FOR CONTRACT NO: 02-2E7304

INFORMATION HANDOUT

MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT

OPTIONAL DISPOSAL SITES

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MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
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To: AL TRUJILLO
DISTRICT 2 SAFETY DESIGN BRANCH CHIEF

Date: February 15, 2012

File: 02-TEH-32-PM22.35/22.75
02-2E7300
Deer Creek Curves
Realignment

Attn: KEN HALLIS
SAFETY DESIGN PROJECT ENGINEER

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

Subject: Geotechnical Design Report for Deer Creek Curves Realignment

1. Introduction

Per your request we are providing this Geotechnical Design Report (GDR) for the proposed realignment of State Route 32 in eastern Tehama County, California. The realignment is proposed to be between the post miles 22.35 to 22.75. The project site is located approximately fifteen miles west of the town of Chester, California. It is our understanding that the proposed realignment is to provide curve corrections for better site distance and widen existing paved shoulders. The purpose of this report is to provide geotechnical recommendations for the project work proposed.

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This report includes a review of published data such as California Department of Mines and Geology (DMG) publications and National Resource Conservation Service (NRCS) soil surveys, a review of previous site explorations, site reconnaissance's and slope stability modeling.

Limited subsurface exploration with regards to rippability was performed and results of the study were reported in the District Preliminary Geotechnical Report (DPGR) for this project. A copy of the DPGR and seismic refraction survey are attached.

Slope stability analyses were completed on select representative proposed cuts to help develop the recommendation in this report. Proposed project layout (undated) and preliminary cross-sections (dated 7/29/11) were provided by District Design and utilized to develop the recommendations in this report.

The purpose of this report is to assist planners, project studies personnel, and environmental personnel. Information from this report may be included in the project report.

2. Existing Facilities and Proposed Improvements

At the time of our field reconnaissance, this northeast-southwest trending segment of State Route 32 consisted of two 11-foot wide lanes with 0 to 1-foot shoulders, unpaved shoulder areas vary from 1-7 feet throughout the project limits and asphalt-paved lanes that link the City of Chico with Lassen Volcanic National Park and the city of Chester. Two 18 inch diameter corrugated metal pipe cross culverts for the adjacent Deer Creek were observed at PM 22.43 and 22.54. Both culverts were partially blocked with debris.

A concrete sack wall and a can wall with guardrail were observed along south bound shoulder. The concrete sack wall observed has a maximum exposed height of 7.5 feet and length of 270± feet split by culvert at PM 22.54. The can wall with guardrail observed has a maximum exposed height of 6 feet and length of 300± feet near PM 22.5. No other utilities or structures were identified within the project limits.

Based on the Project Study Report (PSR) provided by the District, the purpose of this project is to reduce the number and severity of accidents by improving the lane, shoulder geometrics and increasing the clear recovery zone. It is our understanding that the new roadway will include two 12-foot wide lanes with 4-foot wide shoulders, which can be used for snow storage and will increase the clear recovery zone for vehicles that have left the traveled way. All existing drainage systems will be replaced.

3. Pertinent Reports and Investigations

Preparation for this report included a review of published data such as California Geologic Survey publications and previous reports, a field reconnaissance, geophysical (seismic refraction) survey to estimate seismic velocity.

A limited field investigation, including a site review and completion of a rippability study was completed for this report. No subsurface investigation, i.e., drilling, sample collection, or laboratory testing, was conducted for this report.

The following documents or websites were reviewed for the preparation of this report:

- "A General Location Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally-Occurring Asbestos", Churchill, R.K., and Hill, R.L., CDMG Open File Report 2000-19, 2000.
- "Geologic Map of California: Westwood sheet". Lydon, P.A, Gay, T.E. and Jennings, C.W., California Division of Mines and Geology, 1960
- Caltrans Memorandum dated May 17, 2010 from Dennison Leeds to Douglas Brittsan, "Deer Creek Curves Realignment", (attached).
- Caltrans Memorandum "District Preliminary Geotechnical Report", dated March 21, 2011
- National Resource Conservation Soil Survey, U.S. Department of Agriculture website, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
- Western Regional Climate Data Center website, www.wrcc.dri.edu, December 2010.
- Bridge Inspection Records Information System website, http://db2.dot.ca.gov:7777/forms/frmservlet?config=biris
- CALTRANS Document Retrieval System website, http://drs.dot.ca.gov/falcon/websuite.shtml, June 2010.
- The Digital Highway Inventory Photography Program website, http://svhqdhipp:8080/dhipp/jspform.jsp, June 2010.
- United States Geological Survey (USGS) 7.5 minute Topographic Map "Childs Meadow Quadrangle" dated 1985
- United States Geological Survey/Cascades Volcano Observatory (USGS/CVO) website, http://vulcan.wr.usgs.gov/, January 2011.

4. Physical Setting

4.1. Climate

Climate information was obtained from the Western Regional Climate Data Center at http://www.wrcc.dri.edu/. The nearest weather station is located at Chester (approximate elevation 4500 feet), fifteen miles northeast of the project. The Western Regional Climate Center maintained monthly climate records for this location from 10/1/1949 through 8/31/2009. The average annual maximum temperature is 62.3°F, with the maximum for the warmest month, July, averaging 85.3°F. The average annual minimum temperature is 31.2°F, with the minimum for the coldest month, January, averaging 19.6°F. The average annual precipitation at Chester is 31.82 inches, with the majority falling between November and March. The heaviest snowfall occurs between December and April, with an average annual snowfall of 128.3 inches with January being the greatest contributor.

4.2. Topography and Drainage

According to the USGS quadrangle reviewed, the existing SR 32 roadway within the project area roughly trends north/south and parallels Deer Creek, located on the north side of the highway through a forested area. Widening for the new alignment is proposed to be completed on the south side of the existing highway, in rugged volcanic terrain. Elevation above mean sea level along the current alignment varies from approximately 4560 feet at the east end, rising to nearly 4600 feet in elevation on the west end of the project limits. Surface drainage is generally west to southwesterly with some local variations. Deer Creek eventually drains westward into the Sacramento Valley. Native vegetation in the project area includes White Fir, ponderosa pine, Douglas-fir, Incense-Cedar, Sugar Pine, Black Oak, Manzanita, Deerbrush and Mountain Whitethorn.

4.3. Man-made and natural Features of Engineering and Construction Significance

In general, the current alignment of the highway roughly trends north and south within the project limits but the overall alignment is considered an east/west connector. The highway is bounded on the north side by fill and native slopes extending down to Deer Creek located approximately 15 to 60 feet below the existing highway grade. Fills observed within the project limits were noted to be 1:1 or flatter. Several of the steeper fills (1:1) appeared to be distressed due to erosion with the presence of minor slumps and erosion gullies. It appears that the concrete sack walls were utilized in attempts to repair portions of the distressed fills.

The south side of the highway is bounded by cuts and native slopes. The existing cuts range from near vertical (Andesite Rock) to 1.5:1 (H:V) (Pyroclastic Debris Flows) with a maximum vertical height ranging up to 50 feet. Bedrock exposed in the cuts consists of layered lava (andesitic) flows and pyroclastic debris flows with varying thickness of soil mantel or rock talus at the crests. During our site reconnaissance all of the existing slopes appeared to be performing well with respects to global stability. Moderate to severe differential erosion is impacting the cut at the east end of the project limits and is slightly too

moderately impacting the cut at the western limits of the project. The differential erosion is causing rockfall as more competent rock blocks fall from the slope as the ash matrix is eroded away. Rock blocks up to 2 feet in diameter were observed in the drainage ditch at these cut locations. In addition, sheet flow erosion is causing over-steepened slopes at the crest of many of the cuts were pyroclastic rock or soil mantels are exposed at the top of the slopes. Native slopes were noted to have a slope ratio of 2:1 or slightly steeper and were predominately covered with rock scree/talus (volcanic rock blocks).

Per conversation with Maintenance Supervisor from the Chester Maintenance Station (11/11), the areas of concern for them from a geotechnical perspective within the project limits is rockfall between PM 22.72-22.84. The Supervisor indicated that there is consistent year round rockfall at this location that causes minor vehicle problems (flat tires, punctured oil pans, etc.) The rockfall concerns are addressed in the rockfall section below. In addition, the Maintenance Supervisor indicated the concrete sack walls observed during our field reconnaissance were placed in the 1980's as a storm damage response to slip outs along the highway.

4.4. Regional Geology and Seismicity

The project is located in northeastern Tehama County, within the Cascade Range geomorphic province. This region includes the southern section of a long chain of volcanoes, extending from British Columbia in Canada to Northern California, that define a subduction zone where the Juan de Fuca Plate plunges beneath the North American Plate. Researchers believe the Lassen area developed in several stages, beginning with volcanism at Brokeoff Mountain. More recent volcanic activity shifted to domes and flows of dacite and rhyodacite that erupted on its northern flank. Lassen Peak (elevation 10,457 feet), at the southern tip of the Cascades, is located directly north of the project site. Lassen Peak is considered to be an active to potentially active volcano (USGS/CVO) that had its last major eruption in 1915, with lesser activity extending into 1921.

We utilized Caltrans ARS Online v 1.0.4 to determine the controlling active fault seismic concerns within the project limits. The program indicated the Butt Creek Fault Zone is located approximately 7.5 miles northeast of the site is the controlling fault for peak bedrock acceleration within the project limits. The Butt Creek fault zone is considered to be made up of vertically dipping right-lateral strike slip faults and could produce a maximum credible earthquake of magnitude 6.8. The ARS results indicated that a maximum credible earthquake based on a probabilistic curve with a 5% chance of reoccurrence in 50 years would result in a peak horizontal bedrock acceleration of approximately 0.27g at the site. Bedrock at the site is at or near the surface based on the field review.

4.5. Natural Occurring Asbestos (NOA)

We reviewed the State of California, Air Resources Board (ARB) Map of California Showing Principal Asbestos Deposits. The site is not located in an area known to contain

naturally occurring asbestos and no rock containing serpentine was observed during the field reviews.

4.6. Soil Survey Mapping

The National Cooperative Soil Survey describes the soils within the project limits as belonging to the McCarthy soil series.

McCarthy Series, 50-65 percent slopes. This soil consists of well drained sandy loam derived from weathered volcanic breccia. Surface runoff is medium and the erosion potential is slight (K factor 0.20). Corrosion potential is high for both concrete and steel (pH 6.1-7.6). This soil has been assigned to Hydrologic Group B. Permeability is reported as 0.00 to 0.6 in/hr.

5. Exploration

5.1. Geophysical Studies

A surface geophysical survey was conducted in April 2010 to determine the rippability of material proposed for removal to accommodate the new curve. Plate No. 1 shows the approximate location of geophysical survey line.

Based on the seismic refraction survey conducted for this project, the andesitic/basaltic rock will be encountered in the proposed excavation and require hard rock excavation methods for removal. A more detailed discussion of the geophysical survey is provided in the attached memorandum entitled, "Deer Creek Curves Realignment, PM 22.35/22.75".

6. Geotechnical Conditions

6.1. Site Geology

Based on the geologic maps reviewed, bedrock in the area is mapped as basaltic lava, andesitic lava and pyroclastic debris flows of Pliocene age. Based on our site reconnaissance bedrock exposed in the highway cuts within the western limits (approx. project station 7+00-18+50) of the project consists andesitic lava flow overlying pyroclastic debris flow(s). Bedrock exposed in the highway cuts within the eastern portions of the project limits (approx. project station 18+50-37+00) consists of pyroclastic debris flow(s). Some areas within the project site have a variably thick soil cover and/or are overlain by rock scree/talus. The pyroclastic debris flows observed contain andesitic/basaltic rock blocks up to 3 feet in diameter contained within moderately well to well welded ash matrix. Excavation for the new road cuts are likely to intercept loose detrital blocks of andesite overlying jointed andesitic rock (lava flows). Bedrock observed within the project limits compares favorably with the geologic map reviewed. A portion of the geologic map reviewed is presented in Plate No. 2.

6.1.1. Regolith and Lithology

Four distinct material types were observed in and/or on the existing cuts and native slopes. Materials observed consisted of Talus/Colluvium, sandy-Clay/clayey-Sand (weathered bedrock), Andesitic Lava Flows and Pyroclastic Debris Flows. A brief field description of each material type is provided below:

Talus/Colluvium- Within the project limits this material was observed on the native slopes above the existing cuts. This material is comprised of predominately gravel to boulder size rock blocks of andesite and basalt composition with minor amount of clayey- sand within the voids between blocks. The andesite and basalt blocks are predominately angular, moderately to slightly weathered and moderately hard to hard. Blocks in excess of 10 feet in diameter were observed on the slopes.

Sandy-Clay/clayey-Sand- Within the project limits this material was observed typically near the tops of the existing cuts, overlying the bedrock and underlying the talus/colluvium. This soil is estimated to be stiff/medium dense, varies in color from reddish-pink to brown when moist, from dry to moist and is slightly plastic.

Andesitic Lava Flows- consist of thickly to massive bedded andesite that is moderately weathered, hard to very hard, with moderately wide to wide fracture spacing.

Pyroclastic Debris Flows- are very thickly to massive bedded, consisting of andesite and basalt cobbles and boulders incorporated in a fine grained ash matrix and/or beds of predominately welded ash. The ash matrix is decomposed to moderately weathered, weak to moderately strong and weakly welded. Cobbles and boulders within the flows are, moderately to slightly weathered and hard to very hard.

6.1.2. Structure

Based on observations of the bedrock outcrop on the west end of the project limits (approximate project STA: 14+00), it appears that the contact between the lava flows has a general dip and dip direction to the north-northeast. It is unknown if this is due to the historic topography of the area or if the beds have been displaced.

6.1.3. Natural Slope Stability

The presence of active and dormant deep-seated slides was not observed in the project area during the site reconnaissance. In general the existing native slopes within the project limits appear to be performing well with regards to natural stability.

6.2. Water

6.2.1. Surface Water

During our site reconnaissance the only surface water observed was water flowing with Deer Creek. However, the indication of surface water flow was observed in erosion

features noted on the existing highway cuts, fills and drainage channels in the natural slopes. Locally within the project limits, based on topographic features surface flow travels off the northwest facing slopes, northwest towards Deer Creek. Globally Deer Creek and surrounding major drainage flow southwest towards the Sacramento Valley.

6.2.1.1. Erosion

As stated above, evidence of erosion was observed during the field reconnaissance effecting existing cuts and fills. Two concrete sack walls were constructed where erosion/water flow caused slip outs in the existing highway embankment slopes. Existing cuts exhibit moderate erosion features including rills, exposed root balls and over-steepened slope faces at the crest of the existing cuts. In addition, it is our opinion that erosion is the cause of the rock falls observed in the northern portions of the project limits. Sheet flow on the existing slope faces is eroding the softer ash matrix of the pyroclastic debris flows, releasing the harder less erosive basalt and andesitic boulder to fall down the slope faces.

It is anticipated that similar erosion features will impact future embankments and cuts completed for projects in this area. We recommend that District Landscape and District Hydraulics be consulted to provide erosion mitigation options for any earthwork items associated with this project.

6.2.1.2. Groundwater

Based on the site location, topography, geology, and the absence of any obvious artesian conditions (no springs or seeps were observed in the project area), the proposed cuts are not anticipated to encounter or impact the groundwater regime. Depending on the time of year, seepage may be encountered in the rock fractures. Seepage and groundwater conditions will vary accordingly with variations in rainfall, construction activities and water levels within Deer Creek and surrounding drainages.

7. Geotechnical Analysis and Design

7.1. Cuts and Excavations

Based on the cross-sections provided by the District it is our understanding that new and/or widening of existing cuts are proposed between the following project stations:

10+00 to 30+50
32+25 to 34+25

The cross-sections reviewed indicates the Districts proposed cuts will vary in vertical height up to a maximum of 100 feet with a proposed slope ratio of 1.25:1 (H:V). A cross-section depicting one of the maximum height cut sections is attached as Plate 3. It is our Office's opinion that the District proposed cuts should perform adequately. Based on the results of

slope stability modeling (see stability section below), it is our Office's opinion that the District could consider a slightly steeper slope ratio (1:1(H:V)) to help limit right-of-way needs and reduce environmental impacts. If the slightly steeper slope ratio is selected the District should be aware that there is a slight increase in potential for minor slumps to occur in the upper soil/decomposed rock located near the crest of the cuts. To help reduce the potential for slumps our Office would recommend that slope rounding be completed on portions of the cut. Our Office recommends the slope rounding be completed by selecting the lesser amount of the following; either the maximum extent of the soil horizon above non-rippable rock or the upper 15 feet of non-rippable material of the cut.

For cuts constructed utilizing blasting for hard rock excavation, there is the potential for loose unstable rocks or rock blocks to remain on the slope after the bulk of the material is removed with heavy equipment. Our Office recommends that hand scaling of the blasted slopes be complete at the discretion of the Engineer after the cut slope excavation has been completed. Representatives from our Office are available to assist the Engineer in determining if hand scaling is warranted and should be contacted during construction of or within a few days post construction of the blasted slopes.

7.1.1. Stability

Our Office completed slope stability analysis on models of select proposed cuts throughout the project limits. Our analysis was completed utilizing SlopeW software. As no subsurface drilling, sampling or laboratory testing was completed for this project, generalized soil properties for soil materials at the site were utilized in the analysis. Roclab 1.0 was utilized to obtain an equivalent phi and cohesion for the subsurface rock materials to be utilized in the SlopeW program. Roclab provides equivalent phi and cohesion values for rock based on generalized Hoek and Brown criteria.

Material properties utilized in our analysis are as follows:

Talus/Soil (decomposed bedrock)
Cohesion = 50psf
phi = 35°
γ = 130pcf

Pyroclastic Debris Flows (ash layer)
Cohesion = 4800psf
phi = 35°
γ = 160pcf

Pyroclastic Debris Flows
Cohesion = 3400psf
phi = 37.5°
γ = 160pcf

Andesite Lava Flow
Cohesion = 9600psf
phi = 46.6°
γ = 160pcf

Slope stability of the cuts was analyzed utilizing the District proposed slope ratio of 1.2:1 (H:V) and a slightly steeper slope ratio of 1:1(H:V). In all stability analysis's completed, the slopes were found to be globally stable. By globally stable we mean that no failure surfaces extending through all materials in the cuts from the top of the proposed cuts, to

at or below the proposed road elevation were indicated in the stability outputs. However, the stability models indicated potential superficial failures in the upper most material (Talus/Soil) horizon in each model. The modeling indicates a Factor(s) of Safety of 1.1 and 1.3 in the Talus/Soil horizon for slope ratios of 1:1(H:V) and 1.2:1(H:V) respectively. The modeling indicates that these slope instabilities extend from top to base of the Talus/Soil horizon and vary in depth depending on the thickness of the horizon. For modeling purposes we utilized the maximum thickness (20 feet) of the rippable material encountered in the seismic survey conducted. This thickness indicated a potential maximum failure depth of 6 feet for a 1:1(H:V) cut. Based on our observations of the existing cuts, the Talus/Soil horizon thickness is highly variable but was typically observed to be less than the 20 foot thickness modeled in our analysis. Since the depth of potential instability varies with the thickness of the Talus/Soil horizon, it is anticipated that if localized instabilities are encounter it is likely the failure plane will shallower than that produced by the model.

7.1.2. Rippability

Our site reconnaissance and map review indicates that the Deer Creek Curve widening project area is underlain by Pliocene age volcanic rock (andesite lava and pyroclastic debris flows).

Based on the seismic refraction survey report, non-rippable rock with seismic velocities up to 16,000+ ft/sec will be encountered within the excavation limits. Based on the seismic refraction survey completed for this project, between project stationing 10+00 to 18+00 excavations deeper than 3 feet will encounter material that classified as difficult ripping to non-rippable and excavations deeper than 12 feet will be in material classified as non-rippable. Although the seismic refraction survey did not extend into the proposed project cuts beyond station 18+00 it is our Office's opinion that non-rippable material will be encountered in those cuts as well, however our Office estimates quantities of non-rippable material between project stations 18+00 to 34+00 will be less than that encountered in western project limits. In addition, depending on excavation equipment utilized by the contractor, over-sized boulders that will require reduction will be encountered in the excavations throughout the project limits.

Based on our estimates of depth to non-rippable material, field observations of existing rock outcrops and the Districts proposed cuts, our Office estimates that 85% of the project total excavations between project stationing 10+00 to 18+00 and 40% between project stationing 18+00 to 34+25 will require hard rock excavation techniques. However, these estimates will vary depending on the size and type equipment a respective contractor intends to utilize for their bid submittal. In addition, oversized material requiring reduction via hard rock excavation methods should be anticipated within all excavations.

For excavation of difficult to non-rippable material, it is anticipated that the use of explosives or other hard rock excavation methods such as hydraulic splitters, hoe-rams and chemical expanders will be required to complete the new cuts. Blasting is typically the most cost effective and efficient method to complete hard rock excavation.

If the District approves blasting as a hard rock excavation method, our Office recommends that Caltrans Standard Special Provisions 19-705 "Rock Excavation" be included within the project specifications.

Our Office is aware of the two existing retaining walls within the project limits that would fall within a 300 foot radius of likely blasting operations, and may be identified as structures of concern. However, it is our opinion that wall types within the project limits are flexible wall types and can tolerate some minor movement without distress. If the District would like to reduce risk of damage to these structures, or if the presence of other structures or underground/overhead utilities (gas, telecommunications, etc) are discovered, then we would recommend SSP 19-705 be replaced with SSP 19-706 "Rock Excavation Controlled Blasting".

Based on the cross-sections provided by the District, the proposed cuts between project stationing 10+00 to 11+00, 30+50 and 32+25 to 34+25 are sliver cuts. Our Office does not recommend that blasting be utilized to complete the sliver cuts as there is typically not enough overburden to contain fly rock.

7.1.3. Grading Factor

Grading factors (earthwork factors) have been estimated from seismic refraction velocities in conjunction with field observations regarding soil types, rock types, density of rock fractures, and boulder sizes and angularity. Due to the variability of the geologic environment and the numerous variable factors that determine the actual earthwork balance, the factors given here should be considered as estimates. Grading factors for non-rippable rock assume that the rock will be blasted into pieces small enough for scrapers to move. Under typical conditions a smaller maximum rock piece created by blasting will result in a larger empirical grading factor. For soil layers use an estimated grading factor of 0.8. The basalt and andesite rock sources have an estimated grading factor of 1.2.

7.2. Embankments

Based on the preliminary cross-sections provided, it is our understanding that new fills will be constructed or existing fills widened between the following project stationing:

12+50 to 34+00

It is our understanding between project stationing 12+50 to 13+25 and 33+25 to 34+00 the

District proposes to complete the embankments (sliver fills) with a maximum vertical thickness of 1 foot with a slope ratio of 1.35:1(H:V). It is our Office's opinion these fills will be difficult to construct as proposed. Typically adequate compaction is difficult to achieve on fills of this thickness and extensive excavation (Standard Specification 19-6.03) is needed to bench the existing slope prior to placement of this small amount of fill. Between these project stations our Office recommends that the District consider one of the following three alternatives:

1. Shift the alignment slightly towards the cut side eliminating the proposed fill.
2. Shift the alignment towards the fill side and flatten to a slope ratio of 1.5:1(H:V), therefore widening and thickening the fill. We recommend that the fill be a minimum of 5 feet in width to get adequate size equipment on the fill for compaction effort.
3. Over build the fill to the recommend minimum in option 2 above and then cut the fill to the proposed design width.

Based on review of the cross-sections fills between project stationing 13+50 to 33+00 are proposed to be constructed with a slope ratio of 1:5:1(H:V) and will have a maximum vertical thickness of 30 feet. It appears that portions of these fills are to cover areas of the existing highway that will no longer be utilized once the re-alignment is completed. It is our Office's opinion that these proposed fills should perform adequately for their intended use. A cross-section depicting one of the fill locations is attached as Plate 4.

District Design, Construction and Contractors should be aware that to complete the construction of the benches for placement of the proposed fills per Standard Specifications 19-6.03 (in particular between project stations 10+00 to 18+00) hard rock excavation techniques will likely be required. In addition, hard rock conditions maybe encountered in areas of excavation between project Station 18+00 to the end of the project limits.

7.3. Corrosion

Based on our review of the soil survey for the project area (section 4.6 above) the majority of the site soils have been identified as highly corrosive to concrete and steel. If culverts are planned to be replaced or added, we recommend that a corrosion tests be performed at proposed culvert locations. Typically this activity is completed by District Materials Engineer.

7.4. Rockfall

Based on conversations with the local Maintenance Supervisor for the area and our site reconnaissance, rockfalls that reach the existing roadway elevation are currently being generated from the existing cut between PM 22.72-22.84. Due to the limited shoulder area in these limits, the majority of the rockfall ends up in the traveled way. Based on our field reconnaissance and Maintenance reports the average rock block size that is falling appears to be 6-18 inches in diameter. Blocks as large as 3-4 feet in diameter occasionally need to be removed from the roadway within these limits.

Based on the preliminary cross-sections provided by the District it is our understanding that the catchment area at the base of the existing slope where rockfall is occurring will be increased from its current width of 1 foot paved and 4 feet unpaved (total 5 ft.) to a width of 4 feet paved and 6 feet unpaved (total 10 ft.). The increase in catchment width should reduce the potential for rock fall to reach the travel lanes. However, the District is also proposing to increase the slope ratio from 1.5:1 to 1:1 in this area and the new cut will likely result in an increased slope length. The increase in slope ratio and slope length provides more potential energy for falling rocks which requires additional catchment width to contain the material. Therefore, it is our opinion that the increase in catchment width will be offset by the increase in slope height and slope ratio and rockfall occurrence reaching the traveled way at this location will remain constant or increase.

Our Office recommended in the District Preliminary Geotechnial Report (DPGR) for this project that the District consider incorporating rockfall mitigation alternatives as a portion of this project. Also provided in the DPGR were mitigation alternatives the District might consider. It is our understanding that the District is opting not to include rockfall mitigation measures as a portion of this project, but will be monitoring the new slopes after construction to quantify the contributing slopes, amount and extent of rockfall. Additionally, if rockfall is identified by the District as a concern after the new slopes are constructed they will then determine if they will create a new project to complete rockfall mitigation measures within the project limits.

If the District determines that the new slopes are creating a rockfall problem that needs mitigation, our Office should be contacted to provide revised rockfall mitigation alternatives for a new project.

8. Construction Considerations

8.1. Construction Advisories

Contractors should be aware that we have made our best attempts, based on field observations and seismic refraction survey, to quantify the amount of non-rippable rock that will be encountered during excavation of the District's proposed cut slopes. These quantities by no means an interpretation of the exact volumes of non-rippable bedrock between the project stations. Due to unknown excavation equipment utilized by the bidding contractor, the undulatory nature of and the erosion and decomposition of rock, it should be anticipated that quantities of non-rippable bedrock will vary throughout the project limits. It is recommended that contractors bidding on the project complete a field review of the project site to estimate rippability prior to bidding on the project.

There is the possibility that the blasting performed may cause some disturbance to wedges or blocks within the final cut face. Should loose/disturbed wedges or blocks of rock remain on the finished cut face after blasting and excavation our Office recommends that they be

removed. It is anticipated that these loose/disturbed rocks could be removed utilizing hand scaling methods. The need and scope of scaling should be at the discretion of the Engineer during construction and a representative from our Office could assist the Engineer in making a determination.

8.2. Construction Considerations that Influence Design

If District Design selects to utilize the recommended cut slope ratio of 1:1 and slope rounding is not completed as recommended, the occurrence of pre and post construction superficial slumps and erosion at the crests of the new cuts should increase significantly.

8.3. Construction Considerations that Influence Specifications

If subsurface utilities are not identified prior to construction but are encountered during construction and blasting is the alternative selected for hard rock excavation it is anticipated that a change order will be needed by the contractor to fulfill the additional surveys and monitoring that are required in SSP 19-706 that are not in SSP 19-705.

9. Recommendations and Specifications

If designers have questions or problems with any of these recommendations, or, if conditions are found to be different during construction, contact the geotechnical staff who prepared this report. Additional field work, analysis or change in recommendations may be required.

- **Cut slope ratio of 1:1 or flatter.**
- **Embankment (fill) slope ratio of 1.5:1(H:V) or flatter.**
- **Between Project Stationing 12+50 to 13+25 and 33+25 to 33+00, remove the proposed sliver embankments or re-design so they are not constructed as sliver embankments. Flatten embankment slope ratios at these locations to 1.5:1(H:V) or flatter.**
- **SSP 19-705 "Rock Excavation" be included with the project plans and specifications, unless the District prefers or deems necessary SSP 19-706 "Rock Excavation Controlled Blasting".**
- **For quantity estimating purposes 85% non-rippable rock will be encountered in excavations between project stationing 10+00-18+00 and 40% non-rippable rock will be encountered in excavations between project stationing 18+00-34+20.**
- **District Landscape and District Hydraulics be consulted to provide erosion control recommendations for proposed project cuts and fills.**
- **Corrosion testing be completed where culverts are proposed to be replaced or extended.**

10. Project Information

Standard special Provisions S5-280, "Project Information," discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following

is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the information handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. None

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. "Geotechnical Design Report" for Deer Creek Curves Re-alignment Project, dated February 15, 2012

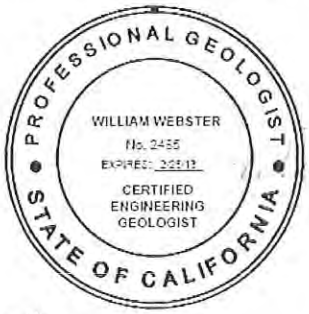
Data and information available for inspection at the District Office:

A. None

Data and information available for inspection at the Transportation Laboratory:

A. None

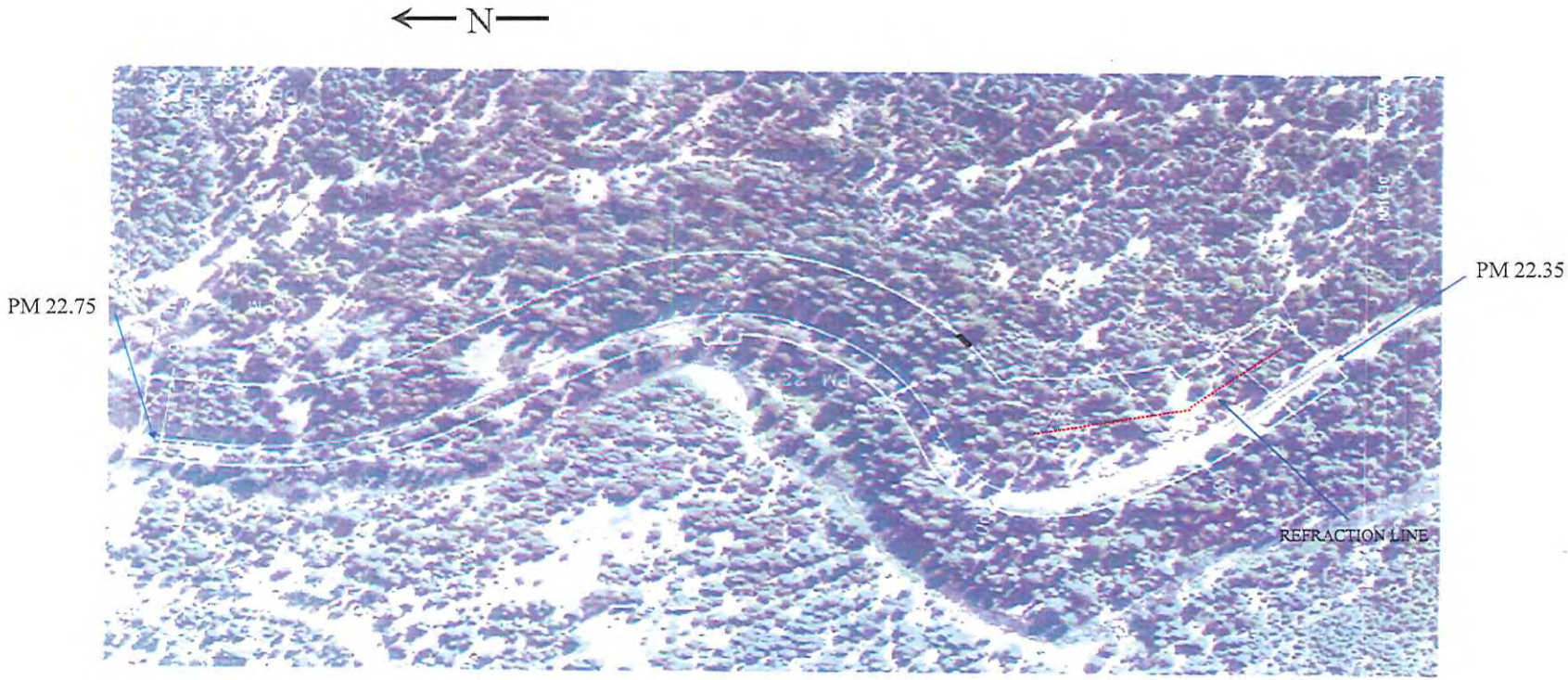
The recommendations contained in this report are based on the specific project information provided to this Office through August 3, 2010. If any conceptual changes are made during final design or in the field that could relate to or are related to geotechnical issues, the Office of Geotechnical Design North should review those changes to determine if these recommendations still apply. If you have any questions or comments, please call Bill Webster at (916) 227-1041.



William Webster, CEG
Engineering Geologist
Office of Geotechnical Design North
Branch C

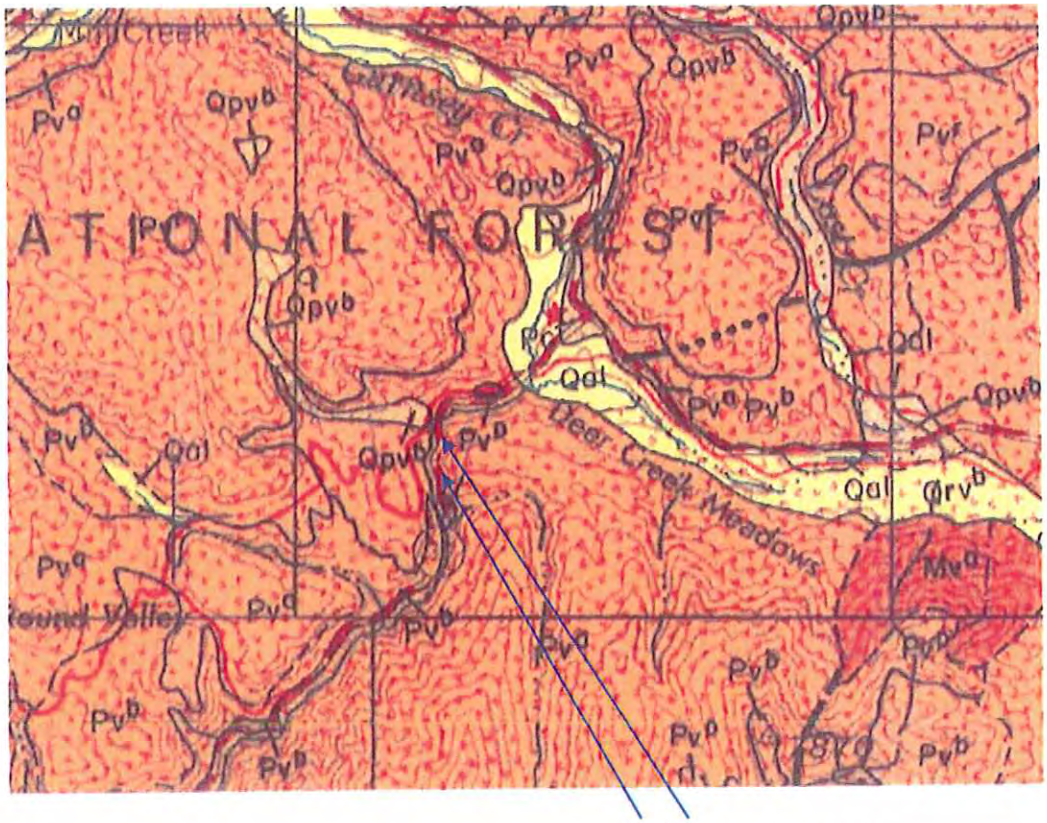
Attachments
1. Plate 1. Aerial Photograph of Project Area, depicting seismic refraction line locations
2. Plate 2. Geologic Map
3. Geophysics Report dated May 17, 2010

e-Copy: Chris Harvey, (D2-PM)
Eskinder Tadesse, (PCE)
Byron Berger, (D2-DME)
District 2 RE Pending File (C/O Ken Hallis)



AERIAL PHOTOGRAPH OF PROJECT. Aerial photograph of project showing the approximate location of the seismic refraction line, beginning and ending project postmiles.

Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North Caltrans		EA: 03-2E7300 Date: JANUARY 2012	AERIAL PHOTOGRAPH OF PROJECT AREA
		03-THE-32; PM 22.35/22.75 GEOTECHNICAL DESIGN REPORT	Plate 1



PROJECT LIMITS

PERTINENT GEOLOGIC UNIT

- Pvg — Pliocene Volcanic - Andesite
- Pvb — Pliocene Volcanic - Basalt
- Pvp — Pliocene volcanics - pyroclastic rocks

APPROXIMATE SCALE
0 4000 8000 12000 16000 20000 feet
0 2 4 miles
0 2 4 kilometer

N

Base Map Reference: Geologic Map of California, Westwood sheet, 1:250,000, Department of Conservation, Division of Mines and Geology, 1962.

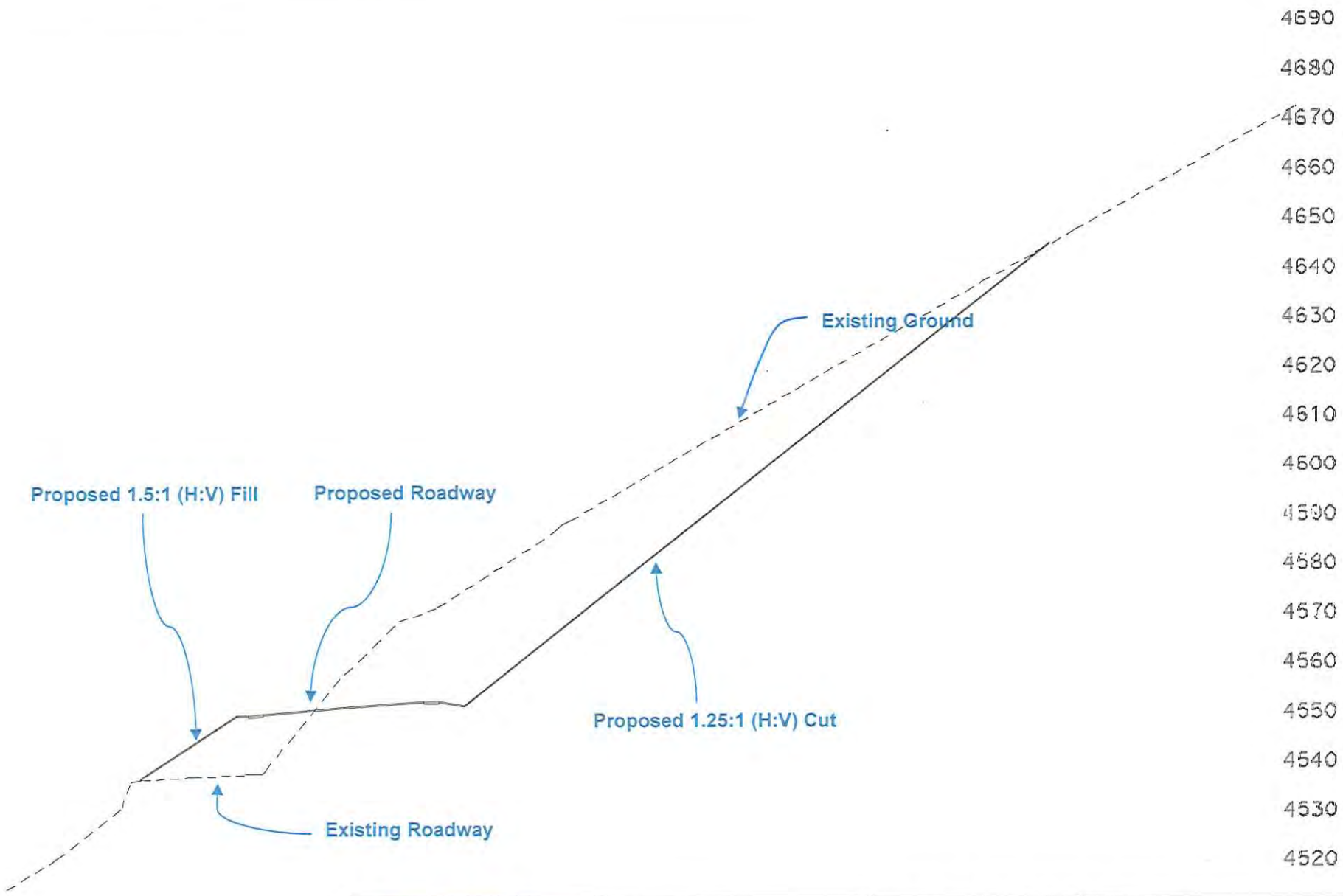
CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design-North

EA: 02-2E7300
Date: January 2012

GEOLOGIC MAP

02-TEH-32; PM 22.35/22.75
GEOTECHNCIAL DESIGN REPORT

Plate No. 2



Caltrans

Department of Transportation
Division of Engineering Services
Geotechnical Services
Geotechnical Design - North

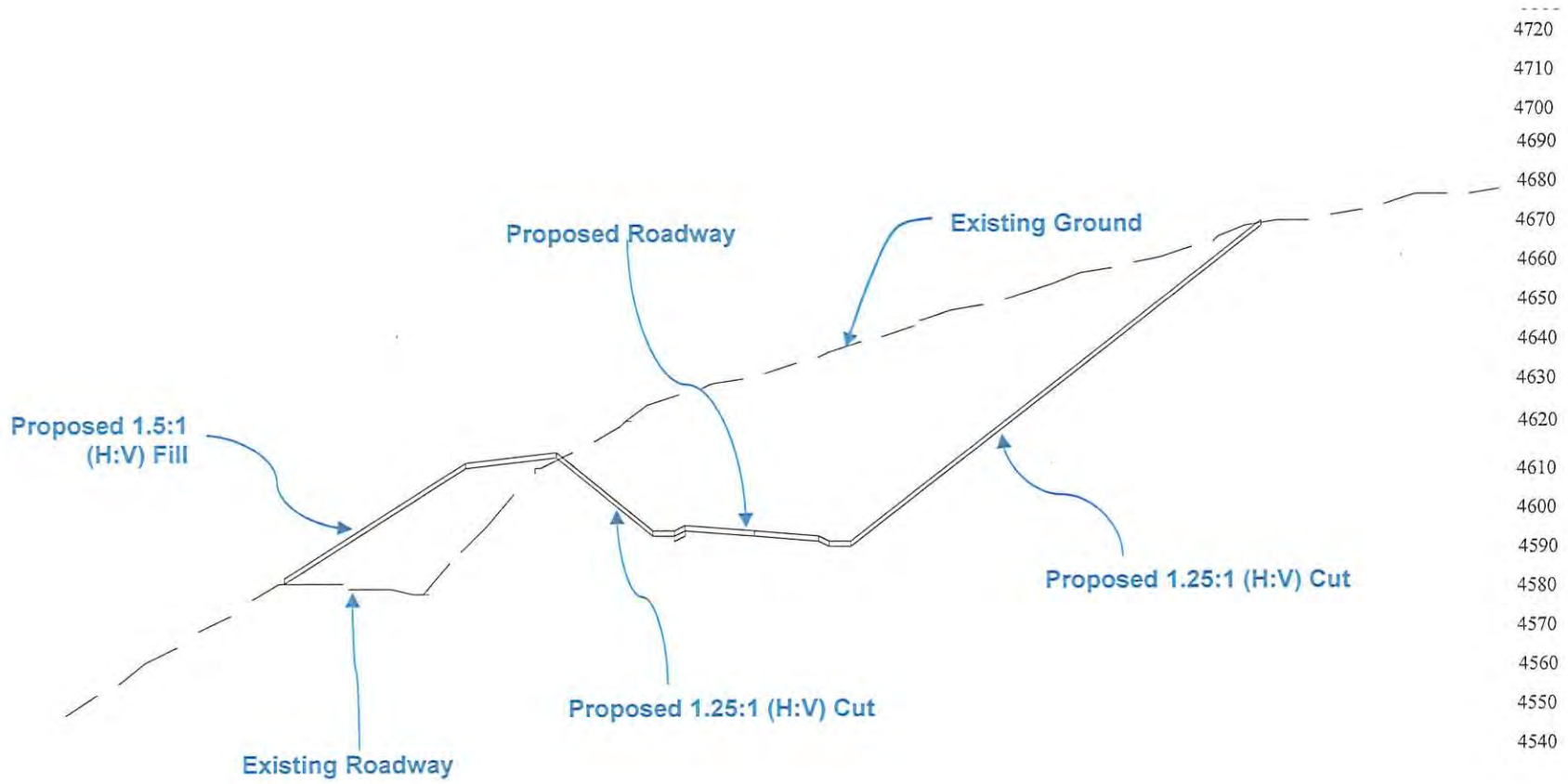
EA: 02-2E7300

Date: February 2012

X-SECTION; STA 23+50

02-TEH-299 PM 22.3/22.7
GEOTECHNICAL DESIGN REPORT

Plate 3



Caltrans

Department of Transportation
Division of Engineering Services
Geotechnical Services
Geotechnical Design - North

EA: 02-2E7300

Date: February 2012

X-SECTION; STA 15+75

02-TEH-299 PM 22.3/22.7
GEOTECHNICAL DESIGN REPORT

Plate
4

MATERIALS INFORMATION

OPTIONAL DISPOSAL SITE

INFORMATION HANDOUT

FOR CONSTRUCTION CONTRACT
IN TEHAMA COUNTY ABOUT 35 MILES EAST OF FOREST RANCH
FROM 0.6 MILE WEST OF DEER CREEK BRIDGE 08-0072
TO 0.1 MILE WEST OF DEER CREEK BRIDGE 08-0072

TEH-32 PM 22.3/22.8
DEER CREEK CURVE IMPROVEMENT & SHOULDER WIDENING

OPTIONAL DISPOSAL SITE:
Plumas County Public Works
6600 Old Ski Hill Road
Chester, CA 96026

Main Office:
1834 East Main St.
Quincy, CA 95971
Contact Personnel:
John Mannle (530) 283-6498
JohnMannle@countyofplumas.com
Joe Blackwell (530) 283-6491
JoeBlackwell@countyofplumas.com

Facts stated herein are as known to the State of California (Caltrans) and are to be verified by the Contractor. Note that Water Pollution Control as per Section 13 of the 2010 Standard Specifications will be the responsibility of the contractor.

General Provisions

This site is provided by Plumas County through Caltrans at the option of the contractor for the disposal of excess earthen materials generated at the Deer Creek project. Existing facilities at the disposal site shall be preserved from damage by the Contractor.

- This site is owned and operated by Plumas County Public Works Department to be coordinated with county personnel for access to the site.
- Placement of material will be in a configuration as directed by the county personnel if required to differ from the attached typical section detail
- The State or County assumes no liability for damage to the Contractor's equipment used within the disposal site.
- The materials to be placed in the disposal area are limited to earthen soils and rock
- Materials shall be compacted to the extent that it will support rubber tired equipment
- The finished surface shall be uniformly graded
- Construction Storm Water Best Management Practices shall apply to this site along with section 13 of the 2010 Standard Specifications
- A county grading permit may be required by the Plumas County Building Department

Attachments:
Disposal Site Location Map
Disposal Site Aerial
Disposal Site Typical Section
Final Geotechnical Report – Project Limits

DEPARTMENT OF TRANSPORTATION
District 2
1657 Riverside Drive (96001)
P. O. BOX 496073
Redding, CA 96049-6073
PHONE (530) 225-3164
FAX (530) 225-3230
TTY 711

Flex your power!
Be energy efficient!

November 19, 2012

Plumas County Public Works
1834 East Main Street
Quincy, CA 95971
Attn: Robert A. Perreault, Jr P.E.
Subject: Letter to Request Acceptance

Dear Plumas County Public Works:

This is in regard to the optional availability of the excess earthen material that will be created from the Caltrans construction project on Highway 32 PM 22.3 at Deer Creek and Elam Camp Ground. This Caltrans contract will be constructed by a licensed general contractor by competitive bid the summer of 2013.

In an effort to balance the earthwork on this project based on ground surveys, there will be an approximate excess of excavated earthen materials of 45,000 cubic yards that will be removed from the limits of the job. This will become excess and the control of the contractor.

In correspondence with Joe Blackwell, Plumas County Public Works Department, he has expressed an interest in receiving this excess material at the yard at Assessor's Parcel No. 001-500-002 located off of Old Ski Hill Road in Chester, CA.

Attached is an Information Handout that will be given to all bidders at advertisement of the contract to perform this work. Within that package are general provisions, Disposal Site Location Map, Aerial and a Typical Section of the configuration the county would want the material placed when delivered to that location.

Please review the attached Information Handout and comment on the information within. Please supplement with additional county requirements that may have been omitted.

Sincerely,

KEN HALLIS, P.E.
Project Engineer

c: Chris Harvey, Project Manager
Al Trujillo, Design Senior
Deena Matagulay, Office of Engineer Services

INDEX OF PLANS

SHEET No.	DESCRIPTION
1	TITLE

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO BIDDERS AND SPECIAL PROVISIONS BOOK.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

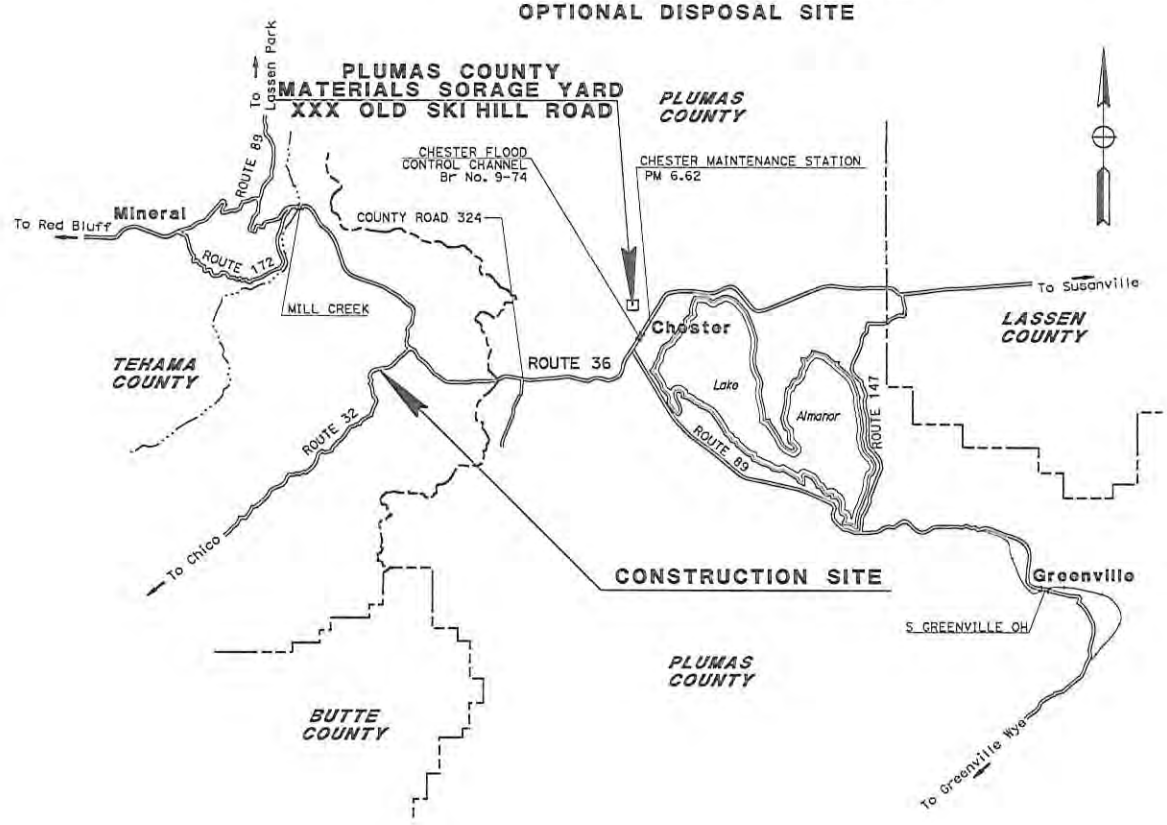
PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN TEHAMA COUNTY ABOUT 35 MILES EAST OF FOREST RANCH FROM 0.6 MILE WEST OF DEER CREEK BRIDGE 08-0072 TO 0.1 MILE WEST OF DEER CREEK BRIDGE 08-0072

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2010

OPTIONAL DISPOSAL SITE



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Teh	32	22.3/22.8	1	28

DESIGN ENGINEER	PROJECT MANAGER
AL TRUJILLO	CHRIS HARVEY

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

NO SCALE

10-26-12
PROJECT ENGINEER REGISTERED CIVIL ENGINEER — DATE

KEN HALLIS No. C38203 Exp. 3-31-13 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

CONTRACT No.	02-2E7304
PROJECT ID	0200000599

To see all the details that are visible on the screen, use the "Print" link next to the map.

Google

PLUMAS COUNTY PUBLIC WORKS
MATERIAL STORAGE YARD
6600 OLD SKI HILL ROAD
CHESTER, CA 96026

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Teh	32	22.3/22.8		28

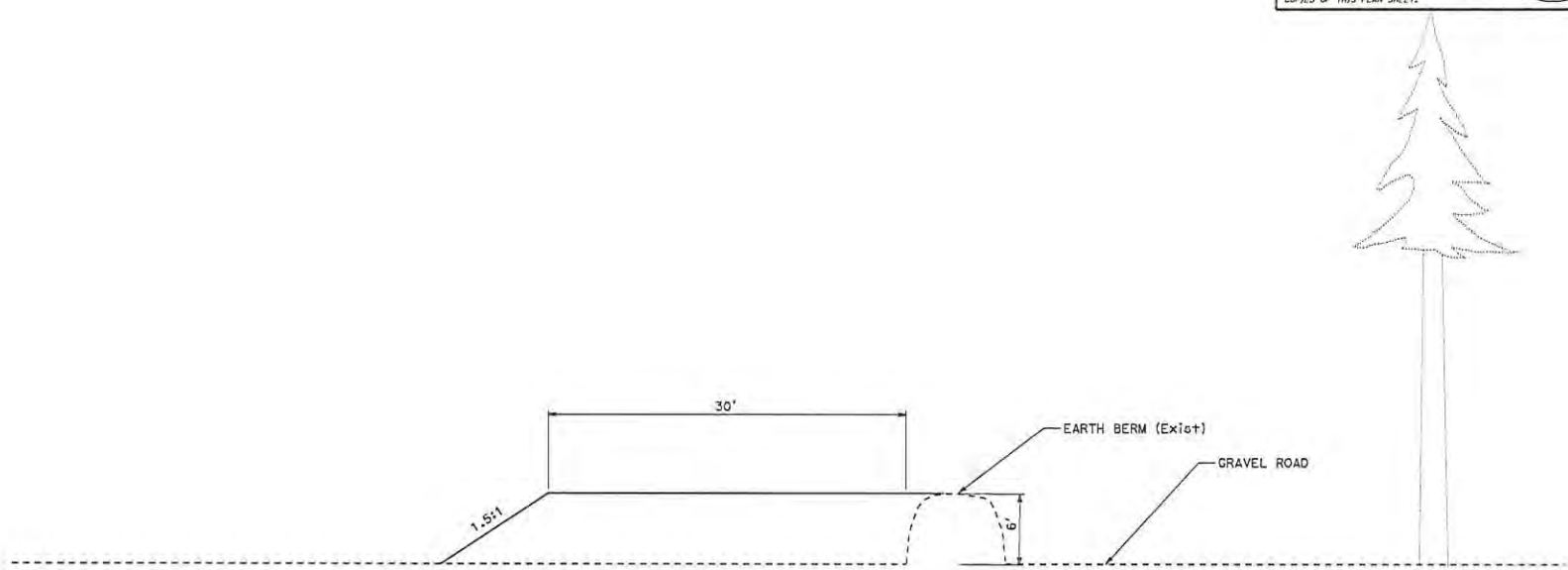
PSE REVIEW 10-26-12

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER KEN HALLIS No. C38203 Exp. 3-31-13 CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



NOTES:
1. A QUANTITY OF 45,000 CY PLACED IN THE SECTION CONFIGURATION SHOWN ABOVE WILL COVER AN AREA OF 250 LF ADJACENT TO THE EXISTING BERM.

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans DESIGN

FUNCTIONAL SUPERVISOR: AL TRUJILLO

CALCULATED-DESIGNED BY: RYAN PRINS

CHECKED BY: KEN HALLIS

REVISED BY

DATE REVISED

P:\proj2\02\2E730\design\disposal_site\disp_typ.dgn

BORDER LAST REVISED 7/2/2010

USERNAME => s124139
DGN FILE => disp_typ.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0316

PROJECT NUMBER & PHASE 02000005991