871,000
MOBILIZATION	$319,000
SUBTOTAL	$3,190,000
CONTINGENCIES (25%)	$797,500
SUBTOTAL	$3,987,500
ESCALATION	$1,057,960
TOTAL	$5,045,460
TOTAL COST FOR BUDGETING	**$5,050,000**

Escalation Rate per Year **6** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

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Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Riego Road Overhead	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder	**RTE**	CR
EA		**PM**	
		DEPTH	5′-4″
PRICES BY	A. Prince	**LENGTH**	286′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	33′-0″
QUANTITIES BY	A. Prince	**AREA**	9,438-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	600	CY	$120.00	$72,000
2	STRUCTURE BACKFILL (BRIDGE)	1,100	CY	$150.00	$165,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	1,360	LF	$260.00	$353,600
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	200	LF	$2,400.00	$480,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	300	CY	$650.00	$195,000
6	STRUCTURAL CONCRETE, BRIDGE	500	CY	$1,450.00	$725,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	300	CY	$1,000.00	$300,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	100	CY	$850.00	$85,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	12	EA	$5,000.00	$60,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	8	EA	$40,000.00	$320,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (110′-120′)	4	EA	$55,000.00	$220,000
12	JOINT SEAL (MR 1 1/2″)	220	LF	$100.00	$22,000
13	BAR REINFORCING STEEL (BRIDGE)	460,000	LB	$1.15	$529,000
14	BRIDGE REMOVAL (PORTION)	1	LS	$120,000.00	$120,000
15	MINOR CONCRETE (MEDIAN)	40	CY	$1,000.00	$40,000
16	MISCELLANEOUS METAL (BRIDGE)	300	LB	$15.00	$4,500
17	BRIDGE DECK DRAINAGE SYSTEM	18,000	LB	$10.00	$180,000
18	PEDESTRIAN RAILING	350	LF	$120.00	$42,000
19	CONCRETE BARRIER (TYPE 842)	350	LF	$150.00	$52,500
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SUBTOTAL	$3,965,600
MOBILIZATION	$440,622
SUBTOTAL	$4,406,222
CONTINGENCIES (25%)	$1,101,556
SUBTOTAL	$5,507,778
ESCALATION	$1,461,318
TOTAL	$6,969,096
TOTAL COST FOR BUDGETING	**$6,970,000**

Escalation Rate per Year **6** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Dewberry | Drake Haglan

Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Retaining Walls	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	MSE Wall	**RTE**	CR
EA		**PM**	
		DEPTH	Varies
PRICES BY	A. Prince	**LENGTH**	1,855′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	N/A
QUANTITIES BY	A. Prince	**AREA**	35,722-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	MECHANICALLY STABILIZED EMBANKMENT, LOCATION A	11,100	SQFT	$50.00	$555,000
2	MECHANICALLY STABILIZED EMBANKMENT, LOCATION B	6,000	SQFT	$50.00	$300,000
3	MECHANICALLY STABILIZED EMBANKMENT, LOCATION C	18,800	SQFT	$50.00	$940,000
4	STRUCTURAL CONCRETE, BARRIER SLAB	1,000	CY	$800.00	$800,000
5	BRIDGE REMOVAL (PORTION)	1	LS	$390,000.00	$390,000
6	PEDESTRIAN RAILING	1,750	LF	$120.00	$210,000
7	CONCRETE BARRIER (TYPE 842)	1,750	LF	$150.00	$262,500
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SUBTOTAL	$3,457,500
MOBILIZATION	$384,167
SUBTOTAL	$3,841,667
CONTINGENCIES (25%)	$960,417
SUBTOTAL	$4,802,083
ESCALATION	$1,274,084
TOTAL	$6,076,167
TOTAL COST FOR BUDGETING	**$6,080,000**

Escalation Rate per Year **6** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Ultimate)
(Concept Alternative 3)

PROJECT DESCRIPTION

Limits Riego Road from Station 603 to Station 631

Proposed Improvement (Scope) Construction of a grade separation to raise Riego Road over the UPRR tracks and close the at-grade crossing. Work includes street improvements, roadway bridge over the tracks, roadway bridge over Natomas Road and the channel, local road bridge over the channel, retaining walls, and OH utilities.

Alternative Overpass of Riego Road

ROADWAY ITEMS		**$**	**12,710,000**
STRUCTURE ITEMS		**$**	**43,290,000**
SUBTOTAL CONSTRUCTION COSTS		**$**	**56,000,000**
RIGHT OF WAY		**$**	**400,000**
SUBTOTAL CONSTRUCTION & RIGHT OF WAY COSTS		**$**	**56,400,000**
AGENCY MANAGEMENT & ADMINISTRATION	***0%***	**$**	**-**
DESIGN & ENVIRONMENTAL SERVICES	***12%***	**$**	**6,720,000**
CONST MANAGEMENT & ADMINISTRATION	***15%***	**$**	**8,400,000**
TOTAL PROJECT COST		**$**	**71,520,000**
TOTAL PROJECT COST (WITH 4% ESCALATION OVER 2 YEARS)		**$**	**77,356,000**

Approved by: _____ Date _____

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Ultimate)
(Concept Alternative 3)

I. ROADWAY ITEMS

Section I - Earthwork	Quantity	Unit		Unit Price		Cost	Section Cost
Clearing and Grubbing (Removals)	1	LS	$	500,000	$	500,000	
Remove Roadway Pavement (Removals)	84,000	SF	$	3	$	252,000	
Unclassified Excavation	1,000	CY	$	25	$	25,000	
Unclassified Fill	109,500	CY	$	20	$	2,190,000	
					Total Earthwork		**$ 2,967,000**

Section 2 - Structural Section	Quantity	Unit		Unit Price		Cost	Section Cost
Crushed Aggregate Base	14,620	CY	$	50	$	731,000	
AC Pavement	11,860	TON	$	100	$	1,186,000	
PCC Curb and Gutter	4,718	LF	$	25	$	117,950	
Raised Median Pavement	10,800	SF	$	15	$	162,000	
Concrete Barrier	1,850	LF	$	100	$	185,000	
Chain Link Fence	1,000	LF	$	30	$	30,000	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	
					Total Structural Section		**$ 2,411,950**

Section 3 - Railroad Related Items	Quantity	Unit		Unit Price		Cost	Section Cost
Railroad Flagger	1	LS	$	400,000	$	400,000	
Trackwork and Panel Removal	1	LS	$	250,000	$	250,000	
Signal Work	1	LS	$	200,000	$	200,000	
Inspection	1	LS	$	50,000	$	50,000	
					Total Railroad Items		**$ 900,000**

Section 4 - Drainage/Utilities	Quantity	Unit		Unit Price		Cost	Section Cost
OH Transmission	1	LS	$	1,000,000	$	1,000,000	
	-		$	-	$	-	
	-		$	-	$	-	
	-		$	-	$	-	

Note: It is assumed that gas, telephone, and OH distribution utilities are in franchise and no project costs are included.

Total Drainage/Utilities **$ 1,000,000**

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Ultimate)
(Concept Alternative 3)

Section 5 - Specialty Items	Quantity	Unit		Unit Price		Cost	Section Cost
Landscaping & Irrigation - new	-	SF	$	10	$	-	
Landscaping & Irrigation - replacement	-	LS	$	20,000	$	-	
Trees	-	EA	$	500	$	-	
Prepare SWPPP	1	LS	$	10,000	$	10,000	
Implement SWPPP	1	LS	$	400,000	$	400,000	
					Total Specialty Items		**$ 410,000**

Section 6 - Traffic & Lighting Items	Quantity	Unit		Unit Price		Cost	Section Cost
New Traffic Signal -	-	LS	$	350,000	$	-	
Temp Lighting	-	LS	$	125,000	$	-	
Permanent Street Lighting	-	LS	$	240,000	$	-	
Signing & Striping	1	LS	$	30,000	$	30,000	
Traffic Control	1	LS	$	250,000	$	250,000	
					Total Traffic & Lighting Items		**$ 280,000**

					SUBTOTAL SECTIONS 1 - 6		**$ 7,968,950**

Section 7 - Minor Items							
10% of Subtotal Sections 1 - 6						Cost	Section Cost
	$ 7,968,950	X		10%	$	796,895	
					Total Minor Items		**$ 796,895**

Section 8 - Roadway Mobilization							
Subtotal Sections 1-5	$ 7,968,950						
Minor Items	$ 796,895						
Sum	$ 8,765,845	X		10%	$	876,585	
					Total Mobilization		**$ 876,585**

Section 9 - Roadway Additions							
Supplemental							
Subtotal Sections 1-5	$ 7,968,950						
Minor Items	$ 796,895						
Sum	$ 8,765,845	X		5%	$	438,292	
Contingencies							
Subtotal Sections 1-5	$ 7,968,950						
Minor Items	$ 796,895						
Sum	$ 8,765,845	X		30%	$	2,629,754	
					Total Roadway Additions		**$ 3,068,046**

Preliminary Project Cost Estimate Summary
Riego Road 6-Lane Grade Separation (Ultimate)
(Concept Alternative 3)

TOTAL ROADWAY ITEMS , SECTIONS 1 - 9 **$ 12,710,475**

II. STRUCTURE ITEMS	Quantity	Unit		Unit Price		Cost	Section Cost
Bridge - Riego Road Bridge	1	LS	$	13,830,000	$	13,830,000	
Bridge - Riego Road Overhead	1	LS	$	18,750,000	$	18,750,000	
Bridge - Residential Access Road Bridge	1	LS	$	1,800,000	$	1,800,000	
Walls - MSE	1	LS	$	8,910,000	$	8,910,000	
	-				$	-	

Note: Assumes 10% for mobilization, 25% contingencies, and 2 years at 4% escalation.

Subtotal Structures Items **$ 43,290,000**

Mobilization

Subtotal Structural Sections					
Sum	$ 43,290,000	X	0%	$ -	

Total Mobilization **$ -**

Contingencies

Subtotal Structural Sections					
Sum	$ 43,290,000	X	0%	$ -	

Total Contingency **$ -**

Total Structures Items **$ 43,290,000**

III. RIGHT OF WAY

	Quantity	Unit		Unit Price		Cost	Section Cost
Fee Acquisition - Land, Full	N/A	SF	N/A		$		
Fee Acquisition - Land, Partial	12,300	SF	$	25	$	307,500	
Aerial Easement		SF	$	25	$	-	
Temporary Construction Easements		SF		2.50	$	-	

Total R/W **$ 307,500**

Note: R/W acquisition costs include estimated values for land, improvements, damages, and escrow fees.

Contingencies

Subtotal R/W Sections					
Sum	$ 307,500	X	30%	$ 92,250	

Total Contingency **$ 92,250**

Total R/W Items **$ 399,750**

Dewberry | Drake Haglan

Project No. 50128054

	GENERAL PLAN ESTIMATE		X	ADVANCED PLANNING ESTIMATE
BRIDGE NAME	Riego Road Bridge		**DISTRICT**	03
BRIDGE NUMBER	TBD		**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder		**RTE**	CR
EA			**PM**	
			DEPTH	5′-4″
PRICES BY	A. Prince		**LENGTH**	155′-0″
PRICES CHECKED BY	B. Hansen		**WIDTH**	107′-0″
QUANTITIES BY	A. Prince		**AREA**	16,585-FT²
DATE	05/31/2020		**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	1,900	CY	$120.00	$228,000
2	STRUCTURE BACKFILL (BRIDGE)	3,200	CY	$150.00	$480,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	4,500	LF	$260.00	$1,170,000
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	400	LF	$2,400.00	$960,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	800	CY	$650.00	$520,000
6	STRUCTURAL CONCRETE, BRIDGE	1,400	CY	$1,450.00	$2,030,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	600	CY	$1,000.00	$600,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	400	CY	$850.00	$340,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	26	EA	$5,000.00	$130,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (60′-70′)	13	EA	$30,000.00	$390,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	13	EA	$40,000.00	$520,000
12	JOINT SEAL (MR 1 1/2″)	220	LF	$100.00	$22,000
13	BAR REINFORCING STEEL (BRIDGE)	1,180,000	LB	$1.15	$1,357,000
14	BRIDGE REMOVAL	1	LS	$190,000.00	$190,000
15	MINOR CONCRETE (MEDIAN)	30	CY	$1,000.00	$30,000
16	MISCELLANEOUS METAL (BRIDGE)	500	LB	$15.00	$7,500
17	BRIDGE DECK DRAINAGE SYSTEM	14,000	LB	$10.00	$140,000
18	PEDESTRIAN RAILING	220	LF	$120.00	$26,400
19	CONCRETE BARRIER (TYPE 842)	430	LF	$150.00	$64,500
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SUBTOTAL	$9,205,400
MOBILIZATION	$1,022,822
SUBTOTAL	$10,228,222
CONTINGENCIES (25%)	$2,557,056
SUBTOTAL	$12,785,278
ESCALATION	$1,043,279
TOTAL	$13,828,556
TOTAL COST FOR BUDGETING	**$13,830,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Dewberry | Drake Haglan

Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Riego Road Overhead	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	PC PS California Wide-Flange Girder	**RTE**	CR
EA		**PM**	
		DEPTH	5′-4″
PRICES BY	A. Prince	**LENGTH**	286′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	107′-0″
QUANTITIES BY	A. Prince	**AREA**	30,602-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	1,900	CY	$120.00	$228,000
2	STRUCTURE BACKFILL (BRIDGE)	3,600	CY	$150.00	$540,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	4,500	LF	$260.00	$1,170,000
4	96″ CAST-IN-DRILLED-HOLE CONCRETE PILING	800	LF	$2,400.00	$1,920,000
5	STRUCTURAL CONCRETE, BRIDGE FOOTING	1,000	CY	$650.00	$650,000
6	STRUCTURAL CONCRETE, BRIDGE	1,600	CY	$1,450.00	$2,320,000
7	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	1,000	CY	$1,000.00	$1,000,000
8	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	400	CY	$850.00	$340,000
9	ERECT PRECAST PRESTRESSED CONCRETE GIRDER	39	EA	$5,000.00	$195,000
10	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (80′-90′)	26	EA	$40,000.00	$1,040,000
11	FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (110′-120′)	13	EA	$55,000.00	$715,000
12	JOINT SEAL (MR 1 1/2″)	220	LF	$100.00	$22,000
13	BAR REINFORCING STEEL (BRIDGE)	1,640,000	LB	$1.15	$1,886,000
14	MINOR CONCRETE (MEDIAN)	40	CY	$1,000.00	$40,000
15	MISCELLANEOUS METAL (BRIDGE)	900	LB	$15.00	$13,500
16	BRIDGE DECK DRAINAGE SYSTEM	25,000	LB	$10.00	$250,000
17	PEDESTRIAN RAILING	350	LF	$120.00	$42,000
18	CONCRETE BARRIER (TYPE 842)	700	LF	$150.00	$105,000
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SUBTOTAL	$12,476,500
MOBILIZATION	$1,386,278
SUBTOTAL	$13,862,778
CONTINGENCIES (25%)	$3,465,694
SUBTOTAL	$17,328,472
ESCALATION	$1,414,003
TOTAL	$18,742,476
TOTAL COST FOR BUDGETING	**$18,750,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Dewberry | Drake Haglan

Project No. 50128054

	GENERAL PLAN ESTIMATE		X	ADVANCED PLANNING ESTIMATE
BRIDGE NAME	Residential Bridge		**DISTRICT**	03
BRIDGE NUMBER	TBD		**CO**	SUT
STRUCTURE TYPE	PC PS Slab Span		**RTE**	CR
EA			**PM**	
			DEPTH	2′-0″
PRICES BY	A. Prince		**LENGTH**	66′-0″
PRICES CHECKED BY	B. Hansen		**WIDTH**	29′-0″
QUANTITIES BY	A. Prince		**AREA**	1,914-FT^2
DATE	05/31/2020		**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	STRUCTURE EXCAVATION (BRIDGE)	400	CY	$120.00	$48,000
2	STRUCTURE BACKFILL (BRIDGE)	400	CY	$150.00	$60,000
3	30″ CAST-IN-DRILLED-HOLE CONCRETE PILING	830	LF	$260.00	$215,800
4	STRUCTURAL CONCRETE, BRIDGE FOOTING	100	CY	$650.00	$65,000
5	STRUCTURAL CONCRETE, BRIDGE	200	CY	$1,450.00	$290,000
6	STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER)	100	CY	$1,000.00	$100,000
7	ERECT PRECAST PRESTRESSED CONCRETE DECK UNIT	7	EA	$5,000.00	$35,000
8	FURNISH PRECAST PRESTRESSED CONCRETE DECK UNIT (60′-70′)	2,000	SQFT	$60.00	$120,000
9	JOINT SEAL (MR 1″)	60	LF	$100.00	$6,000
10	BAR REINFORCING STEEL (BRIDGE)	130,000	LB	$1.15	$149,500
11	CONCRETE BARRIER (TYPE 842)	700	LF	$150.00	$105,000
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SUBTOTAL	$1,194,300
MOBILIZATION	$132,700
SUBTOTAL	$1,327,000
CONTINGENCIES (25%)	$331,750
SUBTOTAL	$1,658,750
ESCALATION	$135,354
TOTAL	$1,794,104
TOTAL COST FOR BUDGETING	**$1,800,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Dewberry | Drake Haglan

Project No. 50128054

	GENERAL PLAN ESTIMATE	X	ADVANCED PLANNING ESTIMATE

BRIDGE NAME	Retaining Walls	**DISTRICT**	03
BRIDGE NUMBER	TBD	**CO**	SUT
STRUCTURE TYPE	MSE Wall	**RTE**	CR
EA		**PM**	
		DEPTH	Varies
PRICES BY	A. Prince	**LENGTH**	1,855′-0″
PRICES CHECKED BY	B. Hansen	**WIDTH**	N/A
QUANTITIES BY	A. Prince	**AREA**	71,444-FT²
DATE	05/31/2020	**COST INDEX**	

	CONTRACT ITEMS	QUANTITY	UNIT	PRICES	EXTENSION
1	MECHANICALLY STABILIZED EMBANKMENT, LOCATION A	11,100	SQFT	$50.00	$555,000
2	MECHANICALLY STABILIZED EMBANKMENT, LOCATION B	11,100	SQFT	$50.00	$555,000
3	MECHANICALLY STABILIZED EMBANKMENT, LOCATION C	6,000	SQFT	$50.00	$300,000
4	MECHANICALLY STABILIZED EMBANKMENT, LOCATION D	6,000	SQFT	$50.00	$300,000
5	MECHANICALLY STABILIZED EMBANKMENT, LOCATION E	18,800	SQFT	$50.00	$940,000
6	MECHANICALLY STABILIZED EMBANKMENT, LOCATION F	18,800	SQFT	$50.00	$940,000
7	STRUCTURAL CONCRETE, BARRIER SLAB	2,000	CY	$800.00	$1,600,000
8	PEDESTRIAN RAILING	1,750	LF	$120.00	$210,000
9	CONCRETE BARRIER (TYPE 842)	3,500	LF	$150.00	$525,000
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SUBTOTAL	$5,925,000
MOBILIZATION	$658,333
SUBTOTAL	$6,583,333
CONTINGENCIES (25%)	$1,645,833
SUBTOTAL	$8,229,167
ESCALATION	$671,500
TOTAL	$8,900,667
TOTAL COST FOR BUDGETING	**$8,910,000**

Escalation Rate per Year **2** years @ **4%**

COMMENTS: Escalated budget estimate is for information only, actual construction costs may vary.

Attachment C. Preliminary Foundation Report

SIERRA GEOTECH

PRELIMINARY FOUNDATION REPORT

TYPE OF SERVICES	Preliminary Geotechnical Bridge Foundations
PROJECT NAME	Riego Road Grade Separation Feasibility
LOCATION	Riego Road At Union Pacific Railroad Sutter County, California
CLIENT	Dewberry/Drake Haglan
SIERRA GEOTECH PROJECT NO.	DB20025
DATE DOCUMENT ISSUED	June 19, 2020

SIERRA GEOTECH

PRELIMINARY FOUNDATION REPORT

TYPE OF SERVICES	Preliminary Geotechnical Bridge Foundations
PROJECT NAME	Riego Road Grade Separation Feasibility
LOCATION	Riego Road At Union Pacific Railroad Sutter County, California
CLIENT	Dewberry/Drake Haglan
CLIENT PROJECT NO.	50128054
SIERRA GEOTECH PROJECT NO.	DB20025
DATE DOCUMENT ISSUED	June 19, 2020.

Prepared By

Robert Lawrence, P.E., G.E.
Principal Geotechnical Engineer

Shaun Vemuri, P.E., MBA
Managing Principal, Geotechnical Engineering

Version History	
06-20-2020	Issued as DRAFT

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SIERRA GEOTECH

Table of Contents

List of Tables

List of Appendices

SIERRA GEOTECH

TYPE OF SERVICES	Preliminary Geotechnical Bridge Foundations
PROJECT NAME	Riego Road Grade Separation
LOCATION	Riego Road At Union Pacific Railroad Sutter County, California

1. Scope of Work

Sierra's Scope of Work for the Riego Road Grade Separation was to prepare a Preliminary Foundation Report in general accordance with the Caltrans *Foundation Report Preparation for Bridge Foundations, August 2018*. Under this task, the following work was performed to prepare the report:

- Performed a literature search for readily available published geologic and geohazards information at and in the near vicinity of the project site.
- Obtained copies of readily available previous studies performed at or in the near vicinity of the project site.
- Visited the site to better identify any existing utilities or other conflicts with the proposed improvements.

The Preliminary Foundation Report will provide the following information:

- A project summary and description of the overall proposed project improvements;
- A summary of the observed surficial geology in the general vicinity of the bridge site.
- A discussion of the published regional and site geology as it pertains to the proposed improvements.
- A preliminary seismic study providing the peak ground acceleration (PGA) and the design response spectrum (ARS Curve) data.
- A discussion of the available As-Built information as it pertains to the proposed foundation analysis.
- A discussion of the foundation types which are applicable to this structure based upon the available subsurface information;
- A discussion of the additional field work and laboratory testing needed for final design.

2. Project Description

The overall proposed widening project extends for the 12-mile segment of Riego Road / Baseline Road between SR-99 and Foothills Boulevard and includes three local jurisdictions – County of Sutter, County of Placer and the City of Roseville (within Placer County). The border between Sutter County

and Placer County is located at Pleasant Grove Road (South) and Locust Road. The Riego Road portion of the overall project is in Sutter County, while the Baseline Road portion is in Placer County. The extents of the proposed crossing improvements of Riego Road discussed in this Study fall within Sutter County.

Within the limits of the SPSP and PVSP (between Natomas Road and Pleasant Grove Road), Riego Road is a two-lane roadway with a bridge over Steelhead Creek (also known as the Natomas East Main Drainage Canal) and an at-grade crossing at the UPRR tracks just east of the canal. The envisioned Riego Road grade separation would eliminate the at-grade railroad crossing to improve mobility and safety; however, this feasibility study analyzes and compares a grade separation and an improved at-grade crossing alternative.

Impacts to utilities are anticipated to be minor and include relocation of surface facilities such as pedestals, service cabinets and power poles. Drainage modifications including culvert extensions, inlet relocations and adjustments, as well as new inlets would be required. A new access road is required for the properties which will be cut off from existing access to Riego Road from the profile raise.

2.1. PROJECT LOCATION

The proposed structures are located where the existing Riego Road crosses the Union Pacific Railroad and Steelhead Creek (Natomas Main Drain) in unincorporated Sutter County, California. The project location can be seen in relation to the surrounding features on Figure 1, Vicinity Map which is attached in Appendix I.

2.2. EXISTING AND PROPOSED BRIDGES

At the time this report was prepared, the As-builts were not available for the existing bridge. Based upon the limited information contained the Foundation Report, the existing bridge (No. 18C0061) is three span structure supported by intermediate piers and abutments with shallow spread foundations bearing on the competent soils identified on the boring logs.

For the project, multiple structures and retaining walls are required to clear span both UPRR tracks (existing and future) and the existing drainage canal (Natomas East Main Drainage Canal), as well as provide a new access road for the property owners on the north and south side of Riego Road. The first proposed structure is the Riego Road Bridge which will cross Natomas Road/E Levee Road and the drainage canal and will be a 2-span, precast (PC) prestressed (PS) California Wide Flange girder bridge with span lengths of 70'-0" and 85'-0" for an overall length of 155'-0". This structure type will utilize 4'-6" precast prestressed wide flange girders and a total structure depth of 5'-5" (including girder, haunch, and deck). The deck width will be 77' 0" and incorporate a 12' 0" path, 6' 0" shoulders, 12' 0" lanes, and a 4' 0" median. The substructure will consist of 60" diameter circular columns founded 96" cast-in-drilled hole piles. At this time, the abutments will be tall cantilever seat type abutments supported on pile foundations.

The second proposed structure is the Riego Road Overhead which will cross UPRR right-of-way and the realigned driveway for the northern and southern properties. This structure will be a 3-span, precast (PC) prestressed (PS) California Wide Flange girder bridge with span lengths varying between 86'-0" and 114'-0" for an overall length of 286'-0". The structure will utilize 4'-6" precast prestressed wide flange girders and a total structure depth of 5'-5" (including girder, haunch, and deck). The deck width will be 77'-0" and incorporate a 12'-0" path, 6'-0" shoulders, 12'-0" lanes, and a 4'-0" median. The substructure will consist of 60" diameter circular columns founded 96" cast-in-drilled hole piles. At this time, the abutments will be tall cantilever seat type abutments supported on pile foundations.

The proposed access road bridge crossing the drainage canal will be a single span, precast (PC) prestressed (PS) Concrete Slab Girder bridge with a total length of 66'-0". This structure type will utilize 1'-9" deep precast prestressed voided concrete slab girders with a 6" cast concrete deck surface. The abutments will be seat type abutments founded on piles due to potential scour issues given its proximity to the drainage canal.

The approaches are Mechanically Stabilized Embankment (MSE) walls will retain the approach fills on the east and west approaches as well as the fills between the proposed structures. Three back-to-back MSE walls are proposed at the project site: walls to the west that lead up to the proposed Riego Road Bridge (MSE Walls 1 & 2), walls between the proposed Riego Road Bridge and Riego Road Overhead (MSE Walls 3 & 4), and walls to the east that lead away from the Riego Road Overhead (MSE Walls 5 & 6). MSE Walls 1 & 2 are approximately 713'-0" long and vary in height from 6'-0" to 28'-0". MSE Walls 3 & 4 are approximately 217'-0" long and vary in height from 29'-0" to 31'-0". MSE Walls 5 & 6 are approximately 925'-0" long and vary in height from 31'-0" to 6'-0". Given the maximum MSE wall heights and the proposed roadway widths, overlapping MSE wall straps are not anticipated.

3. Field Investigation And Testing Program

No field investigation or testing program was performed for this preliminary foundation report.

4. Laboratory Testing Program

No laboratory investigation was performed for the preparation of this preliminary foundation report.

Laboratory testing was performed as part of the study for the existing bridge and consisted of two direct shear tests and one unconfined compressive strength test. The unconfined compressive strength test is shown on the LOTB and a copy of the direct shear testing results are included in Appendix II.

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5. Site Geology and Subsurface Conditions

5.1. GEOLOGY

The subject site is located within the Great Valley Geomorphic Province of California. The geology of this region is typically characterized by ongoing alluvial sediment deposition since the Jurassic period. The province encompasses the San Joaquin and Sacramento Valleys and is bounded by the Sierra Nevada Mountains to the east, the Cascade and Coast Ranges to the west, the Transverse Range (Tehachapi Mountains) to the south, and the Klamath Mountains to the north.

The Sacramento Valley is a structural trough that covers approximately 5,000 square miles, which makes up the northern third of the Great Valley Geomorphic Province. The Sacramento Valley extends from the Stockton-Tracy area on the south to the Klamath Mountains on the north. The Sacramento Valley is underlain by sediments transported from the Sierra Nevada Mountains and Coast Ranges by the Sacramento River and its tributaries. The topography ranges from gentle hills to approximately flat. During the late Mesozoic and to the early and middle Cenozoic eras (approximately 20 to 100 million years before present), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to present) overlie these marine sediments.

Based upon the Preliminary Geologic Map of the Sacramento 30' x 60' Quadragle, California (Gutierrez 2011), the project is underlain by the Riverbank Formation Middle Unit (Qr2) which are typically Middle to Late Pleistocene aged Arkosic alluvium consisting of sand with and silt, forming alluvial terraces and dissected alluvial fans along streams on the southeast side of the Sacramento Valley. The upper, middle and lower units of the Riverbank Formation form terraces that increase in topographic position with age.

The project can be seen in relation to the published geology Figure 2, Geologic Map, which is included in Appendix I.

5.2. SUBSURFACE CONDITIONS

For this study, Sierra reviewed the Foundation Engineering Report for the Riego Road Bridge at Natomas Canal prepared by Lowry & Associates dated March 21, 1980. The Log of Test Borings attached to this report show the subsurface soils in general agreement with the published geology. The two borings performed for this study both identified approximately seven to eight (7 to 8) feet of loose dark brown clayey Sand (recent alluvium) with Riverbank Formation beneath. The Riverbank Formation soils consisted of light brown to brown, very dense, slightly to partially cemented clayey medium to fine Sand which discrete layers of hard cemented sandy Silt. All of the samples had blow counts greater than 100 blows per foot with the majority of the sample recording refusal blow counts (unable to drive the sampler 12 inches with 100 hammer blows).

The actual descriptons and strata breaks of the borings can be seen on the As-built LOTB which is attached in Appendix II.

5.3. GROUNDWATER

Groundwater was not identified in the boring reviewed in the available As-built LOTB data. Regionally, groundwater is generally encountered at depths of greater than 100 feet in the general vicinity of the project site for most of the year. According to a review of groundwater level records from the California Department of Water Resources Groundwater Information Center Map Interface, Station 387556N1214898W001 has groundwater at greater than 50 feet (between Elevation -20 and -30 feet) and Station 387480N1214946W001 has groundwater at greater than 50 feet (between Elevation -15 and -25 feet). It appears that groundwater is shallower as you go from east to west away from the project site.

Groundwater is not expected to be encountered in any shallow excavations (less than 10 feet) made during construction of the project. Any deeper excavations for CIDH pile construction should anticipate encountering groundwater below Elevation -10 feet and based upon previous experience in the area, groundwater may be under pressure (artesian) and will need to be accounted for in the CIDH pile construction.

6. Scour evaluation

At the time this report was prepared a scour evaluation of the Steelhead Creek (Natomas Main Drain) was not performed.

7. Corrosion Evaluation

The California Department of Transportation (Caltrans) has the following definition of corrosive soils (Corrosion Guidelines Version 2.1 dated January 2015):

"*For structural elements, the Department considers a site to be corrosive if one or more of the following conditions exists for the representative soil and/or water samples taken at the site:*

- *Chloride concentration is 500 ppm or greater,*
- *Sulfate Concentration is 2000 ppm or greater,*
- *pH is 5.5 or less."*

In addition to the conditions listed above, The California Amendments to AASHTO LRFD Bridge Design Specifications (BDS), 6th Edition Section 10.7.5 considers a site corrosive if the additional condition listed below exists for the representative soil and/or water samples taken at the site:

- *Minimum resistivity of 1000 ohm-cm or less.*

At this time, no site specific corrosive potential testing was available for the project site. In the absence of site specific testing for preliminary design purposes, all soils shall be considered corrosive until site specific testing has been performed.

The following mitigation measures may be employed as prudent engineering practice but not required per the code and therefore up to the discretion of the design engineer. For concrete, the use of mineral admixtures (such as fly ash, silica fume, metakolin, etc…), a reduced water content, and increased cementitious material content generally result in a high-density, durable concrete that is more resistant to corrosion. According to the California Amendments to the LRFD Bridge Design Specifications – Sixth Edition, Table 5.12.3-1 Minimum Concrete cover (inches) for 75-year Design Life, the maximum water-to-cementitious material ratio shall not exceed 0.40 and a minimum of 3-inches clear cover shall be provided for all reinforcing bars where the concrete is cast against the surrounding soils. We also recommend the use of a minimum of 675 pounds per cubic yard of cementitious material and Type II Modified or Type V cement with 25-percent mineral admixtures be used on all locations where the concrete is to remain in permanent contact with the surrounding soils. For additional guidance to help mitigate the corrosion of the reinforced concrete due to chlorides, sulfates, and acids, refer to Caltrans Bridge Memo to Designer 10-5.

Future corrosion sampling and testing for the project shall be conducted following the guidelines set forth in Section 6 - Requirements for Conducting Corrosion Investigations of Project Sites and Section 7 - Bridge Structures of the Corrosion Guidelines, Version 2.0, November, 2012.

8. Preliminary Seismic recommendations

8.1. POTENTIAL SEISMIC HAZARDS

The project is located in a seismically active area of California. Potential geologic and seismic hazards for the site include, seismic shaking (ground motion), subsidence, lateral spreading, slope instability, liquefaction, and seismically induced settlement.

8.2. GROUND SURFACE RUPTURE

The project site does not lie within or adjacent to an Alquist-Priolo Earthquake Fault Zone and no active faulting has been mapped as occurring across and/or adjacent to the project site.

8.3. GROUND MOTION

A preliminary site specific seismic study was performed to develop seismic design parameters for the proposed bridge design. Following the Caltrans Seismic Design Criteria (SDC) Version 2.0, (Caltrans, 2019). Memos to Designer (MTD) Section 20, and design tools outlined in the Caltrans *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendation, November 2012*, a seismic analysis was performed for this structure to develop seismic design parameters and to identify potential seismic hazards such as liquefaction or lateral spreading.

A preliminary estimated averaged shear wave velocity (VS 30) of 270 m/sec was used for the site specific seismic analyses, using the available as-built subsurface information at the project site.

The design ARS curve was developed in accordance with the Caltrans SDC 2.0 which was adopted September 1, 2019. Following this guideline, ground shaking shall be characterized for design by the design spectrum and is based on the 2014 U.S. Geological Survey Seismic Hazard Maps with modifications due to fault near-source and deep soil basin amplification factors.

Based upon the location of the project site with respect to both mapped fault sources and mapped basins, no deep soil basin amplification factors were applied.

Based on the analysis as described above, the Peak Ground Acceleration (PGA) for the site is estimated at 0.21g ("g" is the acceleration due to gravity) and the peak spectral acceleration at the site is estimated at about 0.58g at an approximately 0.30 second period. The design ARS curve is presented as Figure 3, Design Response Spectrum (ARS Curve) and the seismic analysis is summarized in Table 1, Seismic Design Parameter Summary below.

Table 1: Seismic Design Parameter Summary

Seismic Design Parameter Summary	
Site Location (at new OH location):	Latitude: 37.921185
	Longitude: -120.843884
Mean Moment Magnitude	6.53
Soil Profile Classification	Soil Class S1
Estimated AverageSite Shear Wave Velocity (Vs_{30avg})	270 meters/second
Peak Ground Acceleration (PGA)	0.21g

Other Seismic Hazards

The site has no known history of subsidence, rock falls/landslides, or embankment failures due to seismic activity and none were observed during our limited field observations and our review of available published seismic hazards for the project area.

8.4. LIQUEFACTION EVALUATION

A preliminary review of potential liquefaction of the site soils was performed to determine the possible extent of liquefaction at the site. Liquefaction is the process in which the seismic shear waves cause an increase in the pore water pressure in a cohesionless (sand and some non-cohesive silts) soil strata. This increase in pore water pressure reduces the effective stress confining the soil. The reduction in effective stress causes a reduction in the shear modulus of the soil, which in turn, results in increased soil deformation. Also associated with liquefaction is a loss in bearing strength. In the case of full liquefaction, when the increase in pore water pressure reduces the confining stress to

zero, the soil experiences a full loss of strength and undergoes large viscous deformations. Lateral spreading (large lateral deformations) are possible when liquefaction occurs in ground having even minimal slope. Additionally included with liquefaction analyses are a dry settlement analyses. Cohesionless soils which are in a loose to medium dense state when subjected to seismic shear waves compact in place in a similar manner to being compacted with a vibratory equipment. The energy of the seismic event reorganizes the grains to a more dense state and subsequently causes a reduction in the overall volume resulting in settlement of the soil.

Based upon the available subsurface data for the site, project soils generally consist of between loose/medium dense silty/clayey sands overlying very dense silty sands/hard sandy silts which have moderate cementation. Due to the lack of a permanent groundwater level, the chance of liquefaction is low and not expected to impact the project improvements. Once more site specific subsurface information is obtained, additional liquefaction studies will be performed during final design for this project. The borings to be drilled during the final design will be used to verify the lack of a permanent groundwater and corrected blow count data for both liquefaction and dry dynamic settlement analyses.

9. As-Built Foundation Data

At the time this report was prepared there was no As-built information for the existing bridge.

10. Preliminary Foundation Recommendations

10.1. RIEGO ROAD BRIDGE OVER NATOMAS ROAD/E LEVEE ROAD

The proposed Riego Road Bridge Over Natomas Road/E Levee Road is a two-span bridge with precast/prestressed concrete girder superstructure supported on seat type abutments and mulit-column bent. Based upon the available subsurface information for the project site, very competent soils are identified approximately 10 to 15 below top of deck grades with 7 to 8 feet of unsuitable soils above them. The following are recommended foundation systems for the proposed abutments and bent:

- Spread foundations bearing directly on these competent soils (Bottom of Footing at 10 to 15 feet below top of deck grade). Preliminary allowable bearing pressures of 10 ksf for Service and 20 ksf for Strength Limit demands may be used to size the footings for cost estimating purposes;
- Large diameter CIDH piles at the bent as the soils identified at 10 to 15 feet below top of deck grade are considered “Intermediate Geomaterials” and can develop both side friction and end bearing to resist axial demands. The competent soils at 10 to 15 feet below top of deck grade are anticipated to develop between 3 and 4 kips per square foot (ksf) ultimate side resistance and 20 ksf end bearing to develop preliminary pile length determination for cost estimating purposes.

- Standard Plan CIDH piles at the abutments and bents can develop side resistance to resist axial demands. For preliminary cost purposes, we estimate the length of these piles to be between 40 and 50 feet, as measured from existing ground, for cost estimating purposes.
- At the abutments, drilled and grouted in steel H-piles extending up through the MSE fill to support a short seat type abutment is a cost-effective option. Lateral forces can be resisted by attaching metallic soil reinforcement to the back of the abutment face and developing tension resistance in the MSE fill.
- Appreciable lateral resistance to resist lateral demands may be developed at and below approximately 10 to 15 feet below top of deck grade.
- Driven pile foundations are not recommended do the hard/very dense/cemented nature of the site soils.

10.2. RIEGO ROAD OVERHEAD

The proposed Riego Road Overhead is a three-span bridge with precast/prestressed concrete girder superstructure supported on seat type abutments and mulit-column bents. Based upon the available subsurface information for the project site, very competent soils are identified approximately 10 to 15 below top of deck grades with 7 to 8 feet of unsuitable soils above them. The following are recommended foundation systems for the proposed abutments and bent:

- Spread foundations bearing directly on these competent soils (Bottom of Footing at 10 to 15 feet below top of deck grade). Preliminary allowable bearing pressures of 10 ksf for Service and 20 ksf for Strength Limit demands may be used to size the footings for cost estimating purposes;
- Large diameter CIDH piles at the bent as the soils identified at 10 to 15 feet below top of deck grade are considered “Intermediate Geomaterials” and can develop both side friction and end bearing to resist axial demands. The competent soils at 10 to 15 feet below top of deck grade are anticipated to develop between 3 and 4 kips per square foot (ksf) ultimate side resistance and 20 ksf end bearing to develop preliminary pile length determination for cost estimating purposes.
- Standard Plan CIDH piles at the abutments and bents can develop side resistance to resist axial demands. For preliminary cost purposes, we estimate the length of these piles to be between 40 and 50 feet, as measured from existing ground, for cost estimating purposes.
- At the abutments, drilled and grouted in steel H-piles extending up through the MSE fill to support a short seat type abutment is a cost-effective option. Lateral forces can be resisted by attaching metallic soil reinforcement to the back of the abutment face and developing tension resistance in the MSE fill.
- Appreciable lateral resistance to resist lateral demands may be developed at and below approximately 10 to 15 feet below top of deck grade.
- Driven pile foundations are not recommended do the hard/very dense/cemented nature of the site soils.

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10.3. ACCESS ROAD BRIDGE

The proposed access road bridge is a short single span structure with precast/prestressed voided slab superstructure with seat type abutments. Based upon the available subsurface information for the project site, very competent soils are identified approximately 10 to 15 below top of deck grades with 7 to 8 feet of unsuitable soils above them. As this is a relatively small structure with small loading demands, the following are recommended foundation systems for the proposed abutments:

- Spread foundations bearing directly on these competent soils (Bottom of Footing at 10 to 15 feet below top of deck grade). Preliminary allowable bearing pressures of 10 ksf for Service and 20 ksf for Strength Limit demands may be used to size the footings for cost estimating purposes;
- Standard Plan CIDH piles can develop side resistance to resist axial demands. For preliminary cost purposes, we estimate the length of these piles to be between 40 and 50 feet, as measured from existing ground, for cost estimating purposes.
- As these foundations will be within the influence of the Natomas East Main Drainage Canal, the results of the scour analysis should be incorporated into the foundation design. Either account for the loss of soil due to scour at the foundations or place scour resistant riprap type armor to help arrest any potential scour.
- Appreciable lateral resistance to resist lateral demands may be developed at and below approximately 10 to 15 feet below top of deck grade.
- Driven pile foundations are not recommended do the hard/very dense/cemented nature of the site soils.

10.4. MECHANICALLY STABILIZED EMBANKMENTS

There are a total of six (6) MSE walls proposed on the project to retain the bridge approach fills. These retaining walls range up to 925 feet long and 31 feet tall. Based upon the as-built soils information, there is between 7 to 8 feet of loose clayey sands above competent bearing materials. The following provide foundation options for the proposed MSE wall foundations:

- Over excavate the unsuitable materials to between 10 to 15 feet below top of deck grade and replace material with select material placed at 95 percent relative density per ASTM D1557. This will allow one stage construction and significantly reduce settlemen of the MSE wall.
- Place the MSE wall on the loose layer of soil and allow the MSE wall to settle. Preliminary estimates of total settlements of between 4 and 9 inches. A settlement period should be included to allow the clayey potions to complete any time dependent settlement.
- For the above option, a two-stage wall (build a fabric or mesh faced wall and allow it to settle at which time the final face panels can be attached) would be feasible. A tall concrete cast-in-place abutment could be constructed with short wing walls to tie the two systems together. As there would be a thin column of fill, the active earth would be computed as a “silo fill” computed utilizing the equation published in the Montana Department of Transportation (MDT) Geotechnical Manual, Chapter 17, Earth Retaining Systems significantly reducing the earth pressure loading on the abutments.

10.5. CONSTRUCTION CONSIDERATIONS

All excavation and backfill work shall be performed in accordance with Section 19, Earthwork, of the State of California Department of Transportation Standard Specifications (2018 or latest edition).

Within the limits of the proposed MSE approach fill footprints, there are existing asphalt pavements, native grassland on the east side, and agricultural fields (rice) on the west. All of the existing asphalt pavements, vegetation, and organic soils should be completely removed within and five feet beyond the limits of the fill footprint. Select granular fill, placed at 95 percent relative density, should be used to fill any voids left from the clearing operations and brought up to a uniform level surface in a condition to start placing the MSE approach fills.

Real time, full time embankment settlement and fill placement monitoring should be performed at the start of construction the MSE approaches if built on the shallow weaker soils. Settlement monitoring plates should be installed and measured at the start and finish of every work shift and have continued readings of at least once a day during both the interim and final embankment construction stages until the measured settlements approach zero settlement, as determined by the Geotechnical Engineer.

There are existing underground and overhead utilities present within the project limits. All overhead utilities which are in conflict with the proposed improvements should be relocated outside of the project limits. Any existing underground utilities which are within the footprint or cross the proposed bridges and embankment alignments, and should be either relocated outside of the project footprint.

Difficulties in cast-in-drilled-hole foundation excavations may be present due to the following:

- Presence of dense granular soils;
- Potential presence of artesian groundwater conditions;
- Potential presence of caving granular soils in the upper 8 feet;
- Presence of utilities, potentially disturbed/contaminated soil and/or construction debris from railroad activities.

Based upon the as-built boring information, the borings were generally advanced through the encountered soils without difficulty. Generally, if the soils can be drilled with standard drilling equipment the excavations for substructures can be performed with standard heavy hydraulic excavation equipment. All excavation and backfill work shall be performed in accordance with Section 19, Earthwork, of the Caltrans Standard Specifications, latest edition.

In order to perform the CIDH pile excavations using dry methods, the excavations should meet the following requirements:

- Have less than 6 inches of water accumulation over a one-hour period when no pumping is performed;
- The sides and bottom of the excavation should remain stable during and after excavation;
- All loose material and water can be satisfactorily removed from the bottom of the excavation before inspection and concrete placement.

All shafts completed in the dry should be observed by the geotechnical engineer to evaluate the suitability of the bearing materials. The contractor should use the “wet” construction method if the above criteria cannot be satisfied.

If the CIDH piles are installed using wet methods (i.e., using drilling slurry to maintain excavation stability), we recommend that inspection tubes be installed within each of the CIDH piles to facilitate gamma-gamma and cross-hole sonic logging at completion of the pile. The contractor should also prevent the slurry from “setting up”, control the sand content of the slurry to less than 4 percent by volume at any point in the excavation and maintain the slurry level a minimum of 10 feet above the highest expected piezometric head surface or tremie bottom, whichever is greater. At no time shall a CIDH pile excavation be left open or with slurry overnight. All piles excavated within one 8 hour work shift shall have concrete placed within that same 8 hour work shift.

The bottom of the drilled shaft excavation should be cleaned of water and loose material before placing reinforcing steel and concrete. We recommend tremie placement for both wet and dry to prevent concrete aggregate separation. The tremie pipe should be clean and have a suitable inside diameter for use with the specific concrete mix, but not less than 10 inches. The discharge end of the tremie should allow free radial flow of the concrete and be immersed at least 10 feet in concrete and maintain a positive pressure differential at all times during placement to prevent water or slurry intrusion.

If a full length segmental temporary casing is used, the bottom of the casing should have a minimum of 10 feet of concrete head at all times when removing the temporary segmental casing to help prevent the formation of a soil intrusion or other defect in the CIDH pile concrete.

Any materials which are generated from the grading operations and not used for fill within the project limits will need to be disposed of off-site. The Contractor shall make arrangements for disposing of the materials outside the highway right of way and shall pay all costs involved.

11. Additional Fieldwork and Laboratory Testing

Typically, one boring is recommended to be drilled near each new substructure and one boring for every 150 feet of retaining structure. These borings should be drilled to sufficient depth to provide adequate information for the analysis and design of the proposed foundation systems. Based upon the limited As-built soils data available for the project site, the boring depths are anticipated to be between 60 and 80 feet in total drilled depth. As artesian (pressure) groundwater has been identified in nearby projects, the installation of piezometers screened within the zone of identified groundwater can be installed. Monthly readings will provide fluctuations in groundwater data which can help in bid document preparation and potential construction claim defense.

Laboratory testing of recovered soil samples may consist of following, depending on the actual type of soil samples recovered from the borings: gradation analysis, moisture/density, Atterberg limits, strength testing (unconfined compressive strength and/or direct shear testing), consolidation, and corrosive potential.

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12. Limitations

This Preliminary Foundation Report was performed in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made as to the conclusions and professional recommendations made in this preliminary report.

This Preliminary Foundation Report is intended for use with the Riego Road Grade Separation Feasibility Project located in Sutter County, California, and any changes in the design or location of the proposed new improvements, however slight, should be brought to our attention so that we may determine how they may affect our conclusions and recommendations. The conclusions and recommendations contained in this report are based upon the data relating only to this specific project and locations discussed herein.

13. Report Copy List

This report was prepared for and sent to:

Dewberry/Drake Haglan
11060 White Rock Rd # 200
Rancho Cordova, CA 95670

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14. Select References

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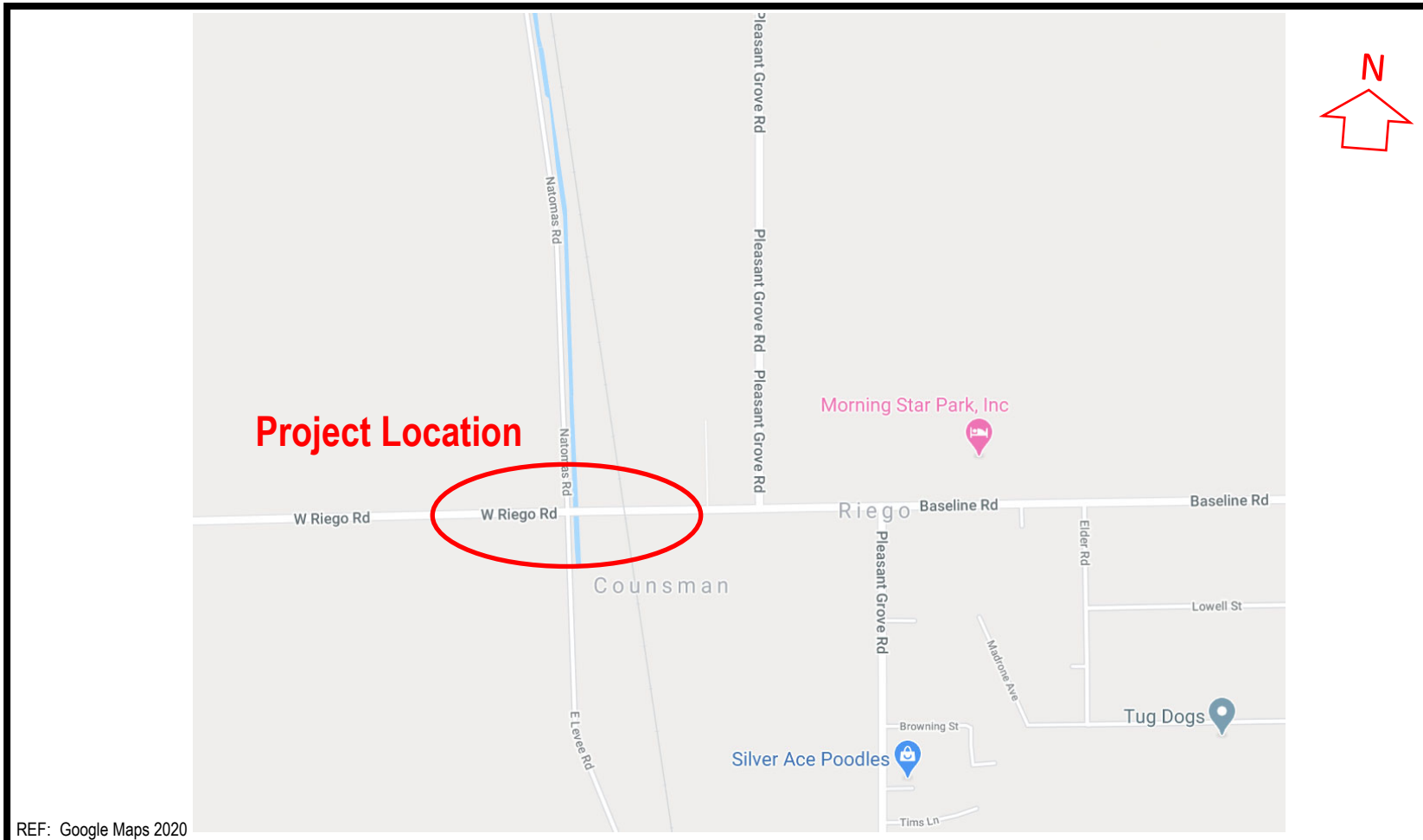
15. Appendices

Appendix I: Figures



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-a disadvantaged business enterprise -

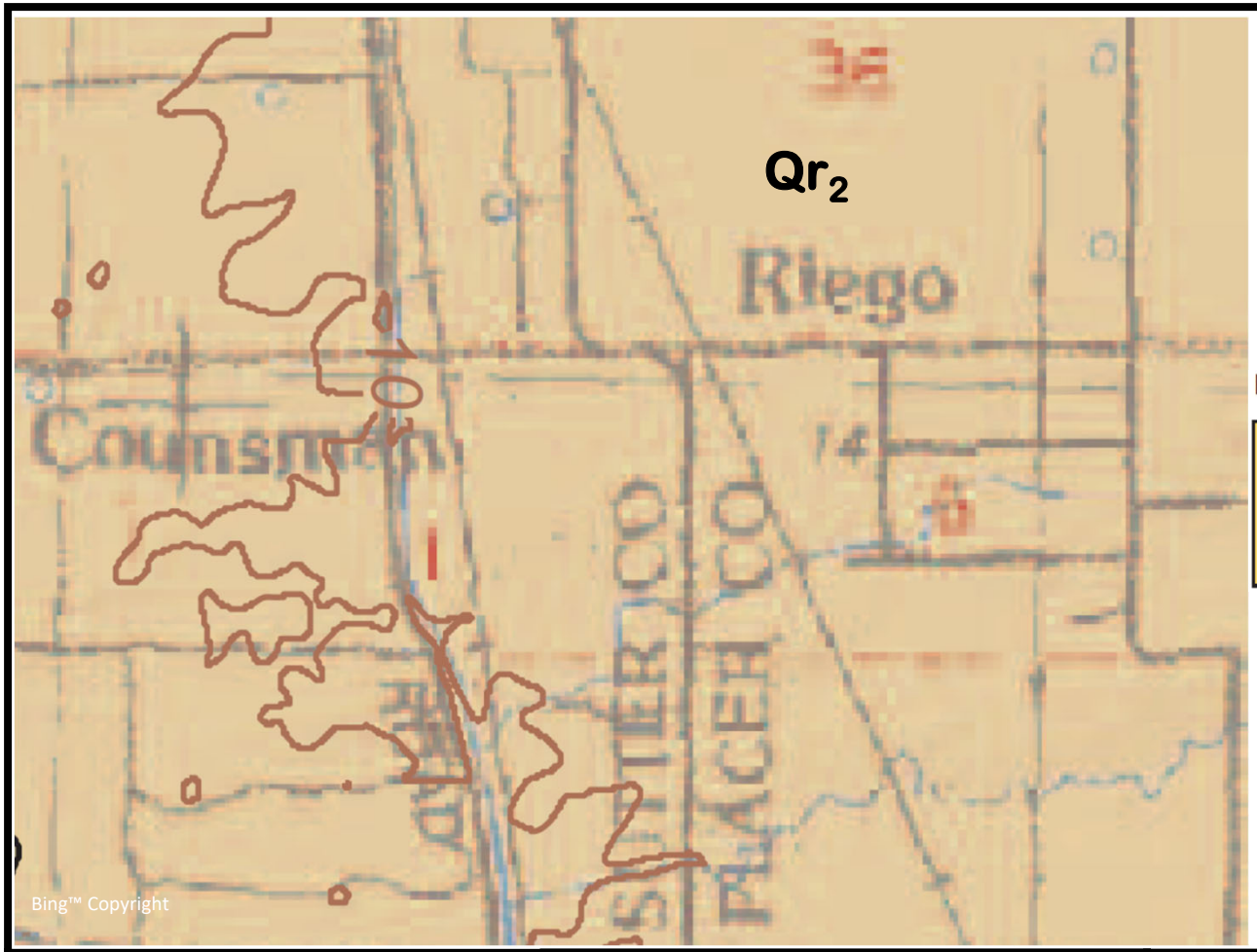
Vicinity Map

Riego Road Grade Separation
Riego Road at Union Pacific Railroad
Sutter County, California

Project Number
DB20025

Figure Number
1

Date Prepared
06-19-2020



N

Riverbank Formation

Qr	Qr_3	Qr - Undivided
	Qr_2	Qr_3 - Upper unit
	Qr_1	Qr_2 - Middle unit
		Qr_1 - Lower unit

REF: Preliminary Geologic Map of the Sacramento 30' x 60' Quadrangle, California Guiterez, 2011

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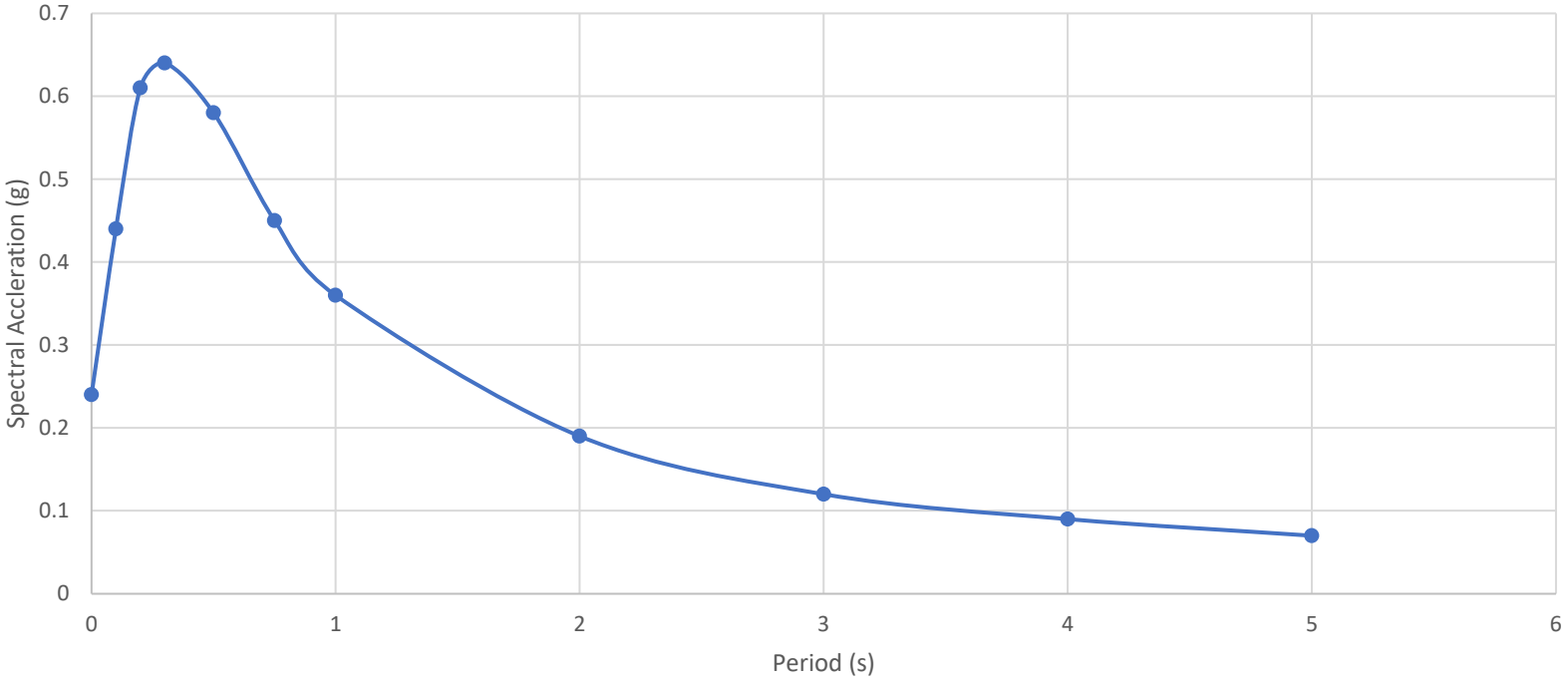
Regional Geologic Map

Riego Road Grade Separation
Riego Road at Union Pacific Railroad
Sutter County, California

Project Number
DB20025

Figure Number
2

Date Prepared
06-19-2020



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Design Response Spectrum (ARS Curve)

Riego Road Grade Separation
Riego Road at Union Pacific Railroad
Sutter County, California

Project Number
DB20025

Figure Number
3

Date Prepared
06-19-2020

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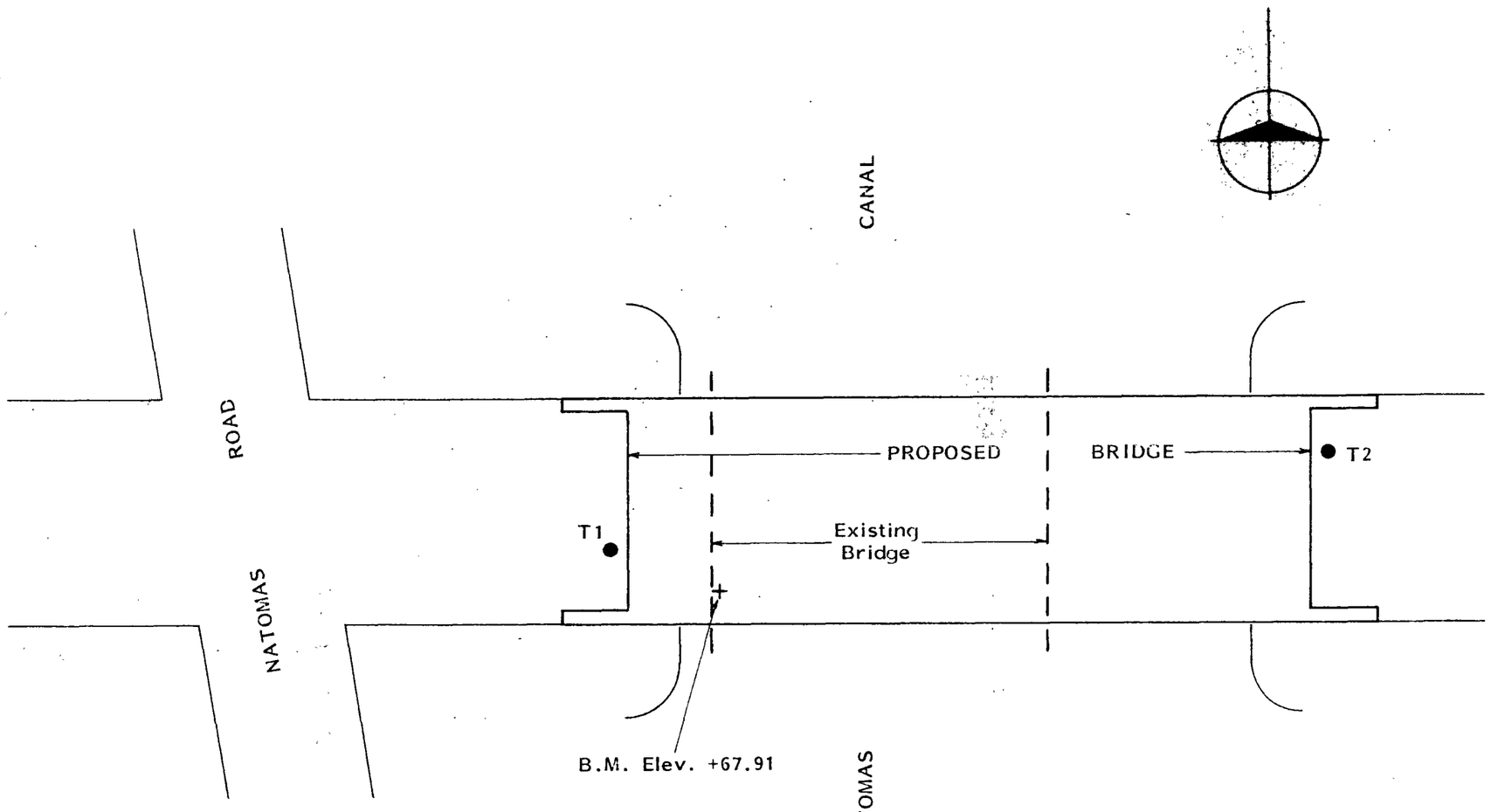
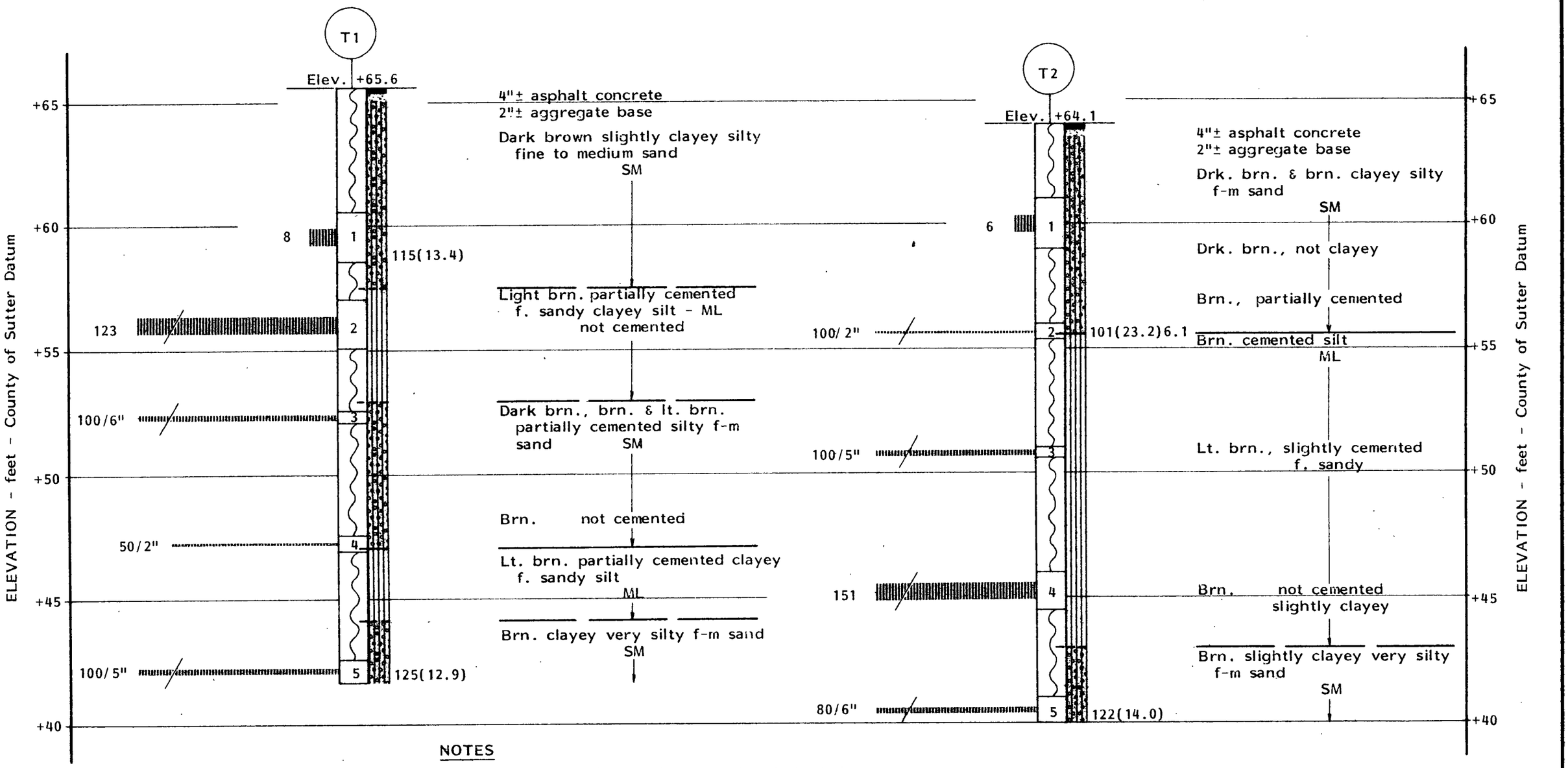
Appendix II: As-Built Log of Test Borings, Previous Laboratory Testing Results



NOTE: Prepared from a 1" = 20' General Plan of Proposed Crossing, dated July 3, 1979, drawn by the County of Sutter. Boring locations shown are only approximate.

BORING LOCATION PLAN

LOWRY & ASSOCIATES **GEOTECHNICAL ENGINEERS**	**DRAWN BY:** G.C. Barmby **CHECKED BY:** R.R. Grant **SCALE: FEET** 0 20	RIEGO ROAD BRIDGE AT NATOMAS CANAL Sutter County, California	**PROJECT NO:** 80-76 **DATE:** 3/80 **PLATE NO:** 1

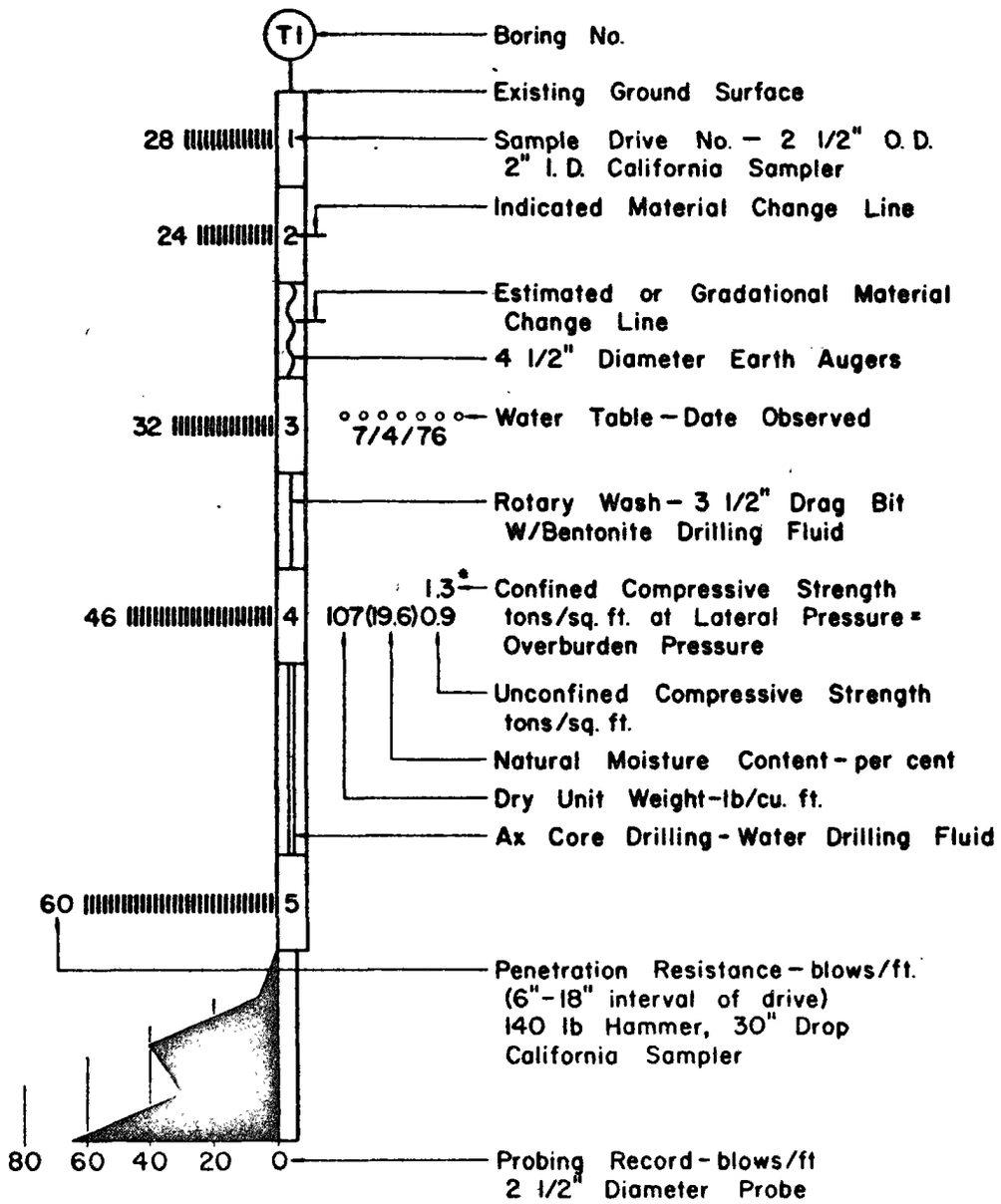


NOTES

1. The boring logs show subsurface conditions at the locations and on the date indicated. It is not warranted that they are representative of subsurface conditions at other locations and times.
2. Explanation of symbols and classification system shown on Plate No. 4.
3. Date drilled: 2/29/80.
4. Free water not observed in borings.

BORING LOGS

LOWRY & ASSOCIATES GEOTECHNICAL ENGINEERS	**DRAWN BY:** G.C. Barmby **CHECKED BY:** R.R. Grant	RIEGO ROAD BRIDGE AT NATOMAS CANAL Sutter County, California		**PROJECT NO:** 80-76 **DATE:** 3/80 **PLATE NO:** 2



BORING LEGEND

RIEGO ROAD BRIDGE
AT NATOMAS CANAL
Sutter County, California

PROJECT NO: 80-76
DATE: 3/80
PLATE NO: 3

MAJOR DIVISIONS		SYMBOLS	COLOR CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel-sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW		Well-graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand-silt mixtures
		SC		Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils

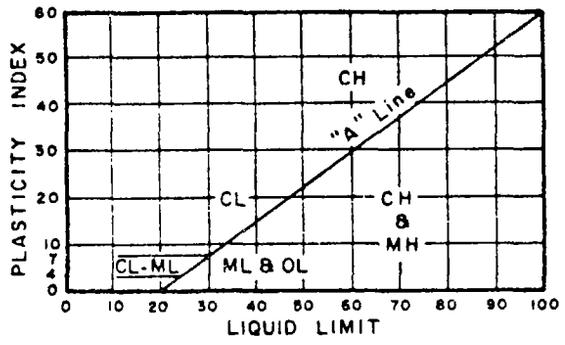
UNIFIED SOIL CLASSIFICATION SYSTEM

COHESIVE SOILS		GRANULAR SOILS	
Description	Blows/ft.	Description	Blows/ft.
Very Soft	< 3	Very Loose	< 5
Soft	3 - 5	Loose	5-15
Medium (firm)	6 - 10	Medium Dense	16 - 40
Stiff	11 - 20	Dense	41 - 65
Very Stiff	21-40	Very Dense	> 65
Hard	> 40		

CONSISTENCY CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
coarse (c)	3" to 3/4"	76.2 to 19.1
fine (f)	3/4" to No.4	19.1 to 4.76
SAND	No.4 to No.200	4.76 to 0.074
coarse (c)	No. 4 to No. 10	4.76 to 2.00
medium (m)	No 10 to No 40	2.00 to 0.420
fine (f)	No.40 to No.200	0.420 to 0.074
SILT & CLAY	Below No.200	Below 0.074

GRAIN SIZE CLASSIFICATION



PLASTICITY CHART

RIEGO ROAD BRIDGE
AT NATOMAS CANAL
Sutter County, California

LOWRY & ASSOCIATES
GEOTECHNICAL ENGINEERS

DATE: 3/80

PROJECT NO 80-76

PLATE NO: 4

SAMPLE NO.	DRY DENSITY (LBS./CU. FT.)	MOISTURE CONTENT INITIAL (%)	MOISTURE CONTENT FINAL (%)	MAXIMUM VERTICAL DEFLECTION (IN. X 10^{-3}) (+)	MAXIMUM VERTICAL DEFLECTION (IN. X 10^{-3}) (−)	NORMAL STRESS (LBS./SQ. FT.)	SHEAR STRENGTH PEAK (LBS./SQ. FT.)	SHEAR STRENGTH ULTIMATE (LBS./SQ. FT.)
Set No. 1 Boring No. T1 Depth: 10' - 11'	108	19.3	21.7			3000	5800	5170
	112	18.0	19.2			6000	7820	5930
	104	21.9	22.5			9000	9330	6560
Set No. 2 Boring No. T2 Depth: $18\frac{1}{2}'$-$19\frac{1}{2}'$	110	18.3	18.9			3000	5800	4040
	112	17.3	18.5			6000	8700	5800
	114	17.7	18.3			9000	10840	7820
	118	14.3	14.8			12000	11470	10840

TEST DATA

RATE OF STRAIN: 0.014 in/min.

SAMPLE CONDITION: Undisturbed

SAMPLE ENVIRONMENT: Submerged

RIEGO ROAD BRIDGE
AT NATOMAS CANAL
Sutter County, California

SUMMARY OF DIRECT SHEAR TESTS

LOWRY & ASSOCIATES
GEOTECHNICAL ENGINEERS

DATE: 3/80

PROJECT No.: 80-76

PLATE No. 5