FOR CONTRACT NO: 02-4C8204

INFORMATION HANDOUT

OPTIONAL MATERIAL DISPOSAL SITE

DISTRICT PRELIMINARY GEOTECHNICAL REPORT

ROUTE: 02-BUT-32, PM D4.4/D4.6

ADDED PER ADDENDUM NO.1 DATED FEBRUARY 19, 2009

INFORMATIONAL HANDOUT

For Contract 02-4C8204

Widen Shoulders and Lay Back Slopes

In Butte County About 31 Miles East of Chico

From 1 Mile to 1.2 Miles East of Soda Springs Road

OPTIONAL DISPOSAL SITE
TEH-32-PM 7.3/7.7

This site is approximately 3 miles east of the project limits. Excess material may be placed along the left shoulder in the California State Right of Way as in accordance with requirements outlined in this Informational Handout.

All work at optional sites is at Contractor's expense. Section 7 of the Standard Specifications applies.

<u>General Information</u>
This site is provided by Caltrans, at the option of the contractor, as a disposal site for the above-referenced contract. All work and provisions will be at the Contractor's expense except as otherwise specified.

This site is not warranted to be completely satisfactory to the contractor's needs.

Existing facilities at or near the site shall be preserved from damage by the Contractor.

Existing vegetation outside the designated limits shall be protected. The outlets of existing culverts shall not be covered or blocked in any way.

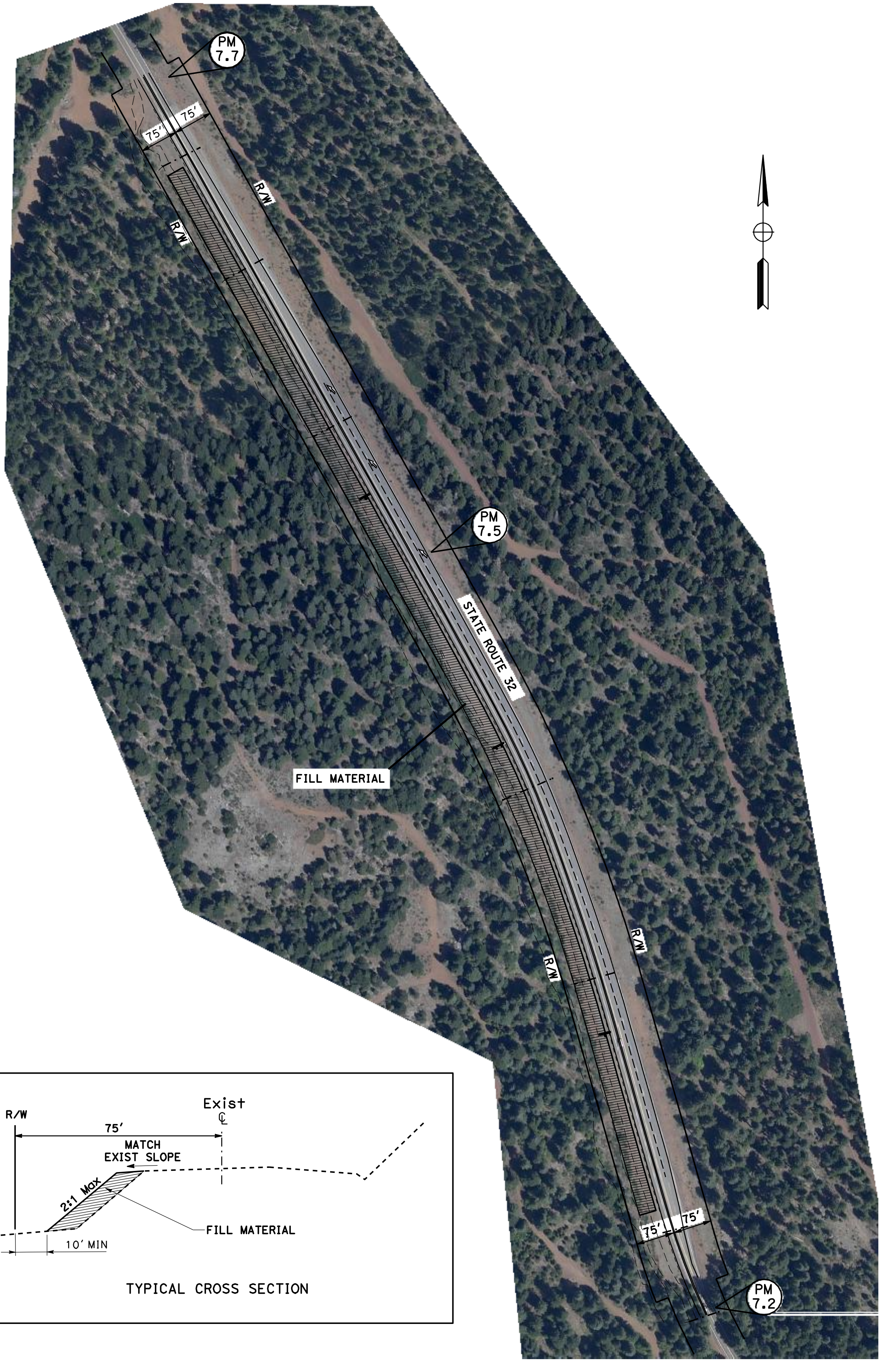
Truck ingress and egress shall be via the paved road.

Finish grade within the disposal area shall be constructed as shown herein. Embankment shall be constructed in accordance with Section 19, "Earthwork", of the Standard Specifications. Construction Stormwater Best Management Practices shall apply to this site. Final Erosion Control (Type D) shall be the same method as within the project limits.

OPTIONAL DISPOSAL SITE INFORMATIONAL HANDOUT

FOR CONTRACT 02-4C8204
02-BUT-32 - PM D4.4/D4.6

WIDEN SHOULDERS AND LAY BACK SLOPES



TYPICAL CROSS SECTION

Memorandum

Flex your power!
Be energy efficient!

To: JULIE CASEY
Senior, Branch Chief Design R4
District 2, Redding

Attention: Kathy Eckard

Date: March 10, 2008

File: 02-TEH-32-PM 4.4/4.6
02-4C820K
Soda Springs Shoulder
Widening

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5S

Subject: District Preliminary Geotechnical Report (DPGR)

1. Introduction

Per your request dated June 28, 2007, we have prepared this DPGR, which presents recommendations for shoulder widening of Route 32 from Post-Mile (PM) 4.4 to 4.6. The purpose of the shoulder widening is to have enough snow storage and sight distance for a through-cut on a curvilinear segment within the limits of this project.

The project is located on Route 32 in Butte County immediately south and east of the boundary with Tehama County. Although the project site is located in Butte County, the project post mile is considered to be part of Tehama County since the road post mile is reset to zero when it first crosses the boundary of Butte County and Tehama County. Within the vicinity of the project area, Route 32 meanders along the border of Tehama and Butte Counties. The project road segment is located in the Lassen National Forest, between Soda Springs and Chico Meadows, approximately 35 miles northeast of the city of Chico (See figure 1, Vicinity Map).

2. Pertinent Reports and Investigations

The District has provided this Office with basic project information including the aerial strip maps and basic contour level maps of the proposed road segment where shoulders will be widened. Our research yielded the following documents, and maps that were utilized in preparing this report. No previous reports for geotechnical concerns were available for our review.

- Geologic Map of California, Westwood Sheet - Scale 1: 250,000 (1960) published by California Geologic Survey (CGS).
- Mualchin, L, A Technical Report to Accompany the Caltrans-California Seismic Hazard Map 1996.
- United States Department of Agriculture, "Soil Survey Tehama County California" March 1967.
- Natural Resources Conservation Service, Soil Map Butte Area, Parts of Butte and Plumas County; and Tehama County, California, Web Soil Survey 2.0, National Cooperative Soil Survey.

3. Existing Facilities and Proposed Improvements

Within the project limits, State Route 32 is a conventional highway with two 12-foot lanes with unpaved shoulders. The existing road segment where shoulders will be widened and paved is divided into a fill section and a through-cut section. The length of the fill section is about 370 feet and the remainder 680 feet forms part of the through-cut section. The width of the unpaved shoulders in the fill section varies from 5 to 15 feet and for the through-cut section varies from 1 to 2 feet. The existing fill slope has an approximate slope ratio of 1.5:1(H:V); the upper section of the fill slope is slightly more pronounced due to accumulation of material that has been removed from the road by Caltrans maintenance personnel The original slope where the through-cut was excavated has a natural slope gradient that ranges from 3:1 to 4:1 (H:V) and an approximate height of 200 feet measured from the middle of the through-cut to the top of the hill (See figure 2, Route 32 Cross Section and Proposed Cut Slopes). The existing road cut along the southbound lane is about 30 feet high with a slope ratio that varies from 1:1 to 0.5:1 (H:V). The catchment area or ditch of the southbound lane is about 3 feet wide with a backslope ratios of 3:1 to 4:1 (H:V). The maximum height of the cut slope along the northbound lane is approximately 10 feet with a slope ratio of 1.5:1 (H:V). The width of the catchment area or ditch for the northbound lane is about 2 feet with backslope ratio of 3:1 to 4:1 (H:V).

On the east side of the project area, approximately 100 feet, there is a 12-foot wide logging road that runs parallel to the highway. The logging road is unpaved, with a base consisting of mainly soil and cobbles with some angular boulders.

Two alternatives have been proposed to widen the shoulders within the project limits. The first alternative consists of cutting the southbound and northbound lane slopes back to a distance consistent with the design of the proposed shoulders and ditches at each lane. The second alternative consists of removing only the existing 10-foot slope of the northbound lane and adding a section consistent with the proposed shoulders. Additionally, more fill will be placed in the fill section of the northbound lane in order to accommodate the new shoulders.

This DPGR addresses geotechnical recommendations related only to the construction of the proposed 4-foot wide shoulder along the north and southbound lanes of the Route 32 road segment between stations 280+00 and 290+50 (PM 4.3 and 4.5)

4. Physical Setting

Climate

According to the National Weather Service, the average annual precipitation at the Mineral Station (045679) is about 55.01 inches, based on record from 07/01/1948 to 06/30/2007. Over 75 percent of the precipitation falls between November and March. The mean annual temperature is approximately 45.2 °F with the highest daily temperature of 100°F during the month of August and September and the lowest daily temperature of -9°F during the month of December. A moderately hot and dry season extends from June through September. A cold and wet season occurs from November through March. The average snowfall is 152.7 inches and over 95 percent of the snowfall occurs during the months of November through April. The climate historical data indicates that significant periods of daily temperature above 50°F, required for paving operations, are not likely from November through March.

Topography and Drainage

The project is located in the eastern section of the Tehama County. According to the topographic maps of the project region at http://www.topozone.com/, the topography of the zone is formed by sloping plateau deeply entrenched by many streams. Summits are fairly large, partly rounded and gently sloping. Streams between summits are entrenched in deep and steep-walled canyons.

Terrain elevations within the vicinity of the project vary from 4200 feet to 3600 feet above the mean sea level (msl). The elevations within the project limits vary from 3970 feet at the beginning of the project to approximately 4010 feet above msl at the end of the project (See figure 3, Topography of the Project Area). A small creek, tributary of Cascade Creek, flows under the road segment through a 36-inch corrugated metal pipe culvert at station 282+20. The general direction of the small creek is northwest to southeast. This creek, as well as Cascade Creek, is considered a perennial stream.

Cascade Creek is considered a tributary of Big Chico Creek. The natural surface drainage of the region, including Cascade Creek, is generally toward the southwest. The area surrounding the site is mostly rural forestland.

Regional Geology and Area Geology

The project site is located within the Sierra Nevada geomorphic province of California. The Sierra Nevada stretches for about 375 miles along much of the California's eastern border and its width ranges from 40 to 80 miles. It trends from south-southeast to north-northwest. The mountain range was formed by the uplift and tilting that has taken place in the past 5 million years. However, the majority of rocks that formed the Sierra Nevada are much older, roughly 120 to 130 million years. These rocks are best described as plutonic rocks or igneous rocks and constitute the Sierra Batholith. Most of the rocks in the batholith are granitic in their composition. The most common granitic rocks of the Sierra Nevada are classified as granite, granodiorite, or tonalite; granodiorite is the most abundant. Other plutonic rocks such as diorite are much less abundant than granitic rocks.

During the field visit to the site on July 25, 2007, attended by the author of this report, Scott Lewis from Office of Geotechnical Design North, Branch C, and Glen Hammond from the Division of Design R4, District 2, Redding, it was observed that the geologic composition of the road cuts reviewed compares favorably with Pliocene pyroclastics rocks described in the Geologic Map of California, Westwood Sheet (1960) (See figure 4 through 6, Legend of Regional Geologic Map, and Regional Geologic Map). The pyroclastic rocks consist of angular andesitic and basaltic gravel to boulder size rocks in a well to poorly cemented ash tuff matrix. The matrix, when loose, consists of dry, silty sand.

Seismicity

According to the Caltrans California Seismic Hazard Map dated 1996 the controlling fault is the Rich Bar Fault (RIB) and it is located approximately 17 miles east of the project location. Caltrans has assigned this fault a Maximum Credible Earthquake of Moment Magnitude (MCE) of 6.5 (See Seismic Hazard Map, Figure 7). Using the attenuation relationship by Sadigh et al (1997), it is estimated that the site is likely to experience a Peak Bedrock Acceleration (PBA) of 0.2g in the event of a 6.5 magnitude earthquake associated with Rich Bar Fault.

Soils

According to the Soil Survey of Tehama County, California, 1967, the soils within the project limits consist mainly of *McCarthy Sandy Loom*. (MkE) (See Figures 8 through 10, Legend of Soils Map, and Soils Map). According to the Soil Survey, the McCarthy series are moderately steep to very steep soils. They are considered well-drained soils and formed in material from volcanic breccia. The volcanic breccia consists of rocks of basalt and andesitic origin, cemented with tuffaceous material. These soils are mostly of granular composition. A short description of the soil present within the limits of the project is presented below.

McCarthy Sandy Loam (MkE), 30 to 50 percent slopes. This soil predominates within the project area and consists of granular sandy loam that is characterized as having very good drainage, medium to rapid runoff, and moderately rapid permeability. Additionally, its capacity of holding available water is low and fertility is moderate. The table below presents a mechanical analysis of representative soils samples from this soil according to the Soil Survey Report of Tehama County, California, Department of Agriculture, 1967.

Table 1: Mechanical Analysis of Representative Samples of *McCarthy Sandy Loam (MkE).*
(Soil Survey Report of Tehama County, California, Department of Agriculture, 1967)

Depth	Gravel		Sand						Silt	Clay
(in)	>2" (%)	Total (>.08") (%)	V.Coarse (.08-.04") (%)	Coarse (.04-.02") (%)	Medium (.02-.01") (%)	Fine (.01-.004") (%)	V. Fine (.004-.002") (%)	Total (%)	(%)	(%)
0 – 3	--	27.1	13.4	11.2	13.8	17.4	15	70.8	21	8
3 – 18	12.7	41.6	10.2	13	10.6	16.2	17.2	67.2	20	13
18 – 30	6.2	62.7	9.2	9.6	11.6	16	13.8	60.2	21	19
30+	Parent rock									

Groundwater

Groundwater information from the vicinity of the project area is non-existent, since no water wells are in the area. However, the project engineer reported the presence of an intermittent spring below the 36-inch culvert that traverses under the road segment. The presence of the spring indicates the groundwater table is intersecting the creek bed. It is common in these areas for groundwater to directly feed creeks during and shortly after the rainy season. The bottom of the creek is approximately 40 to 50 feet below the road grade, and it is projected that the groundwater table may be encountered approximately at that particular depth or slightly higher. It is expected that the ground water will not interfere with the planned construction operations.

5. Site Conditions

During the field visit to the site on July 25, 2007, it was observed that the existing slopes consist of highly weathered to weathered pyroclastic rocks composed of angular andesitic and volcanic gravel to boulder size rock in a loose to well cemented ash tuff matrix. The approximate slope inclinations of the southbound road cut varies from 1:1 to 0.5:1 (H:V) with a height of approximately 30 feet. Slope cut of the northbound lane is 1.5:1(H:V) and 10 feet high. The slopes appear to be performing well with no indications of instability. It was not observed significant active erosion within the project limits. The existing cut/fill slopes do not show significant signs of erosion. However, the potential for erosion is relatively high where the slope materials are loose or decomposed.

The west slope gradient of the road fill section is approximately 1.5:1(H:V) and about 30 feet high. The east slope has the same gradient, but its height approximates 45 feet. It was observed that the east and west slopes are covered by non-structural fill material. The thickness of this unsuitable material varies from 3 to 4 feet at the top of the fill to 1 to 2 feet at the bottom. Material swept from the road has been pushed over the fill and accumulated over the course of several years. The road fill seems to be performing adequately.

Rockfall

In general, the potential for rockfall is low except in areas where rock outcrops are present; it seems that the inclination and the height of the slope, and the road ditch preclude some of the large dislodged rocks to come to rest in the travelled way. At the time of the visit, dislodged boulder-size rocks were not observed in the roadway; however, only cobbles and coarse gravel were observed resting in the road ditch areas. It is likely that rockfall is more frequent during the winter and early spring.

Landslide Potential

Examination of satellite images and maps of the project area indicate that there is no evidence of significant landslides within the project limits. However, there is a geomorphologic evidence of an old landslide approximately 1 mile south of the project along Route 32 and immediately south from the intersection with Soda Springs Road. The old landslide fills a narrow valley between two steep hills. The toe of the landslide still retains its characteristic curved margin. (See figure 11, Landslide Potential).

The lithologic, geopmorphologic, and climate similarities that the old landslide site shares with the project area suggest that the probability for a landslide to occur within the project limits is always present.

6. Preliminary Geotechnical Recommendation

The preliminary geotechnical recommendations presented in this report are related to the location and construction of the proposed shoulders and the road cuts within the project limits.

Our Office recommends that the following two alternatives be considered to construct the road shoulders and at the same time to increase the snow storage and to improve sight distance within the project limits. These alternatives, listed below, are presented in order of preference.

The first alternative involves the removal of the slope of the northbound lane or cutting back the same slope to a distant consistent with the design of the shoulders. If slope is cut back, the slope ratios for the new slope can range from 1.5:1 to 1:1(H:V), (See Figure 2, Route 32 Cross Section and Proposed Cut Slopes). Whatever the choice is made, it will be required that the roadway be realigned. The approximate height of the existing cut is 10 feet at its highest point and existing slope ratio is 1.5:1(H:V). Some of the excavated material would be used for the construction of the fill extension. It has been planned that the excess material will be disposed of in an area out of the project limits.

It is highly recommended to keep the existing catchment area or road ditch width and backslope of the south bound lane intact, or if it is possible to extend these parameters for better protection of the traveling vehicles. A correctly design catchment basin is considered one of the most effective rockfall protection measures. A rough estimate of a catchment area or road ditch can be provided to the District. Using a slope height of 40 feet, slope ratio of 0.5:1(H:V), and considering a 90 percent rockfall retention, it is estimated that the basin width will range between 10 and 12 feet with a unpaved backslope of 4:1 (H:V).

The second alternative consists of cutting back slopes at each side of the road to a distance consistent to the design of the shoulders (See Figure 2, Route 32 Cross Section and Proposed Cut Slopes). The resloping of the 30-foot high southbound slope would be required. The excavation of the slope may be extensive due to the difference in the proposed slope gradient and the terrain natural gradient. The road fill section would be extended to a distant that is also consistent with the design of the shoulders.

Both alternatives will require that the 36-inch culvert under the fill section be extended to a length consistent with the design of the new fill. The first alternative will require that the 36-inch culvert be extended only in the downstream side, whereas the second requires an extension of the culvert in both downstream and upstream sides.

Rippability

Rippability is the ease with which soil or rock can be excavated mechanically. It is anticipated that rippable material will be encountered within project interval. The material is rippable with conventional excavation equipment.

Material Sources

Soil material for the expansion of the fill will be excavated from the through-cut section during the construction of the shoulders. Testing of excavated material will be performed during the design phase.

Expansive Material

According to the Highway Design Manual, and expansive subgrade is defined as having a California R-Value less than 10 and a Plasticity Index greater than 12. Our office recommends that the material from the slope cut must be tested during the design phase.

Settlement

It is anticipated that an immediate ground settlement will occur during the fill placement. Because there are no soft, saturated, clay or silt layers underlying the proposed widening area, we do not anticipate long-term consolidation settlement. If fill placement is compacted according with the "Standard Specifications", it is expected that a post-construction settlement to be less than ½ -inch.

Geometry and Stability

The maximum height of the fill section is 46 feet and side slopes will have a gradient of 1.5:1(H:V). The proposed and existing fill geometries are common slope gradients considered stable for typical road fill.

Site Preparation

Before slope removal or resloping of existing slopes, and placement of additional fill, clear and grub slopes and fill grades in accordance with the Caltrans Standard

Specification, Section 16. Removal or resloping of the existing road slopes of the through-cut section should be performed in accordance with Caltrans "Standard Specifications", Section 19-2. New fill shall be placed in accordance with Caltrans "Standard Specifications" (including in Section 19 titled "Earthwork").

Non-structural fill material accumulated on top and sides of the fill must be removed prior the placement of new fill. The Engineer must approve the prepared slope surface prior the placement of new fill.

Compaction

The placement of the new embankment fill shall be in accordance with Section 19.5 of Caltrans Standard Specifications that provides recommendations for compaction of the material in the embankment.

7. Construction Considerations

Conventional excavation equipment such as scrapers, dozers, backhoes and excavators are sufficient to excavate surficial soil, weakly cemented soil material, and known fill materials present in the project interval.

The 1.5:1(H:V) side slopes proposed for the embankment fill will be adequate for the construction of the additional fill. However, it has been our experience that fill slopes with a this slope ration do not perform well during the first couple of rainy seasons after completion, and surficial slope failures or sliver slope failures may occur during this time. For a variety of reasons the outer few feet for new embankments are not well compacted, and once the soil becomes saturated, it tends to slump. Should the District use this slope gradient, the District should incorporate sufficient mitigating factors for this additional risk. Mitigation factors may consist of extra contingency funds and time in the construction contract so that the slopes can be repaired with Rock Slope Protection. (RSP).

Our Office recommends a 2:1 (H:V) slope for the embankment fill to minimize erosion of the surficial soil and the risk of surficial slope failures. It should be noted if this slope angle is used, then additional right-of-way may need to be acquired.

If the District chooses to construct a 1.5:1(H:V) or stepper slope, our Office highly recommends the incorporation of horizontally placed geosynthetic reinforcement in the outer layers of the embankment to enhance the stability of the soil structure. Generally, the reinforcement consists of primary and secondary or intermediate geogrid layers (See Figure 12, Typical Cross Section of a Reinforced Soil Slope). Typically, spacing of primary geogrid reinforcement are within 2.5-ft to 4-ft range at the bottom of the slopes, and as high as 6 feet at the top of the slope. Secondary or intermediate geogrid layers, utilized to provide stability at the face of the reinforced slopes with inclinations gentler than 45 degrees, are relatively short layers of lightweight geogrid reinforcement placed at relatively tight spacing between the layers of primary reinforcement. Furthermore, intermediate geogrids provide better platform for compaction equipment, thus ensuring uniform soil density to the face of the slope. It is suggested that biaxial geogrids be used for construction of the slope. Biaxial geogrids are those that can be installed and loaded in both machine direction and cross-machine direction. This geogrid feature prevents common mistakes experienced by the contractors during the installation. Experience indicates that the risks of slope failure, and construction and maintenance problems can be significantly lowered by the construction of a reinforced soil slope.

Our Office strongly recommends that sliver fills be avoid during the construction of the embankment.

Unsuitable or non-structural material on the existing fill slopes dumped by Caltrans Maintenance personnel during the course of several years must be removed and disposed of in an area out of the project limits.

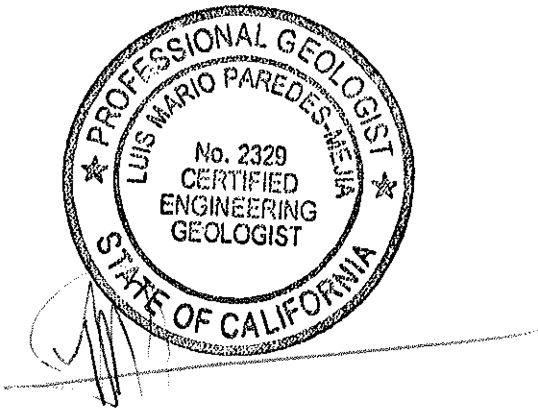
Angular boulders of approximated diameter of 12 inches or greater, are expected to be encountered during the construction of the shoulders along the through-cut section.

8. Future Investigations

The above-mentioned recommendations are intended for preliminary design and estimating purpose only. In order to more accurately determine the probability of encountering boulders, bedrock or groundwater within the limits of the excavation for the construction of the shoulders we recommended a subsurface investigation. A subsurface investigation may consist of seismic refraction survey, sampling and laboratory testing to support our final recommendations.

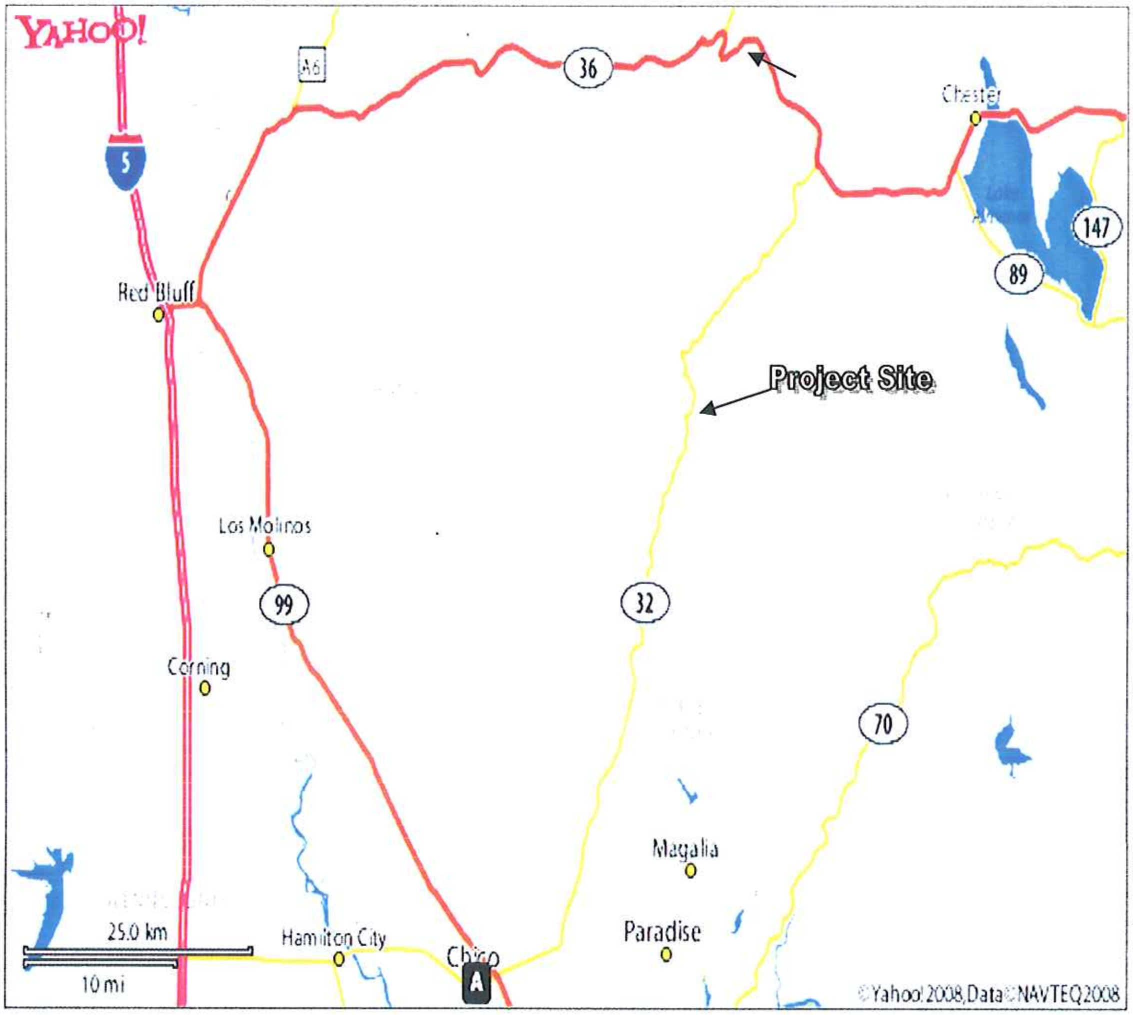
We anticipate that six months will be required to accomplish the subsurface investigation and submit the Geotechnical Design Report (GDR) after we receive the GDR request from the District. Our Office will provide resource estimate to Project Management.

If you have any questions or comments, please call Luis Paredes-Mejia at (916) 227-1047 or Douglas Brittsan at (916) 227-1079.

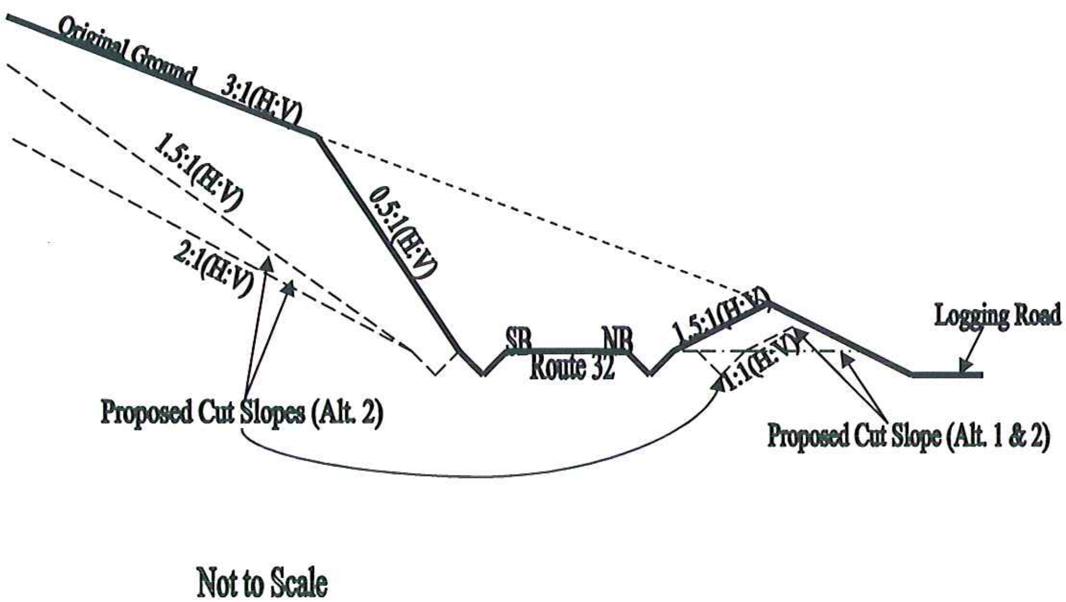


LUIS M. PAREDES-MEJIA
Engineering Geologist, CEG 2329
Geotechnical Design – North, Branch C

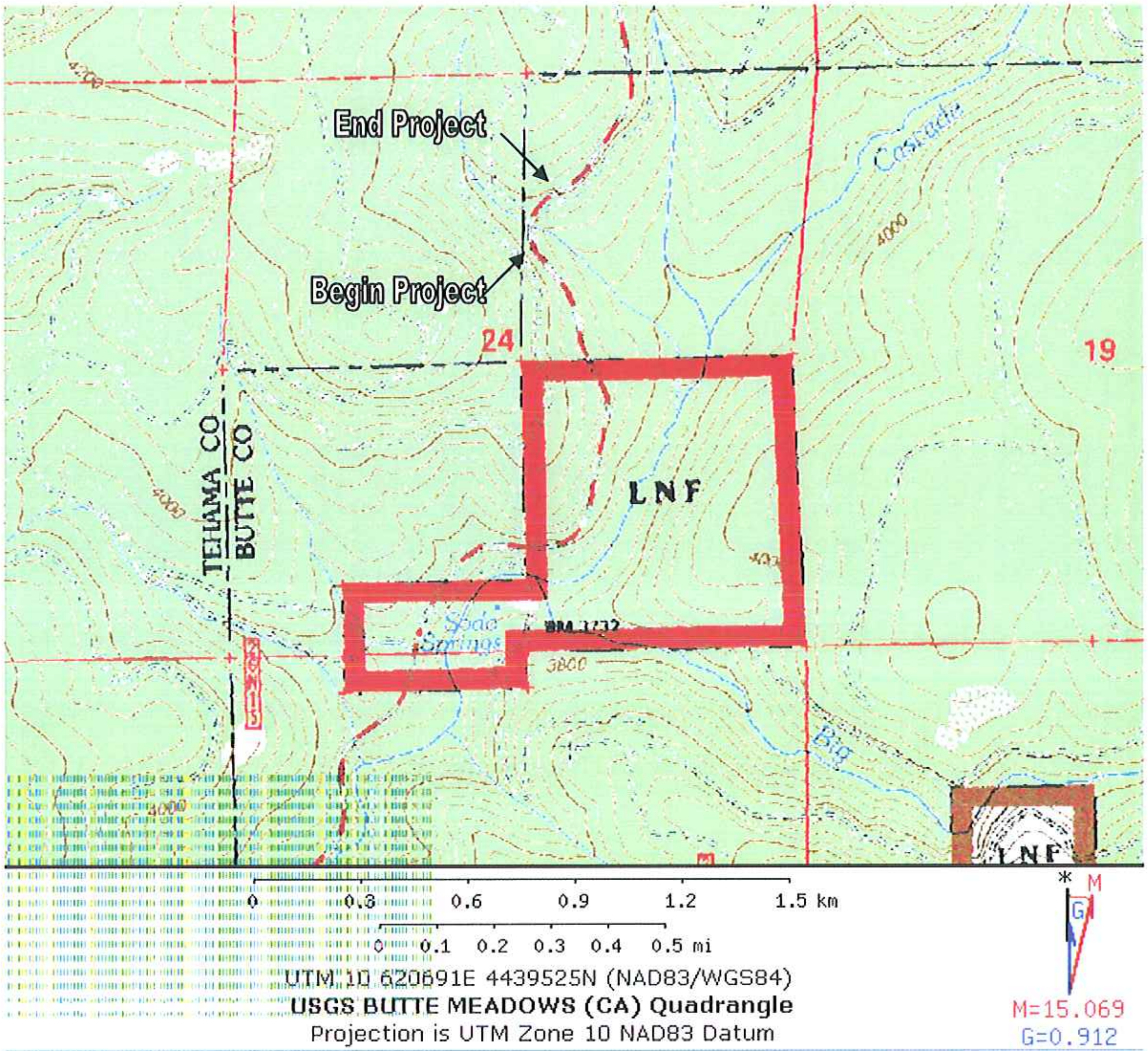
C: Douglas Brittsan
GDN File
DME D2 (e-copy)



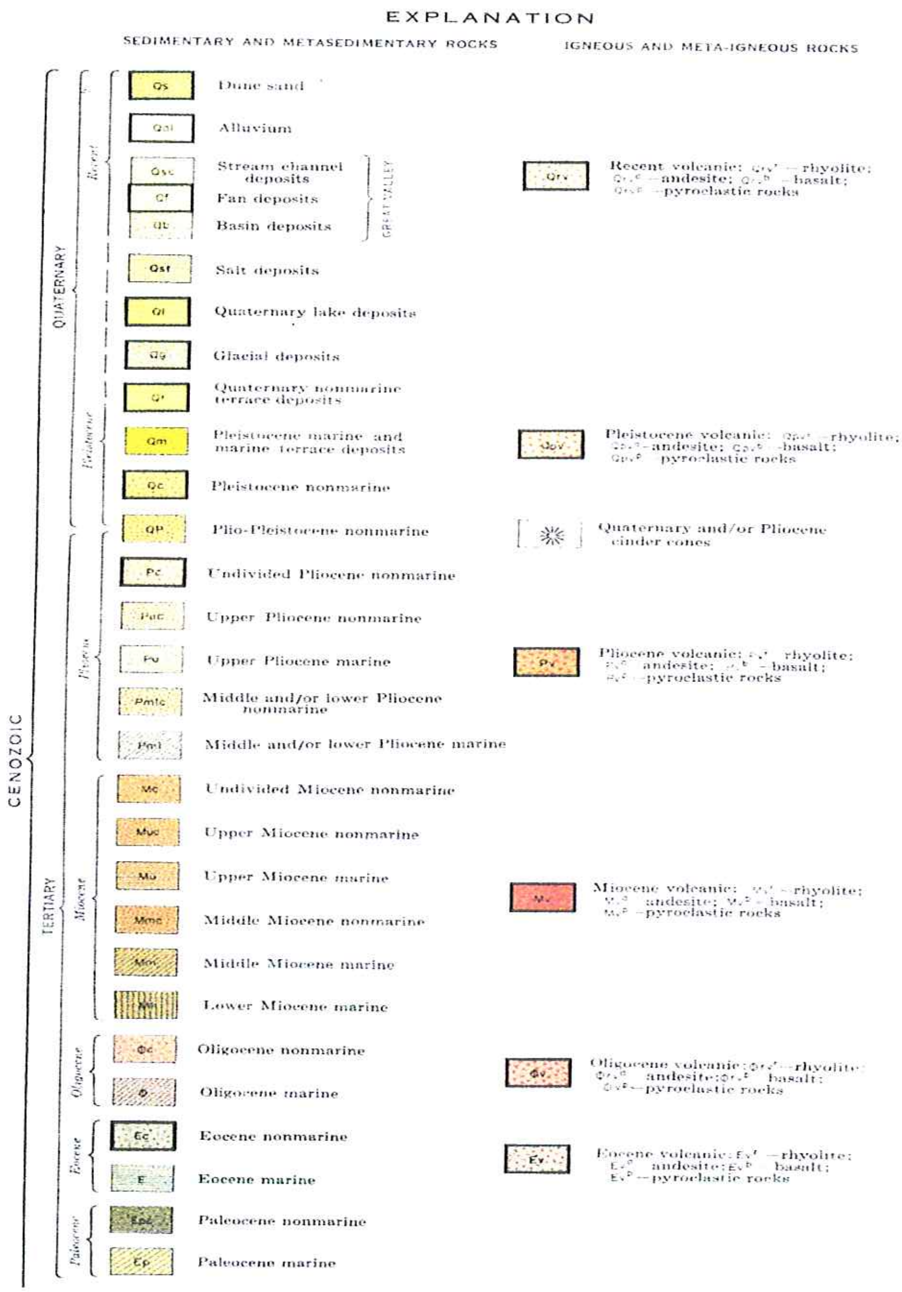
CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Vicinity Map**	
	02-TEH-32- PM 4.4/4.6 **Soda Springs Shoulder Widening**		Figure 1



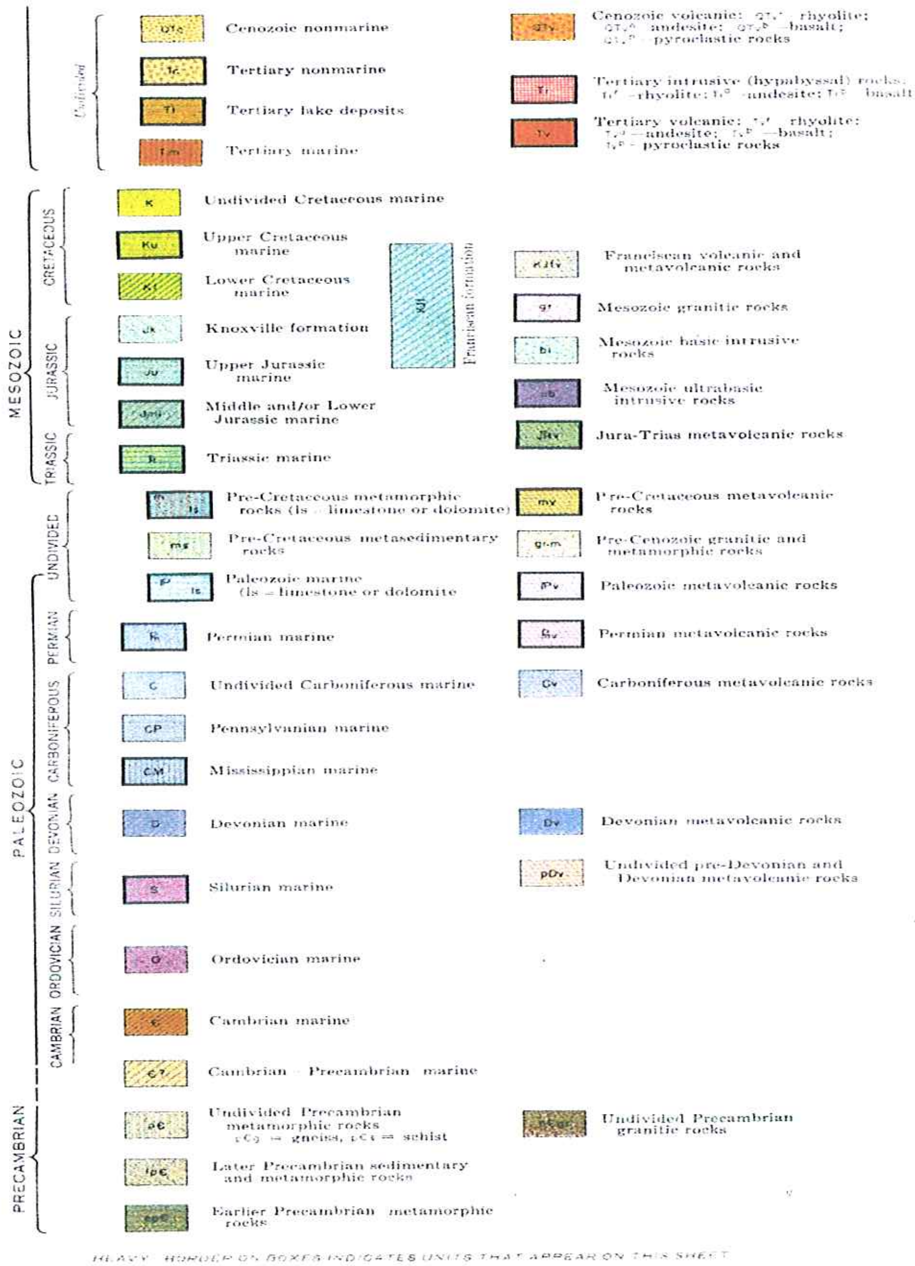
CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	Route 32 Cross Section and Proposed Cut Slopes	
	02-TEH-32-PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 2



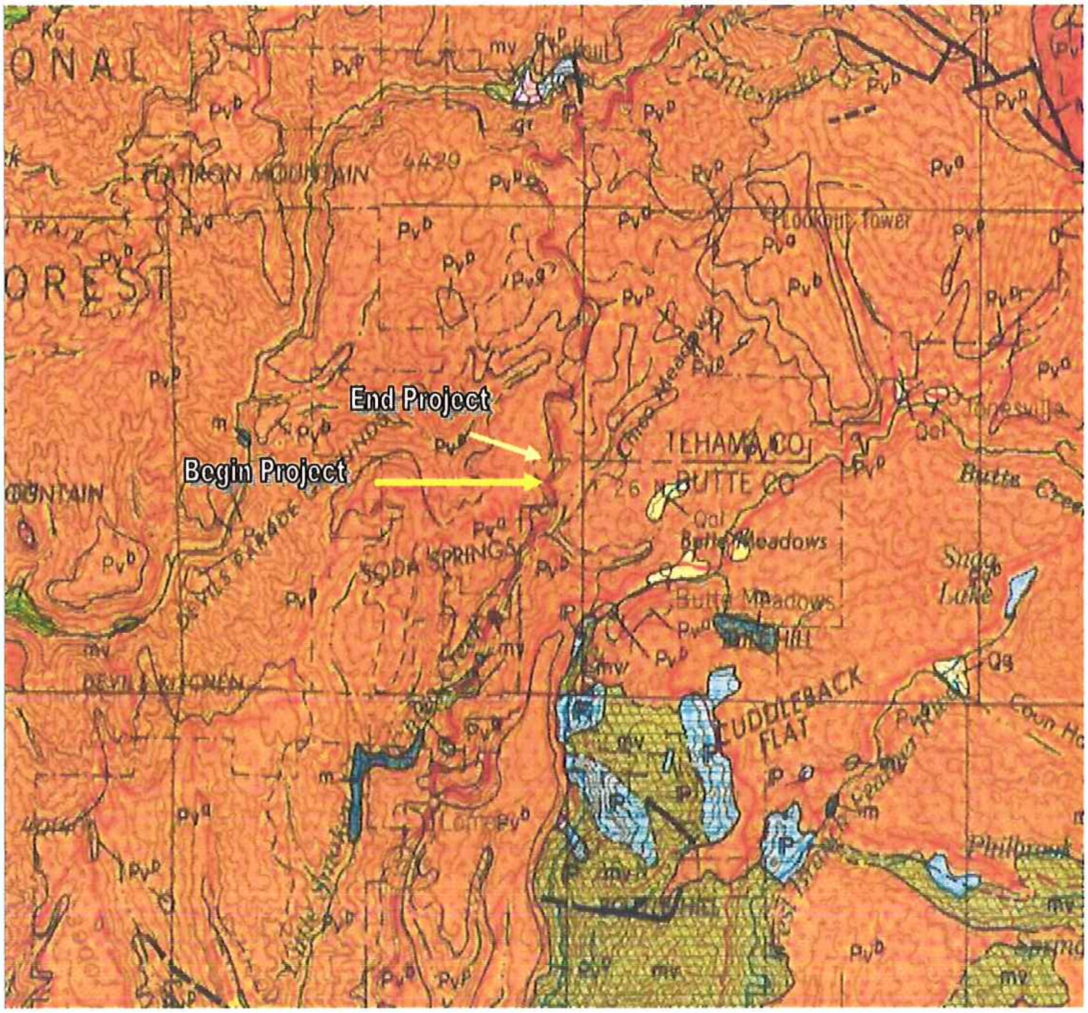
CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Topography of Project Area**	
	02-TEH-32-PM 4.4/4.6 **Soda Springs Shoulder Widening**		Figure 3



CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Legend Regional Geologic Map**	
	02-TEH-32- PM 4.4/4.6 **Soda Springs Shoulder Widening**		Figure 4

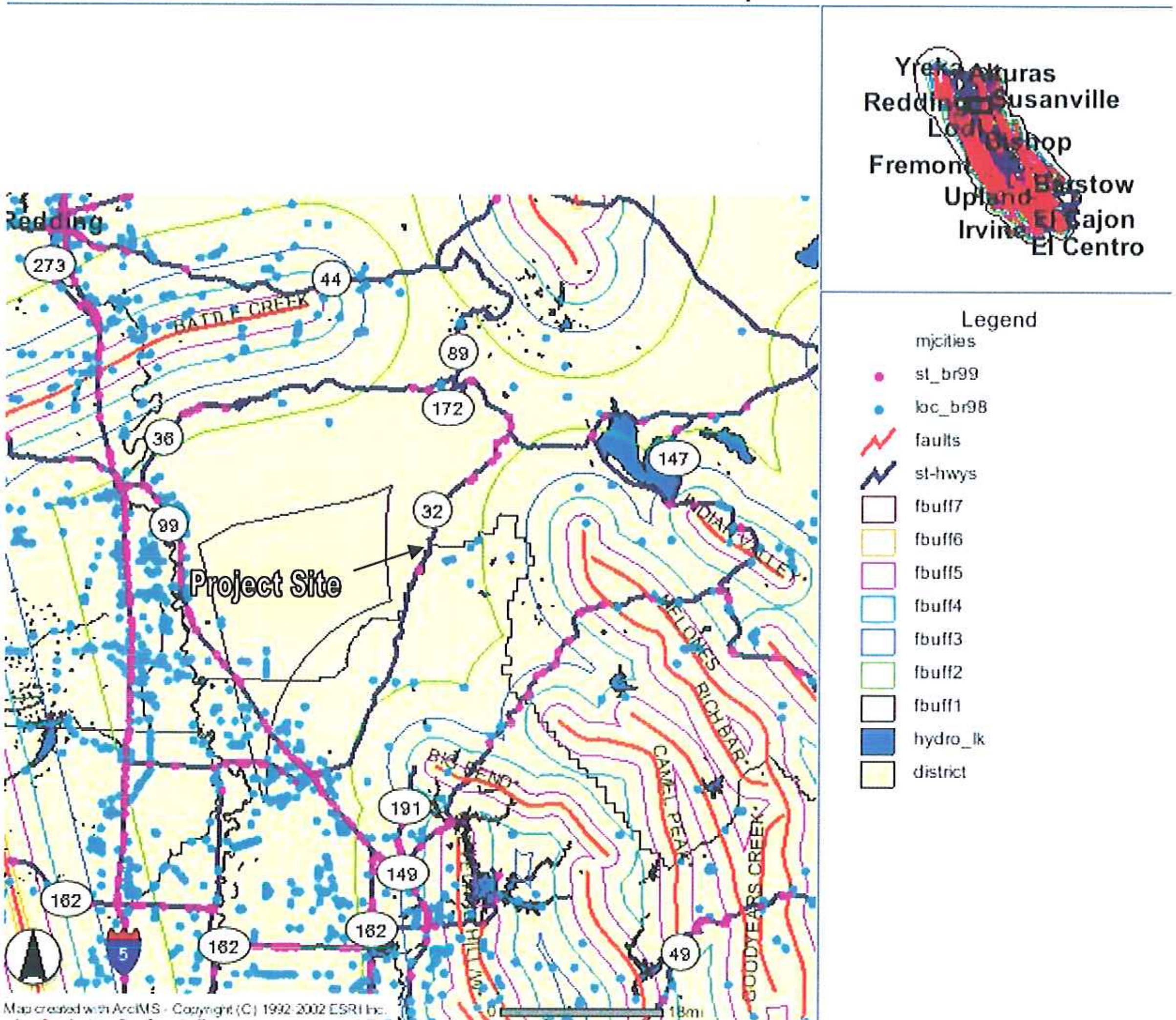


CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Legend Regional Geologic Map**
	02-TEH-32-PM 4.4/4.6 **Soda Springs Shoulder Widening**	Figure 5



CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Regional Geologic Map**	
	02-TEH-32- PM 4.4/4.6 **Soda Springs Shoulder Widening**		Figure 6

ArcIMS HTML Viewer Map



CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	Seismic Map of Project Area	
	02-TEH-32-PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 7

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Butte Area, California, Parts of Butte and Plumas Counties
Survey Area Data: Version 8, Dec 14, 2007

Soil Survey Area: Tehama County, California
Survey Area Data: Version 4, Dec 17, 2007

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 9/14/1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	**Legend of Soils Map**	
	02-TEH-32- PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 8

Map Unit Legend

Butte Area, California, Parts of Butte and Plumas Counties (CA612)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
814	MOUNTYANA GRAVELLY LOAM, 2 TO 15 PERCENT SLOPES	8.7	11.6%
815	MOUNTYANA GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	43.6	58.3%
824	BEECEE VERY GRAVELLY MEDIAL LOAM, 30 TO 50 PERCENT SLOPES	9.8	13.2%

Tehama County, California (CA645)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MkE	McCarthy sandy loam, 30 to 50 percent slopes	12.7	17.0%

Totals for Area of Interest (AOI)	74.8	100.0%

CALTRANS
Division of Engineering Services
Geotechnical Services
Geotechnical Design – North

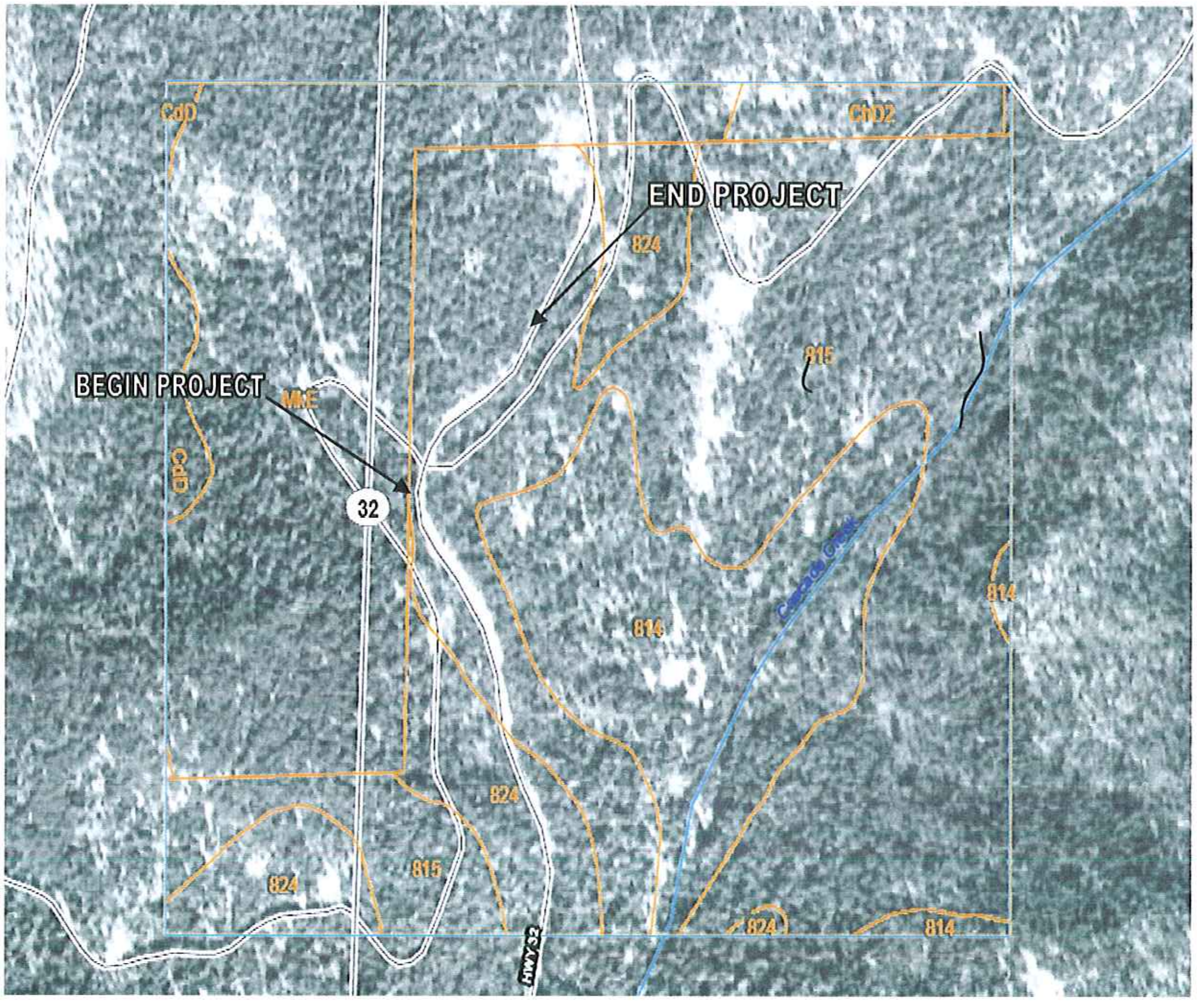
EA: 02-4C8200

March 2008

Legend of Soils Map

02-TEH-32-PM 4.4/4.6
Soda Springs Shoulder Widening

Figure 9



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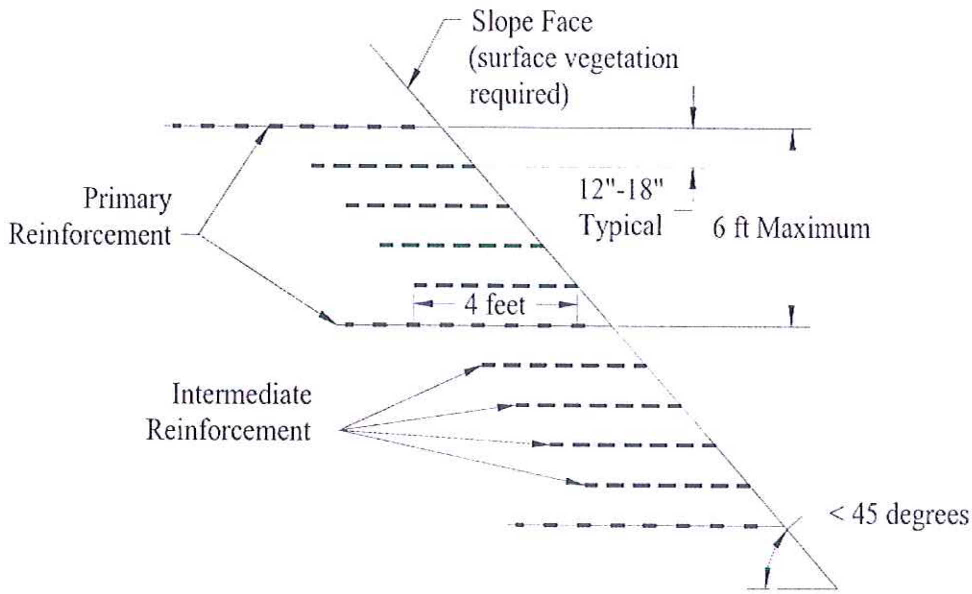
EA: 02-4C8200 March 2008	Soils Map	
02-TEH-32-PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 10

CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	EA: 02-4C8200 March 2008	Landslide Potential	
	02-TEH-32-PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 11



Cross Section of Reinforced Slope with Slope Angle < 45 degrees

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EA: 02-4C8200	Cross Section of Typical Reinforced Soil Slope	
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02-TEH-32-PM 4.4/4.6 Soda Springs Shoulder Widening		Figure 12