INFORMATION HANDOUT

For Contract No. 09-335001
At MNO 395 PM 52.3/53.7

Identified by
Project ID 0900020002

WATER QUALITY

Restricted Ground Disturbing Dates

MATERIALS INFORMATION

Geotechnical Design Reports

Water Source Information

Location 4 Slope Zone Pictures

Pictures of Existing Utility Poles

Lee Vining Test Plot Project As-Builts

Lee Vining Test Plot Project 1st Report

Storm Water Data Report

Restricted Access

WATER QUALITY

Caltrans Construction General Permit for Stormwater requires all disturbed areas to be stabilized by Oct. 15 and further that no vegetation removal or ground disturbing activities occur between October 15 and May 1.

The Caltrans Storm Water Data Report is attached in the Materials section below for reference.

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MATERIALS INFORMATION

Geotechnical Design Reports

Reference attached reports.

GEOTECHNICAL DESIGN REPORT

Lee Vining Rockfall Safety Project in Mono County near Lee Vining from 0.4 mile north of National Forest Visitor Center Road to 0.7 mile north of Picnic Grounds Road

09-Mno-395 PM 52.3/53.7

EA: 09-33501

EFIS: 0900020002

June 25, 2012

Division of Engineering Services

Geotechnical Services

Office of Geotechnical Design – North

Branch E

State of California
Department of Transportation

Business, Transportation and Housing Agency

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: **CEDRICK ZEMITIS**
Project Manager
District 9 - Design

Attention: Cory Freeman

Date: June 25, 2012

File: 09-Mno-395
PM 52.3/53.7
09-355001
Project ID. 09 0002 0002
Lee Vining Rockfall

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

Subject: Geotechnical Design Report

As requested, the Office of Geotechnical Design North (OGDN) is providing a District Geotechnical Design Report for the proposed Lee Vining Rockfall Safety Project on Highway 395 in Mono County, between postmiles 52.3 and 53.7, north the town of Lee Vining.

If you have any questions or comments, please call me, Brandon Badeker, at (916) 227-1046 or my supervisor, John Huang, at (916) 227-1037.

BRANDON BADEKER, C.E.G.
Engineering Geologist
Office of Geotechnical Design – North
Branch E

c: John Huang (Geotechnical Services, Geotechnical Design North)

Cedrick Zemitis (D09 Project Manager)
Mark Willian (Geotechnical Services, Corporate Unit)
Dave Dhillon (D09 District Materials Engineer)
District Construction R.E. Pending File
Brad Rockwell (D09 Office Engineer)

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Table 2: Summary of Rockfall Hazard Rating System (RHRS) for Slopes 1 through 6

1. Introduction

As requested, the Office of Geotechnical Design North (OGDN) is providing a District Preliminary Geotechnical Report for the proposed project on Highway 395 in Mono County, between postmiles 52.3 and 53 .7, near the town of Lee Vining. The project is located adjacent to the westerly shore of Mono Lake. There is recurring rock fall at six locations along the alignment. It is proposed to grade slopes 1 through 3 at 2: 1 (h:v) or flatter. It is recommended that Slope 4 be draped with a double twisted wire mesh (DTWM) drapery. Attenuator systems consisting of DTWM over cable net drapery is anticipated for Slopes 5 and 6. No shoulder widening is anticipated.

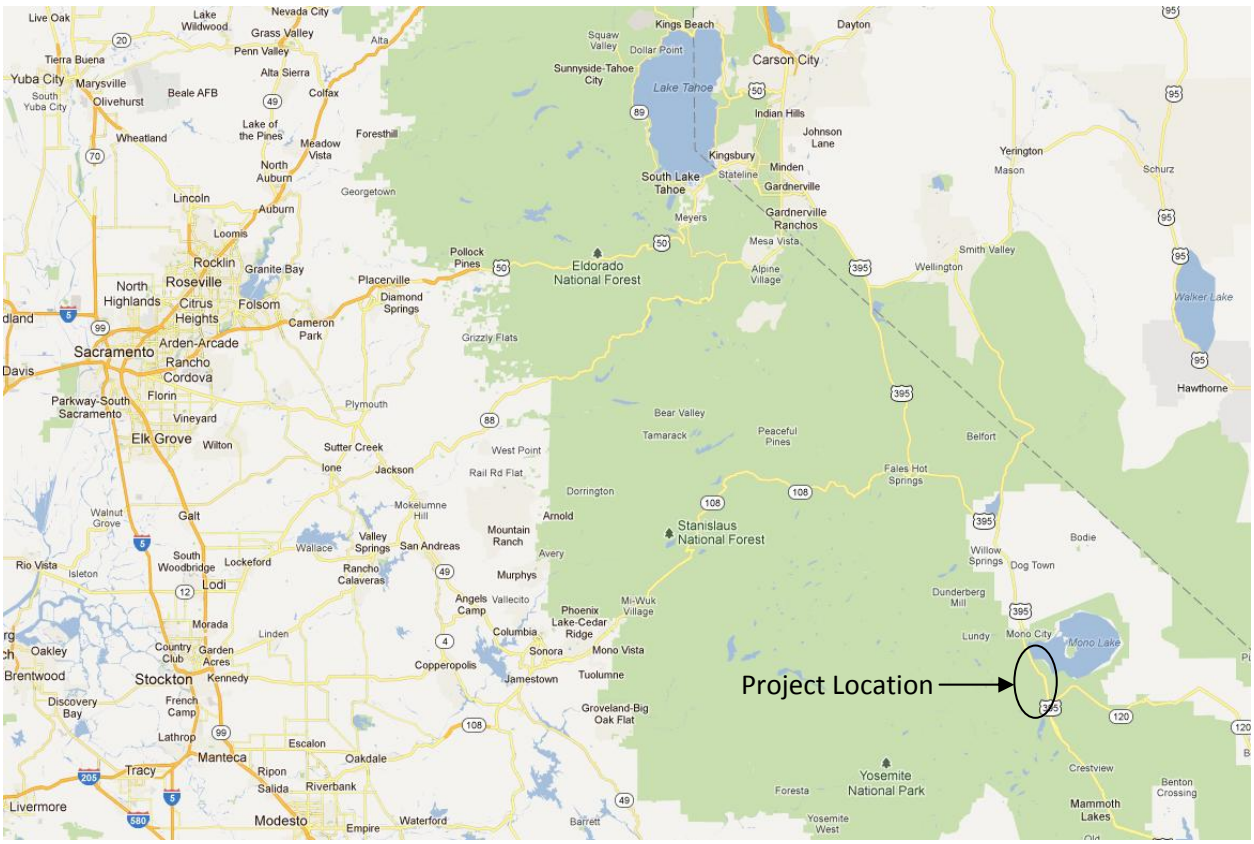

Figure 1: Vicinity Map showing the location of the Lee Vining Rockfall Safey Project, adapted from Google Maps, 2012.

2. Existing Facilities and Proposed Improvements

Highway 395 in this area trends north south, is constructed of two, twelve-foot lanes and one to four-foot paved shoulders and four to six-foot unpaved shoulders. The highway was constructed on a cut/fill in this section with the existing cut slopes graded at with a maximum vertical height of 70-feet. The fill slopes were graded at with a maximum vertical height of 20-feet. The cut slopes arc covered with about 20 to 30% vegetative cover. Loose, fine material consistently erodes from the slope, undermining larger blocks of intact rock.

Slope 1 is located at PM 52.39, and begins at Station 114+90 and extends to Station 117+40. The slope lies at an angle of 1:1 (h:v) with a vertical height of about 25-feet to the hinge line. The slope then continues at 1.5: 1 to 2:1 (h:v). The length of the slope is about 250-feet parallel to the roadway. The rocks at this location are typically about 8-inches to 2-feet in diameter.

Figure 2: Photograph looking to the northwest showing Slope 1.

Slope 2 is located at PM 52.50. It begins at Station 120+60 and extends to Station 123+ 10 The slope lies at an angle of 1:1 with a maximum height of 25-feet and a length of about 215-feet along the roadway. The slope then continues at 1.5:1 to 2:1 (h:v) further west. The rocks at this location are typically 6-inches to l.5-feet in diameter.

Figure 3: Photograph looking to the northwest showing Slope 2.

Slope 3 is located at postmile 52.93 and extends from Station 143+05 to 145+80. The slope lies at an angle of 0.75 :1 to 1:1 (h:v) with a maximum height of about 33-feet and a length of 260-feet. The slope then continues at 1.5:1 to 2:1. The rocks at this location are typically 8-inches to less than two-feet in diameter.

Figure 4: Photograph looking to the northwest showing Slope 3.

Slope 4 is located at postmile 53.05, north of the marina tum off. The slope extends from Station 149+90 to Station 159+95. The slope is currently at a ratio of 1:1 with a maximum height of 40-feet and a length of about 1000-feet. The slope then continues at 1.5:1 to 2:1 further west. The rocks at this location are typically 8-inches to 2-feet in diameter.

Figure 5: Photograph looking to the southwest showing Slope 4.

Slope 5 is located at postmile 53.30 and extends from Station 163+20 to 171+20. The slope lies at an angle of about 0.5: I to 0.75: I (h:v) with a maximum height of about 70-feet and a length of about 800-feet. The slope then continues at 1.5:1 to 2:1. The rock observed at the ground surface at this location is typically 8-inches to over 2-feet in diameter.

Figure 6: Photograph looking to the southwest showing Slope 5.

Slope 6 is located at postmile 53.59 and lies between Stations 175+60 and 179+00. The slope lies at an angle of 1:1 with a maximum height of 60-feet and a length of about 340-feet. The slope then continues at 2: 1(h:v). The rocks at this location are typically 18- inches to greater than four-feet in diameter.

Figure 7: Photograph looking to the north showing Slope 6.

3. Pertinent Reports and Investigations

In preparing of this report, following documents were reviewed:

- Bailey, R.A., 1989, Geologic map of Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, Eastern California: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1933, scale 1:62500.
- Western Regional Climate Center for 1988-2010
- USGS Topographic Map of the Mount Dana 7.5' quadrangle, 1 :24,000,1994
- USGS Topographic Map of the Lee Vining 7.5' quadrangle, 1 :24,000,1994
- Web Soil Survey, http://websoilsurvey.nrcs.usda.gov , United States Department of Agriculture
- Department of Water Resources, Water Data Library, http://www.water.ca.gov/waterdatalibrary/

4. Physical Setting

The physical setting of the project site and the surrounding area was reviewed to provide climate, topography and drainage, geology and seismicity characteristics to aid in preliminary project design and construction planning. The following is a discussion of our review:

4.1 Climate

According to the Western Regional Climate Center for the time period between 1988 and 2010, the average annual precipitation at the Lee Vining Station is about 14.50 inches. The majority of this precipitation (over 60 percent) falls between November and May. The average annual snowfall is 70.5 inches with the majority of the snowfall occurring between November and March. Average annual snow depth is one-inch. A maximum average for snow depth of 7-inches occurs during January. The annual maximum temperature is approximately 61.50 F and the average annual minimum temperature is 35.30 F. The station recorded the highest average daily maximum of 84.30 F in July and the lowest average daily minimum of 19.6° F in January.

4.2 Topography & Drainage

According to the USGS topographic map of the Mount Dana and Lee Vining 7.5 minute quadrangles (1994), the project site lies at an elevation of about 6500 feet above mean sea level as indicated by a bench mark to the east of the site. The overall topography is relatively flat-lying around Mono Lake but became moderately to very steep towards the west in the Sierra Nevada. The map indicates that Mono Lake lies to the east of the project site, and the town of Lee Vining is to the south of the project location. The National Forest Scenic Area Boundary lies to the south of the project. A copy of the topographic map is included as Figure 8. Regional drainage is to the east, towards Mono Lake.

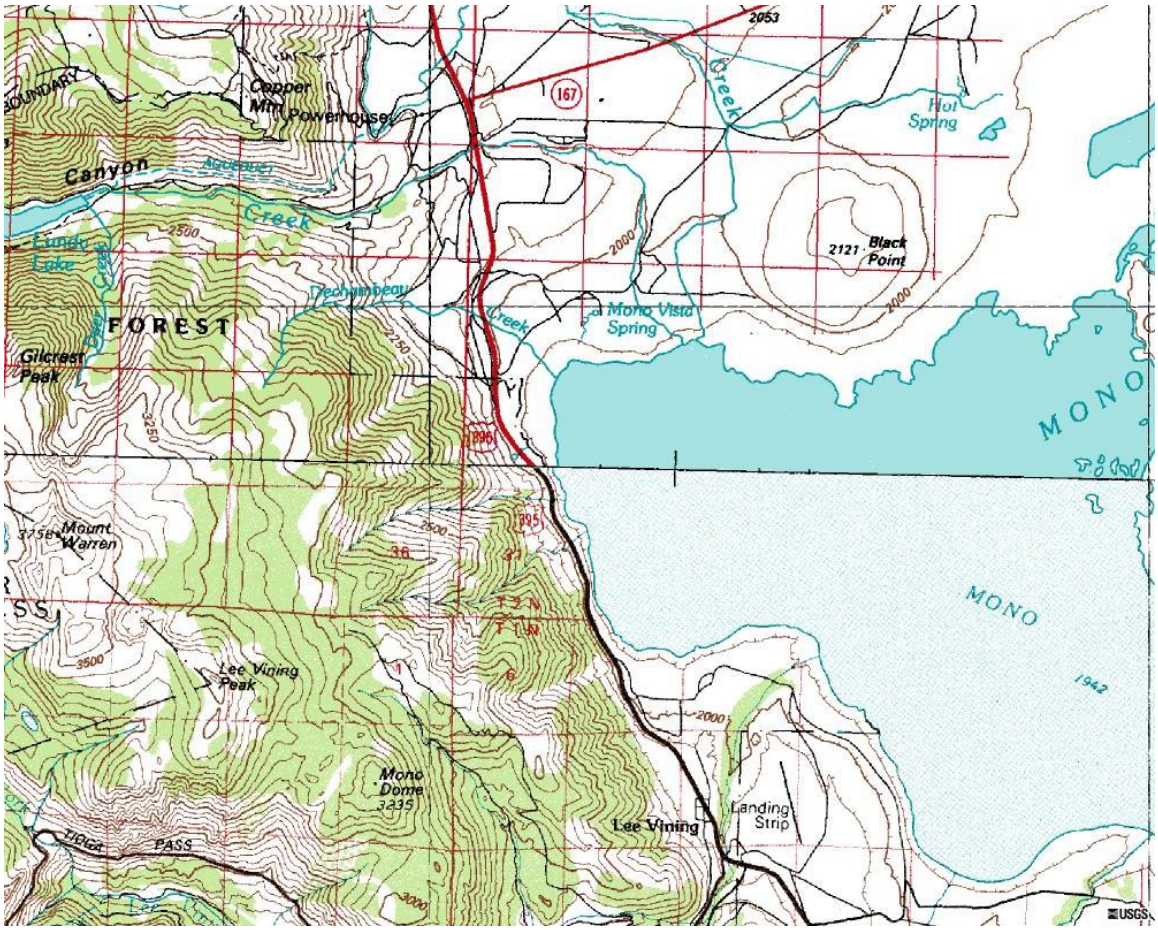

Figure 8: A portion of the Topographic Maps of the Mount Dana and Lee Vining Quadrangles, USGS, 1994.

4.3 Man-made and Natural Features of Engineering and Construction Significance

Mono Lake and its associated tufa towers are considered a natural resource that cannot be disturbed.

4.4 Regional Geology and Seismicity

The project site lies at the interface between the Sierra Nevada Geomorphic province and the Basin and Range Geomorphic province. The Sierra Nevada Geomorphic Province is dominated by granitic rocks of Mesozoic age that intruded the overlying sedimentary deposits, and pushed up the existing Sierra Nevada Mountain Range through a series of orogenic mountain building events. The area is tectonically in a compressional regime.

The Basin and Range Geomorphic Province is typified by tectonic extension, creating a topography of linear, parallel, ridges and valleys, termed horsts and grabens.

According to the Geologic map of the Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, Eastern California (USGS, 1989) the site is underlain by Quaternary

lake deposits (Qlt). A section from this map showing the project location is attached as Figure 9.

The map shows the Lee Vining Fault trends parallel to the Highway. According to Caltrans ARS online, the fault has been renamed to the Mono Lake Fault. The Mono Lake Fault is a normal fault with a maximum moment magnitude (MMax) of 6.6.

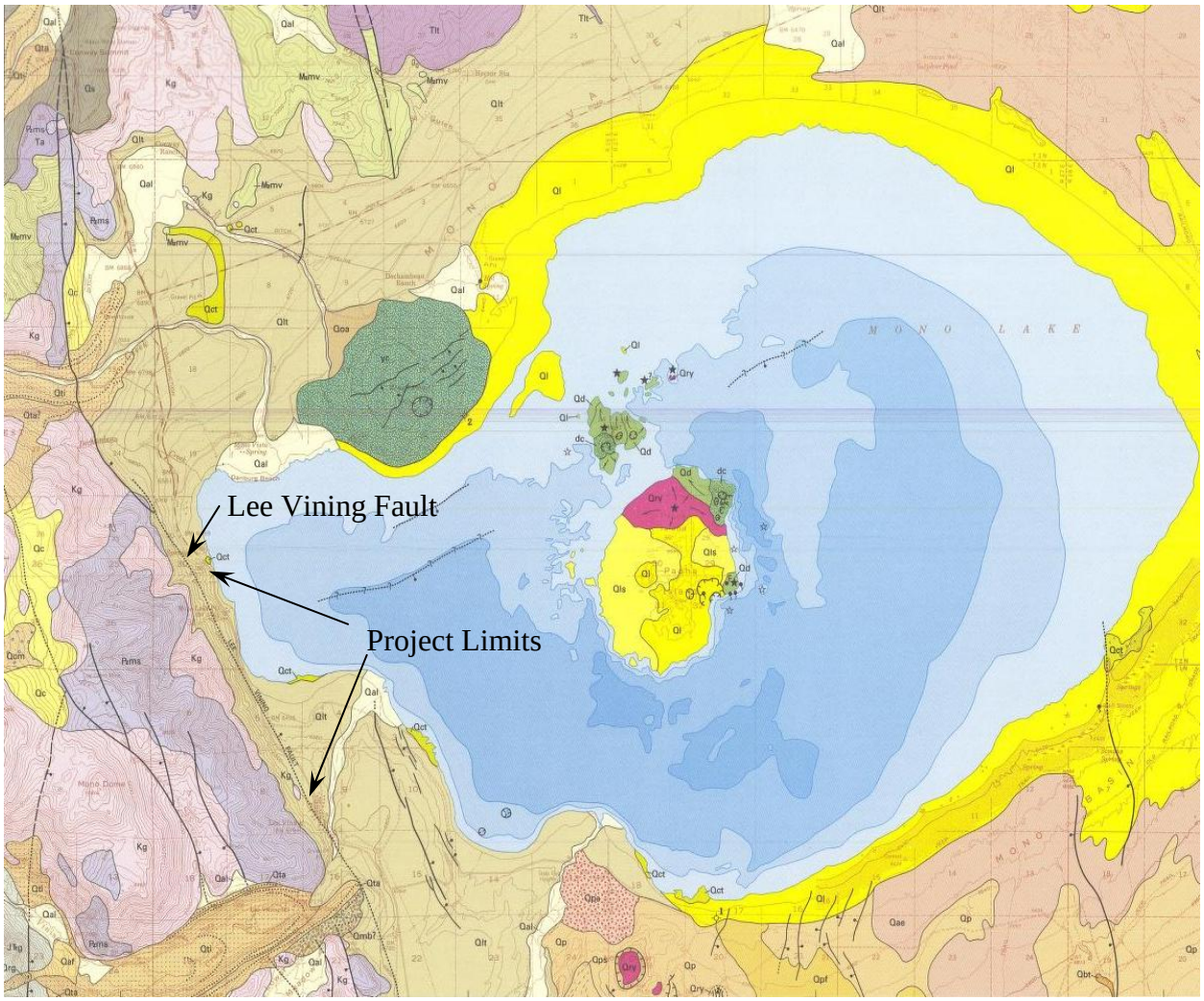

Figure 9: A portion of the "Geologic Map of Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, Eastern California".

SURFICIAL DEPOSITS

Alluvial, lacustrine, and hot-spring deposits

Qal — **Younger alluvium (Holocene)**—Unconsolidated silt, sand, and gravel deposited by actively aggrading streams; includes meadow and marsh deposits

Qt — **Talus (Holocene)**—Angular rock debris forming steep cones and ramparts mainly at base of cliffs

Qc — **Colluvium (Holocene)**—Loose heterogeneous detritus and soil accumulated by slopewash and other mass-wasting processes; locally includes reworked Holocene pumice and ash-fall deposits

Qls — **Landslide deposits (Holocene)**—Restricted to Paoha Island in Mono Lake; lacustrine sediments affected by landslide and earth flow, caused by uplift during emplacement of subjacent rhyolite cryptodome

Qaf — **Alluvial fan deposits (Holocene and Pleistocene)**—Coarse sand and gravel forming fans and moderately steep alluvial cones

Qae — **Aeolian deposits (Holocene and Pleistocene)**—Dune and windblown deposits composed predominantly of sand, ash, and fine pumice clasts; formed mainly by aeolian redeposition of ash and pumice lapilli from unconsolidated parts of the Bishop Tuff and pyroclastic deposits of Mono-Inyo Craters; occur mainly around southeastern and northeastern shores of Mono Lake and in northern parts of Cowtrack and Glass Mountain quadrangles

Ql — **Lacustrine sediments (Holocene and Pleistocene)**—Light-grayish-tan to buff, thin-bedded silts and clays containing numerous interbeds of white diatomite and basaltic, quartz-latitic, and rhyolitic ash, mainly from local sources; occur in Long Valley as deposits of Pleistocene Long Valley Lake (Mayo, 1934) and on Paoha Island as deposits of Pleistocene Mono Lake (Lake Russell), where they underlie Wilson Creek Formation of Lajoie (1968, 1969); also includes lake-bottom oozes recently exposed along receding shoreline of Mono Lake. Also includes lake beds of uncertain age in Adobe Valley. Long Valley deposits attain as much as 300 m thickness in drill holes and are estimated to range in age from about 700 ka to 100–50 ka; Paoha Island deposits are about 100 m thick and are estimated to range in age from at least 170 ka to about 25 ka (Lajoie, 1968)

Qoa — **Older alluvium (Pleistocene)**—Stream deposits undergoing erosion and dissection; includes most late Pleistocene glacial outwash and related periglacial sediments

Qlt — **Lake terrace deposits (Pleistocene)**—Lake terrace gravels, deltaic deposits, and interbedded fluvial and lacustrine sediments surrounding Mono Lake; as mapped, includes Wilson Creek Formation of Lajoie (1968, 1969); approximately coeval with Wisconsin age glaciations; maximum exposed thickness 70 m in Rush Creek

Qct — **Travertine and calcareous tufa (Pleistocene)**—Travertine hot-spring deposits, commonly located on faults, and calcareous tufa, deposited mainly along former shorelines of Pleistocene Long Valley Lake and around shores of Mono Lake

Intermediate to mafic rocks

Qd, dc — **Dacite (Holocene)**—Sparsely porphyritic dacite to rhyodacite lava flows and cinder cones (dc) on Poaha and Negit islands, typically containing small phenocrysts of plagioclase and hypersthene, and less commonly hornblende and biotite; paleoshoreline and tephra studies (Stine, 1984) suggest ages that range from about 2,000 yr B.P. to possibly less than 220 yr B.P.

Qyb, yc — **Younger basalt (Holocene and Pleistocene)**—Dark scoriaceous trachybasalt flows and associated cinder cones (yc) containing conspicuous plagioclase and olivine phenocrysts; includes Red Cones, two cinder cones and associated lava flows that postdate Tioga glaciation, and nonglaciated flows near Pumice Butte in Devils Postpile quadrangle; also includes Black Point, a terraced cinder cone on northwest shore of Mono Lake in Bodie quadrangle, formed by subaqueous eruptions about 13,000 yr B.P. during a higher stand of lake (Lajoie, 1968)

Qry — **Younger domes and flows (Holocene)**—Aphyric rhyolite, predominantly glassy, varying widely in texture from dense obsidian to finely vesicular pumice; ages range from about 3,000 to 550 yr B.P. (Wood, 1977; Sieh and Bursik, 1986); includes chemically similar 1,350-yr-B.P. Wilson Butte in Inyo Craters chain and also sparsely porphyritic, low-silica, pyroxene rhyolite in Mono Lake; individual dome flows attain maximum thickness of 200 m and 4 km length

Tlt — **Latite welded tuff (Miocene)**—Gray to black vitrophyric welded tuff with conspicuous eutaxitic texture; contains sanidine, plagioclase, biotite, augite, and occasionally hornblende phenocrysts; K-Ar ages range from 11.9 to 11.1 Ma (Gilbert and others, 1968); probable source is north of map area

Ta — **Andesite (Miocene)**—Trachyandesitic flows, tuffs, and breccias in northern parts of Cowtrack Mountain and Glass Mountain quadrangles; undated but considered Miocene in age based on stratigraphic relations (Gilbert and others, 1968; Krauskopf and Bateman, 1977)

METAMORPHIC ROCKS

Mzmv — **Metavolcanic rocks (Mesozoic)**—Metamorphosed volcanic rocks of Ritter Range roof pendant, mainly in Mount Morrison, Devils Postpile, and Mono Craters quadrangles (Rinehart and Ross, 1964; Huber and Rinehart, 1965; Kistler, 1966a, 1966b; Fiske and Tobisch, 1978; Kistler and Swanson, 1981); Triassic, Jurassic, and Cretaceous in age

Pzms — **Metasedimentary rocks (Paleozoic)**—Metamorphosed sedimentary rocks in the Benton Range, Casa Diablo Mountain quadrangle (Rinehart and Ross, 1957), in the Mount Morrison roof pendant, Mount Morrison quadrangle, (Rinehart and Ross, 1964), and in Gull Lake roof pendant, Mono Craters quadrangle (Kistler, 1966a, b; Kistler and Nokleberg, 1979); Ordovician, Silurian, Mississippian(?), Pennsylvanian(?), and Permian(?) in age

PLUTONIC ROCKS

Kg — **Granodiorite (Cretaceous)**—Mainly rocks mapped as "quartz monzonite similar to the Cathedral Peak Granite" in Mt. Morrison and Devils Postpile quadrangles (Rinehart and Ross, 1964; Huber and Rinehart, 1965), Round Valley Peak Granodiorite in Mount Morrison quadrangle (Rinehart and Ross, 1964) and equivalent rock formerly mapped as granodiorite or Rock Creek in Casa Diablo Mountain quadrangle (Rinehart and Ross, 1957), Mount Givens Granodiorite, and granodiorite of Fish and King creeks in Devils Postpile quadrangle (Huber and Rinehart, 1965); includes other small granitic masses of probable Cretaceous age: albite granite of McGee Mountain, quartz monzonite of Hilton Creek, granodiorite of Red Mountain, as well as other small unnamed felsic and dioritic bodies in the Mount Morrison and Casa Diablo Mountain quadrangles (Rinehart and Ross, 1957, 1964); also includes quartz monzonite of Aeolian Buttes (Kistler, 1966b) and granite of June Lake (R.W. Kistler, oral commun., 1987) in Mono Craters quadrangle

Jg — **Granitic rocks (Jurassic)**—Consists of rocks mapped as granite of Casa Diablo Mountain in Casa Diablo Mountain, Glass Mountain, and Cowtrack Mountain quadrangles (Rinehart and Ross, 1957; Krauskopf and Bateman, 1977)

JTg — **Granodioritic, dioritic, and gabbroic rocks, undivided (Jurassic and Triassic)**—Mainly Triassic rocks mapped as quartz monzonite of Wheeler Crest and granodiorite of Benton Range in Casa Diablo Mountain and Glass Mountain quadrangles (Ross and Rinehart, 1957; Krauskopf and Bateman, 1977) and as Wheeler Crest Quartz Monzonite in Mount Morrison and Devis Postpile quadrangles (Rinehart and Ross, 1964; Huber and Rinehart, 1965); also includes quartz monzonite of Deer Spring in Casa Diablo Mountain quadrangle (Rinehart and Ross, 1957) and quartz monzonite of Lee Vining Canyon in Mono Craters quadrangle (Kistler, 1966b), also probably Triassic in age; also includes small masses of Triassic diorite and gabbro, as well as Jurassic aplite dikes and small intrusions in Glass Mountain and Cowtrack Mountain quadrangles (Krauskopf and Bateman, 1977)

Figure 10: A portion of the legend from the "Geologic Map of Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, Eastern California".

4.5 Soil Survey

The online Web Soil Survey, http://websoilsurvey.nrcs.usda.gov, was utilized to provide a soil and erodability of the soils located at the Lee Vining rock fall project locations. The following Table and Figure describe the soil units observed at the site. There were two soil surveys utilized to provide soil classifications at the site, one, the "Soil Survey of Benton-Owens Valley Area, Parts of Inyo and Mono Counties" and two, the "Soil Survey of the Inyo National Forest, Western Part, California".

Figure 11: Map denoting the soil units described in the online Web Soil Survey http://websoilsurvey.nrcs.usda.gov.

Map Unit Symbol	Map Unit Name	Erodability	USC soil classification
108	Alamedawell-Orecart complex	Slight	SM
175	Cryoborolls bouldery- Cryoborolls-Rock outcrop complex	Moderate	SM
181	Dechambeau very gravelly-Dechambeau complex	Slight	GC-GM
240	Lithic Xeric Torriorthents- Xeric Torriorthents-Rock outcrop complex	moderate	SC-SM
350	Watterson gravelly loamy sand	Slight	GM
146	Lakash-Brantel families complex	Slight	SM
175bo	Cryoborolls boulder-Cryoborolls-Rock outcrop complex	Moderate	SM
240bo	Lithic Xeric Torriorthents- Xeric Torriorthents-Rock outcrop complex	Moderate	SC-SM
347	Nanamkin family-Rock outcrop complex	Severe	SM
380	Vitrandic Torriothents, ashy-Vitrandic-Haplodurids	Slight	SP-SM
W	Water	N/A	N/A

Table 1: Summary of the map units described in the Web Soil Survey.

5. Exploration

5.1 Drilling and Sampling

Due to limited access for drilling equipment and presumed rippability of the rock, no drilling or subsurface sampling was performed.

5.2 Geologic Mapping

The local geology consist of Quaternary lake terrace deposits (Qlt) as depicted on the "Geologic Map of Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, eastern California (USGS, 1989, Figures 9 and 10). The fine-grained deposits are interfacied with talus on the western side of the lake. The facies are mixed in this area due to the juxtaposition of the Sierra Nevada mountains with Mono Lake.

5.3 Geophysical Studies

No geophysical surveys were performed.

5.4 Instrumentation

No instrumentation was installed at the site.

6. Geotechnical Testing

6.1 In Situ Testing

No in-situ testing was performed.

6.2 Laboratory Testing

No laboratory testing was performed.

6.3 Corrosion

The web soil survey indicates the embankment and cut slope materials adjacent to Mono Lake are highly corrosive. It also indicates the embankment and cut slope materials along the project alignment south of Mono Lake have a low corrosivity.

7. Geotechnical Conditions

7.1 Site Geology

7.1.1 Lithology

According to the "Geologic Map of the Long Valley Caldera, Mono-Inyo Craters Volcanic Chain and Vicinity, Eastern California" (USGS, 1989), the primary geologic lithology encountered at the site consists of Quaternary Lake Terrace Deposits (Qlt). These deposits are Pleistocene in age and consist of lake terrace gravels, deltaic deposits and interbedded stream and lake deposits surrounding Mono Lake.

Travertine and calcareous tufa (Qct) is situated in localized areas in the project alignment. The tufa is coincident in age with the lake deposits (Pleistocene) and were created by bacteria precipitating calcium carbonate through their life processes. The tufa is considered an environmental and educational resource.

Paleozoic metasedimentary rocks (Pzms) are present in the hills to the west of Mono Lake. These were originally sedimentary deposits that have been metamorphosed

through high heat and pressure from the intrusion of the underlying granitic rocks.

Cretaceous granodiorite is locally present in the hills to the west of Mono Lake.

7.1.2 Structure

Due to the interbedding of the lake and stream deposits, there is very little structure to the deposits contained in the cut slopes.

7.1.3 Natural Slope Stability

All of the slopes along the project alignment appeared globally stable. The natural slopes above the cut slopes have had rock fall. The rock fall from the natural slopes appears to be a small contributor compared to the rock fall generated from the cut slopes.

The cut slopes appear globally stable. The cut slopes within the project alignment are locally unstable, generating rock fall.

7.2 Soil and Ground Water Conditions

According to the online Web Soil Survey (Section 4.5), the soils at the site are primarily sands, silty sands and gravels.

7.3 Water

7.3.1 Surface Water

According to the climate information presented in Section 4, average annual rainfall is about 14 inches. The average annual snow depth is 1-inch. The average maximum snow depth is 7-inches in January. Mono Lake is situated to the east of the project alignment.

7.3.1.1 Scour

Scour is not applicable.

7.3.1.2 Erosion

Based on the Web Soil Survey and site reconnaissance, the materials at the site vary from slightly erodible to severely erodible.

7.3.2 Ground Water

According to the Department of Water resources well **01S26E03C001M** south of the Town of Lee Vining, the groundwater has fluctuated between 33-feet and 119-feet below ground surface. The last groundwater reading of 100.6-feet below ground surface was performed in 1984.

The groundwater surface at the project site can be presumed to be that of the surface elevation of Mono Lake.

7.4 Project Site Seismicity

7.4.1 Ground Motions

Ground motion was not evaluated based on the scope of the project.

7.4.2 Ground Rupture

Ground rupture was not evaluated based on the scope of the project.

8.Geotechnical Analysis and Design

8.1 Dynamic Analysis

Dynamic Analysis was not performed due to the scope of the project.

8.2 Cuts and Excavations

8.2.1 Stability

Slopes 1 through 3 are recommended to be cut at 1.5:1 (h:v)or flatter. These new cuts will be globally and locally stable.

The “Rockfall Hazard Rating System” (RHRS) was employed on this project to rate the potential for rock fall for the six slopes relative to each other. The following table summarizes the results of the evaluation. As anticipated, Slope 6 has the highest rating, primarily due to the lack of site distance.

Location	Postmile	Slope Length	Vertical Slope Height	RHRS Rating
1	52.39/52.43	212	37	92
2	52.50/52.54	211	36	87
3	52.93/52.98	264	35	69
4	53.05/53.23	1000	22-85	190
5	53.30/53.49	750	116	262
6	53.59/53.66	370	58	567

Table 2: Summary of the Rockfall Hazard Rating System (RHRS) for slopes 1 through 6.

8.2.2 Rippability

All of the material encountered should be rippable with conventional equipment.

8.2.3 Grading Factors

For excavation purposes on slopes 1 through 3, the excavation factor should be 1.1 to 1.2.

8.3 Embankments

New embankments are not proposed for this project.

8.4 Earth Retaining Systems

No retaining walls are proposed for this project.

8.4.1 Rock Fall Mitigation

Slope 4 is recommended to be draped with Double Twisted Wire Mesh (DTWM) secured to the slope with a cable infrastructure anchored to the slope with grouted cable anchors.

Slope 5 is recommended to have a rock fall attenuator system installed with approximate ten-foot steel posts, placed approximately twenty-feet on center, suspending a drapery consisting of cable net under DTWM.

Slope 6 is also recommended to have a rock fall attenuator system installed with approximate ten-foot steel posts, placed approximately twenty-feet on center, suspending a drapery consisting of cable net under DTWM.

Details of the DTWM and attenuator systems are contained in the Recommendations, Section 12.

8.5 Minor Structure Foundations

It is anticipated that the DTWM drapery on Slope 4 will be held in place by a perimeter cable anchor system consisting of grouted steel cables in a three-inch diameter hole.

The steel posts for the attenuator systems on Slopes 5 and 6 will need concrete foundations consisting of 2-foot by 2-foot by 2-foot spread footings. The top of the footing will remain exposed.

It is anticipated that boulder lashing may be needed on up to ten boulders in Slope 6. The cable lashing will be held in place by cable anchors similar to the perimeter anchor system for Slope 4.

9. Material Sources

It is our understanding that fill will not be needed for this project; any fill that is not structural backfill may be utilized from cutting Slopes 1 through 3.

10. Material Disposal

If the material cut from Slopes 1 through 3 is not utilized for the project it must be disposed of. Excess material generated from the project will need to be disposed of by the contractor at a commercial disposal facility.

11. Construction Considerations

1. All earthworks shall follow Section 19 of Caltrans Standard Specifications.
2. Difficult drilling conditions and caving are expected while drilling the cable anchors and excavation of the spread footings for the steel posts.

12. Recommendations and Specifications

Slope 1

Due to the relatively low generation of rock fall on this slope corresponding to the low RHRS number of 92, as well as a reasonable upslope catchment area, we feel that the proposed 1.5:1 (h:v) cut slopes are constructible. Excavation should be performed according to the 2006 Cal Ttrans Standard Specifications.

Slope 2

Due to the presence of an avalanche shoot at the top of the cut slope, it is not recommended to construct a structure at this location. The most feasible alternative for rock fall mitigation would be to grade the slope at a new ratio of 1.5:1 (h:v) or flatter. Excavation should be performed according to the 2006 Cal Ttrans Standard Specifications.

Slope 3

Slope 3 had the lowest RHRS number for all of the slopes analyzed. Due to the presence of a fifteen-foot unpaved shoulder and a close upslope catchment area, we recommend to grade the slope at a new ratio of 1.5:1 (h:v) or flatter. Excavation should be performed according to the 2006 Cal Ttrans Standard Specifications.

Slope 4

The average size of the rocks falling from this location is typically less than 3-feet in diameter. The use of Double Twisted Wire Mesh (DTWM) drapery would be applicable at this location. Hand scaling and light grading can be performed prior to the mesh being draped on the slope to provide a more uniform surface especially the block of soil and rock at the southerly portion of the slope. The DTWM is anchored along the top. A seed bearing mat and erosion control fabric can be placed beneath the DTWM. If such a system is anticipated Geotechincal Design can aid in the design.

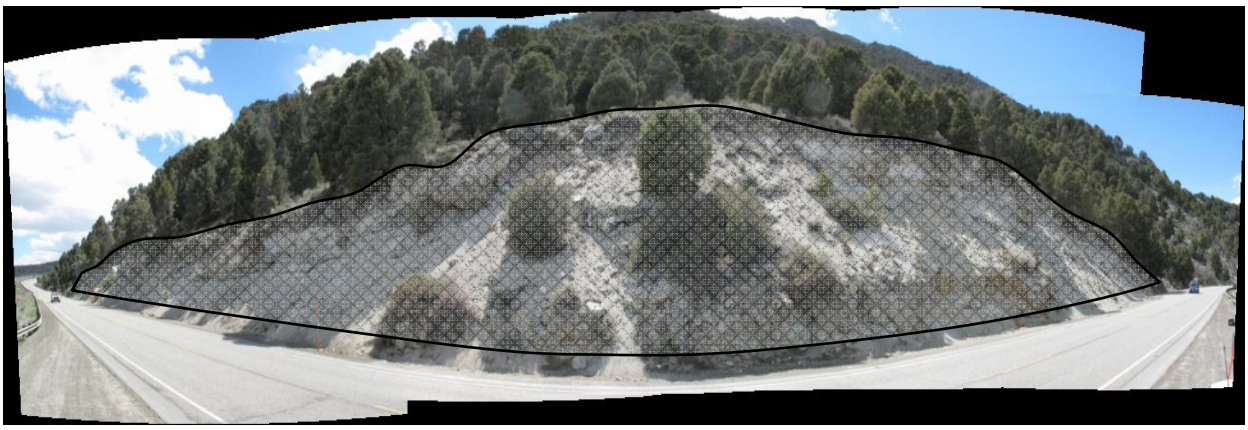

Figure 12: Depiction of the DTWM drapery for Slope 4 which can provide an indication of the vegetation that will need to be removed and/or trimmed.

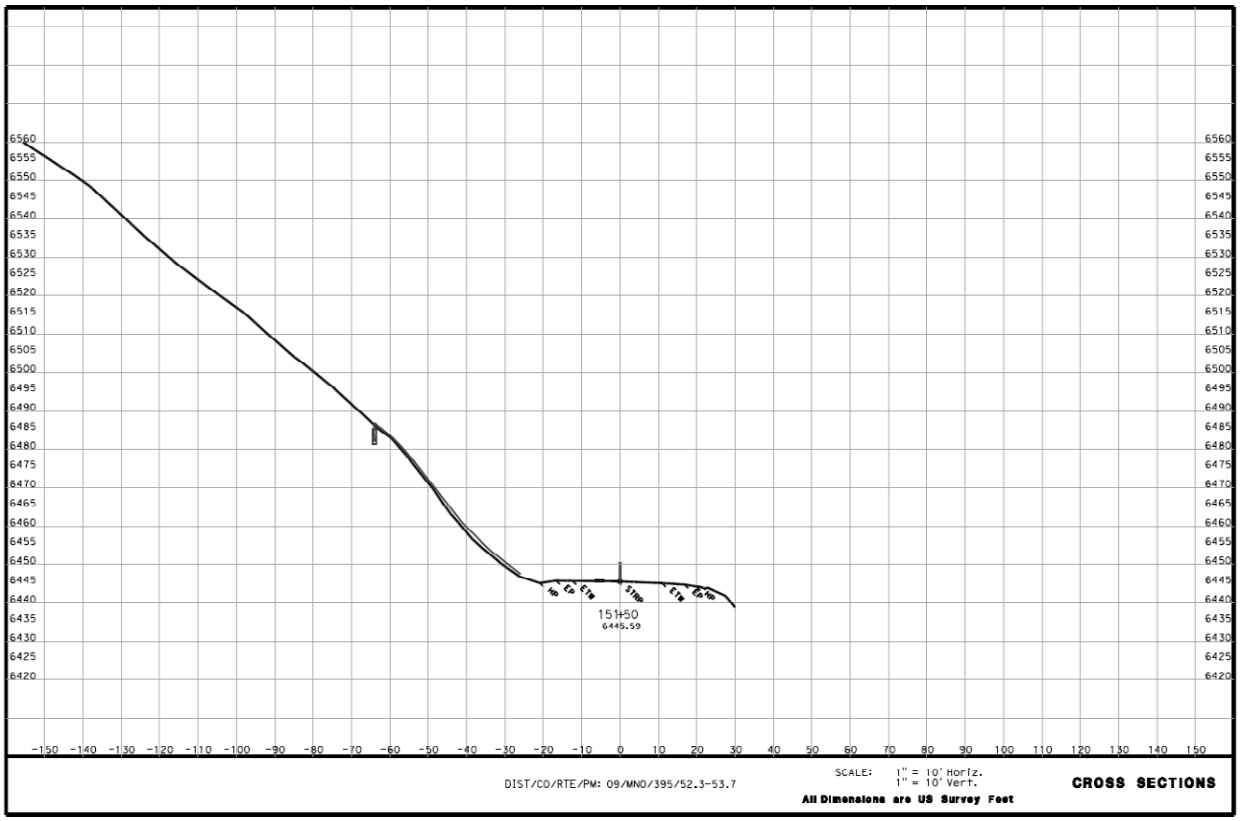

Figure 13: Cross Section of the drapery for Slope 4.

Slope 5

Slope 5 has a relatively high RHRS rating, no upslope catchment area, and narrow shoulder widths. A drapery system is the most feasible option for mitigating rock fall generated from the slope. Due to the presence of large (greater than 4-foot) boulders in the cut slope material, and the potential for material to be released above the existing cut slope, the recommended system is an attenuator style system with cable net underlying DTWM (Figure 14). The system would span the large debris shoot in order to contain the material. The steel posts would be approximately ten-feet in height and spaced approximately twenty-feet on center.

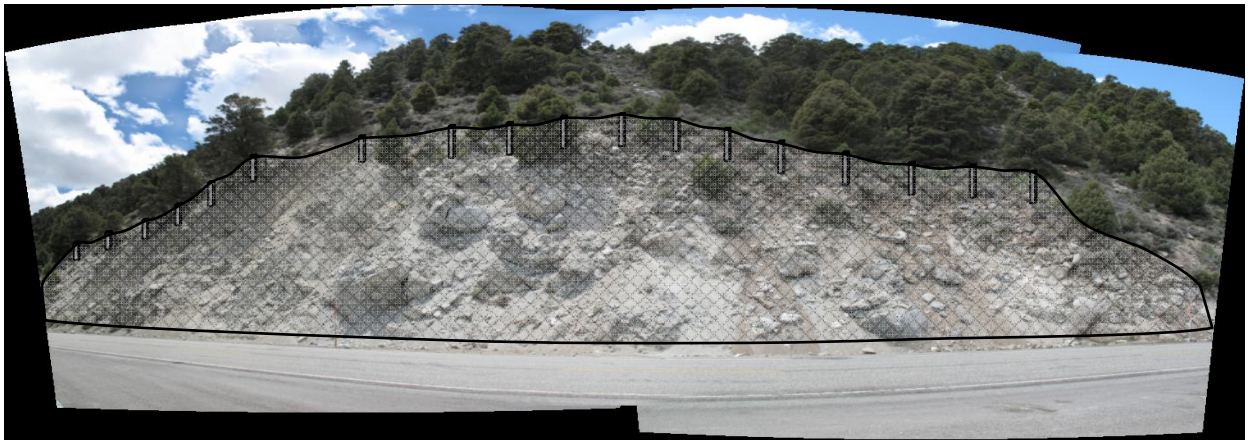

Figure 14: Depiction of the attenuator system for Slope 5 which can provide an indication of the vegetation that will need to be removed and/or trimmed.

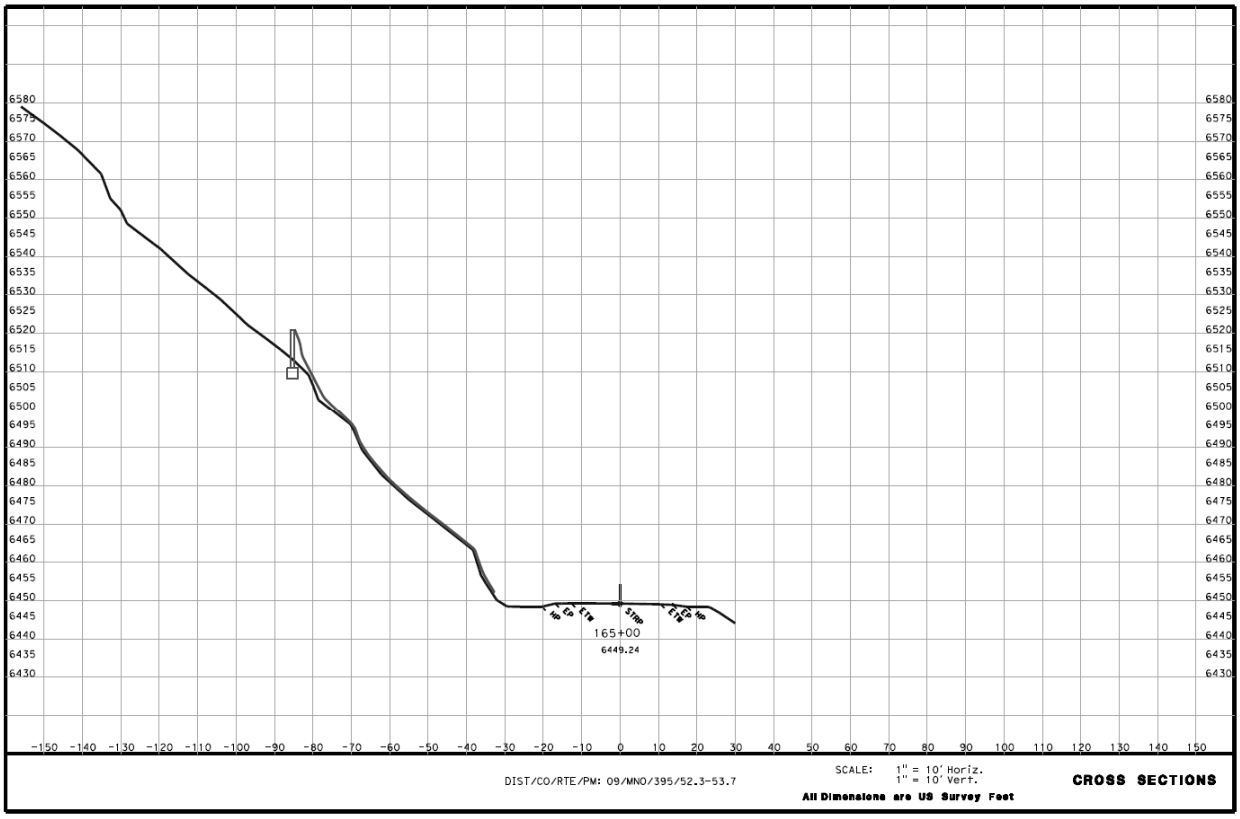

Figure 15: Cross section of the attenuator system for Slope 5.

Slope 6

Slope 6 has the highest RHRS rating of 567, primarily due to the lack of decision sight distance. There is very little shoulder (4-foot on either side). Due to the presence of large (greater than 4-foot) boulders in the cut slope material, and the potential for material to be released above the existing cut slope, the recommended system is an attenuator style system with cable net underlying DTWM (Figure 16). The upper posts should be approximately ten-feet in height and spaced approximately twenty-feet on center.

Figure 16: Depiction of the attenuator system for Slope 6 which can provide an indication of the vegetation that will need to be removed and/or trimmed.

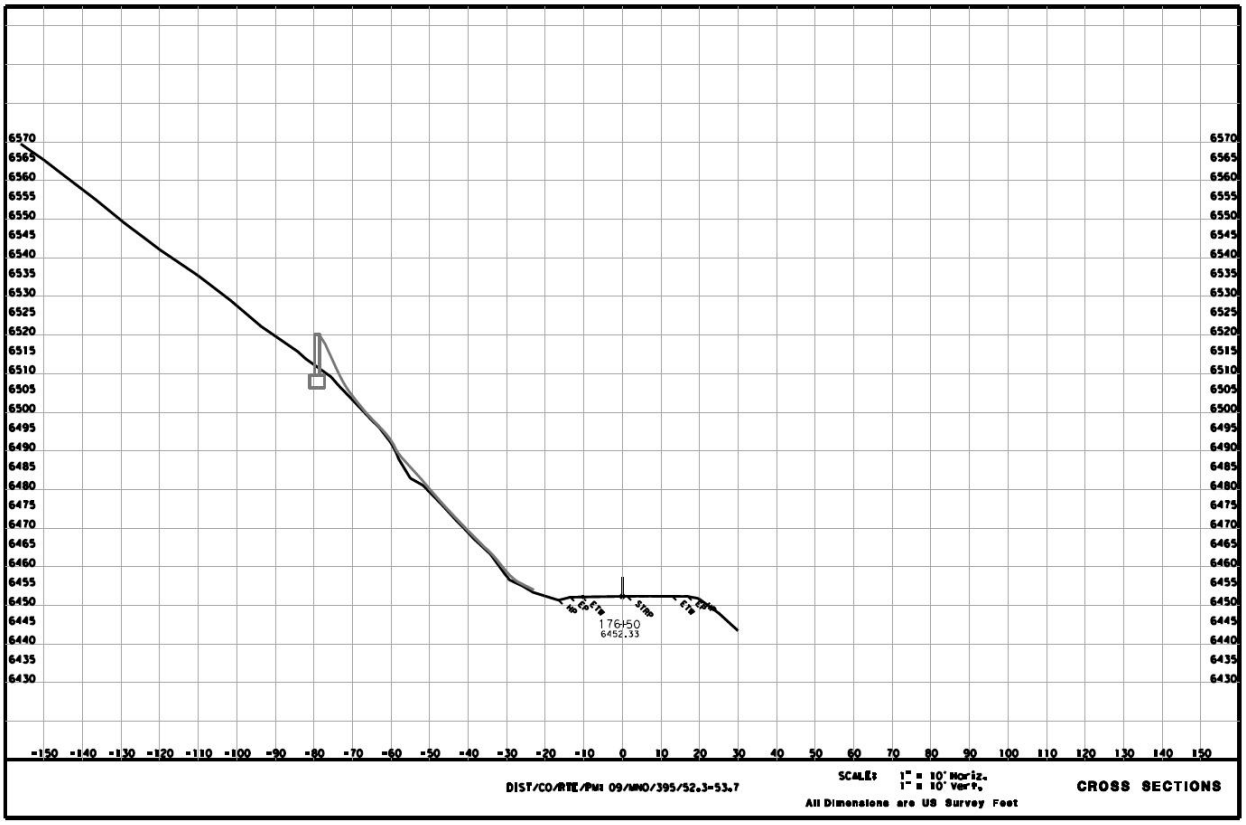

Figure 17: Cross section of the attenuator system for Slope 6.

Alternatively, to aid in the revegetation effort for slopes 5 and 6, an anchored mesh consisting of cable net backed by DTWM may be utilized. A seed bearing mat and erosion control fabric can be placed beneath the anchored cable net. If such a system is anticipated Geotechincal Design can aid in the design. Light hand scaling and grading may be necessary to bring the anchored mesh in conformance with the slope face. Likewise, Caltrans personnel will need to maintain close working conditions with the contractor to maintain tolerances that allow for revegetation.

Project Information

Standard Special Provision 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:

None

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

Geotechnical Design Report for EA 09-33501, dated March 15, 2012.

Data and information available for inspection at the District Office:

None.

Data and information available for inspection at the Transportation Laboratory are:

None.

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Water Source Information

Water is available from the Caltrans Lee Vining Maintenance Station. Contact Randy Walker at (760) 937-0782. Water may also be available from Mr. Bill Banta from Lee Vining. He can be contacted at (760) 647-6543.

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Location 4 Slope Zone Pictures

The following pictures depict the approximate slope zones for Location 4 starting at the south end of Location 4 and progressing north.

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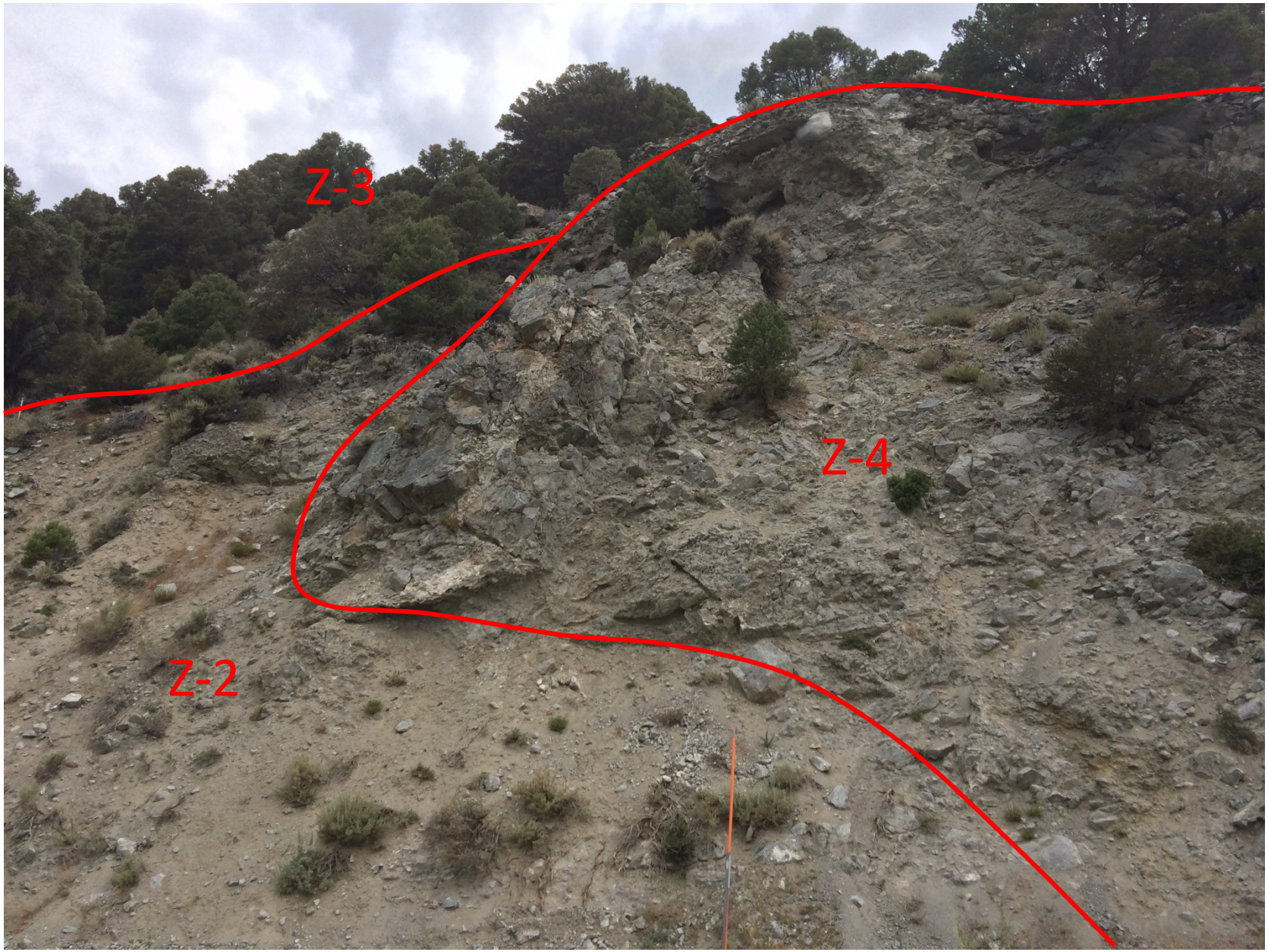
Z-4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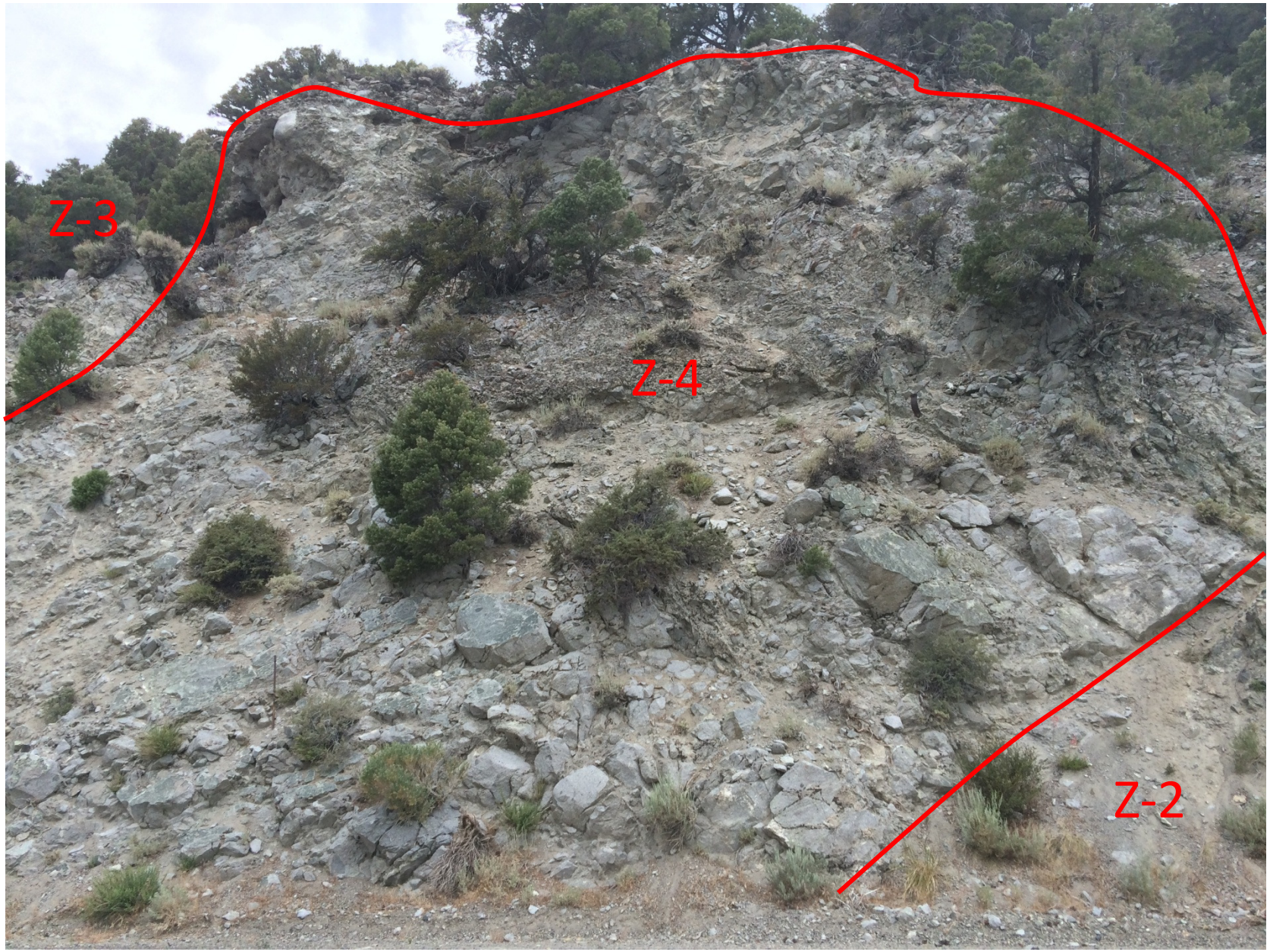
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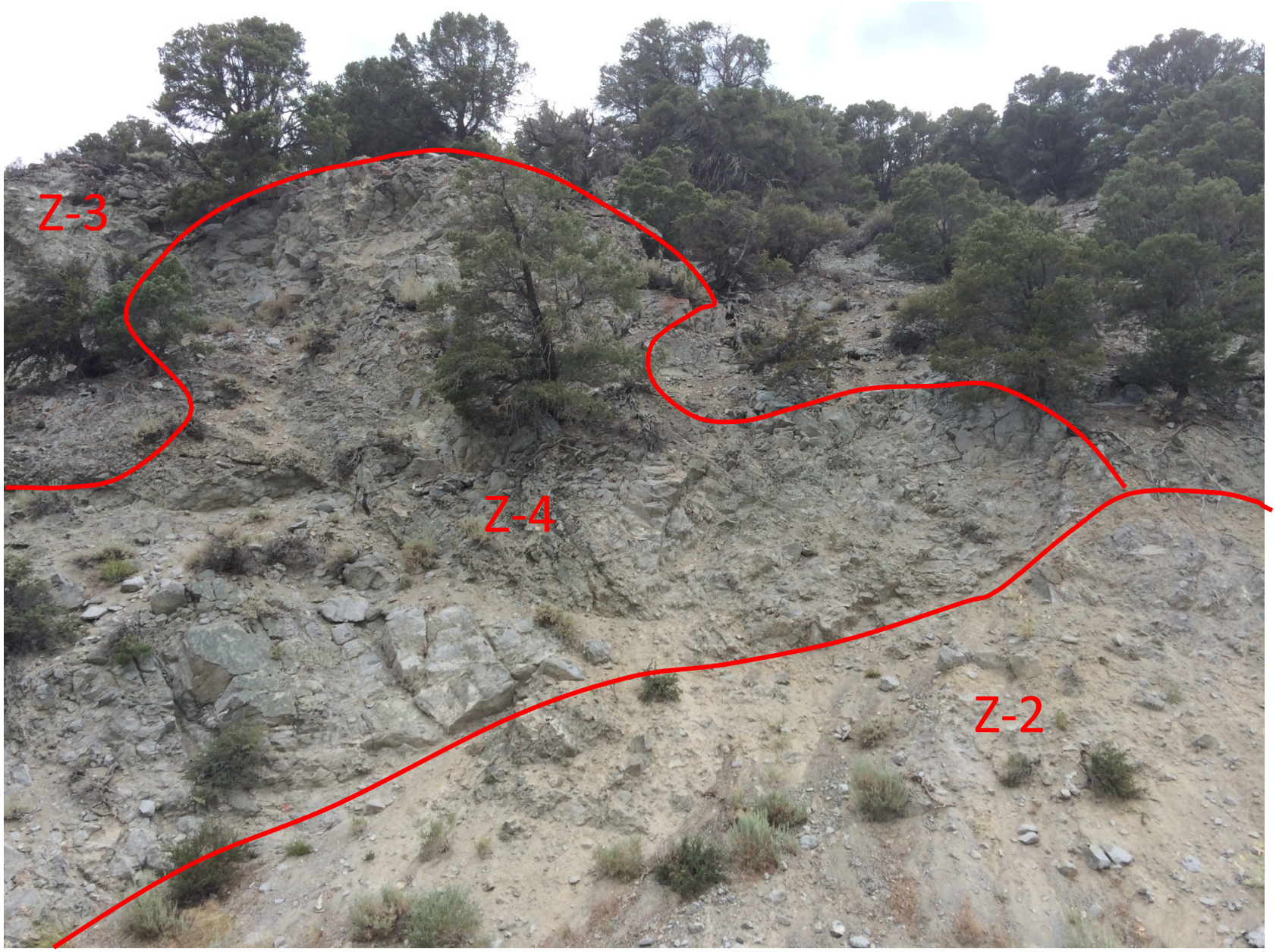
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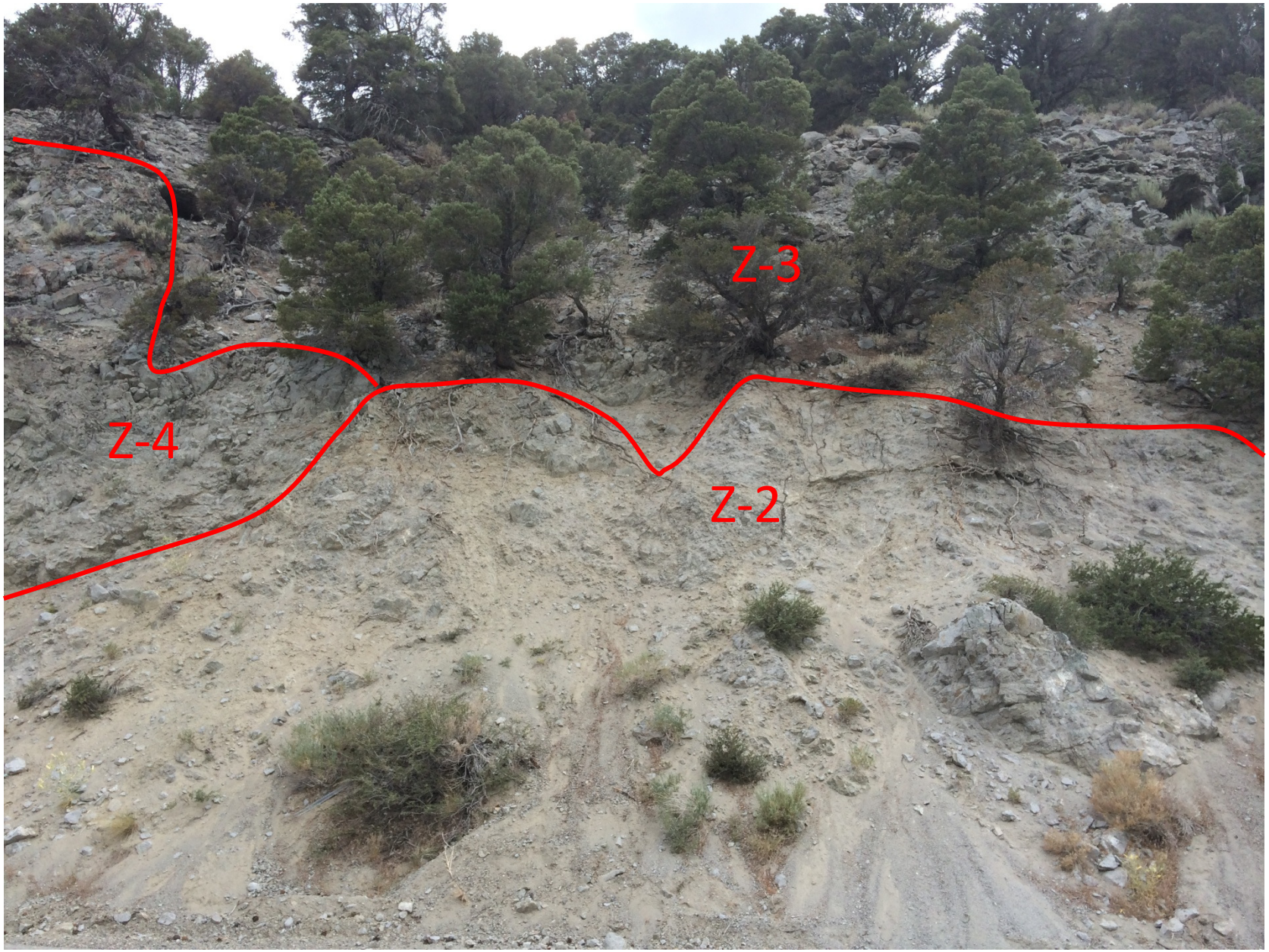
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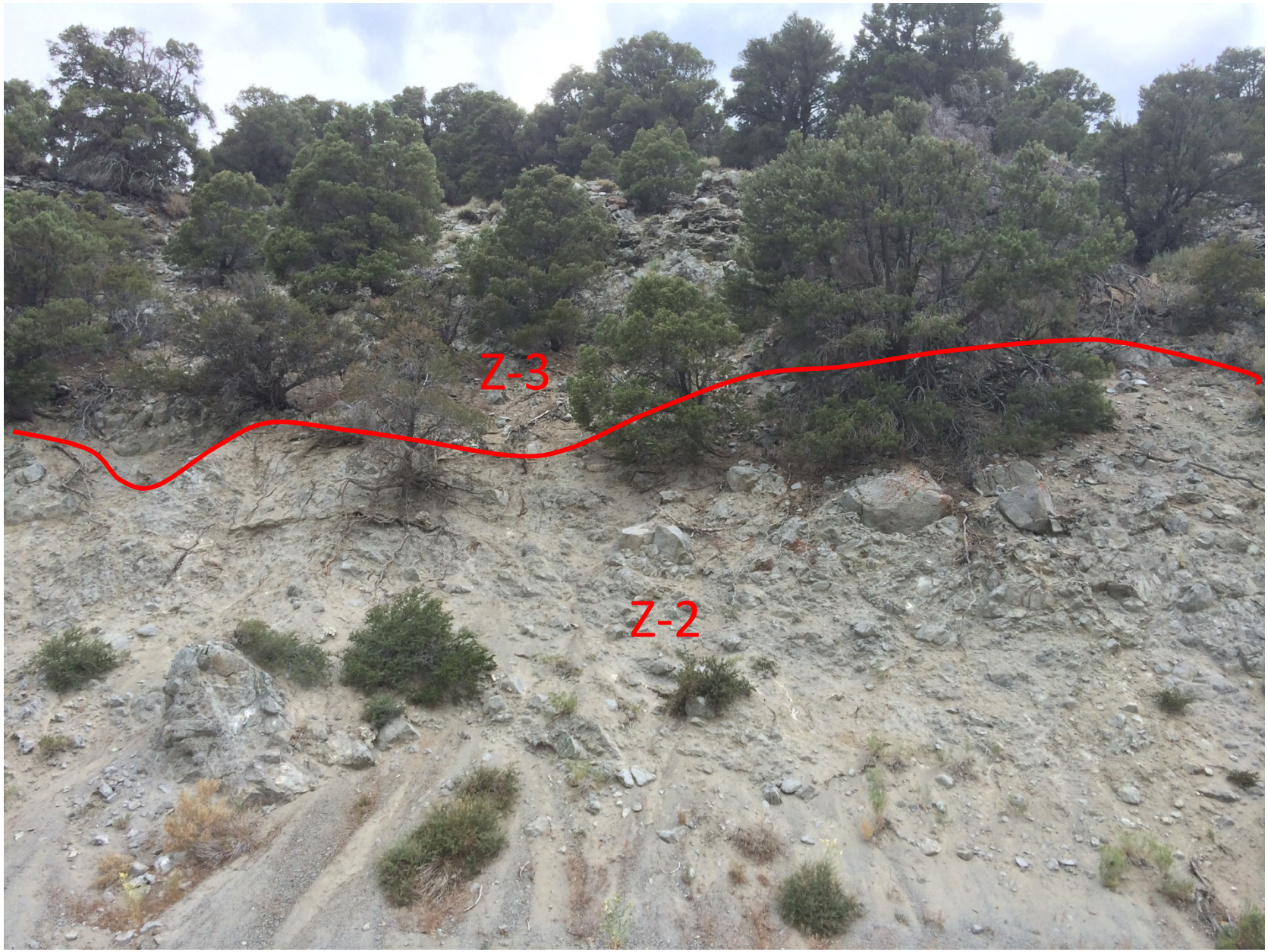
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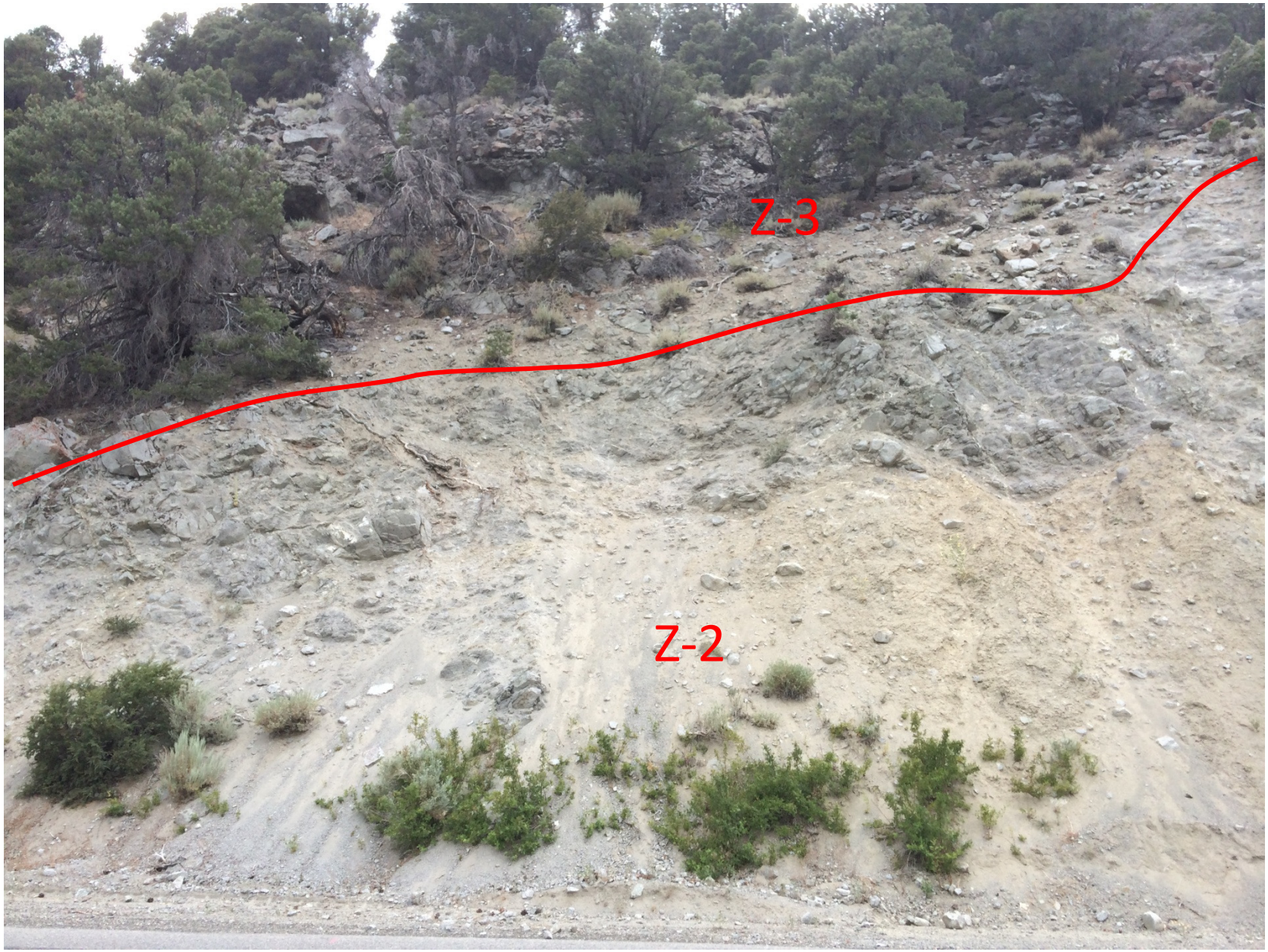
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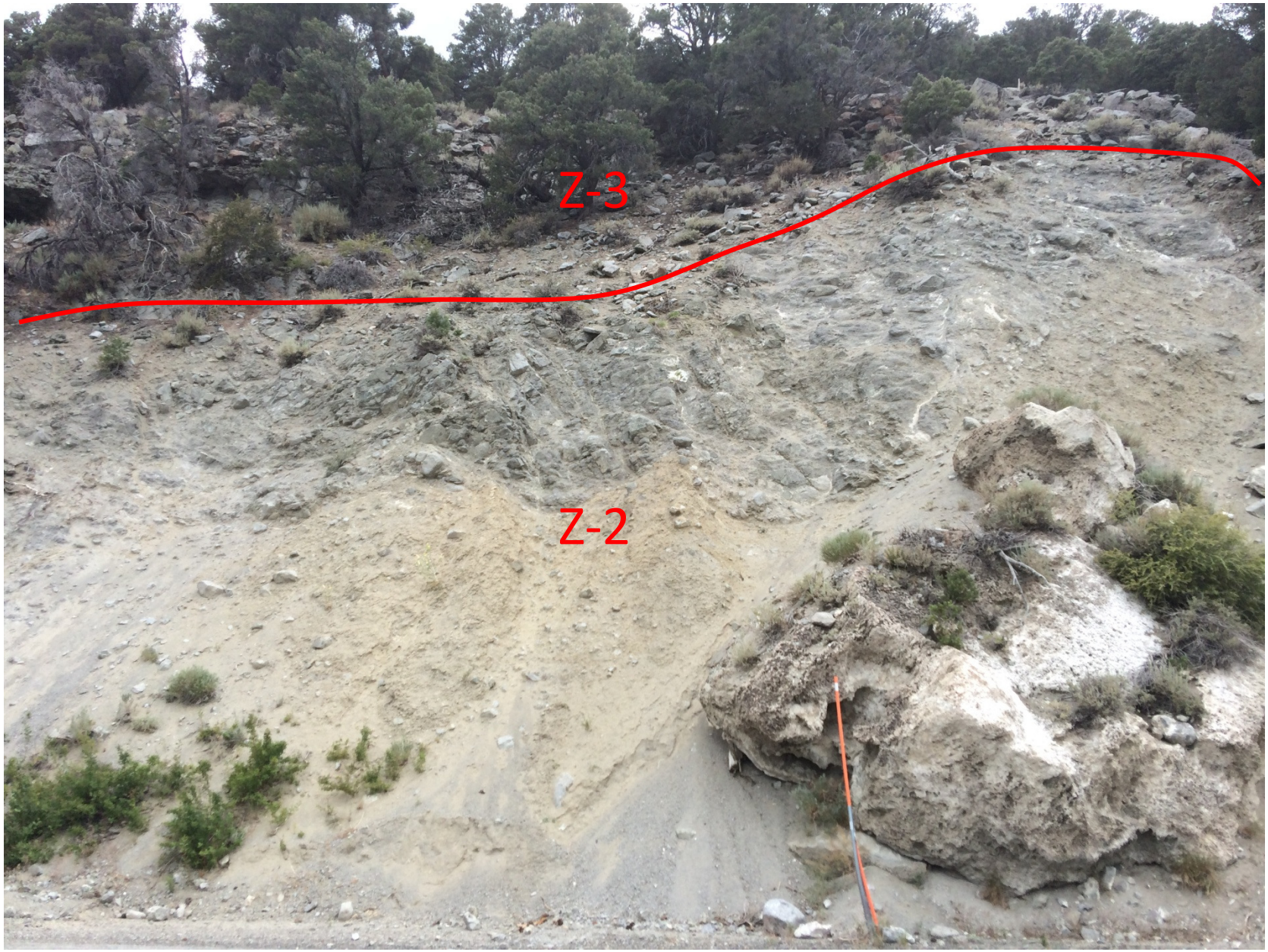
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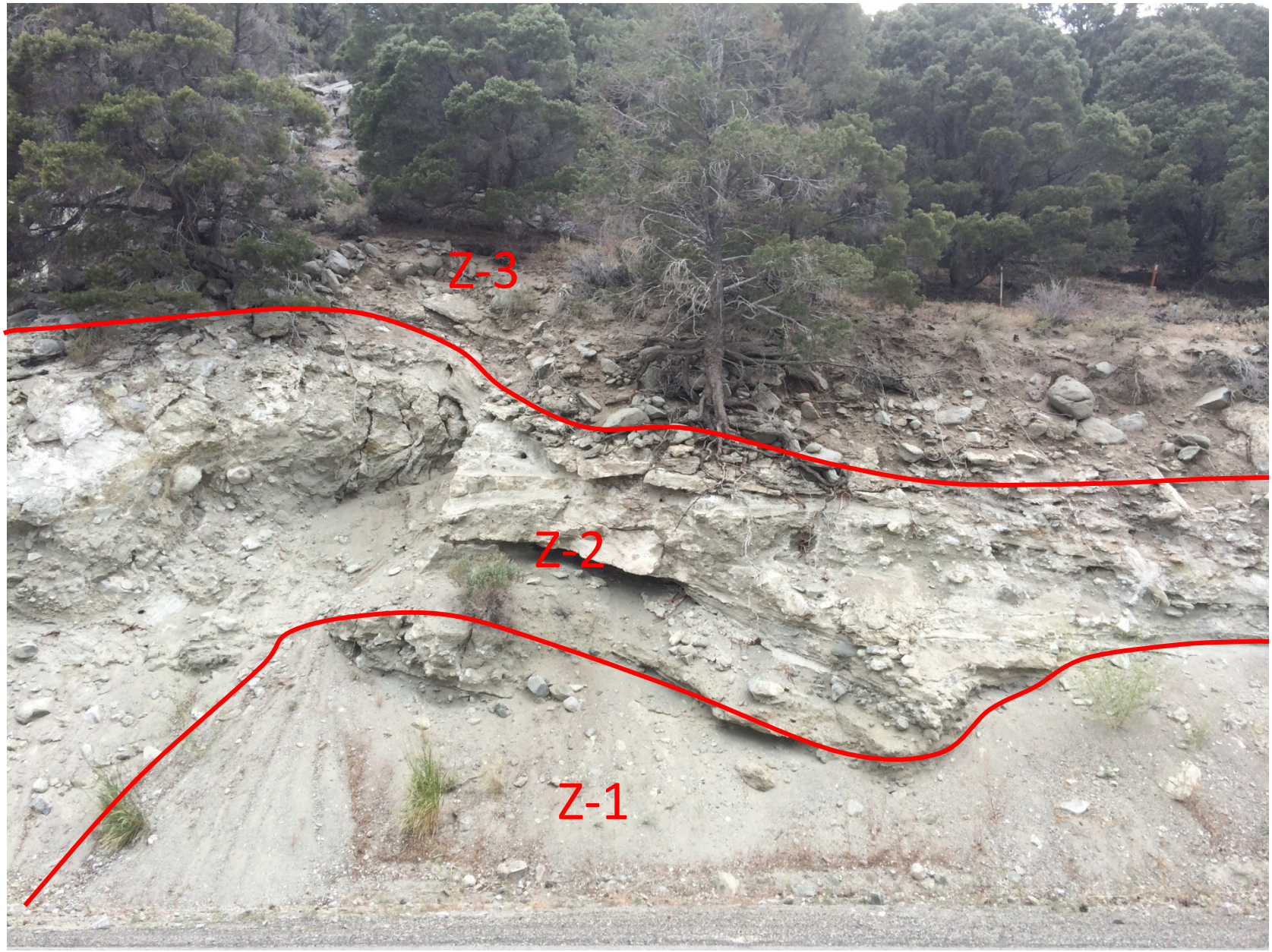
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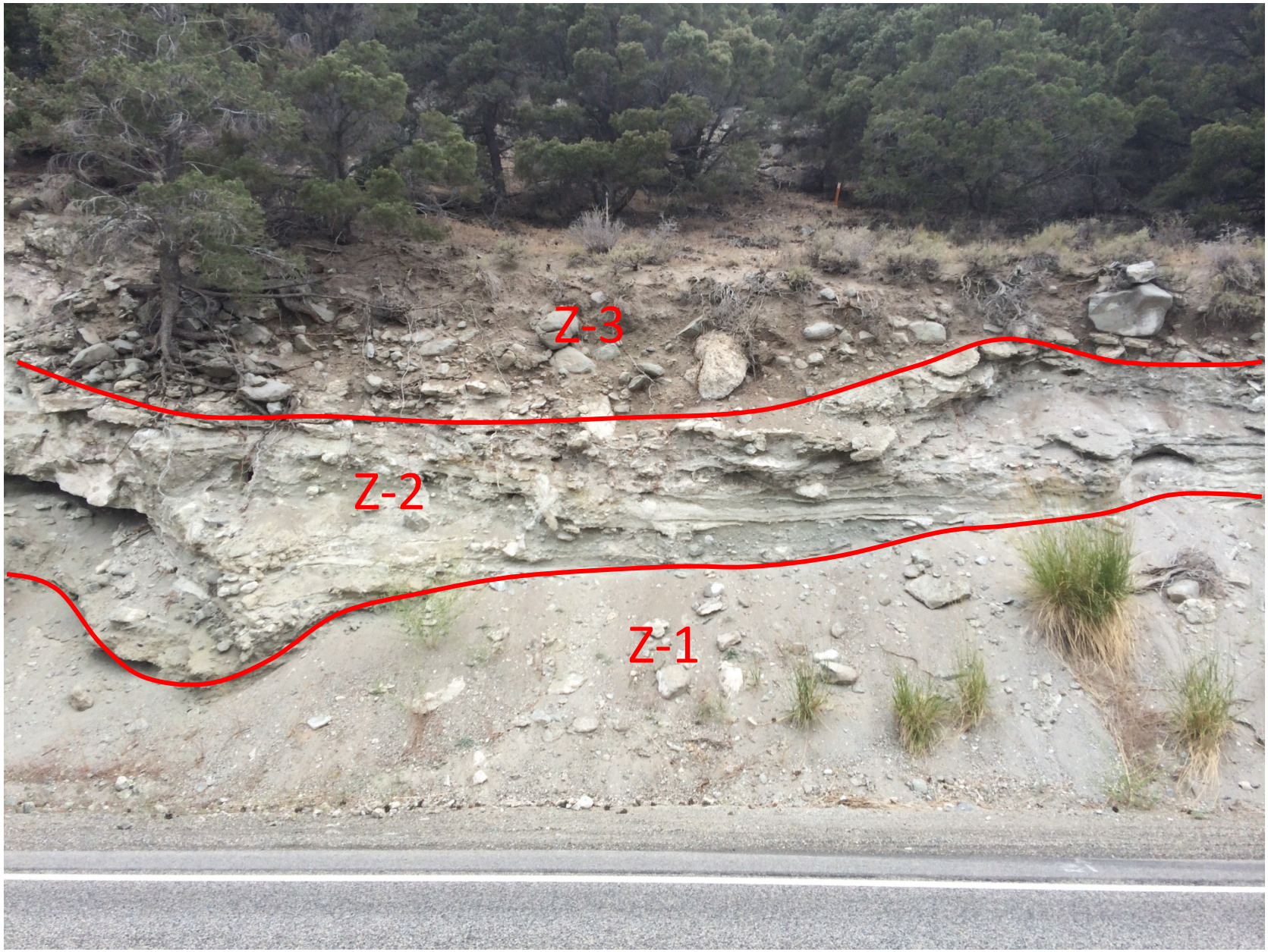
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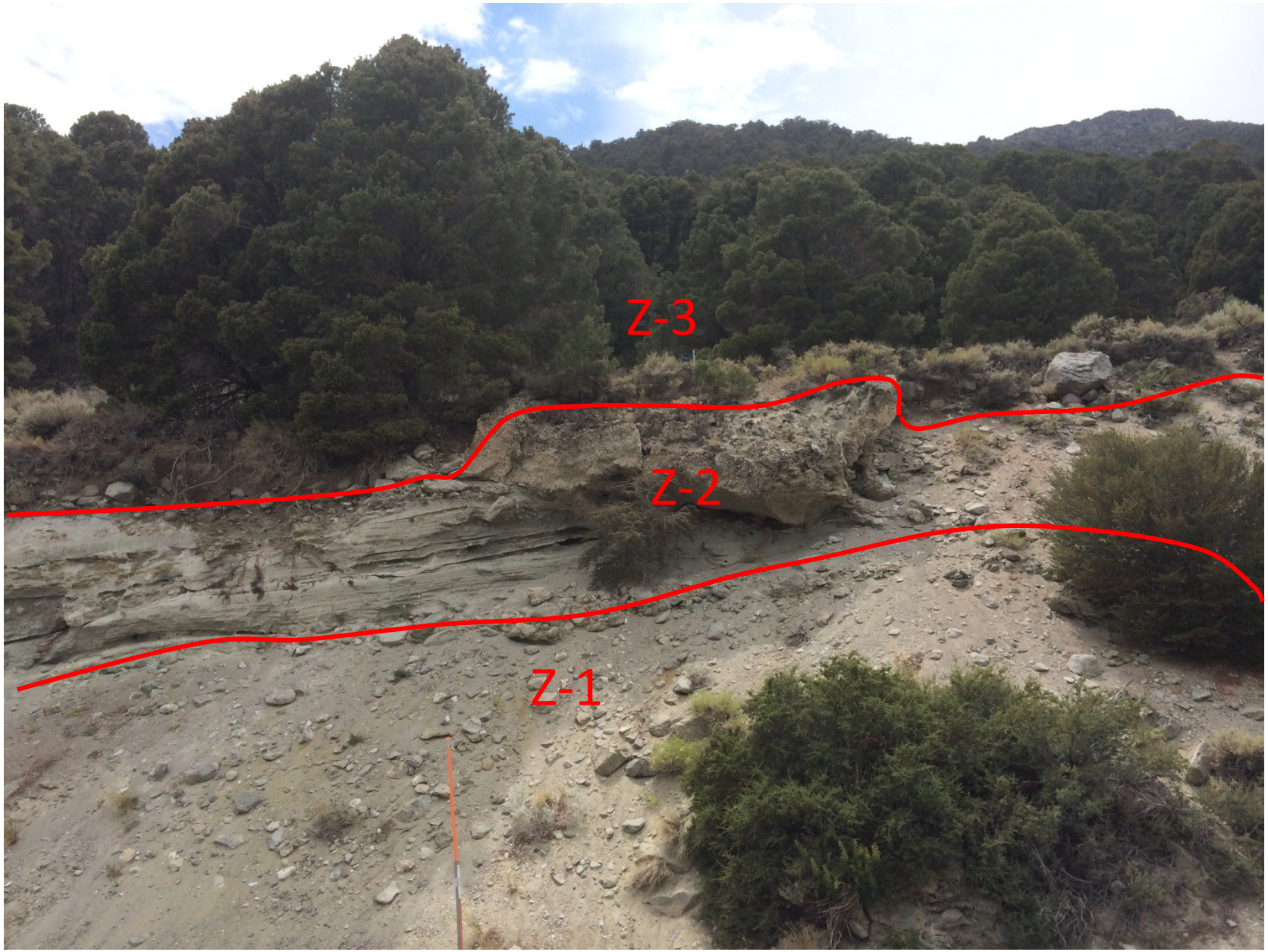
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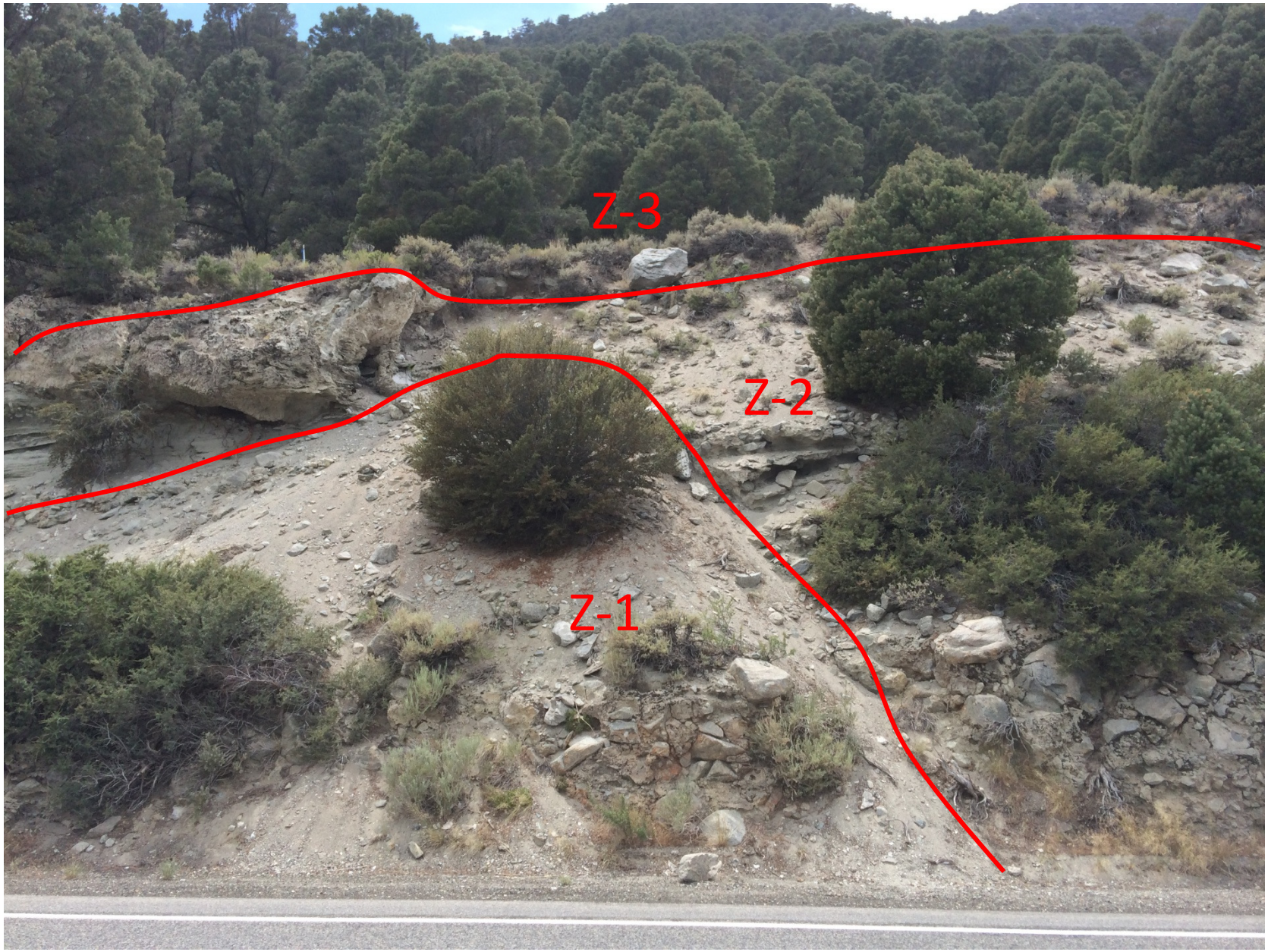
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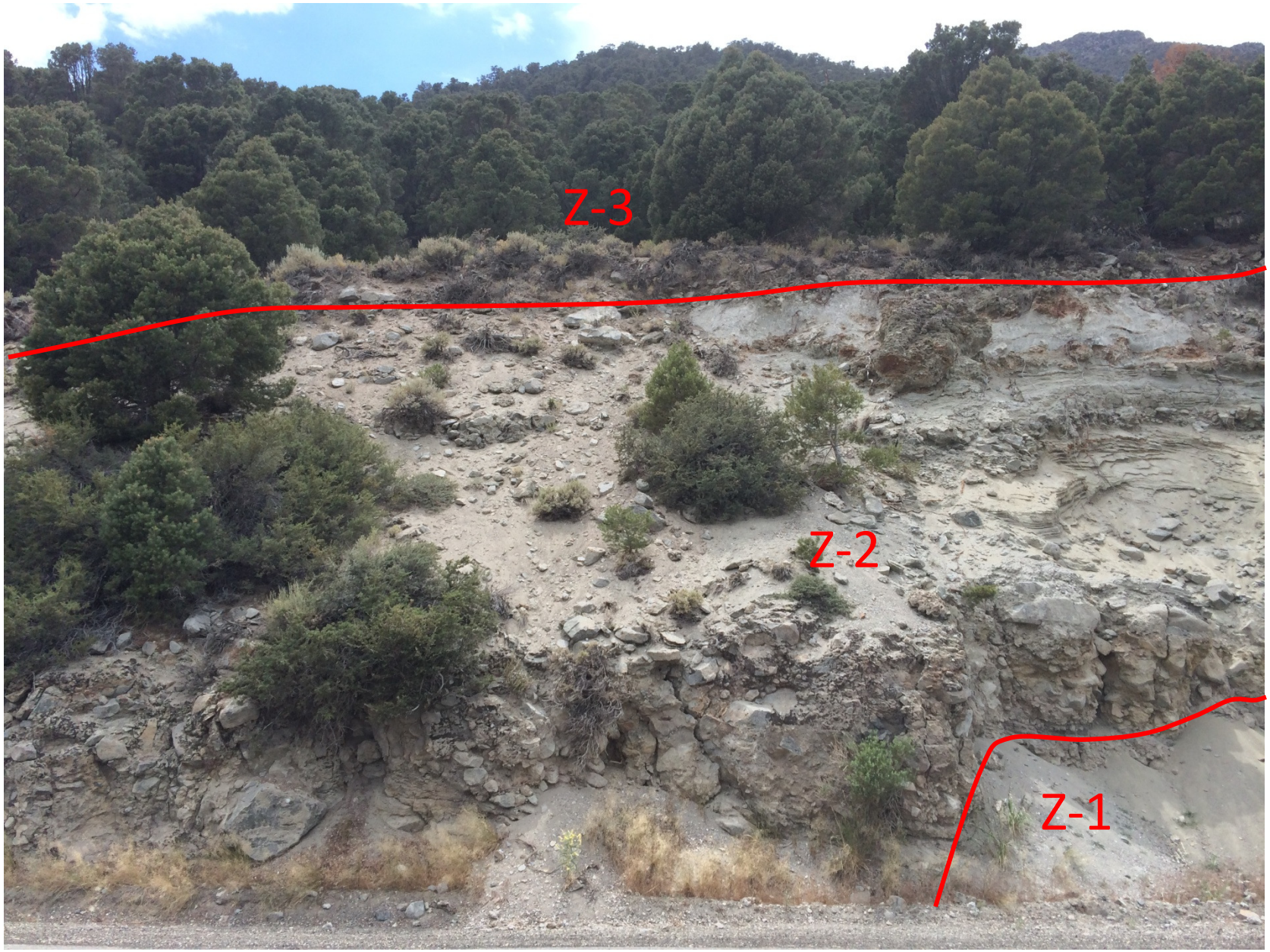
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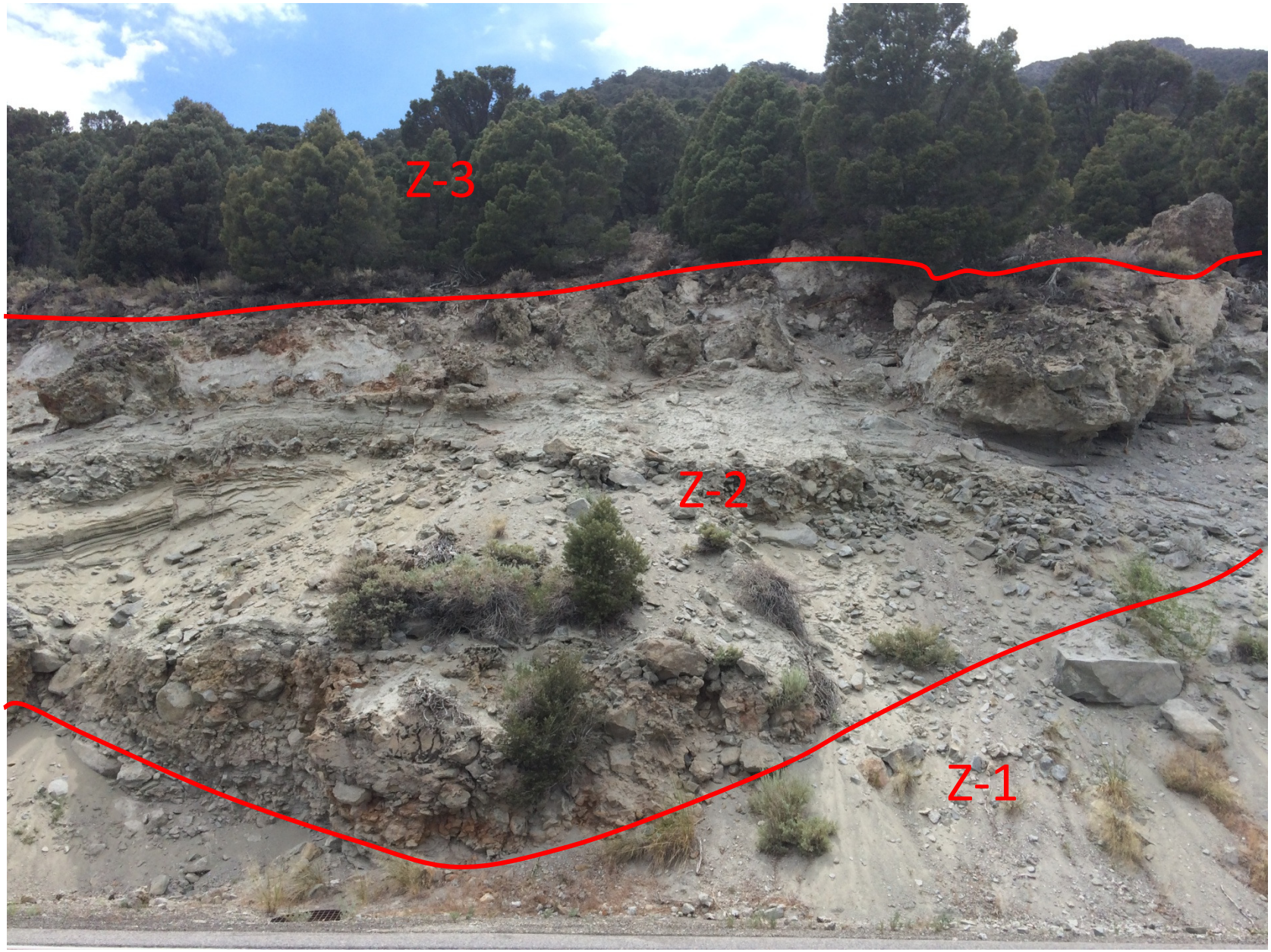
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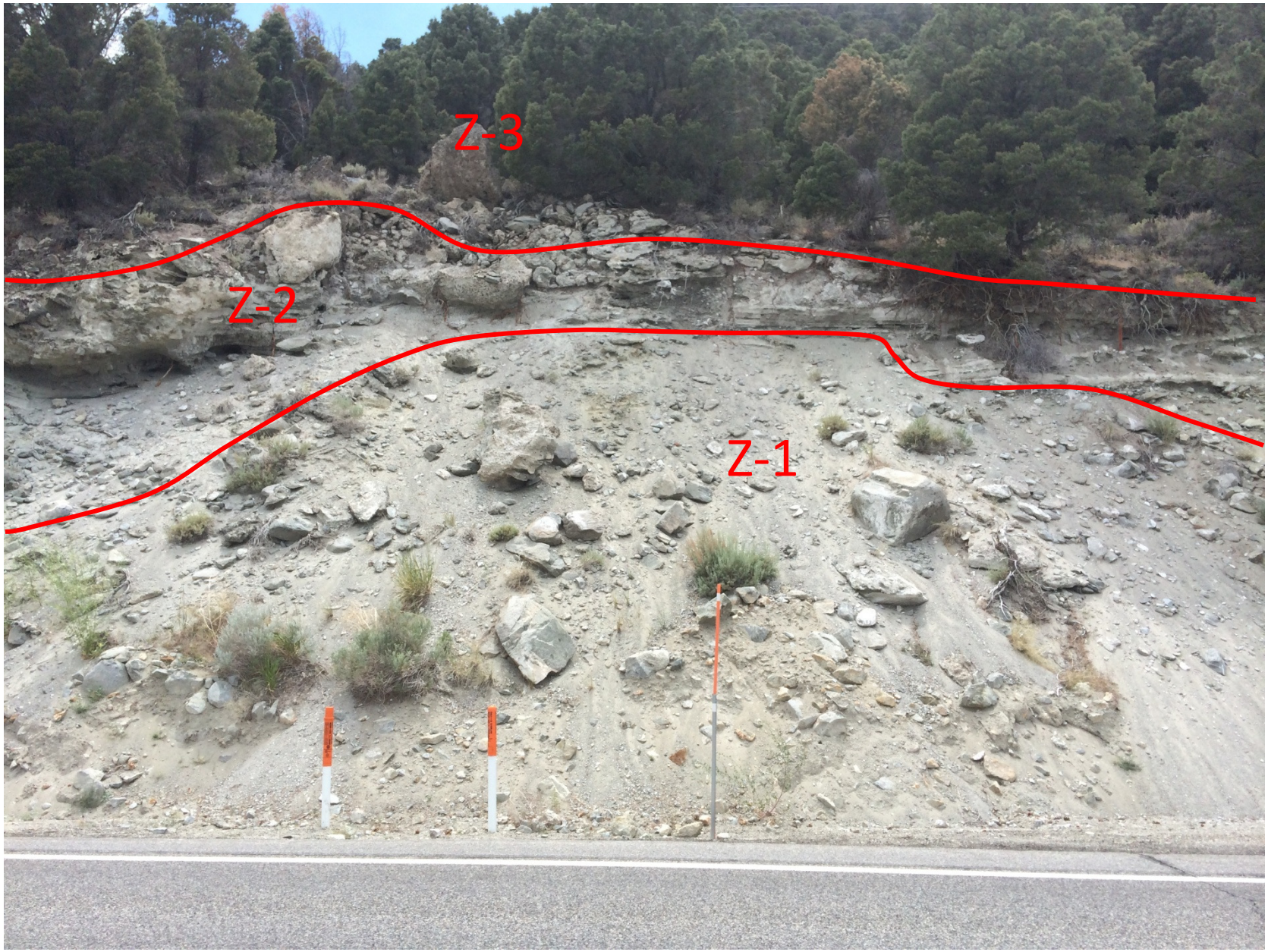
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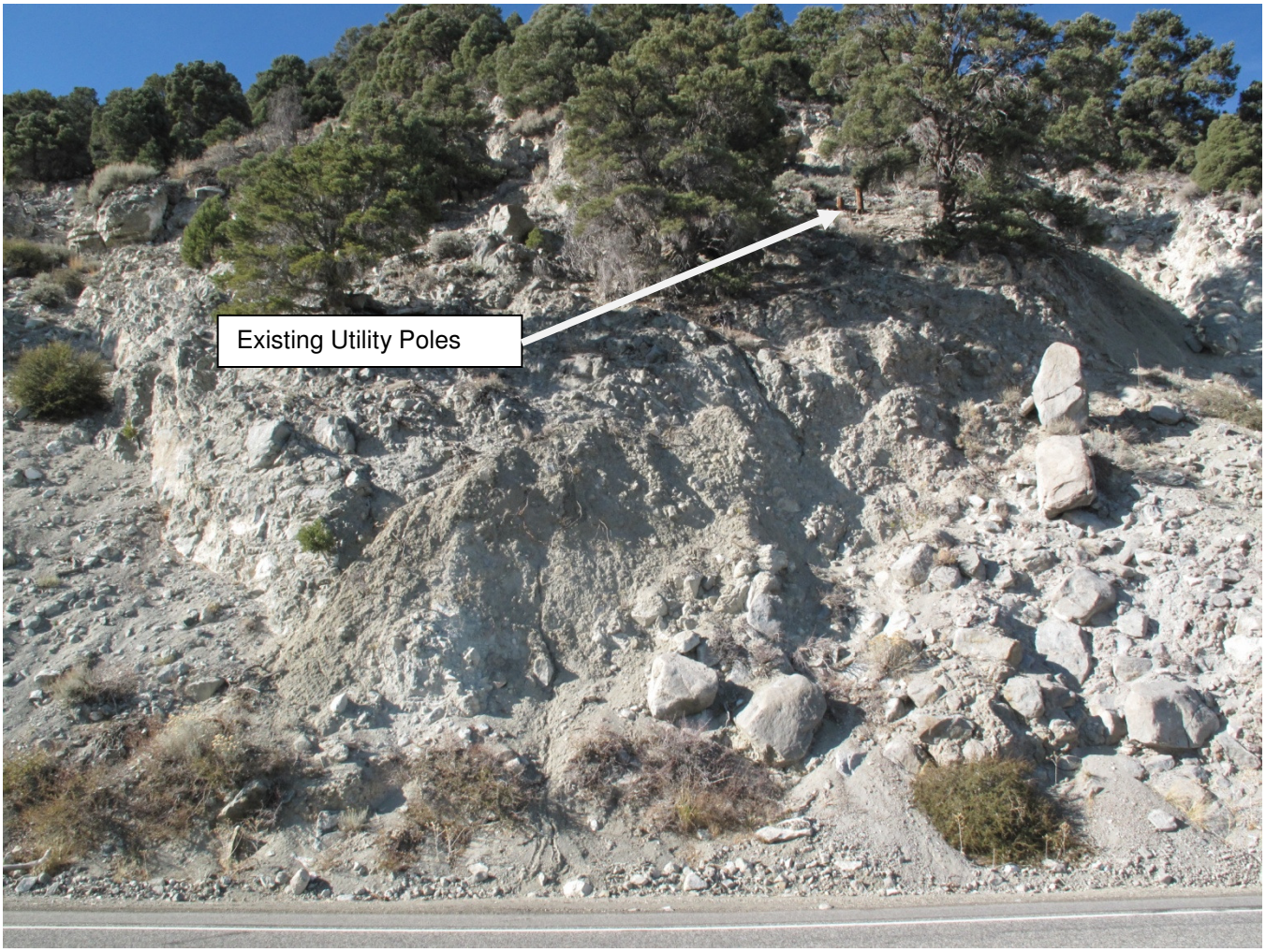

Location 5 Existing Utility Poles

Pictures of Existing Utility Poles

Existing utility poles exist at Location 5.

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Lee Vining Test Plot Project As-Builts

As-built information from the adjacent test plot project.

LEE VINING ROCKFALL - TEST PLOT TREATMENT REPORT

INTEGRATED ENVIRONMENTAL
RESTORATION SERVICES, INC

Prepared by: Integrated Environmental Restoration Services, Inc.
Authors: David Valentine and Michael Hogan
September 27, 2013

LEE VINING ROCKFALL - TEST PLOT TREATMENT SUMMARY

INTRODUCTION:

The "Lee Vining Rockfall - Test Plot Treatment" project consists of applying several different soil stabilization and development measures and soil amendments to existing cut-slopes along Highway 395 approximately 1 mile south of Lee Vining, California. These plots are being used to test and develop techniques and strategies for the larger Lee Vining Rockfall project which is to be constructed beginning in 2015. The soils, steep slope angles and extreme lack of summer moisture have made these slopes difficult to stabilize. The test plot project departs from the standard strategy of surface seed, fertilizer and blanket application and instead is designed to address soil health first. This is being done by amending existing soils with a range of materials in order to determine the most cost effective method of building and stabilizing soil and then establishing vegetation.

Once treated, these cut-slope test plots will be monitored over a three-year period to determine stability and plant response (i.e., does native vegetation growth/type improve; is there a reduction in gullying, rilling, mass failures, and rock-falls; are infiltration and runoff rates affected). The goal of this project is to test/verify which treatments perform the best over the three year period, so that these proven methods can be implemented within the larger rock-fall mitigation and erosion control project

TEST PLOT DETAILS:

A total of seventeen treatments were applied on three slopes over a six day period (8/19-8/22 and 8/27-8/28). The process included the following:

- Removal of loose rock;
- Placement of specific soil amendments (see table below);
- Irrigation to moisten soil prior to tilling;
- Tilling in of soil amendments (where appropriate);
- Seeding and application of Biosol fertilizer (where appropriate);
- Application of pine needle mulch (approximately 1");
- Application of tackifier and bonded-fiber matrix (BFM) tracer (Note: a fourth control plot area without treatment was sprayed with BFM to distinguish the most recent slope erosion and rock-falls that have occurred since BFM application); and
- Additional irrigation to promote seed germination.

Irrigation Notes:

- The irrigation system supports nine heads total, which includes two heads on Plot 1; two heads on Plot 2; and five heads on Plots 3. Each head is capable of delivering approximately 1.5 gallons per minute (90 gallons per hour) in a partial pattern configuration. Thus, the nine heads deliver approximately 810 gallons of water per hour to all three test plots.
    - Prior to test plot construction, approximately 3,000 gallons of water was applied daily on the three irrigated test plots (8/15-8/16). The test plots were irrigated to wet the soil, making the soil easier to till.
    - During test plot construction, approximately 3,000 gallons of water was applied daily (8/19 - 8/22 and 8/27 - 8/28). Test plots were irrigated to promote soil aggregation (prevent slope failure/loose soil from falling during tilling) and promote seed germination.
    - Once test plot construction was complete, approximately 3,500 gallons of water was applied for two days for two week (9/5 - 9/6 and 9/12 - 9/13), in order to promote seed germination and establish vegetation.
- Prior to the first follow-up irrigation cycle (i.e., 8 days after test plot construction/irrigation), soil moisture was visually observed and moisture was present on average 1-2" below mulch surface. Unirrigated soil outside of test plots had no water present in the top 6-8".
- During the last irrigation cycle (9/12-9/13), vegetation was visually monitored on the three test plot slopes. New grasses were growing on these slopes, some of which had a length of approximately 4". In addition, no erosion was observed.

Equipment & Material Used:

- Equipment used on-site for plot construction included an ASV RC-1000 front loader, a Komatsu PC 88MR midi-excavator, and various support vehicles, including a Ford 450 dump truck; 500 gallon water tender; and a 1,200 gallon hydromulcher.
- Soil amendment treatments applied included Full Circle Compost Integrated Zero (Int-Zero); 5+ year aged wood chips (aged wood chips); Biosol 7-3-1 organic fertilizer (Biosol); and BFM.

TABLE 1. LEE VINING ROCKFALL – TEST PLOT TREATMENT DATA

Plot #	Soil Amendment	L x W	SF	Amendment Depth	6-12" Tilling	2,000 lb/acre Biosol	1" Pine Needle Mulch	Erosion Fabric	BFM-Tackifier
1.1.1 (left)	AWC	9.5' x 8'	76	2"	Yes	Yes	Yes	No	Yes
1.1.2 (right)	AWC	9.5' x 8'	76	2"	Yes	No	Yes	No	Yes
1.2.1 (left)	Int-Zero	5' x 9'	45	2"	Yes	Yes	Yes	No	Yes
1.2.2 (right)	Int-Zero	5' x 9'	45	2"	Yes	No	Yes	No	Yes
2.1.1 (left)	AWC	6.5' x 12'	78	2"	Yes	Yes	Yes	No	Yes
2.1.2 (right)	AWC	6.5' x 12'	78	2"	Yes	No	Yes	No	Yes
2.2.1 (left)	Int-Zero	7' x 12'	84	2"	Yes	Yes	Yes	No	Yes
2.2.2 (right)	Int-Zero	7' x 12'	84	2"	Yes	No	Yes	No	Yes
3.1	None, Caltrans-spec	18' x 11'	198	-	No	No	No	Yes	No
3.2.1 (left)	Int-Zero	9' x 18'	81	2"	Yes	Yes	Yes	No	Yes
3.2.2 (right)	Int-Zero	9' x 18'	81	2"	Yes	No	Yes	No	Yes
3.3.1 (left)	Int-Zero	9' x 14'	126	4"	Yes	Yes	Yes	No	Yes
3.3.2 (right)	Int-Zero	9' x 14'	126	4"	Yes	No	Yes	No	Yes
3.4.1 (left)	AWC	9.5' x 18'	171	4"	Yes	Yes	Yes	No	Yes
3.4.2 (right)	AWC	9.5' x 18'	171	4"	Yes	Yes	Yes	No	Yes
3.5	None, Biosol only	18' x 11'	198	-	No	Yes	Yes	No	Yes
3.6	None, Seed only	18' x 11'	198	-	No	No	Yes	No	Yes

AWC: Aged Wood Chips

Int-Zero: Full Circle Integrated Zero Compost (zero % fines)

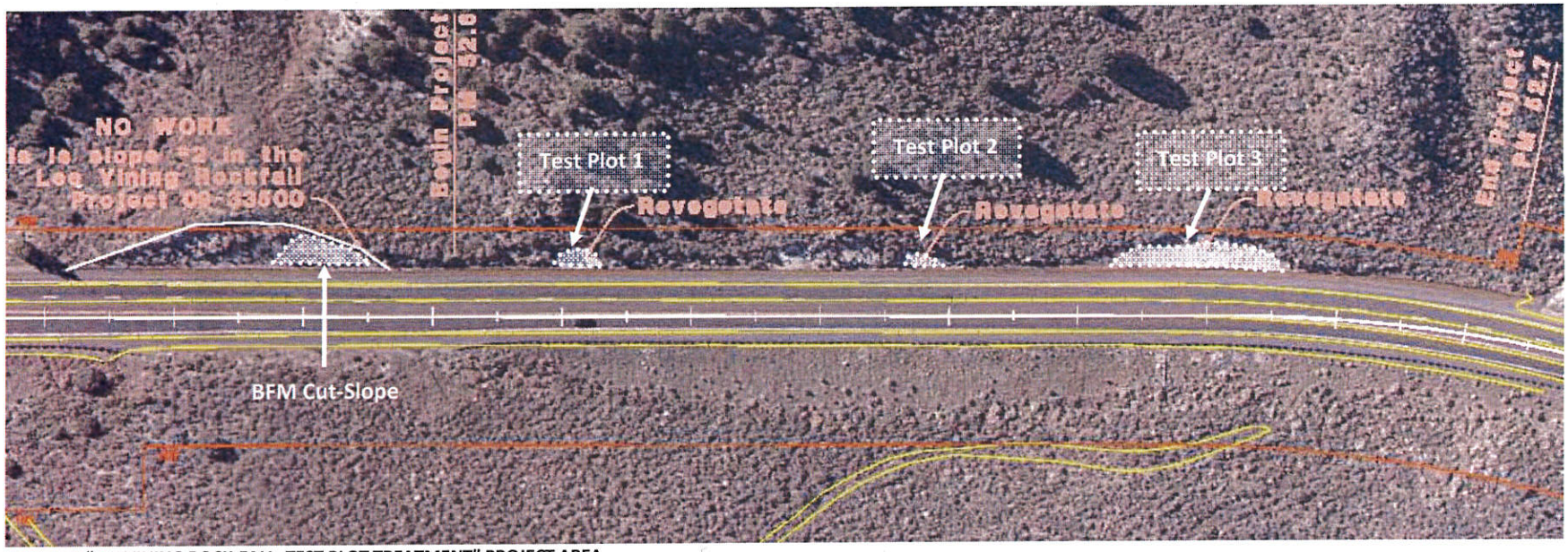

FIGURE 1. "LEE VINING ROCK-FALL -TEST PLOT TREATMENT" PROJECT AREA

FIGURE 2. PLOT 1 POST-TREATMENT

Plot 1 Construction Data

- Soil amendments (AWC and Int-0) placed and spread (2" deep) onto plot 1 (242SF)
- Soil lightly tilled ~6-12" with excavator bucket (poke-and-sweep material uphill)
- Hand-spread Biosol fertilizer on left half of plots only (1.1.1 and 1.2.1) and raked into soil (1-2")
- Hand-spread seed evenly on plots and lightly raked to ensure surface contact
- Covered plot with 1" pine needle mulch
- Sprayed with BFM

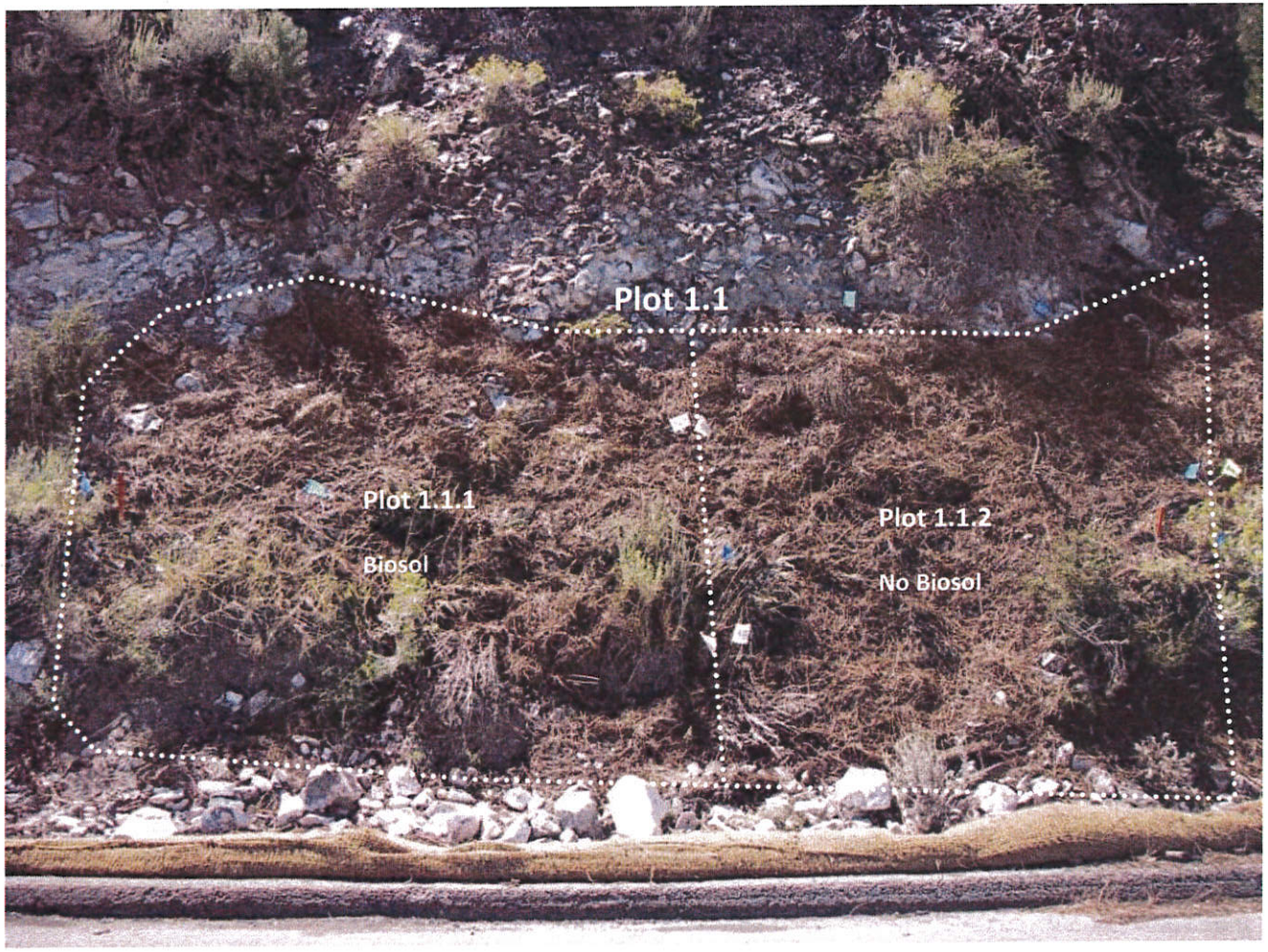

FIGURE 3. PLOT 1.1 POST-TREATMENT (2" AWC)

Plot 1.1 Size: 19' x 8' = 152SF

- Plot 1.1.1: 9.5' x 8' = 76 SF (2,000lb/acre of Biosol applied and raked)
- Plot 1.1.2: 9.5' x 8' = 76 SF (no Biosol applied)

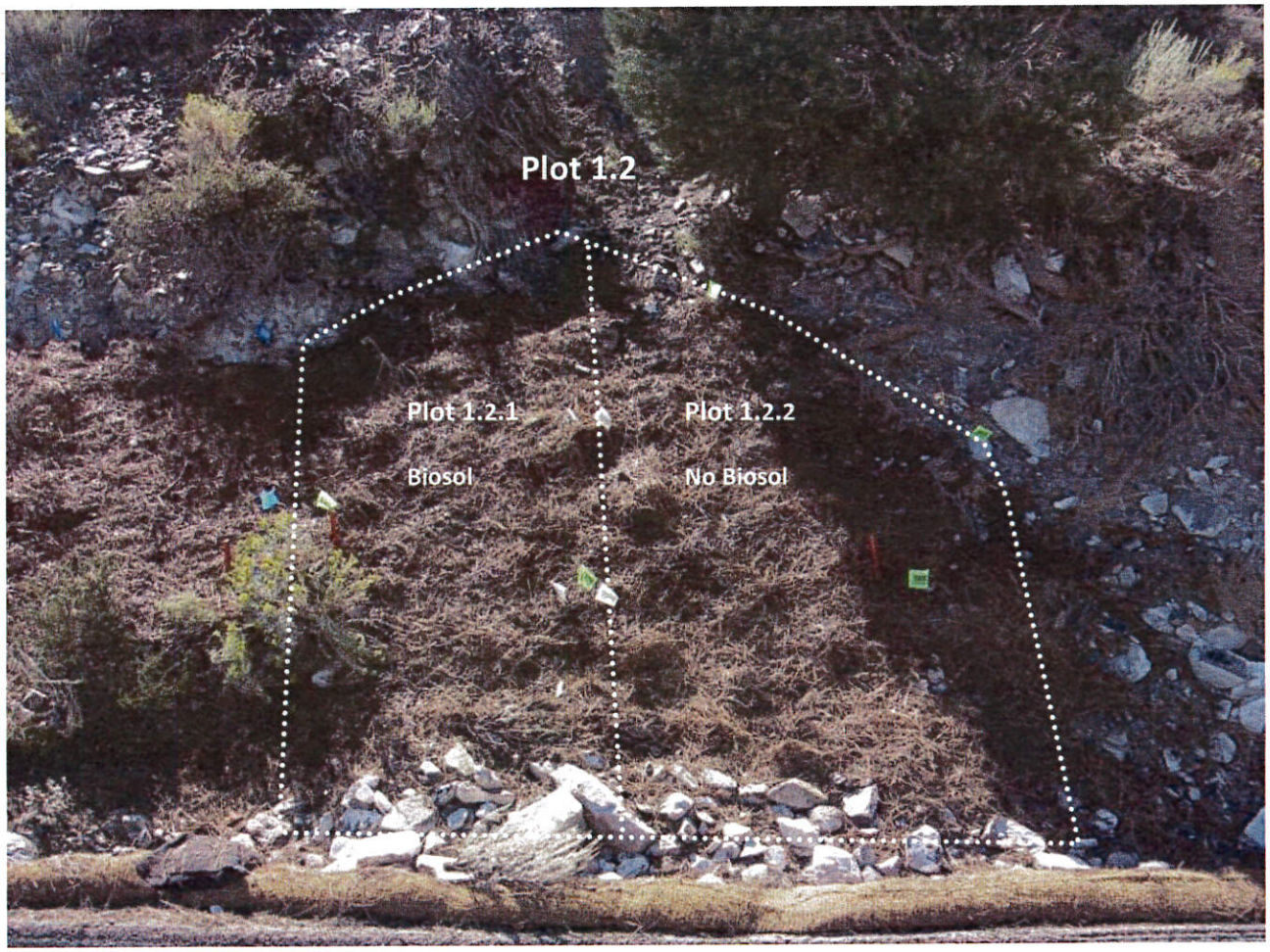

FIGURE 4. PLOT 1.2 POST-TREATMENT (2" INT-ZERO)

Plot 1.2 Size: 10' x 9' = 90SF

- Plot 1.2.1: 5' x 9' = 45 SF (2,000lb/acre of Biosol applied and raked)
- Plot 1.2.2: 5' x 9' = 45 SF (no Biosol applied)

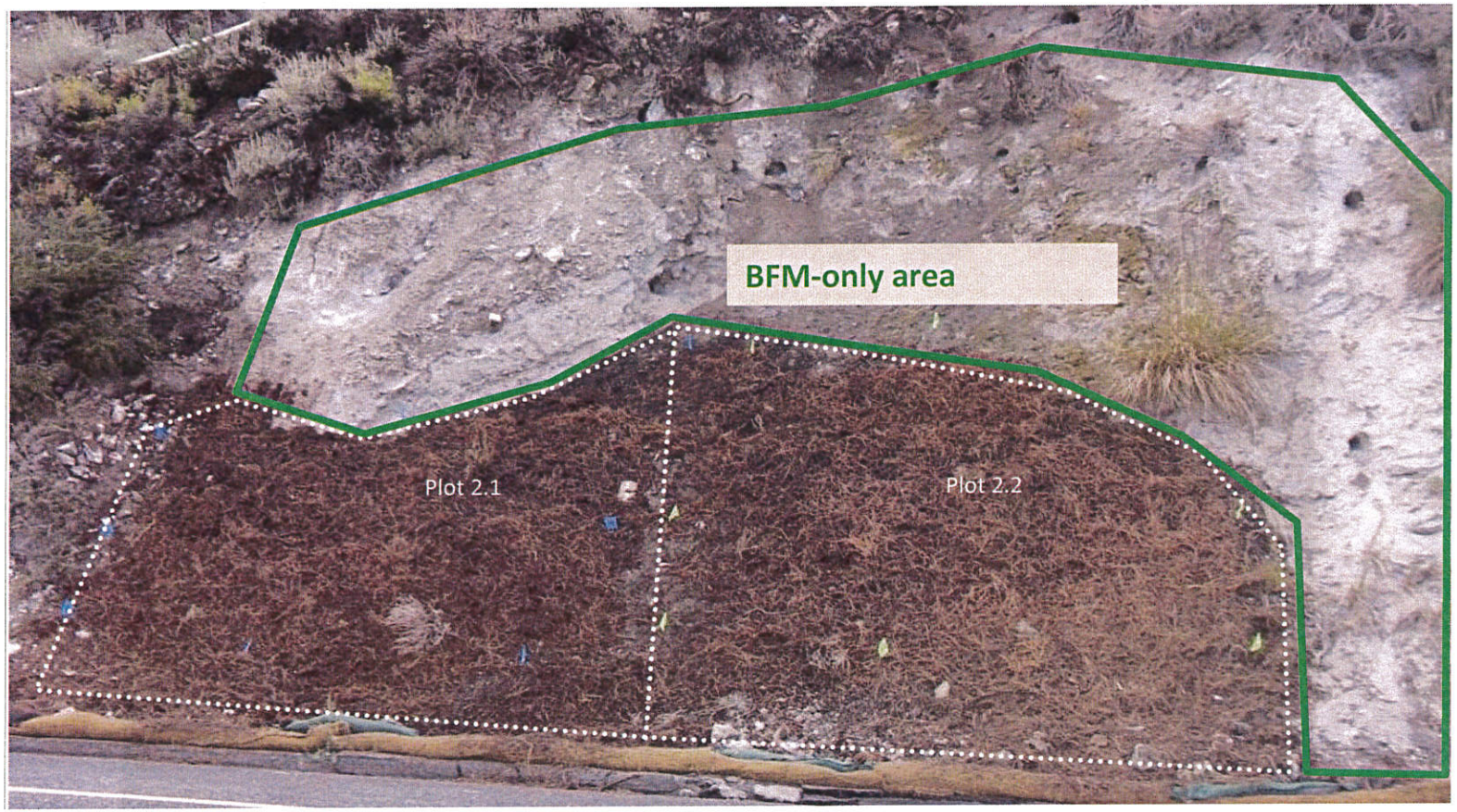

FIGURE 5. PLOT 2 POST-TREATMENT (2" AWC)

Plot 2 Construction

- AWC placed and spread (2" deep) onto plot 2 (156 SF)
- Soil lightly tilled ~6-12" with excavator bucket (poke-and-sweep material uphill)
- Hand-spread Biosol fertilizer on left half of plots only (2.1.1 and 2.2.1) and raked into soil (1-2")
- Hand-spread seed evenly on plots and lightly raked to ensure surface contact
- Covered plot with 1" pine needle mulch
- Sprayed with BFM

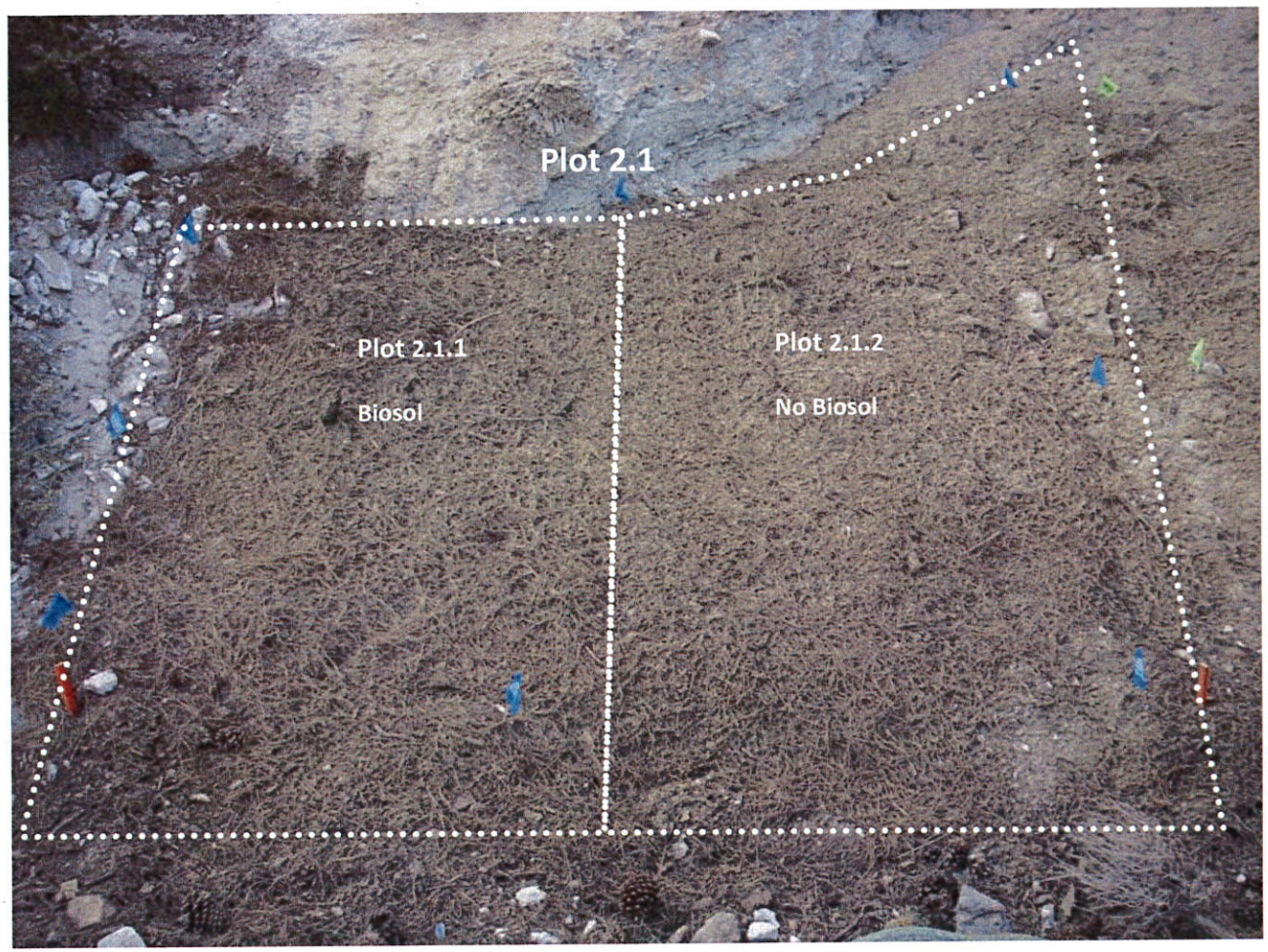

FIGURE 6. PLOT 2.1 POST-TREATMENT (2" AWC)

2.1 Plot Size: 13' x 12' = 156 SF

- Plot 2.1.1: 6.5' x 12' = 78 SF (2,000lb/acre of Biosol applied and raked)
- Plot 2.1.2: 6.5' x 12' = 78 SF (no Biosol applied)

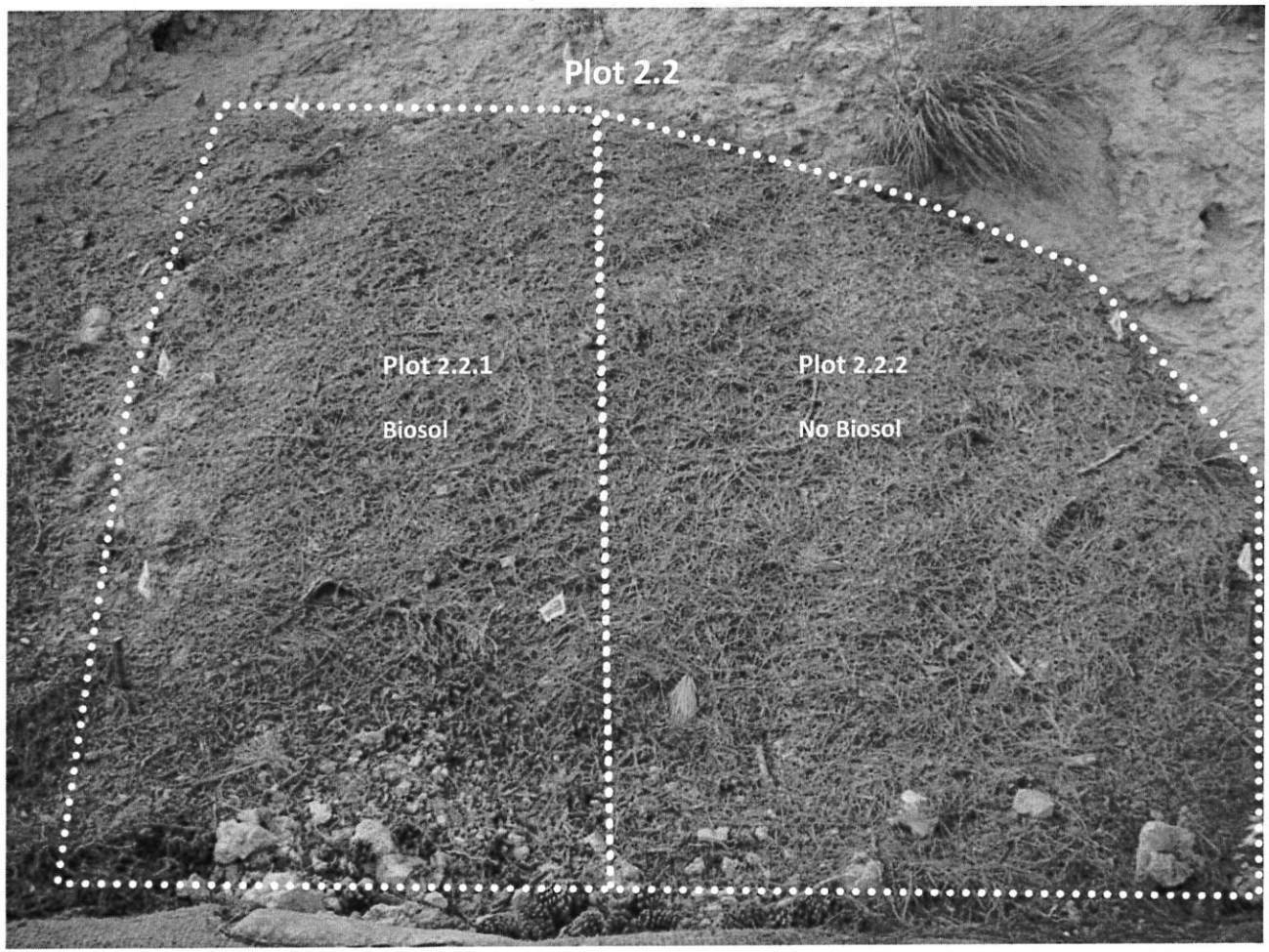

FIGURE 7. PLOT 2.2 POST-TREATMENT (2" INT-ZERO)

2.2 Plot Size: 14' x 12' = 168 SF

- Plot 2.2.1: 7' x 12' = 84 SF (2,000lb/acre of Biosol applied and raked)
- Plot 2.2.2: 7' x 12' = 84 SF (no Biosol applied)

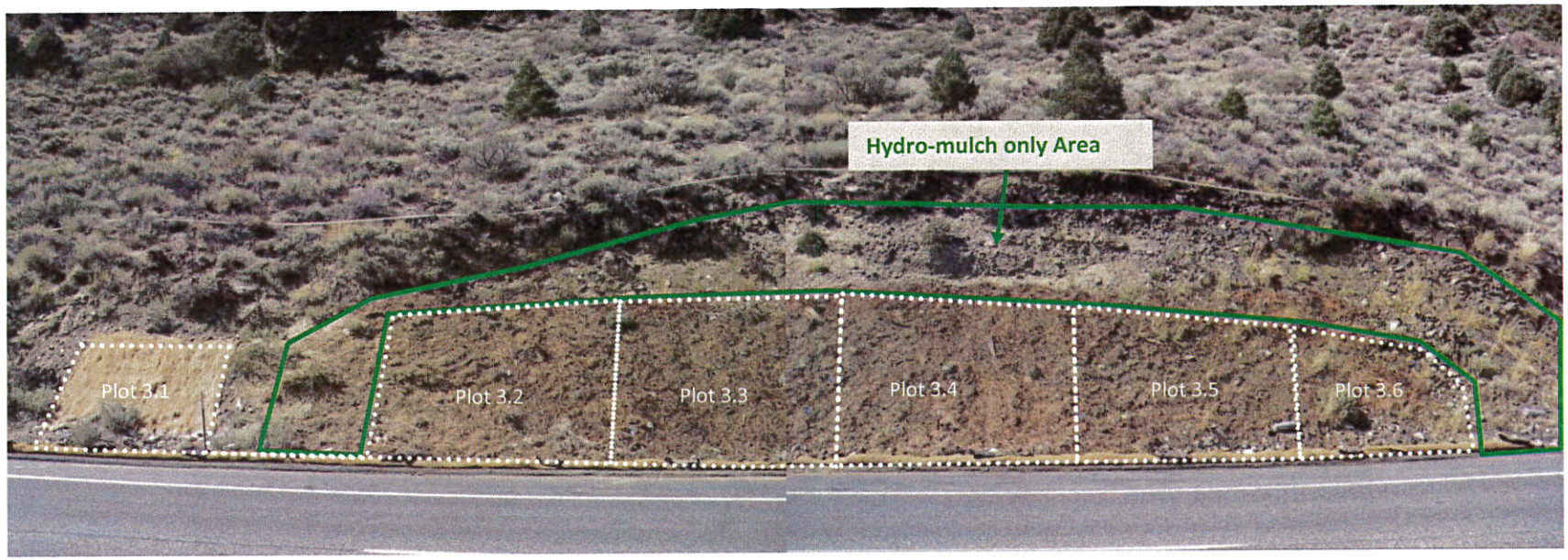

FIGURE 8. PLOT 3 POST-TREATMENT

Plot 3 Construction (1,765 SF)

- Different soil amendments placed and spread (2-4" deep) onto appropriate plots 3.2 - 3.4
- Soil tilled ~6-12" with excavator bucket (all except plot 3.1, 3.5, and 3.6)
- Hand-spread Biosol fertilizer on left half of plots 3.2 - 3.5 and raked into soil (1-2")
- Hand-spread seed evenly on plots and lightly raked to ensure surface contact (all plots except 3.5)
- Covered plot with 1" pine needle mulch (all except plot 3.1)

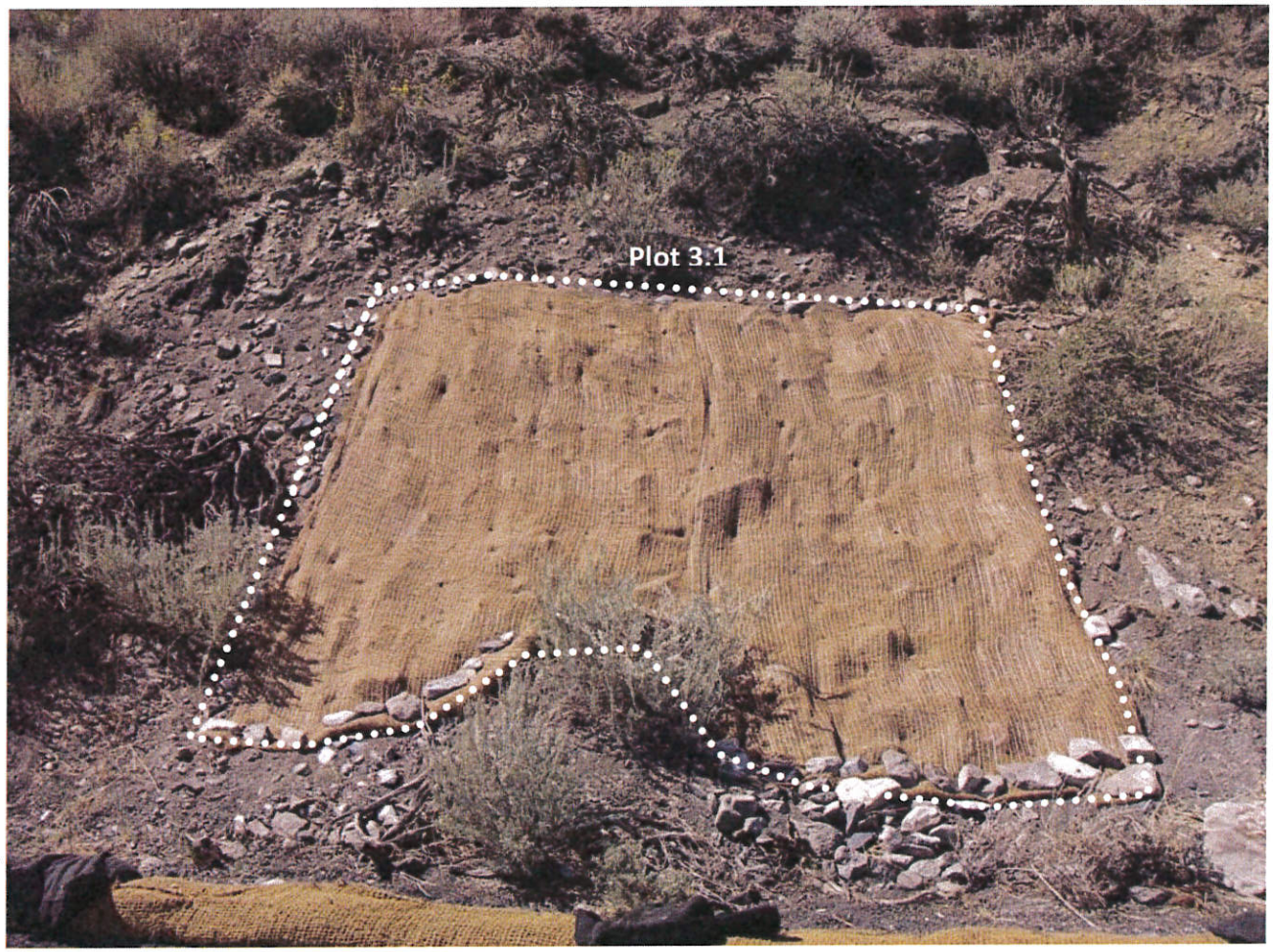

FIGURE 9. PLOT 3.1 POST-TREATMENT (CALTRANS-SPEC)

Plot Area: 18' x 11' = 198SF

- Caltrans-spec Plot: Seed applied and covered with erosion control netting, stapled into ground. No soil amendments, tilling, fertilizer, or BFM applied

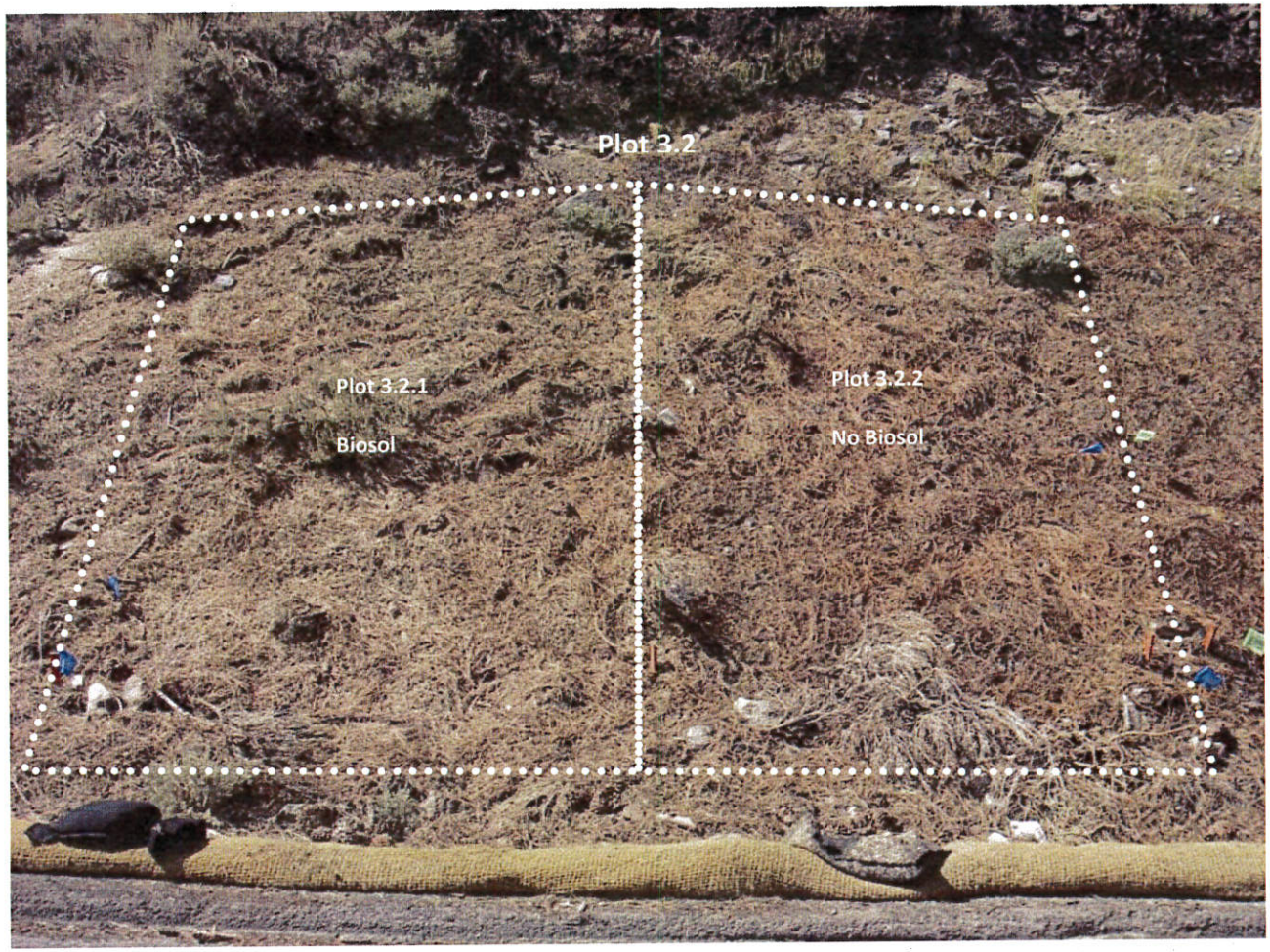

FIGURE 10. PLOT 3.2 POST-TREATMENT (2" INT-ZERO)

Plot Size: 18' x 18' = 324SF

- Plot 3.2.1: 9' x 18' = 162 SF (2,000lb/acre of Biosol applied)
- Plot 3.2.2: 9' x 18' = 162 SF (No Biosol applied)

FIGURE 11. PLOT 3.3 POST-TREATMENT (INT-ZERO 4")

Plot Size: 28'w x 18'h = 504 SF

- Plot 3.3.1: 14' x 18' = 252 SF (2,000lb/acre of Biosol applied)
- Plot 3.3.2: 14' x 18' = 252 SF (No Biosol applied)

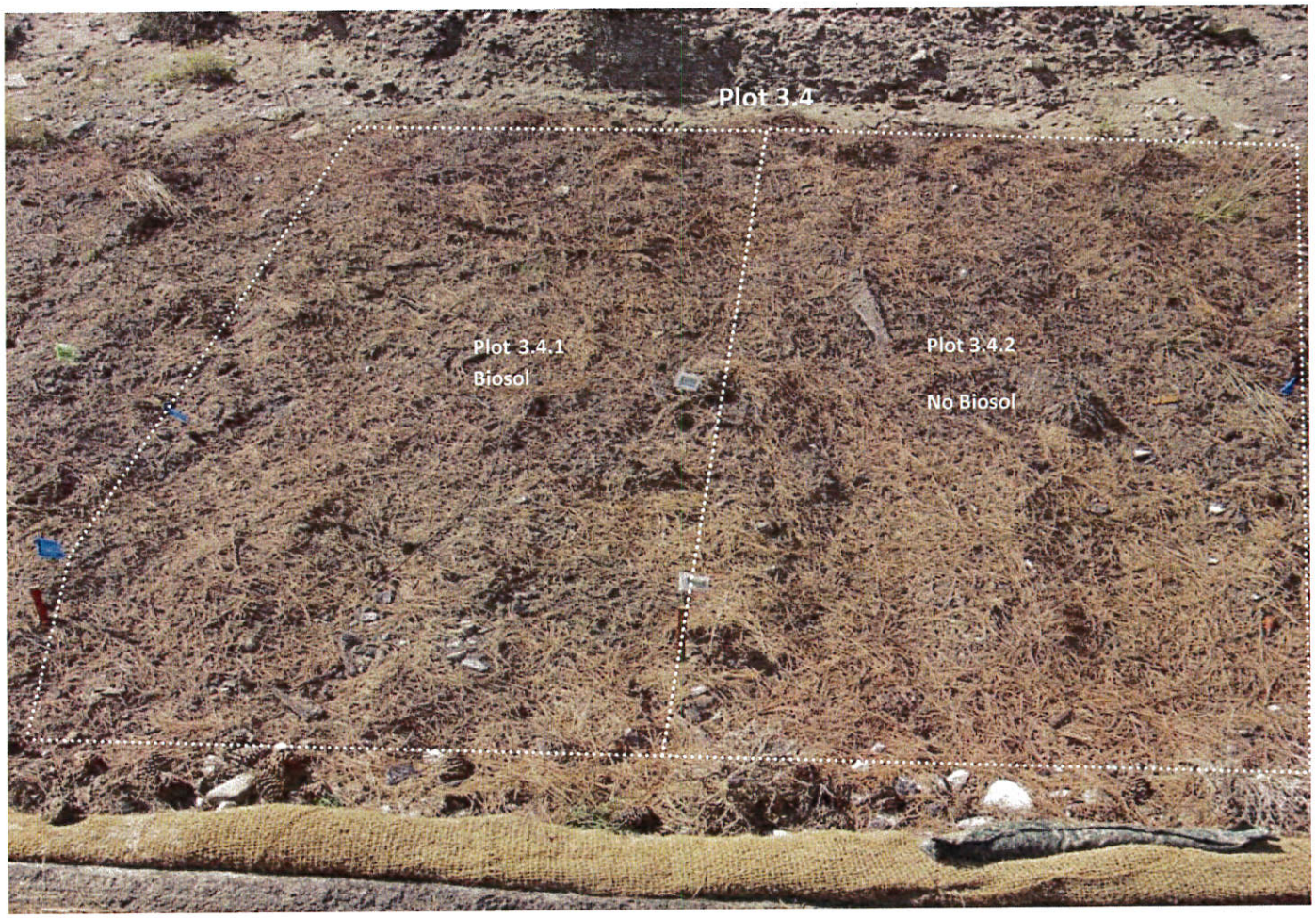

FIGURE 12. PLOT 3.4 POST-TREATMENT (4" AWC)

Plot Size: 19' x 18' = 342 SF

- Plot 3.4.1: 9.5' x 18' = 171 SF (2,000lb/acre of Biosol applied)
- Plot 3.4.2: 9.5' x 18' = 171 SF (No Biosol applied)

FIGURE 13. PLOT 3.5 POST-TREATMENT (BIOSOL)

Plot Size: 18' x 11' = 198SF

- Biosol raked into soil and seeded. No tilling or additional soil amendments.
- Plot covered with pine needle mulch and sprayed with BFM.

FIGURE 14. PLOT 3.6 POST-TREATMENT (SEED)

Plot Size: 18' x 11' = 198SF

- Seed applied to plot. No tilling, Biosol, or additional soil amendments.
- Plot covered with pine needle mulch and sprayed with BFM.

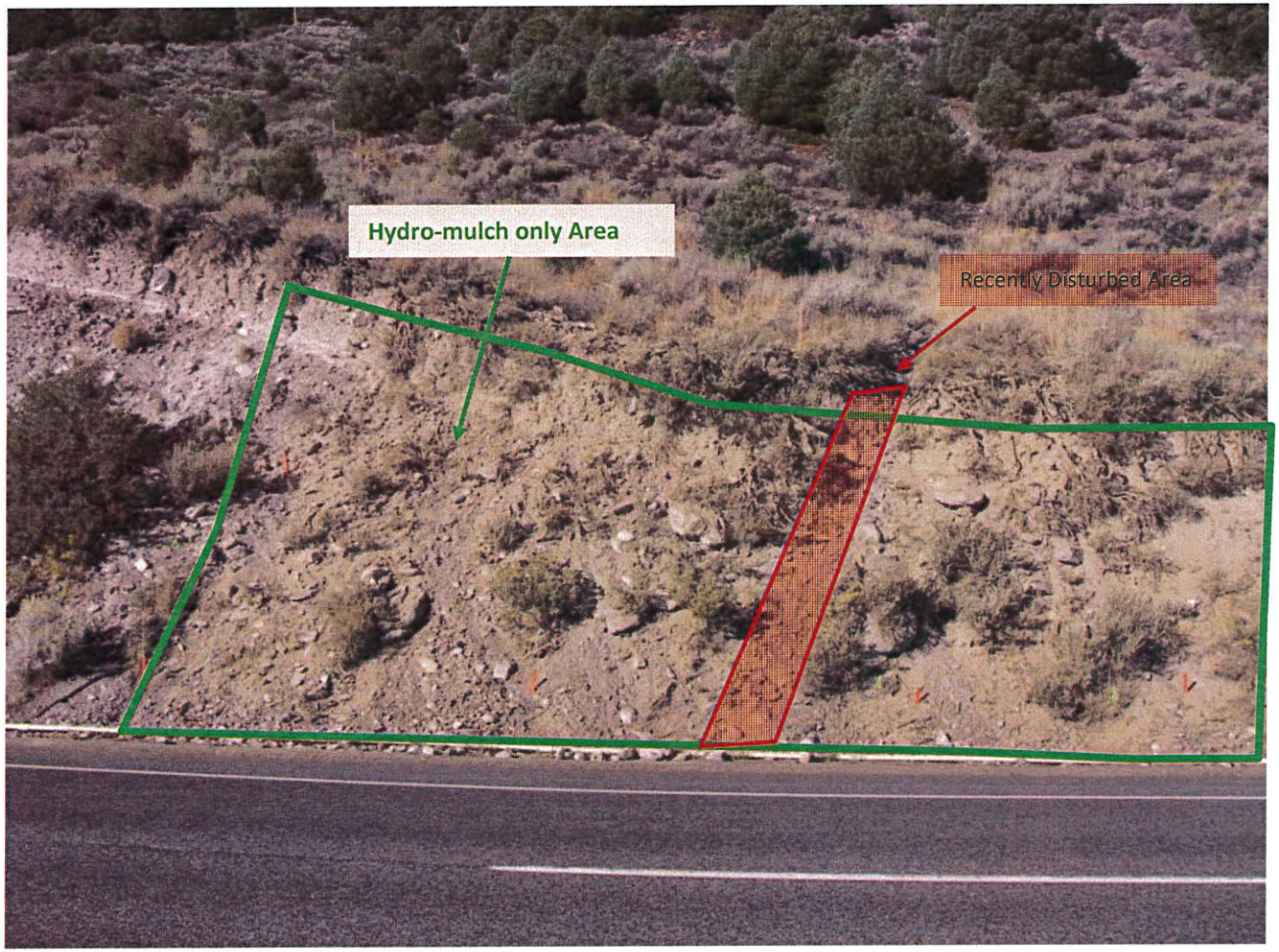

FIGURE 15. BFM-ONLY CUT-SLOPE (NO TREATMENT)

- No soil treatment: no tilling, seeding, Biosol, pine needle mulch, or irrigation.
- Only treatment on cut-slope was application BFM onto bare slopes, to distinguish any recent erosion that occurs after spraying.
- Area highlighted in red has signs of disturbance (animal tracks) going through slope.

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Lee Vining Test Plot Project 1st Report

1st report with recommendations.

LEE VINING ROCKFALL PROJECT TEST PLOTS

MONITORING REPORT AND RECOMMENDATIONS

Prepared by Michael Hogan

Integrated Environmental Restoration Services, Inc.

July 28, 2014

INTRODUCTION

The Lee Vining Rockfall Project is using an 'outcome-based' or 'adaptive' management process to determine which vegetative and soil treatments actually produce desired results[1]. In order to fully implement an outcome-based program, field tests were undertaken to determine which treatments would produce desired results and to help develop monitoring techniques and success criteria that will be used on the larger Lee Vining Rockfall Project. In order for a project to be able to claim success, clear goals and methods to assess progress toward those goals must be developed[2].

GOALS

The revegetation and soil stabilization goals for the Lee Vining Rockfall Project are:

1) To produce a self-sustaining plant community dominated by indigenous native species.
2) To produce a soil medium which is stable (erosion resistant) and provides primary support to the self-sustaining native plant community (*see Goal 1*).
3) To minimize or eliminate ongoing, long-term maintenance of the treated areas.

SUCCESS

Success criteria are designed to be linked directly to the project goals. The main measures or metrics of success are based on 'state' or physical manifestations of site conditions. I propose two elements of "Success" for the Lee Vining Rockfall revegetation work:

1) The persistent presence of native plants in defined treatment areas of the rockfall project area
2) Stable (non-eroding) soil, specifically in identified treatment areas.

These elements are based on:

1) Discussions with Caltrans staff.
2) Discussions with Mono Lake Committee staff.

---

[1] Most highway roadside and other erosion control projects depend on assumed or projected outcomes. However, those outcomes are seldom met and are almost never checked.

[2] Typically, project goals, if they are stated at all, are to 'revegetate' and/or implement erosion control BMPs. However, these goals are so vague as to be useless or in fact counter productive. Here, we attempt to define outcome goals: how the project will *function* upon completion and into the future.

3) Outcomes of test elements of the Lee Vining Rockfall project (grow out pots, field trials).
4) Practicability of achieving success.
5) The heterogeneous nature of the finished site.

These criteria and foundational elements seem relatively straightforward. They are. However, 'the devil is in the details' as is so often said, and the rest of this document is devoted to describing some of the details involved in creating a defensible and cost effective program for assessing, identifying and assisting success.

CONTEXT

Monitoring of the Lee Vining Rockfall project is challenging from the standpoint of a standard 'goals-success criteria-numerical monitoring' point of view, given the heterogeneous nature of the proposed finished site. While this situation makes normal transect-type monitoring impractical, (Hogan and Drake, 2007) success criteria, monitoring and follow-on treatment can be developed for this site. This statement is based on information, data and monitoring of the test plots.

PURPOSE

The basic purpose for success criteria and monitoring should be established in order for the success criteria to be fully understood. In the case of the Lee Vining Rockfall project as in most adaptively managed projects, monitoring is not primarily aimed at regulatory ***compliance***, though achieving success will support compliance with the Clean Water Act. The primary purposes of the success criteria and monitoring are:

1) To determine whether the project is on track to achieve the stated goals
2) To determine if and which remedial actions may be needed if success criteria are not being met, in order to re-direct project trajectories toward success.

This last point is another important element that makes this project unusual. In most highway projects, when intended goals are not met, no follow-on action is taken. Projects are closed out and no further funding is available.

This project creates a process where if success criteria are not met, actions may be taken to attempt to steer the project toward meeting the goals rather than to find either Caltrans or the contractor somehow out of compliance.

TIME

Often overlooked, the element of time needs to be incorporated into our understanding and approach to success. In straightforward engineering projects such as bridge or road building, at the completion of construction the project must meet specific physical conditions or states. In biologically based projects,

particularly ones that entail plant establishment and succession, conditions must be assessed *over a period of time*. The key factor to these projects is biological or ecological ***trajectory***; that is, which direction (or state over time) is the plant and soil community moving? Is the plant community becoming more or less diverse? Is the soil becoming more or less biologically active and resilient? Thus, as recent research is pointing out, a simple one-time assessment of soil-based projects (all erosion control and revegetation projects) can be and likely will be misleading. Further, current research in the Lake Tahoe region is suggesting that initial plant establishment conditions may have little resemblance to long-term plant communities.

General definition of Success

The following operations definitions of success are stated as a foundation for the more specific success criteria to follow:

1) Are plants of the appropriate planted species and type *becoming* established?
    a. Yes=success
    b. No=non-success
2) Are plants of the appropriate species and type *established*?
    a. Yes=success
    b. No=non-success
3) Is excess erosion (destructive to plants or site stability) occurring?
    a. No=success
    b. Yes=non-success

These criteria are reflected below in Table 1.

Response to Success Criteria

The response to success criteria is not binary. That is, success criteria are in many ways time dependent. Thus, some criteria that are not met in the first season may not require an immediate response but would require taking a more careful look in subsequent monitoring periods. We have therefore defined three response types and one no-response category:

1) Immediate response
    a. Respond within 5 days
    b. This response is in reaction to site conditions that can further deteriorate unless addressed immediately.
2) Response prior to fall precipitation
    a. Respond before fall rain and winter snow so that the site can stabilize during the winter and can withstand spring runoff.

b. This response is in reaction to site conditions that are unlikely to deteriorate prior to winter and/or may benefit from late season treatment.

3) Alert

a. Site conditions that suggest less than optimal function but that are do not require immediate treatment.

b. This response level suggests that there may be a problem but that additional time is required to determine whether further action is needed.

c. This response level raises the specific area to a higher level of future scrutiny.

4) No response

a. This response level suggests that success criteria have been met.

b. Until the project is deemed 'acceptable' (final inspection and agreement on goal achievement), this area may still need cursory inspection.

THE APPROACH TO A MEASURABLE OR ASSESSABLE DEFINITION OF SUCCESS

The challenge of defensible monitoring on highly heterogeneous sites is the difficulty in employing normal line or point type transects, to develop a statistical probability function when all of the sites are unlikely to represent a whole 'population' and where each site is small enough to preclude enough replicates or points to develop an acceptable statistical confidence level. In order to circumvent these challenges and at the same time develop acceptable and useful success criteria[3], we suggest that a specific and representative number of areas be chosen that can be measured or otherwise assessed for specific site conditions, listed below in Table 1. These sites would be chosen to represent the overall area and would be more intensively monitored. However, if issues arose on other non-monitored sites, some action may be taken to remediate the issue at hand. The success criteria are called out in Table 1 as well as the response levels and actions.

ELEMENTS OF SUCCESS CRITERIA-DESCRIPTION

This section defines elements and indicators to be used for success and remedial actions.

Of primary importance to project success and monitoring is the understanding that the various elements listed below are integrated and interact. Short-term vegetation

[3] Acceptable in this case is defined as acceptable to both Caltrans and the Mono Lake Committee, who have agreed to implement a rigorous and enforceable plan to achieve successful revegetation on slopes affected by the project.

alone is a poor indicator of long term project success (Herrick et al, 2006). Thus, appropriate interpretation of monitoring and assessment information will be crucial to understanding what actions need to be taken to correct whatever problems may exist.

EROSION

Erosion can occur for a number of reasons and cannot always be foreseen or controlled, even when all precautions have been taken. However, erosion represents the removal of resources and appropriate site conditions and therefore needs to be dealt with as soon as is practicable.

Erosion for the purpose of this project includes both erosion and deposition as both are indicators of an unstable system that can threaten project success. Indicators of erosion include the obvious rills, gullies and sediment deposition. Less obvious but as important are gravity erosion (dry ravel, etc.) and surface erosion. Surface erosion is sometimes difficult to identify and will require an experienced field erosion specialist.

Animal caused erosion can also have a significant impact on the success of the project. In areas where anchored wire mesh is installed, deer and coyote may not be an issue. However, ground squirrels and other rodents are likely to cause some difficulty. In this case, response will be determined by deciding whether action CAN be taken or whether that erosion is part of the overall process.

SURFACE RUN-ON

Channelized or otherwise concentrated surface water flow can supersede all other site characteristics in terms of potential damage. If water comes on to a site from upslope (run-on), that water is likely to remove or damage any revegetation efforts that are in place. It will also likely erode soil, removing the planting medium and causing potential water quality issues.

SOIL

Soil is the most critical element of the revegetation process in that soil defines to a large extent what other vegetation and erosion outcomes are produced. If soil is compacted and/or nutrient poor, plants will tend to be made up of weedy annuals and other undesirable species and will tend to be more erosion prone. If soil contains the right type and amount of nutrients and organic matter (from which most nutrients are derived), the appropriate plant types will become established and will produce a stable and aesthetically acceptable site condition.

BIOLOGICAL ACTIVITY-MULCH COVER

Biological activity is essential to soil development and sustainability. Biological activity is problematic and generally expensive to measure and most measurements are prone to interpretation. However, organic matter is the foundation of biological activity since it provides the 'food' and some of the energy needed to support that activity. This project includes the incorporation of organic matter into organic poor

soils to 'bootstrap' that organic activity. However, as an indicator of long term carbon inputs, the presence of mulch, produced by plants, is a useful indicator of organic carbon input to the system[4]. Thus, the presence of mulch cover will be used

PLANTS

The primary approach to vegetation establishment is direct seeding using a native grass, forb and shrub mixture that consists of indigenous plant species. The treatment approach and success criteria are based on a successional process where these species become established OVER TIME. That is, seeded species are not expected to dominate the first year but are expected to increase over the first three years. This expectation is based on monitoring observations of the Lee Vining Test Plots and other field observations and research throughout the western U.S. This increase over time is facilitated by soil development over time brought about by organic matter incorporation into the soil and in some cases deep tilling to allow native plant roots to access resources deep in the soil. As organic matter breaks down, conditions are created whereby the native species can gain a foothold and increase, outcompeting the invasive species to a large extent.

WEEDS

NOXIOUS WEEDS

Noxious weeds are plants that are listed in Federal and State registers. (Specifically: Federal: https://plants.usda.gov/java/noxiousDriver

State: https://plants.usda.gov/java/noxious?rptType=State&statefips=06

For management of noxious weeds, refer to: http://www.inyomonoagriculture.com/eastern-sierra-weed-management-area.html

Where noxious weeds exist on the project, they must be removed. Noxious weeds are regulated at the county level and must be dealt with appropriately and per directions of the county agricultural agency. Where other weeds exist, a case by case decision will be made. For instance, some species of thistle may be immediately removed and others may not. Mullen may or may not be required to be removed, depending on the density. Cheatgrass will not be removed (see below) nor will other revegetation grasses such as pubescent or crested wheatgrass, even though they are considered weeds by some. Again, an incident by incident decision will need to be made by a weed specialist.

OTHER WEEDS AS INTERMEDIATE SPECIES

Some plants, particularly cheatgrass (*bromus tectorum*), which are considered invasive weeds, are under consideration as intermediate species whereby they provide some ecosystem services while native grasses, forbs and shrubs are becoming established. Recent research and field work in the Lake Tahoe area is

---

[4] Another highly useful indicator of organic inputs is plant roots, particularly grass roots. However, these cannot be assessed without destructive sampling and is not practicable.

showing a strong trend toward understanding cheatgrass as an intermediate species *when site conditions have been maximized to support native species*. That is, while cheatgrass can be persistent in many substandard sites, research is showing that when a site is set up to favor native grasses (deep tilling and slow release nutrients from specific types of organic matter), cheatgrass is an initial colonizer (or was already established prior to treatment and thus is contained in the seed bank) and then gives way to the native grasses which can then dominate the site.

The impact of this information on this project is that cheatgrass specifically and other 'weeds' that are not listed as noxious, will be considered intermediate species in the first season and will be watched but, unless otherwise directed by Caltrans mandate, will not be removed. If cheatgrass attains dominance in the second and third season across the site, other actions will need to be taken.

MULCH

Pine needle mulch was used on all test plots. No other mulch was tested since a great deal of mulch tests and research have taken place elsewhere. Mulch is critical to protect from raindrop splash, surface runoff and to help retain moisture in the soil. Additionally, clear evidence from all of the test plots show that a small berm of pine needles at the top of the treated slope captures runoff and sediment from above, thus minimizing impacts of surface run-on. For extremely steep slopes such as exist on the Lee Vining Rockfall project, pine needles represent the most effective type of mulch for the following reasons:

1) Serrated or 'toothed' edges lock pine needles together once applied, providing a highly stable, movement-resistant mulch.
2) The highly surface-compliant nature of pine needles create a much higher coefficient of soil surface contact than fabric or other types of mulch.
3) Slow breakdown rate of pine needles allows long-term (>3 seasons) protection and some input of organic matter to the system.
4) Pine needle berms at the top of the treated area create a sediment filter that also slows surface flow.

DESCRIPTION OF MONITORING TECHNIQUES

The following section describes monitoring techniques to be used as listed in Table 1, below.

DIRECT OBSERVATION

Direct observation entails visual observation of a specific phenomena or observation of a site to determine whether that phenomena exists. Specifically, erosion/sedimentation and run-on will be assessed using direct observation.

OCULAR ESTIMATE

Ocular or visual estimate is a rapid but potentially inaccurate method of determining plant and mulch cover, and amount of weeds present. Ocular estimates must be done by a qualified and experienced individual who has calibrated their ocular estimate with an actual measured amount. This can be done in a number of ways but is critical in attaining a relatively consistent, accurate and repeatable estimate. Also, ocular estimates should be done by a disinterested 3rd party in order to minimize bias toward or against taking a specific action.

Quadrat frame

Vegetation density is measured by a quadrat frame. In this case, a 1ft by 1ft frame is placed over the vegetation and in contact with the soil surface and a count of individual plants in that $1ft^2$ area is taken.

Photo Monitoring

Photo monitoring is done by taking a photograph of the area of interest and then using a scaled photo grid monitoring process to determine cover or density. This process and the photo grid monitoring tool are available in "Roadside Revegetation" from the Federal Highway Administration at: (http://www.wfl.fhwa.dot.gov/programs/td/publications/documents/reveg-documents/roadside-revegetation-manual.pdf).

Feedback and Response Process and Criteria

Monitoring and success criteria, as previously described, is not intended to identify compliance but is designed to help Caltrans achieve its vegetation and erosion goals on the project. The Feedback and Response process is designed to assure that intervention can occur if and when it is needed. This focus creates a more flexible process but one that relies heavily on experience in making the judgment calls necessary to achieve the goals and outcomes intended. The process of who makes the final decision will be developed and defined prior to development of final project specifications.

Monitoring information and data is intended to be used to guide decisions about whether a remedial action needs to be taken. It should be noted that sometimes no action is preferred even when a success criteria is not met if a *trajectory* toward success seems apparent. Unfortunately, numerical specificity cannot always capture this trajectory.

TABLE 1:YEAR ONE SUCCESS CRITERIA. TO BE USED ON SPECIFIED AREAS

Parameter	Description	Quantitative or qualitative measurement	Criteria	Actionable Outcome Status	Response	Response period	Notes
Visible erosion	Presence of soil movement from planting area and/or deposition of soil onto planting area	Direct observation	No erosion	Rilling and/or >5% of site soil moved	Develop response plan, get approved and implement immediately	Immediate	Could include re-treating, re-mulching, re-seeding but must address the root cause.
Run on	Water running on to site from above capable of moving soil and disturbing plants	Direct observation	No run on from above planting area capable of removing soil or plants during low (0.1 in) or greater rainfall event	Run-on present	Divert run-on or protect site using mulch, rocks or other elements.	Immediate	
Seeded vegetation	Seeded species present	Direct measurement using quadrat frame if possible or photo monitoring or ocular estimate[5]	Seeded species of at least 3 plants/ft^2	<3 plants/ft^2	Alert-can apply additional seed	Alert or prior to fall precipitation	This criteria will become more important in year 2.
Weeds- not noxious	Plants such as cheatgrass (*bromus tectorum*, and others)	Ocular estimate	Presence of insidious weeds of >10% of total plant cover	Present->10%	Alert	No response or as directed	No action is needed in year one as some species may become limited over time
Weeds-listed noxious		Ocular estimate	Presence of any listed noxious weeds	Present	Remove or treat per Mono County Ag Commissioner	Per County ag commissioner or weed specialist	
Mulch	Presence of organic plant litter	Ocular estimate	20% of surface covered	0%		Prior to fall precipitation	
				10%		Prior to fall precipitation	
				20% and greater	None		

[5] Ocular or visual estimates should only be accomplished by a trained individual who has calibrated his or her visual estimates to a known, measured quantity.

Figure 1: plot 1.1.1 showing robust growth, some of which was established prior to plot installation. This plot exemplifies area that will be treated that already have some growth but that are enhanced by additional treatment. Seeded species have established alongside non-native and native species.

Figure 2: Plot 1.1.2 showing less growth on non-fertilized (right) side. Right side is dominated by cheatgrass. However some native seeded species are present. This photo, taken in June 2014 will be compared to conditions later in the 2014 season in order to assess native grass trajectory (toward more or less presence).

Figure 3: Plot 2.1.1-Aged wood chips, showing similar pattern to plot 1.1 where the fertilized (left) side exhibits superior growth. Both areas were previously bare subsoil and thus likely benefit from the more nutrient rich compost, at least initially.

Figure 4: Plot 2.2 Integrated Zero compost showing the more robust growth on the fertilized side. Note also the animal tracks from the upper right to lower left of the plot.

Figure 5: Plot 2.2.1 showing robust sagebrush (seeded) surrounded by squirreltail grass (also seeded)

Figure 6: plot 3.3.1- aged wood chips on partially developed soil showing robust establishment of squirreltail. A close look also reveals some emergent shrubs.

BASIS OF SUCCESS: MONITORING INFORMATION AND DATA (from field monitoring)

TABLE 2: TREATMENT MATRIX AND MONITORING INFORMATION. THE TERM 'PLANTS' REFERS TO ANY GREEN PLANT PRESENT IN THE PLOTS INCLUDING NATIVE AND NON-NATIVE GRASSES, FORBS AND SHRUBS.

Plot #	Soil Amendment	L x W	SF	Amendment Depth	6-12" Tilling	2,000 lb/acre Biosol	1" Pine Needle Mulch	Erosion Fabric	BFM-Tackifier	Growth 6/14/14	Other notes
1.1.1B (left)	AWC	9.5' x 8'	76	2"	Yes	Yes	Yes	No	Yes	- >5 plants/ft2 -many existing or seed bank plants present, not planted	This area would be considered successful but the majority of plants are from pre existing or seed bank plants. However, many seeded individuals exist. Some cheatgrass noted.
1.1.2 (right)	AWC	9.5' x 8'	76	2"	Yes	No	Yes	No	Yes	-3-4 plants/ft2	Less plants than fertilized plot. More cheatgrass than fertilized plots
1.2.1B (left)	Int-Zero	5' x 9'	45	2"	Yes	Yes	Yes	No	Yes	-3 plants/ft2.	Good response but more cheatgrass
1.2.2 (right)	Int-Zero	5' x 9'	45	2"	Yes	No	Yes	No	Yes	-2 plants/ft2	Less cheatgrass
2.1.1B (left)	AWC	6.5' x 12'	78	2"	Yes	Yes	Yes	No	Yes	-5 plants/ft2	Some cheatgrass
2.1.2 (right)	AWC	6.5' x 12'	78	2"	Yes	No	Yes	No	Yes	-3 plants/ft2	More cheatgrass
2.2.1B (left)	Int-Zero	7' x 12'	84	2"	Yes	Yes	Yes	No	Yes	-4 plants/ft2	Some cheatgrass
2.2.2 (right)	Int-Zero	7' x 12'	84	2"	Yes	No	Yes	No	Yes	-2 plants/ft2	Animal damage
3.1	None, Caltrans-spec	18' x 11'	198	-	No	No	No	Yes	No	2 plants/ft2	Some cheatgrass; Other plants not ready to identify
3.2.1B (left)	Int-Zero	9' x 18'	81	2"	Yes	Yes	Yes	No	Yes	6 plants/ft2 mostly cheatgrass	Estimate of seeded species: 0.3 plants/ft2
3.2.2 (right)	Int-Zero	9' x 18'	81	2"	Yes	No	Yes	No	Yes	5 plants/ft2	Same as 3.2.2B

Plot #	Soil Amendment	L x W	SF	Amendment Depth	6-12" Tilling	2,000 lb/acre Biosol	1" Pine Needle Mulch	Erosion Fabric	BFM-Tackifier	Growth 6/14/14	Other notes
3.3.1B (left)	Int-Zero	9' x 14'	126	4"	Yes	Yes	Yes	No	Yes	5 plants/ft2 Squirreltail-1 plants/ft2	More cheatgrass on left (fertilized) plot
3.3.2 (right)	Int-Zero	9' x 14'	126	4"	Yes	No	Yes	No	Yes	4 plants/ft2 Squirretail-1 plants/ft2	More squirreltail on right (non-fertilized) plot
3.4.1B (left)	AWC	9.5' x 18'	171	4"	Yes	Yes	Yes	No	Yes	10 plants/ft2, mostly squirreltail	Some cheatgrass but squirreltail is already dominating
3.4.2 (right)	AWC	9.5' x 18'	171	4"	Yes	No	Yes	No	Yes	10 plants/ft2 mostly squirreltail	Less cheatgrass than fertilized plot
3.5B	None, Biosol only	18' x 11'	198	-	No	Yes	Yes	No	Yes	8-10 plants/ft2, mostly previous reveg grasses and cheatgrass	Cheatgrass was already present but seemed to respond will to Biosol
3.6	None, Seed only	18' x 11'	198	-	No	No	Yes	No	Yes	8 plants/ft2,	Difficult to tell if seeded species are responding due to the prevalence of already existing reveg grasses and cheatgrass. Check this site in the fall for further development.

TABLE 3: SEED MIX USED ON ALL PLOTS EXCEPT CALTRANS SPEC

Species	% of mix by weight	PLS #/ac
Great Basin wildrye	42%	31.3
Bitterbrush	21%	15.6
Sagebrush	8%	6.3
Wax current	8%	6.3
Squirreltail	21%	15.6
Total	**1**	**75**

PLOT LAYOUT

Figure 7: Slope 1 plots.

Figure 8: Slope 2 plots.

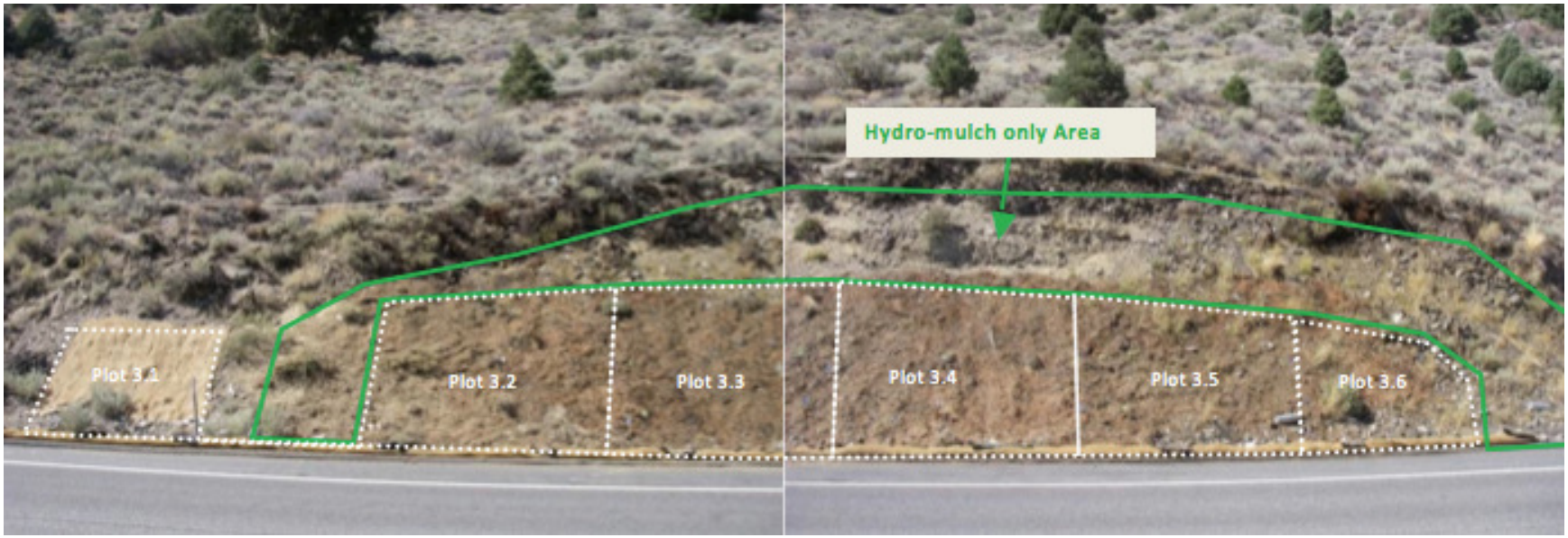


Figure 9: Slope 3 plots

IMPORTANCE OF SOIL DEVELOPMENT

This section includes soil sample data taken prior to implementation of the test plots. It is included in order to show how soil can develop over time and suggests that the Revegetation Reference site and native site are targets for soil development. This information supports the need for organic matter incorporation in organic poor soils (Herrick et al, 2006).

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

REPORT NUMBER: 13-114-040 CLIENT NO: 4810

SEND TO: INTEGRATED ENVIRONMENTAL RESTORATION
PO BOX 7559
TAHOE CITY, CA 96145

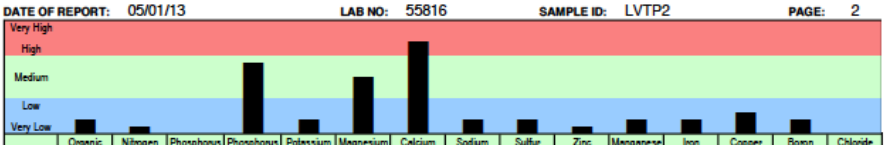
GROWER: LEE VINING-MONO LAKES

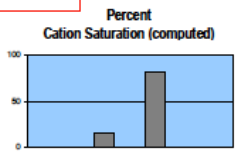
SUBMITTED BY: SUZANNE PATTINSON

Test plot 2

Graphical Soil Analysis Report

DATE OF REPORT: 05/01/13 LAB NO: 55816 SAMPLE ID: LVTP2 PAGE: 2





Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	0.9	1	0	14	60	333	2702	22	2	0.2	1	4	0.5	0.3	
			LOW		AVERAGE		HIGH								

Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
0.9	16.5	81.9	0.6
	ACIDIC	BASIC	

0.2 ECe dS/m — INCREASING SALINITY

16.5 CEC meq/100g

H Ex. Lime

8.2 pH — INCREASING NEED FOR LIME — Buffer pH:

Weak Bray P unreliable at M or H excess lime or pH > 7.5

Figure 10: Bare Lee Vining Rockfall (sub) soil from test slope 2. Note the high pH and very low organic matter. Note also the lack of weak Bray P measurement and low potassium.

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

REPORT NUMBER: 13-114-040 CLIENT NO: 4810

SEND TO: INTEGRATED ENVIRONMENTAL RESTORATION
PO BOX 7559
TAHOE CITY, CA 96145

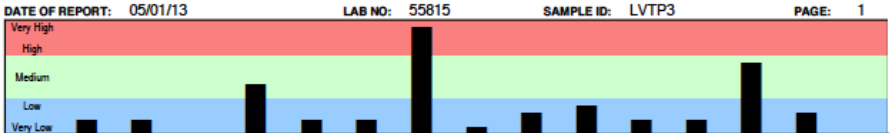
GROWER: LEE VINING-MONO LAKES

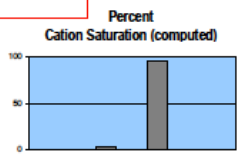
SUBMITTED BY: SUZANNE PATTINSON

Test Plot 3

Graphical Soil Analysis Report

DATE OF REPORT: 05/01/13 LAB NO: 55815 SAMPLE ID: LVTP3 PAGE: 1





Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	0.8	2	1	10	62	80	3035	14	6	0.9	1	4	1.4	0.4	
			LOW		AVERAGE		HIGH								

Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
1.0	4.1	94.5	0.4
	ACIDIC	BASIC	

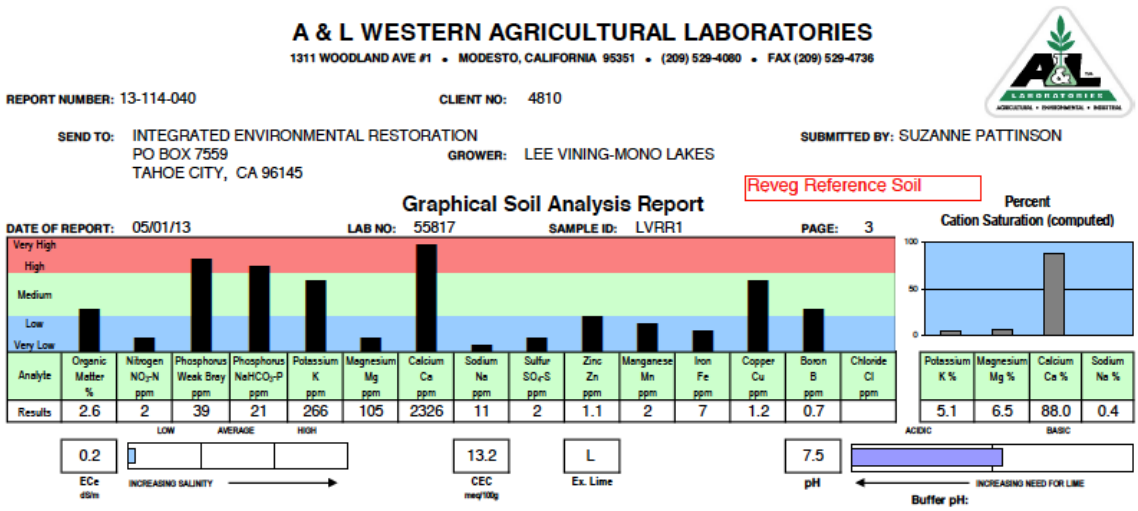
0.2 ECe dS/m — INCREASING SALINITY

16.0 CEC meq/100g

H Ex. Lime

8.1 pH — INCREASING NEED FOR LIME — Buffer pH:

Figure 11: Bare Lee Vining Rockfall (sub) soil from Test Slope 1. Note near identical pH and OM. Note again the low weak Bray P and potassium. These slopes (1&2) would not be expected to support vegetation in their untreated state.



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REPORT NUMBER: 13-114-040 CLIENT NO: 4810

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TAHOE CITY, CA 96145

GROWER: LEE VINING-MONO LAKES

SUBMITTED BY: SUZANNE PATTINSON

Reveg Reference Soil

Graphical Soil Analysis Report

DATE OF REPORT: 05/01/13 LAB NO: 55817 SAMPLE ID: LVRR1 PAGE: 3

Very High / High / Medium / Low / Very Low

Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	2.6	2	39	21	266	105	2326	11	2	1.1	2	7	1.2	0.7	

LOW AVERAGE HIGH

Percent Cation Saturation (computed)

Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
5.1	6.5	88.0	0.4

ACIDIC BASIC

ECe dS/m: 0.2 — INCREASING SALINITY

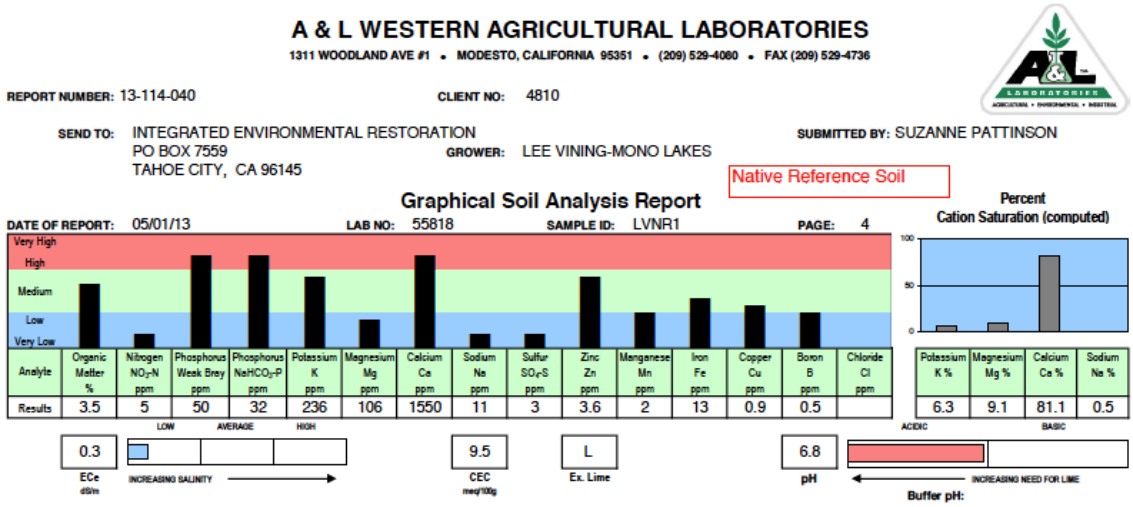
CEC meq/100g: 13.2

Ex. Lime: L

pH: 7.5 — INCREASING NEED FOR LIME

Buffer pH:

Figure 12: Partially (spontaneously) developed soil near edge of bare area where soil color was clearly darker. This area had been developing for at least 20 and as much as 40 years. Note lower pH.



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REPORT NUMBER: 13-114-040 CLIENT NO: 4810

SEND TO: INTEGRATED ENVIRONMENTAL RESTORATION
PO BOX 7559
TAHOE CITY, CA 96145

GROWER: LEE VINING-MONO LAKES

SUBMITTED BY: SUZANNE PATTINSON

Native Reference Soil

Graphical Soil Analysis Report

DATE OF REPORT: 05/01/13 LAB NO: 55818 SAMPLE ID: LVNR1 PAGE: 4

Very High / High / Medium / Low / Very Low

Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	3.5	5	50	32	236	106	1550	11	3	3.6	2	13	0.9	0.5	

LOW AVERAGE HIGH

Percent Cation Saturation (computed)

Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
6.3	9.1	81.1	0.5

ACIDIC BASIC

ECe dS/m: 0.3 — INCREASING SALINITY

CEC meq/100g: 9.5

Ex. Lime: L

pH: 6.8 — INCREASING NEED FOR LIME

Buffer pH:

Figure 13: native soil from area adjoining other sampled areas but in fully native vegetation with no sign of disturbance. Note pH and organic matter differences. Note pH in the range of 'ideal' for a garden soil.

INITIAL RECOMMENDATIONS BASED ON PRELIMINARY MONITORING

SOIL AMENDMENT

BARE SOIL SLOPES

Both aged wood chips and Integrated Zero produced adequate results in initial monitoring. In soils that were very bare and of high pH initially, aged wood chips outperformed the compost in terms of establishment of native seeded species, specifically squirreltail and sagebrush.

Partially vegetated slopes

In areas where soil already showed some development, Integrated Zero compost[6] produced a great deal of initial cheatgrass. However, within the cheatgrass, some native seeded species were present. In these areas of partial soil development, aged wood chips produced the highest cover of native seeded grasses and the lowest cover of cheatgrass. Fall 2014 and spring 2015 assessment will be needed to determine whether this trend holds true over time.

Initial Recommendation

Based on current monitoring information, aged wood chip[7] treatment is recommended for areas that contain a substantial amount of 'fresh' soil or soil that has not been exposed to the environment for more than 5 years. These areas include freshly 'scalped' regions. This will likely be the case in the steeper sections of the rockfall project where anchored wire mesh is to be placed. Aged wood chips are also recommended in areas where soil has been partly developed. This is likely the case in areas where some crown removal and smoothing but no rock fencing is to be placed, such as the southernmost areas of the projects and less steep areas. Where well aged wood chips are not available, Integrated Zero compost may be appropriate. A final recommendation will be made following the fall 2014 site assessment.

Caveat to initial recommendations

A fall survey is likely to provide additional information, which will inform these recommendations. Thus, final recommendations for materials and amounts should be informed by both fall 2014 and spring 2015 site surveys.

Summary

This monitoring and success criteria report suggests that extremely poor, extremely steep Mono Lake Basin soils can be successfully revegetated during the first season using specific techniques which incorporate specific types of organic matter and leaves soil loose to a depth of 12-18 inches. The use of the listed seed mix, which consists of native grass, forb and shrub species has met a high level of initial success. Application of pine needle mulch, which includes a small upslope berm above the plots has also been shown to be effective at protecting the soil surface and providing an upslope filter to run-on and colluviation.

Final specifications can be derived from this information. Those specifications should be developed following fall 2014 assessment.

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[6] Integrated Zero compost is produced by Full Circle Compost of Minden Nevada and has been developed for use on roadside and other upland revegetation projects in an effort to minimize weeds and support vegetation establishment and growth. Integrated Zero consists largely of composted wood chips (EPA-aerobic compost process).

[7] Aged wood chips are typically aged for at least one year. The wood chips used in the plots were aged approximately 2 seasons. Wood chips should be disease free, contain no garbage and show clear darkening in color, which is a sign that organic acids have been leached from the material. Wood chips that are green or younger than 1-2 years are likely to create growth limitations and will need to be approved by a soil amendment specialist.

REFERENCES

Herrick, J.E., Gerald E. Schuman and Albert Rango; (2006) *Monitoring Ecological Processes for Restoration Projects* Journal for Nature Conservation V14, 1610171

Hogan, M.P. and Kevin Drake (2008) Sediment Source Control Handbook Sierra Business Council

Drake, Kevin and Michael Hogan (2013) Watershed Management Guidebook Lahontan Regional Water Control Board, South Lake Tahoe, CA

Roadside Revegetation (2007) FHWA-WFL/YD-07-005

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Dist-County-Route: 09 – MNO – 395
Post Mile Limits: **52.3 / 53.7**
Project Type: Rockfall Safety Project
Project ID (or EA): 09-33500 1
Program Identification: SHOPP / 201.015
Phase: ☐ PID
☐ PA/ED
☒ PS&E

Regional Water Quality Control Board(s): Lahonton (6)

Is the Project required to consider Treatment BMPs? Yes ☐ No ☒
If yes, can Treatment BMPs be incorporated into the project? Yes ☐ No ☐
If No, a Technical Data Report must be submitted to the RWQCB at least 30 days prior to the projects RTL date. List RTL Date: 10/20/2014

Total Disturbed Soil Area (DSA): 6.3 Acres Risk Level: 1
Estimated: Construction Start Date: 06/01/2015 Construction Completion Date: 8/31/2016
Notification of Construction (NOC) Date to be submitted: 05/01/2015

Erosivity Waiver	Yes ☐	Date:_____	No ☒
Notification of ADL reuse (if Yes, provide date)	Yes ☐	Date:_____	No ☒
Separate Dewatering Permit (if yes, permit number)	Yes ☐	Permit #_____	No ☒

This Report has been prepared under the direction of the following Licensed Person. The Licensed Person attests to the technical information contained herein and the date upon which recommendations, conclusions, and decisions are based. Professional Engineer or Landscape Architect stamp required at PS&E.

Cory S. Freeman, Registered Project Engineer — Date: 9-24-14

I have reviewed the stormwater quality design issues and find this report to be complete, current and accurate:

REGISTERED PROFESSIONAL ENGINEER
CORY S. FREEMAN
C62107
EXP. 9/30/15
CIVIL
STATE OF CALIFORNIA

Cedrik Zemitis, Project Manager — Date: 9/29/14

Ron Kaiser, Designated Maintenance Representative — Date: 10-1-14

Jim Hibbert, Designated Landscape Architect Representative — Date: 9/24/14

Rebecca Eastman, District Design SW Coordinator or Designee — Date: 10/1/2014

[Stamp Required for PS&E only)

STORMWATER DATA INFORMATION

1. Project Description

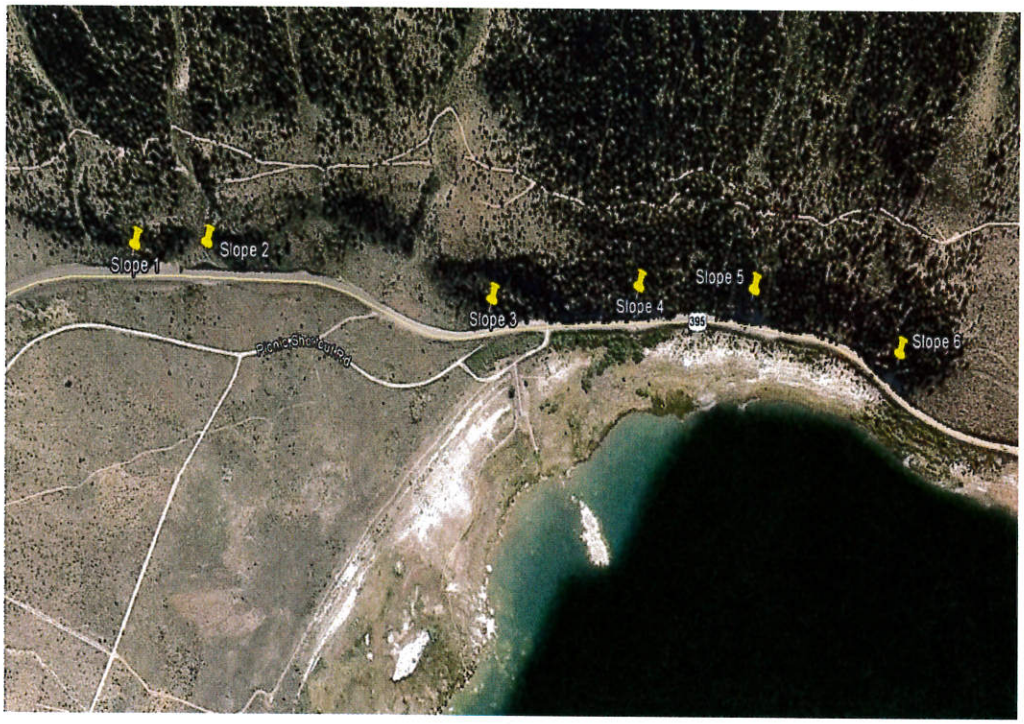
The Lee Vining Rockfall Project (Project) proposes to reduce rockfall and stabilize six existing cut slopes on the west side of U.S. 395 near Mono Lake. The project will also include a five year post construction monitoring program which will monitor revegetation growth after the project is completed. The project occurs on U.S. Highway 395 (U.S. 395) in Mono County between post miles (PM) 52.3 to 53.7and is approximately 0.85 miles from the town of Lee Vining. The project lies within the *Mono Basin National Forest Scenic Area* which is administered by the Inyo National Forest Service. Mono Lake lies within the project limits with Slopes 4, 5, and 6 directly across from it. Mono Lake is designated as an Outstanding National Resource Water (ONRW), by the State Water Resources Control Board (1994) and the EPA

The project proposes to stabilize the existing cut slopes by applying a revegetation strategy, outlined below, to all six slopes and applying anchored mesh at Slopes 4-6 which pose a higher risk for rockfall. The anchored mesh will retain rockfall and further stabilize the soil mass on the slope.

The six project slopes, Slopes 1-6, consists of existing cut slopes which were created in the 1930's for construction of a new roadway alignment. The steepness of the existing cuts vary between 0.5:1 (h:v) to 1:1 (h:v), with an average of 1(h):1(v). The slopes above the existing cut slopes averages 2:1 (h:v) in steepness. The slopes adjacent to the cut slopes vary in steepness from 1:1 to 2:1. Vegetative cover adjacent to the six cut slopes is well established with grasses, bitterbrush, and pinion trees to name a few. The amount of vegetative cover within the existing cut slopes is much less established than the adjacent native slopes. The existing surface of these cut slopes is currently in a constant state of erosion and shed rock and sediment. This material is deposited along the toe of slope, with some rocks reaching the traveled way.

The total *existing* disturbed soil area of the six cut slopes is approximately three acres. The project will disturb an additional 3.25 acres for a total project disturbed area of 6.3 acres. Newly disturbed area accounts for rounding the top of Slope 2, rock scaling activities, tree clearing, and vegetation pruning within the areas to receive anchored mesh, and light grading within the areas to receive anchored mesh. Where anchored mesh will be installed, existing vegetation will be pruned two inches above ground and trees will be trimmed to adjacent grade. Pruning of the existing vegetation and cutting trees flush with adjacent grade minimize ground disturbance.

The project is expected to take two seasons of work with a winter suspension between season 1 (summer 2015) and season 2 (late Spring/Summer 2016). It is anticipated that Season 1 will start in June 2015 and will involve completing work for Slopes 1, 2, 5, and 6. Season 2 will start approximately in May 2016, the following year completing Slopes 3 and 4. Although it is possible for Stage 2 to begin in March/April if winter snow fall amounts allow.



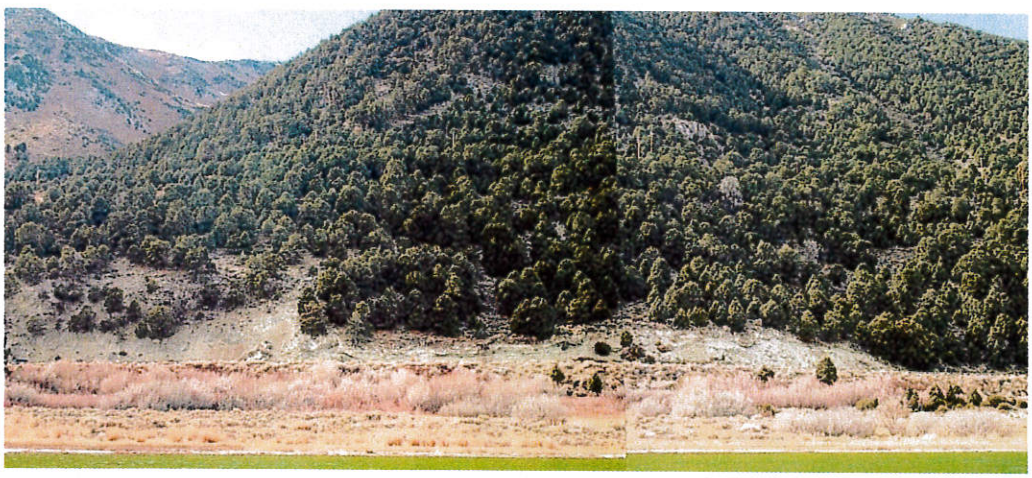
Project Location showing Slopes 1-6.

The six existing cut slopes are shown below:

Slope 1

Slope 2

Slope 3



Slope 4

Slope 5

Slope 6

Summary for All Slopes

In addition to rockfall mitigation, this project will stabilize the existing cut slopes through revegetation and/or mechanical stabilization methods (anchored mesh). Based on comments received on the Draft Environmental Document from the U.S. Forest Service (USFS), The Mono Lake Committee (MLC), and the regional water quality board, LAHONTAN a revegetation strategy was included in the project to control erosion for short term construction impacts and long term stability. As a result of the comments received on the Draft Environmental Document, a legal contract was created between Caltrans and MLC which defined the revegetation requirements as well as requiring a post construction five year monitoring program. Within the contract it was stipulated that revegetation strategies will be based on the adjacent test plot project, the Lee Vining Test Plots Project (*Test Plots Project*).

The *Test Plot Project* is a smaller Caltrans test revegetation project adjacent to this proposed rockfall project. It was created for the sole purpose of determining successful soil and protective surface treatments to apply to the The Lee Vining Rockfall Project with the intention of establishing native plant growth on the cut slopes. This will help retain the soil mass on the slopes and reduce erosion. The *Test Plots Project* is studying various revegetation and soil amendment strategies on slopes of similar steepness and soil composition. The slopes associated with the *Test Plots Project* are smaller in size compared to this rockfall project, but similar in composition and inclination. They are located between Slopes 2 & 3 of this proposed rockfall project. The *Test Plots Project* will also evaluate effective surface treatments to prevent short term soil erosion. *Test Plots Project* will issue recommendations for applicable revegetation strategies for the LV Rockfall Project. Three reports will be issued with recommendations. The first report was issued on July 28, 2014 and is included as an attachment to this report. The recommendations contained in this first report are the foundation of the Lee Vining Rockfall revegetation strategy. These strategies, discussed below, will address both short and long term stormwater quality issues.

All slopes will require rock scaling, the degree to which is dependent on the individual slope as described below. Rounding the top of Slope 2 will also occur to reduce run-on concentrated erosion potential. The project is estimated to generate approximately 1000 cubic yards from the soil disturbing activities. This material will be removed from the site and disposed of by the contractor. Caltrans Standard Specifications, Special Provisions, and the SWPPP will address removal and collection methods of this material to assure air and water quality standards are maintained.

Overall Sediment and Rockfall Reduction Strategies

The overall strategy is to revegetate suitable areas within the six cut slopes and apply anchored mesh to those slopes which pose a greater rockfall hazard (Slopes 4-6). Since the original top soil has been long since removed, plant establishment is difficult due to lack of nutrients, slope steepness, run-on, and wind erosion, soil composition, and geology.

As part of the overall revegetation strategy, outlined below, a native seed mix will be applied to the entire area as shown on the erosion control plans. In addition to that compost amendments will be mixed into the existing soil at locations shown on the erosion control plans. Mixing of the compost will create a nutrient rich environment for plant establishment as well as leave a rough surface. Fertilizer will also be added to the areas to receive compost amendments. Finally pine needle mulch will be used to cover the slopes to act as protective cover and long term source of organic nutrients as it decomposes. The areas, identified on the plans as EC Type 1, to receive compost amendments were identified with the help from the erosion control specialist in charge of the *Test Plots Project*, Michael Hogan. These areas are mostly soil in composition and will allow compost amendments to be mixed into the existing soil; creating a soil matrix suitable for plants to grow. Temporary irrigation will be provided to accelerate plant germination as outlined in the contract specifications.

Installation of anchored mesh serves two purposes, retaining rockfall on the slope and decreases sediment transport. For the slopes that receive anchored mesh, it is vitally important to maintain as much contact with the ground and mesh as possible. This will further stabilize the slope and minimize sediment transport. In order to achieve this ground contact the plans and specifications call require a tolerance for the various locations on the slope. Further, light grading will be required to facilitate this ground-mesh contact.

Last of the revegetation strategies is implementation of a five year post construction monitoring program.

The following revegetation strategies are taken from the *Lee Vining Rockfall Project Test Plots Monitoring Report and Recommendations* dated July 28, 2014. This document is attached to this report.

<u>Revegetation Strategies (all slopes)</u>

1. **In areas of loose soil** (EC Type 1 - generally at the base of the existing cut slopes):
    a. Apply 2" of compost and incorporate 12" into the soil – this will add nutrients back to the slope which will foster and support plant reestablishment.
    b. Apply fertilizer
    c. Apply hydro-seed composed of native plant seed
    d. Apply a layer of mulch (pine needles) to the surface – pine needles have shown to be very effective at preventing surface erosion due to its ability to interlock and disperse rain drop energy. Varying thicknesses are shown on the Erosion Control Plans. Thicker layers are placed at the bottom of vertical or near vertical slopes to account for the concentrated sheet flows coming from these locations as well as above the area of work to control run-on flows.
    e. Apply a bonded fiber matrix over the mulch to bond it all to the slopes until plant growth takes hold

2. **In Rocky Areas** (EC Type 2 – more rock than soil):
    a. Apply hydro-seed composed of native plant seed
    b. Apply a layer of mulch (pine needles) to the surface – pine needles have shown to be very effective at preventing surface erosion due to its ability to interlock and disperse rain drop energy. Varying thicknesses are shown on the Erosion Control Plans. Thicker layers are placed at the bottom of vertical or near vertical slopes to account for the concentrated sheet flows coming from these locations as well as above the area of work to control run-on flows.

    c. Apply a bonded fiber matrix over the mulch to bond it all to the slopes until plant growth takes hold

3. **Five Year Post Construction Monitoring Program**
    a. All slopes will be monitored for revegetation success, localized rilling or gulleying, and monitor for off-site sediment transport. Under the Monitoring Program activities may include making localized repairs and reapplication of erosion control products, mulch, hydroseed, etc. as needed.

<u>Description of Work at Each Slope</u>

Slopes 1, 2, & 3: Minor rock scaling will be performed to remove loose rock from the slopes prior to the application of the Revegetation Strategy described above and as shown on the Erosion Control Plans. It was decided not to round the top of slopes of 1 and 3 as the erosion control specialist, working on the Lee Vining Test Plots Project, felt it will do more harm than good. Due to the large amount of rock and existing vegetation on these slopes, it was decided to seed the bare areas on the top of the slopes that do exist and cover them with mulch to prevent run-on and run-off erosion. Specific areas of Slopes 1 and 3 will receive compost amendments and fertilizer to promote revegetation of these areas. See the attached erosion control plans.

Slope 2, will receive the same revegetation strategy described above along with minor rock scaling. However due to the more soil like nature and less rock at Slope 2, it will be rounded to reduce run-on flow concentrations. Prior to rounding, existing duff and topsoil will be collected and reapplied to the area that is rounded. The above revegetation strategy will then be applied. Since Slope 2 is more soil like in composition, compost and fertilizer will be applied to the entire slope.

With the vertical crown removed at Slope 2(rounded), loose rocks removed (rock scaling), and revegetation established, the slope surface will be stabilized. This will reduce rockfall and soil erosion from these slopes.

Slope 4, 5, & 6: These slopes will all receive an anchored mesh application along with revegetation strategies described above to reduce rockfall and sediment erosion. Anchored Double Twisted Wire Mesh (ADTWM) will be used for Slope 4 due to the smaller size rocks at this location. Because of the larger rocks found on Slopes 5 & 6 an Anchored Cable Net System will be used; this consists of 3/16" cable assembled to create 12" square openings combined with double twisted wire mesh. The smaller openings in ADTWM combined with the larger cable mesh will be effective at holding back both small and large rocks found on these slopes in addition to retaining the soil particles. The nominal opening size for DTWM varies in width between 2.5-3.25 inches. Anchoring the mesh to the slope will hold rocks on the slope preventing them from rolling out on the highway and help stabilize the smaller soil particles.

Prior to placing the revegetation strategies and anchored mesh, the slopes will be rock scaled to remove potentially unstable rocks. Also, the area to receive anchored mesh will be cleared of trees, with the tree trunk cut flush with the slope, leaving the root ball in place, and pruning existing shrubs within 2" of the surface will minimize ground disturbance.

Localized light grading within the eroding portion of the existing cut slope will be required at some locations to promote improved contact between the slope surface and the mesh. Maintaining contact between the mesh and the surface will promote revegetation and reduce soil erosion. Large keystone rocks shall be left in-place undisturbed below grade, but the portion above grade may be trimmed to within the tolerances specified in the project specifications.

Once the installation of the rock dowels have been completed, the revegetation strategies described above will be applied to the slope within the area covered by the anchored mesh. A thickened layer of mulch (pine needles) will also be applied a minimum of five feet beyond the area to be covered by the anchored mesh. See the Erosion Control Plans.

Description of Proposed Disturbed Area(DSA)

The total existing disturbed soil area of the six cut slopes is approximately three acres. The project will disturb an additional 3.25 acres for a total project disturbed acres of 6.25. Most of the newly disturbed area accounts for the installation of the anchored mesh above the existing cut slopes to contain rocks on the slope. These areas will be disturbed by construction activities involved with clearing trees, pruning brush, and installing the anchored mesh. The revegetation strategies described above will be applied to the existing disturbed areas in addition to the newly disturbed areas.

The existing dirt shoulder cross slopes below the existing cut slopes vary between 5-10% and vary in width between 5-10 ft. These dirt shoulders will be lightly graded to 5-10% between the existing toe of slope and paved shoulder to improve retainment of any loose debris which comes off the slope. They will not be widened or steepened beyond what currently exist and will not create additional stormwater flows.

Existing Surface Flows

Stormwater runoff collects from run-off of the existing project slopes, existing slopes adjacent to the project slopes, and from the highway. These flows originate from rain fall and melting snow. Concentrated flows coming from the project are mostly constrained to the west side of the highway by the geometry and profile of the roadbed. Concentrated flows near the project slopes are as follows:

Near Slope 1, concentrated flows from the highway collect west of and flow away from the crown towards slope 1; where it is collected via a paved shoulder and asphalt dike. Stormwater run-off from Slope 1 sheet flow over the slope and collect at the toe of slope which is above the paved highway flow line. If surface flows are minimal then it flows along the toe of slope and makes its way to the drainage inlet located at sta 1051+64. If surface flows are large enough, they will flow over the asphalt dike and into the paved flow line. These concentrated flows follow the highway profile grade of 6% towards the drainage inlet and culvert located between Slopes 1 and 2, sta 1051+64. This is then transported east under the highway and discharged approximately 0.3 miles away from the shoreline of Mono Lake.

Near slope 2, concentrated flows collects south of the drainage inlet located at sta 1051+64 dirt and paved shoulder/asphalt dike and combines with sheet flow off Slope 2 and highway surface flows west of the crown. This concentrated flow travels along at the paved asphalt gutter (approximately 6%) to an asphalt overside drain and discharged into a natural sediment basin; ultimately arriving at the culvert located at sta 1067+11. This culvert discharges to the east side of the highway approximately 0.3 miles away from the shoreline of Mono Lake.

South of the culvert at sta 1067+11, concentrated sheet flows collected from the highway west of the crown and slopes west of the highway, originate just south of Slope 3 and collect along the asphalt dike and paved shoulder and existing dirt swale. These concentrated flows follow the highway profile grade which varies between 4%-6% to the drainage inlet located at sta 1080+97. Once at the drainage inlet these flows are conveyed east below the highway via a corrugated metal pipe and discharged near the entrance road to the California State Parks Old Marina site. This discharge point is approximately 0.14 miles away from the Mono Lake shoreline but is constrained by the entrance road.

The profile grade between Slopes 4-6 is fairly flat and varies between 0%-2%. Concentrated flows generally flow from Slope 6 south towards the drainage inlet located at sta 1089+90. This drainage inlet conveys the flow east under the highway via corrugated metal pipe culvert and discharges it .09 miles away from the Mono Lake shoreline. Though some concentrated flow does flow south from the drainage inlet at sta 1089+90 to the drainage inlet located just north of Slope 3 at sta 1080+97. Concentrated flows are collected from stormwater run-off from the project slopes and the existing slopes adjacent to the project as well as from sheet flow collected from the highway west of the crown. However, due to highway super elevation there are two curve locations where highway drainage sheet flows

from west to the east along the pavement. These are the curves located between Slope 4 and Slope 5 and between Slope 5 and Slope 6. Sheet flow and the corresponding concentrated flows which develop from the project slopes would not flow across to the east side due to the grade difference between the highway edge of pavement and flow line at the toe of slope. There is no ground disturbing activities across from these two locations, however tracking of sediment would need to be controlled.

All existing culverts discharge within our right-of-way.

The project will maintain the original purpose of the facility and will not increase hydraulic capacity.

The project is not located within an MS4 area.

The existing paved highway through the project area is approximately 7.7 acres of impervious area. The project will add approximately 0.04 acres of impervious area; created by paving an existing dirt shoulder on the lake side of the highway. This paved shoulder is needed to allow traffic to be shifted on to the shoulder during construction.

2. Site Data and Stormwater Quality Design Issues (refer to Checklists SW-1, SW-2, and SW-3)

Hydrologic Units

The project resides within the Mono Hydrologic Unit, Hydrologic Sub-Area No. 601, and Planning Watershed No. 9601000305 which is within Region 6 (Lahontan Regional Water Quality Control Board) of the State Water Resources Control Board(SWRCB) and the Mono Basin Natural Scenic Area.

Climate and Topography

The project is located between the steep eastern slopes of the Eastern Sierra Nevada and the western shoreline of Mono Lake at an elevation between 6400-6600 ft. The mountain side immediately west of the project rises steeply with gradients between 2:1 (h:v) and 1:1 and steeper, immediately above the project. Lee Vining Peak rises above the project at an elevation above 12,000 ft. Mono Lake's current elevation is approximately 6382 ft. and is more than 250 ft. from the project. The majority of the land surrounding the project site is United States Forest Service land.

According to the Western Region Climate Center, the annual precipitation for the project area is approximately 15" with most of it falling in the winter as snow. A portion of the annual precipitation occurs as rainfall during summer thunder storms. The estimated rainfall intensity from a 5 year 24 hour rainfall event is 3 inches/hour.

Erosion Potential

The upland area above the project is covered with vegetation most predominately of sage brush and bitterbrush, and Pinion trees. The predominant soil types are mostly silty sands and sandy silts (K factor of 0.25) as identified by the USDA's online soils database, Web Soil Survey. The soil is classified as moderate to severely erodible.

Receiving Water Body

The project has the possibility to indirectly discharge to Mono Lake. Mono Lake, a saline water-body, is listed on the 2010 303(d) list for salinity/TDS/chlorides ; ***it is not considered a sediment-sensitive water body.*** According to the Lahontan Basin Plan there are no TMDLs established for it and it does not meet the criteria of having beneficial uses for COLD, SPAWN, and MIGRATORY.

Mono Lake is designated as an Outstanding National Resource Water (ONRW), by the State Water Resources Control Board (1994) and the EPA, one of two such designations in the State of California. This is a Federal Antidegradation Policy which provides protection to high quality water resources of national importance. ONRW designation allows some limited activities which result in temporary and short-term changes to water quality, but such changes should not adversely affect existing uses or degrade the essential character or special uses for which the water was designated an ONRW. Appropriate Best Management Practices(BMPs) and stormwater sampling proposed for the project will prevent degradation of water quality in Mono Lake.

Risk Assessment

Since this project will require coverage under the Construction General Permit (CGP), a risk level analysis was performed for the project utilizing Caltrans Risk Level Calculator. Risk Level was determined using the Individual Method as outlined in Section 2 of the Caltrans Project Risk Level Determination Guidance dated April 2012. The Caltrans Water Quality Planning Tool, the USDA Soil Survey Website, the project's Geotechnical Report, and site specific cross section analysis was utilized in determining the overall project combined risk level. A combined project risk level of 1 has been determined for the project and is a combined result of the following factors: an R factor of 6.25, A Site Sediment Risk Factor of Low (less than 15 tons/acre), and a Receiving Water Risk of Low.

The *R factor* was determined using methods outlined in the EPA document Stormwater Phase II Final Rule, Construction Rainfall Erosivity Waiver (EPA 833-F-00-014) dated March 2012. The calculation performed assumes construction will be completed within two seasons. It also assumes the following:

- Season 1 ground disturbance (clearing and grubbing) starts June 12, 2015; stabilized slopes August 27, 2015
- Season 2 ground disturbance (clearing and grubbing) starts May 2, 2016; stabilized slopes July 8, 2016

The project falls in Erosivity Index (EI) Zone 22 and has an isoerodent value of 10.

An erosivity waiver was not applicable for the project since it disturbs more than 5 acres of soil.

Determination of the *Slope Steepness factor (LS)* was determined using a site specific analysis using several cross sections at each slope. The Caltrans Topography Tool in combination with using the RUSLE equation was used to evaluate the individual cross sections and determine a weighted average for LS. Where the steepness of the slope exceeded 60% the RUSLE equation was used to evaluate and determine the LS value. Based on our analysis an LS value of 8 has been determined. See attached worksheet.

Combining the values above for R, LS, and K a *Site Sediment Risk Factor* of Low (less than 15 tons/acre) was determined using the Sediment Risk Factor Worksheet.

Determination of the the Receiving Water Risk was determined to be low since the project won't discharge to a water body impaired for sediment and does not have beneficial uses. With a low sediment risk and low receiving water risk the combined project risk level is level 1.

Local Agency and RWQCB Special Concerns/Requirements

The USFS, MLC, State Parks, and Lahontan provided written responses to the Caltrans Draft Environmental document. Lahontan's written response to Caltrans was dated September 21, 2012. In a nutshell Lahontan's primary concerns were to 1) prevent short term water quality impacts to Mono Lake during construction and 2) insure a long term reduction of sediment runoff from the existing cut slopes identified in the project. They felt a stabilized slope with anchored mesh and standard Caltrans revegetation strategies will not be adequate to meet long term sediment reduction from the Basin. They along with MLC felt performance based success criteria be established for the project, aggressive revegetation strategies be used to establish long lasting vegetation on the slopes, and utilize a post construction monitoring program.

The USFS and MLC shared similar written responses echoing the need for more aggressive revegetation strategies and a post construction monitoring program.

I spoke with Bud Amorfini, Lahontan, on June 18, 2014 via telephone regarding our stormwater strategies and various other questions/concerns I had regarding the project. Of particular interest was our discussion of appropriate Risk Level for the project. He stated they will accept a Risk Level of 1 so long as the methodology used in the analysis is justifiable. With regards to Risk Level 1 versus Risk Level 2 water sampling requirements he stated he would rather rely on good BMP strategies and implementation than relying on additional water quality sampling. See Section 3 for further discussion of our conversation.

Measures for Avoiding or Reducing Potential Storm Water Impacts

New areas of ground disturbance will be kept to a minimum. All disturbed areas will be covered with pine needle mulch to control run-on and run-off stormwater flows. Existing drainage inlets and culverts will be protected with best management practices (BMPs) outlined below. Check dams of pine needle wattles will be placed along existing drainage swales as shown on the layout sheets. Pine needle wattles will be placed within areas of ground disturbing activities. Existing cut slopes will be revegetated as shown on the plans to reduce long term water quality impacts. Slopes will be stabilized prior to a winter suspension of work. Work will not begin on slopes which cannot be completed or stabilized prior to winter suspension without the installation of BMPs.

Right-of-Way (Requirements)

The project will require new right of way from the USFS to allow for all or some of the following: slope rounding, rock scaling, and installation of anchored mesh. The costs associated with this right of way is minimal and only for permit/review fees.

This project will not require a federal permit for discharge (404 permit) as determined by the U.S. Army Corps of Engineers and thus will not require a 401 permit.

There are no Drinking Water Reservoirs or Recharge Facilities within the project limits.

The project does not propose to reuse soil containing aerially deposited lead.

There are no known Treatment BMPs within the project limits and the project does not require permanent treatment.

3. Regional Water Quality Control Board Agreements

There are no negotiated understandings or agreements with the Lahontan RWQCB pertaining to this project. Lahontan's concerns are documented above in section 2. However the design team has contacted them via telephone to discuss various stormwater related strategies or issues regarding the project. Since the PAED version of the SWDR, Cory Freeman contacted Bud Amorfini via telephone on June 18, 2014 to update him on the progress of the project and discuss the following topics with him:

1. Risk Level Determination
    a. We discussed risk level 1 vs risk level 2 and if Lahontan will entertain a risk level 1 assessment. Bud said as long as the risk level assessment will justify a level 1 assessment they will be okay with that. He wasn't concerned with reduced water sampling requirements of Risk Level 1 as opposed to the stringent requirements that a Risk Level 2 will require. He felt visual monitoring and the appropriate BMPs are more important.

2. Temporary slope stabilization requirements during rock dowel installation,(Slopes 4-6)
    a. Normally new cut slopes require slope interrupters to temporarily stabilize the slope. Since these are existing cut slopes, and installation of temporary slope interrupters will interfere or be damaged by rock dowel installation, he said we wouldn't need to install them provided we have in-place adequate run-on and run-off BMPs, culverts and drainage inlets are protected, and appropriate street sweeping and tracking control.

3. Temporary BMP requirements during winter suspension
    a. Since these are existing cut slopes he said we don't have to provide any temporary BMPs for the project during winter suspension so long as we don't start any ground disturbing activities without providing a stabilized slope

4. Discuss General BMP Strategies
    a. I discussed our general revegetation and BMP strategies with him as outlined above. He was in general agreement with those strategies.

5. Variance for work disturbing activities between Oct 15 to May 1
    a. If work is to occur between Oct. 15 and May 1 a stormwater variance may be required. Bud did not believe this will be a problem with obtain from Lahontan if needed.

Caltrans staff also contacted the Army Corp. of Engineers(Army Corp) to determine if a 404 permit will be applicable and/or required for the project. Their response was that it will not be required. See letter dated June 4, 2012.

Both correspondence with Lahontan and Army Corp are included as an attachment to this document.

4. Proposed Design Pollution Prevention BMPs to be used on the Project.

Downstream Effects Related to Potentially Increased Flow, Checklist DPP-1, Parts 1 and 2

Existing and Post Construction Conditions:

The six project slopes, Slopes 1-6, consists of existing cut slopes which were created in the 1930's for construction of a new roadway alignment. The steepness of the cuts vary between 0.5:1 (h:v) to 1:1 (h:v), with most slopes averaging 1:1. The slope steepness up-slope from the cut slopes averages 2:1 (h:v). The existing cut slopes are sparsely covered and shed rock and erosion. The slopes adjacent to the cut slopes vary in steepness from 1:1 to 2:1. The steeper portions of the slopes vary in a mix of vegetative cover with a mix of grasses, bitterbrush, and pinion trees. The slopes are generally very uneven with relatively planar slopes to near vertical rock outcrops. The project slopes consist of varying mixtures

of rock and soil. Some areas consist of solid rock outcroppings to areas composed of mostly soil.

Stormwater flows originate up slope and from within the project slopes and flow via sheet flow to the toe of slope. Due to the steep slopes and sparse vegetation at most of these locations, intense rainfall tends to dislodge soil particles which are displaced to the toe of slope. Once at the toe of slope, these become concentrated flows following the toe of slope and roadway profile grade to the culverts mentioned in section 1 above.

Post construction slopes will be similar in composition and steepness; only light grading is proposed for areas that will benefit from increased contact with the anchored mesh. Hand scaling will remove existing loose rocks from the surface which are not embedded in the slope. Trees will have been removed, cut flush with adjacent grade, where new anchored mesh will be installed. In addition, existing vegetation will be pruned to within 2" of grade to facilitate anchored mesh installation. This existing vegetation will grow back over time. The removal of existing trees and pruning of existing vegetation will allow more rainfall to impact the slopes potentially increasing the possibility for short term sediment transport. To mitigate for this pine needle mulch will be applied to the slopes. Pine needle mulch has shown to be effective at dispersing raindrop energy on steep slopes as well as reducing impacts from run-on flows. The pine needle much will reduce sheet flow concentrations and minimize run-off flows and velocities for the short and long term. Once vegetation takes hold it will further shield the slope from rain drop impacts, stabilize the surface soils with its root structures, thus further reducing sediment transport and run-off flows.

Slope/Surface Protection Systems, Checklist DPP-1, Parts 1 and 3

No new cut or fill slopes are proposed. Long term sediment reduction and soil stabilization will be achieved by revegetation of existing cut slopes and installation of anchored mesh where appropriate. The strategy outlined in section 1, will establish plant growth on the existing cut slopes. With the five year monitoring program in place, plant growth will take hold in areas where little vegetation occurs now. This will provide cover from rain drop energy and absorb stormwater flows instead of sheet flowing down to the toe of slope as they do now. The following revegetation strategy and summary of work is as follows:

1. **In areas of loose soil** (generally at the base of the existing cut slopes):
    a. Apply 2" of compost and incorporate 12" into the soil – this will add nutrients back to the slope which will foster and support plant reestablishment.
    b. Apply organic fertilizer
    c. Apply hydro-seed composed of native plant seed
    d. Apply a layer of mulch (pine needles) to the surface – pine needles have shown to be very effective at preventing surface erosion due to its ability to interlock and disperse rain drop energy. Varying thicknesses

are shown on the Erosion Control Plans. Thicker layers are placed at the bottom of vertical or near vertical slopes to account for the concentrated sheet flows coming from these locations as well as above the area of work to control run-on flows.

e. Apply a bonded fiber matrix over the mulch to bond it all to the slopes until plant growth takes hold

2. In Rocky Areas (little soil):
   a. Apply hydro-seed composed of native plant seed
   b. Apply a layer of mulch (pine needles) to the surface – pine needles have shown to be very effective at preventing surface erosion due to its ability to interlock and disperse rain drop energy. Varying thicknesses are shown on the Erosion Control Plans. Thicker layers are placed at the bottom of vertical or near vertical slopes to account for the concentrated sheet flows coming from these locations as well as above the area of work to control run-on flows.

   b. Apply a bonded fiber matrix over the mulch to bond it all to the slopes until plant growth takes hold

3. Apply anchored mesh to Slopes 4-6.
4. Apply a layer of thickened Pine Needle Mulch five feet beyond installed anchored mesh (Slopes 4-6) and as shown on the Erosion Control Plans for Slopes 1-3; placed behind

5. Five Year Post Construction Monitoring Program
   a. All slopes will be monitored for revegetation success, localized rilling or gulleying, and monitor for off-site sediment transport. Under the Monitoring Program activities may include making localized repairs and reapplication of erosion control products, mulch, hydroseed, etc.

Concentrated Flow Conveyance Systems, Checklist DPP-1, Parts 1 and 4

No new concentrated flow interrupters are proposed for this project. The existing network of asphalt dike, ac overside drains, drainage inlets, culverts, and natural sediment basins will be utilized to convey concentrated flows. Appropriate temporary BMPs will be utilized to control short term stormwater impacts as discussed in section 6.

Preservation of Existing Vegetation, Checklist DPP-1, Parts 1 and 5

The project will strive to minimize disturbance and preserve existing vegetation whenever possible. Areas of clearing and grubbing are shown on the plans and will be limited to the area of work shown. Where slope rounding occurs at Slope 2 the existing topsoil and duff

will be collected prior to clearing and grubbing, stockpiled, and then be reapplied over that newly disturbed area.

Light grading of is anticipated on Slopes 4-6 within the existing disturbed areas to facilitate better contact with the anchored mesh. Existing vegetation within the anchored mesh limits will be pruned to allow installation of the mesh. In time the pruned vegetation will grow back.

5. Proposed Permanent Treatment BMPs to be used on the Project

Treatment BMPs are not required because the project is not located within an MS4 and does not significantly change the line/grade or hydraulic capacity of the existing slopes.

6. Proposed Temporary Construction Site BMPs to be used on Project

Construction Site BMP Strategy

The project is a risk level 1 and is estimated to take two seasons, during the summer and possibly early spring for the second stage, depending on snow levels. From initial soil disturbing activities to final slope stabilization (application of revegetation strategies to all slopes plus anchored mesh on Slopes 4-6) are estimated to be approximately 50 days for each stage. See Risk Level Assessment Calculation for each stage for specific estimated days.

General Construction Sequence (all stages):

1. Install construction area signs
2. Install temporary construction BMPs, including thickened mulch area above area of work
3. Extend existing paved shoulder, .04 acres of impervious area.
4. Install temporary traffic control system and temporary krail
5. Begin soil disturbing activities, clearing of trees, pruning of vegetation, light grading, and rock scaling
6. Apply revegetation strategies to slopes which do not receive anchored mesh (Slopes 1-3)
7. Install rock dowels on slopes to receive (Slopes 4-6)
8. Remove temporary traffic control system and krail
9. Install anchored mesh

The following construction site BMPs strategy is utilized for the project:

1. Soil Stabilization measures
2. Sediment Control Measures
3. Tracking Control
4. Non-stormwater Management Measures
5. General Construction Site management

Estimate of Construction Site BMP Quantities & Costs

Water Pollution Control (SWPPP) DSA>1 ACRE

ITEM	DESCRIPTION	UNIT	QTY	PRICE	AMOUNT
66595	WPC MAINTENANCE SHARING [3]	LS	1	16000	16000
66596	ADDITIONAL WATER POLLUTION CONTROL[3]	LS	1	3200	3200
66597	STORMWATER SAMPLING AND ANALYSIS[3]	LS	1	3200	3200
130100	JOB SITE MANAGEMENT [2]	LS	1	15000	15000
130300	PREPARE SWPPP [1]	LS	1	5400	5400
130330	STORM WATER ANNUAL REPORT	EA	2	2000	4000
Items below determined from Caltrans Cost Database[4]					
130610	TEMPORARY CHECK DAM	LF	180	20	3600
130620 066595	TEMPORARY DRAINAGE INLET PROTECTION	EA	4	300	1200
130630A	TEMPORARY PINE NEEDLE WATTLE	LF	8200	4	32800
130710 066595	TEMPORARY CONSTRUCTION ENTRANCE	EA	4	3000	12000
130730	STREET SWEEPING	LS	1	50000	50000
130900	TEMPORARY CONCRETE WASHOUT	LS	1	3000	3000
205040A	PINE NEEDLE MULCH	CY	1500	45	67500
210010	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	4	3000	12000
210250	EROSION CONTROL (BFM)	SQFT	283000	0.1	28300
210430	HYDROSEED	SQFT	283000	0.1	28300
			TOTAL BMP COSTS	=	**$285,500.00**

BMP estimates of cost were derived from recent District 9 projects with similar items and/or the District 8 Contract Cost Database. Estimated costs were also derived from the September 2010 Caltrans publication *Estimating Guidance for CGP*.

Construction has been heavily involved with the project during the PSE phase. The Resident Engineer, Joe Blommer has helped with the staging plans and has been involved with stormwater related issues. The Construction Senior, Tim Shultz has also been involved with stormwater related issues involving BMPs, winter suspension, street sweeping amounts, and Notice Of Termination.

In regards to the Notice of Termination (NOT), a meeting is proposed to discuss the unique conditions of the project with Lahontan. Normally a NOT is acquired once construction

activities have ended and the contract has been accepted. However this project is unique as it will maintain a monitoring program for five years under the original construction contract EA. A summary of the proposed meeting will be provided in the RE binder.

Construction is in agreement with the proposed BMP strategies proposed.

Soil Stabilization Measures

During construction, the primary strategy for Temporary Construction BMPs is to control the potential for run-on and run-off from the steep and erosively prone existing cut slopes, especially at Slopes 4-6. To address potential run-on flows, an area of pine needle mulch six inches thick and varying between 2'-15' wide will be placed above the area of work shown on the erosion control plans. This will serve to intercept potential run-on flows and prevent it from removing the erosion control placed within the area of work. This area of thickened pine needle mulch will be placed before soil disturbing activities commence. Additionally, within the area of work pine needle mulch and a bonded fiber matrix will be placed/applied within the area of work shown on the erosion control plans after rock dowels have been installed. Mulch will be thickened to 6" at the base of vertical to near vertical areas on the slope to help absorb the energy of sheet flow coming from these areas. These areas of thickened mulch are as recommended by the first report from the Test Plots Project. A bonded fiber matrix will be applied to the mulch to further stabilize the slope. This pine needle mulch will act as short term temporary and long term stabilization measures. As the pine needles decompose they will add nutrients to the soil enhancing the biomass and supporting continued plant growth.

In addition to consideration of the site topography and soil strata, the construction sequence and methods were primary considerations as well. We met with one particular rockfall construction crew on site to discuss the project. They suggested we not install any erosion control measures on the slope where rock dowels will be installed until after all rock dowels were installed. They believed our revegetation strategy will be heavily disturbed and need reapplication if it were installed prior to the rock dowels. I spoke to Bud Amorfini about this and he was in agreement. He did point out the additional importance of that tracking and sediment controls will have.

Sediment Control Measures

To address run-off, the following sediment will be provided:

a) Pine needle wattles will be placed at the toe of all slopes
b) Additional pine needle wattles will be placed on the lake side of the highway behind existing MBGR, at Slopes 4-6.
c) During rock scaling, light grading, and rock dowel installation, pine needle wattles will be placed along the krail at Slopes 4-6 to capture any potential run-off before it gets to the lake side pine needle wattles. These activities will produce the largest amount of material coming from the slope
d) Temporary drainage inlet protection will be placed at existing drainage inlets.
e) Pine needle wattles will be placed at culvert inlets

Tracking Control Measures

Offsite tracking of sediment will be limited by installing temporary construction entrances in combination with regular street sweeping. I met with Tim Schultz, Construction regarding the amount of street sweeping. He was in favor of $50,000 amount shown in the Engineer's Estimate.

Wind Erosion Control

The project and the existing cut slopes are susceptible to some wind erosion. However the existing cut slope disturbed area isn't known to produce excessive levels of dust and. The additional newly disturbed area isn't expected to contribute much if any dust pollution. Because of that, the standard specifications for dust control should be sufficient. Application of pine needle mulch and erosion control (bonded fiber matrix) will prevent dust from occurring.

Dewatering and ATS is not anticipated for the project.

Waste Management and Materials Pollution Control

Waste management and materials pollution control BMPs will be utilized as specified in the Standard Specifications and Special Provisions. These BMPs prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater. These involve day-to-day operations of the construction site and are under the control of the contractor and are part of the "good house-keeping practices". The following waste management and materials pollution control BMPs will be used: *Material Delivery and Storage, Material Use, Stockpile Management, Spill Prevention and Control, Solid Waste Management, Concrete Waste Management, Sanitary/Septic Waste Management, and Liquid Waste Management.*

The project will involve grouting operations during rock dowel installation. Temporary Concrete Washouts have been provided.

7. Maintenance BMPs (Drain Inlet Stenciling)

Drain inlet stenciling will not be required for this project.

Required Attachments

- Vicinity Map
- Evaluation Documentation Form (EDF)
- Construction Site BMP Consideration Form
- SWDR Attachment for SMARTS Input

- Risk Level Determination Documentation
- Quantities and Costs for Construction Site BMPs

Supplemental Attachments

- Stormwater BMP Cost Summary
- Pertinent Correspondence with RWQCB
- Checklist SW-1, Site Data Sources
- Checklist SW-2, Stormwater Quality Issues Summary
- Checklist SW-3, Measures for Avoiding or Reducing Potential Stormwater
- Checklist DPP-1, Parts 1-5 (Design Pollution Prevention BMPs)
- Checklists CS-1, Parts 1–6 (Construction Site BMPs)
- Plans
- Specifications
- Engineer's Estimate
- LS Calculations

September 23, 2014

EA 09-33500

ID 0900020002

NO.	CRITERIA	YES ✓	NO ✓	SUPPLEMENTAL INFORMATION FOR EVALUATION
1.	Begin Project Evaluation regarding requirement for consideration of Treatment BMPs	✓		See Figure 4-1, Project Evaluation Process for Consideration of Permanent Treatment BMPs. Go to 2
2.	Is this an emergency project?		✓	If **Yes**, go to 10. If **No**, continue to 3.
3.	Have TMDLs or other Pollution Control Requirements been established for surface waters within the project limits? Information provided in the water quality assessment or equivalent document.		✓	If **Yes**, contact the District/Regional NPDES Coordinator to discuss the Department's obligations under the TMDL (if Applicable) or Pollution Control Requirements, go to 9 or 4. _____ *(Dist./Reg. SW Coordinator initials)* If **No**, continue to 4.
4.	Is the project located within an area of a local MS4 Permittee?		✓	If **Yes**. *(write the MS4 Area here)*, go to 5. If **No**, document in SWDR go to 5.
5.	Is the project directly or indirectly discharging to surface waters?	✓		If **Yes**, continue to 6. If **No**, go to 10.
6.	Is it a new facility or major reconstruction?		✓	If **Yes**, continue to 8. If **No**, go to 7.
7.	Will there be a change in line/grade or hydraulic capacity?		✓	If **Yes**, continue to 8. If **No**, go to 10.
8.	Does the project result in a net increase of one acre or more of new impervious surface?			If **Yes**, continue to 9. If **No**, go to 10. _____ *(Net Increase New Impervious Surface)*
9.	Project is required to consider approved Treatment BMPs.		See Sections 2.4 and either Section 5.5or 6.5 for BMP Evaluation and Selection Process. Complete Checklist T-1 in this Appendix E.	
10.	**Project is not required to consider Treatment BMPs.** PSE *(Dist./Reg. Design SW Coord. Initials)* CF *(Project Engineer Initials)* 9-24-14 *(Date)*		Document for Project Files by completing this form, and attaching it to the SWDR.	

See Figure 4-1, Project Evaluation Process for Consideration of Permanent Treatment BMPs

DATE: September 23, 2014

Project ID (or EA): 09-33500

Project Evaluation Process for the Consideration of Construction Site BMPs

NO.	CRITERIA	YES ✓	NO ✓	SUPPLEMENTAL INFORMATION
1.	Will construction of the project result in areas of disturbed soil as defined by the Project Planning and Design Guide (PPDG)?	✓		If Yes, Construction Site BMPs for Soil Stabilization (SS) will be required. Complete CS-1, Part 1. Continue to 2. If No, Continue to 3.
2.	Is there a potential for disturbed soil areas within the project to discharge to storm drain inlets, drainage ditches, areas outside the right-of-way, etc?	✓		If Yes, Construction Site BMPs for Sediment Control (SC) will be required. Complete CS-1, Part 2. Continue to 3.
3.	Is there a potential for sediment or construction related materials and wastes to be tracked offsite and deposited on private or public paved roads by construction vehicles and equipment?	✓		If Yes, Construction Site BMPs for Tracking Control (TC) will be required. Complete CS-1, Part 3. Continue to 4.
4.	Is there a potential for wind to transport soil and dust offsite during the period of construction?	✓		If Yes, Construction Site BMPs for Wind Erosion Control (WE) will be required. Complete CS-1, Part 4. Continue to 5.
5.	Is dewatering anticipated or will construction activities occur within or adjacent to a live channel or stream?		✓	If Yes, Construction Site BMPs for Non-Stormwater Management (NS) will be required. Complete CS-1, Part 5. Continue to 6.
6.	Will construction include saw-cutting, grinding, drilling, concrete or mortar mixing, hydro-demolition, blasting, sandblasting, painting, paving, or other activities that produce residues?	✓		If Yes, Construction Site BMPs for Non-Stormwater Management (NS) will be required. Complete CS-1, Parts 5 & 6. Continue to 7.
7.	Are stockpiles of soil, construction related materials, and/or wastes anticipated?	✓		If Yes, Construction Site BMPs for Waste Management and Materials Pollution Control (WM) will be required. Complete CS-1, Part 6. Continue to 8.
8.	Is there a potential for construction related materials and wastes to have direct contact with precipitation; stormwater run-on, or stormwater runoff; be dispersed by wind; be dumped and/or spilled into storm drain systems?	✓		If Yes, Construction Site BMPs for Waste Management and Materials Pollution Control (WM) will be required. Complete CS-1, Part 6. Continue to 9.
9.	End of checklist.		Document for Project Files by completing this form, and attaching it to the SWDR.	

Cory [illegible] 9-24-14

PE to initialize after concurrence with Construction (PS&E only) *Date*

SWDR ATTACHMENT FOR SMARTS INPUT

Construction General Permit (CGP)

Permit Registration Document

Background of Information Transfer to RE

The National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges Associated with Construction and land Disturbance Activities Order No. 2009-0009-DWQ NPDES No CAS000002 (CGP), was issued September 2, 2009 and is effective July 1, 2010. This new permit has Permit Registration Documents (PRD) that will be required to be filed electronically in the SMARTS system.

The SWDR completed at PS&E will contain the necessary design information to input into SMARTS. However, the SMARTS system also requires information such as a SWPPP, storm water manager, RE name, Contractor name, QSD/QSP names, and certification of the Notice of Intent (NOI) PRD information. In addition, it also requires data entry and reporting throughout the construction period; REAPS, Quarterly reporting, BMP maintenance, annual reports, and sampling data. Lastly, many projects do not have their permits at PS&E and addendums are added to contract documents to address additional 401 requirements that will be part of the SWPPPs and then entered into SMARTS for compliance. For these reasons, it is expected that construction staff will enter all of the information into SMARTS. The PE will be responsible for preparing the design information necessary to enter into SMARTS and to support Construction for any contract change orders, including those related to stormwater.

SWDR ATTACHMENT FOR SMARTS INPUT

DESIGN INFORMATION FOR RE FILE

The following information is based on the PS&E design plans and specifications. If contract amendments or change orders are made after the design is complete, then the information should be updated by construction, as appropriate.

Enter the following data into the CGP SMARTS Notice of Intent-Site Information page.

1. **Total site size** (acres); for project area use Caltrans R/W x post mile limits (begin-end) on plan sheets.

Total site size: 31.4 acres

2. Enter **latitude and longitude** in decimal degrees to 5 significant figures. Use a location from the center of the project. This information can be obtained from Survey information, GPS units, Google earth, CT Earth, or other mapping software.

Latitude: 37°58'37"N

Longitude: 119°08'09"W

3. **Total Area to be Disturbed** (total Disturbed Soil Area (DSA)): This information is already calculated and can be taken from section one of the SWDR. It is should be described in acres.

DSA: 6.3 acres

4. **Imperviousness before Construction (percentage)** - This is calculated as the total impervious area of the project area divided by the total project area (see total site size), multiplied by 100. The impervious area is all paved areas or hard surfaces within the project limits.

Impervious area before construction 25%

5. **Percent of total disturbed (percentage)**; This should be calculated by dividing the total disturbed soil area by the total project area and multiply by 100.

Percent of Total disturbed area: 20%

6. **Imperviousness after Construction (percentage)**, This should be calculated by adding all impervious area paved and hard surfaces based on the final design within project limits from above and dividing by the total project area from above multiply by 100.

Impervious area after construction: 25%

7. **Mile Post Marker**, enter the approximate post mile at the center of the project or take the average of the "begin" and "end" post mile markers from the title sheet.

Mile post Marker: 53.06

SWDR ATTACHMENT FOR SMARTS INPUT

8. **Is the construction site part of a larger common plan of development**? Yes or No; in most cases mark no for Caltrans projects, as this is intended for developers (in accordance with the EPA definitions referenced by the CGP in 40 CFR title 22). This clarification is based on direction from the State Board. Get a confirmation with the Design Stormwater coordinator to determine if there is a special case project where the "common plan of development" may apply. No X

9. **Name of development**. Mark "Not Applicable (N/A)" in most cases.

Name of plan or development: N/A

10. **Construction Commencement Date**, mm/dd/yyyy. The PE provides the estimated construction start date from the cover of the SWDR. The actual construction start date should be used to input into SMARTS. After the contract is awarded, the RE will use an updated start date (if different) when entering in SMARTS. The RE needs to be aware of the original date provided by Design, as this date was used to calculate the design information including the Risk Level Determination. If the actual start date is different, construction should coordinate with the PE to determine if the Risk Level has changed.

Construction Commencement Date, 06/01/2015

11. **Complete Grading Date/Complete Project Date**; The PE provides the estimated construction completion date from the cover of the SWDR to be used for both of these inputs. After the contract is awarded, the RE will use an updated completion date (if different) when entering in SMARTS. The RE needs to be aware of the original completion date provided by Design, as this date was used to calculate the design information including the Risk Level Determination. If the completion date is different, construction should coordinate with the PE to determine if the Risk Level has changed.

Complete Grading Date/Complete Project: 08/31/2016. Use the same date for both inputs, unless instructed otherwise.

12. **Does the Stormwater from the construction site discharge directly or indirectly into waters of the United States.**

Indirect discharge Y - If yes, list name(s) of receiving water(s) MONO LAKE

Direct discharge N - If yes, list name(s) of receiving water(s) _____

13. **Risk Level**; the combined project risk level is calculated using the sediment risk factor and the water body risk factor to give one overall project risk level. Use the Caltrans risk level determination guidance, (see the Storm water design web page). Attach all risk calculations.

R factor value: 6.25

K factor value: 0.25

LS factor value: 8

SWDR ATTACHMENT FOR SMARTS INPUT

Receiving water risk comes from the state water resources control board mapping of water bodies for 303-d listing or TMDLs for sediment or water body with the beneficial use of cold and spawn and migratory. The input will either be high= yes and low=no;

Receiving water risk NO, (yes or no)

The dates used for determining the project risk level and other design elements of the project required for CGP compliance are dependent on having the same sediment risk factor. This is a critical element for compliance, as modifying the estimated construction dates may cause the sediment risk factor to change and ultimately modify the overall project risk factor. This could impact the projects CGP compliance requirements and the assumptions used for the design documents and engineers estimate.

14. Provide electronic copy of plan sheets in .pdf format that can be loaded to SMARTS, burn a CD for the RE to use for the project. The Title sheet can be used as the site map.

15. Methodology for obtaining the CGP NOT decided by the PDT, see SWDR section 4 text for methodology text and computational proof as appropriate, circle one. See SWRCB bulletin for details: http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/bulletin_2013_1.pdf

a. 70% final cover method: Attach photo documentation _____

b. RUSLE II: Attach computational proof and photo documentation _____

c. Other custom method if coordinated with local regional board, attach photo documentation or other proof as necessary.

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
QUANTITY CALCULATIONS
DC-CEM-4801 (OLD HC-52 REV. 11/92)7541-3520-0

SHEET ____ OF ____

JOB STAMP	ITEM RISK LEVEL CALC	FILE NO.
LV ROCK FALL PSE SWDR	LOCATION	SEGREGATION ☐ YES ☐ NO
	CALC. BY CSF	DATE
	CHK. BY	DATE 6-6-2014

SWDR ASSUMPTIONS & FACTS

ASSUMPTIONS:

1) TWO SEASON JOB
   STAGE 1 (LOCATIONS 1,3,5,6) SEASON 1 2015
   STAGE 2 (LOCATIONS 3,4) SEASON 2 2016

2) TREAT EACH STAGE AS INDIVIDUAL SITE TO EVALUATE RISK FACTOR, SEDIMENT RISK, RECEIVING WATER RISK & COMBINED RISK LEVEL. BASED ON GUIDENCE IN CT "PROJECT RISK LEVEL DETERMINATION GUIDENCE" APRIL 2012, PG 15.

- FOR BOTH STAGE 1 & 2 BOTH SITES ARE LOCATED IN ONE WATERSHED: LEE VINING CREEK - FRONTAL MONO LAKE
- BOTH STAGE 1 & 2 ARE LOCATED IN EI ZONE 22
- BOTH STAGE 1 & 2 HAVE AN ISODERANT VALUE OF 10
- MONO LAKE IS LISTED ON THE 303d LIST BUT NOT FOR SEDIMENT, IT DOES NOT HAVE TMDLS FOR SEDIMENT, NOR DOES IT HAVE ALL 3 MIGRATORY, SPAWN, COLD BENEFICIAL USES.
- MONO LAKE IS LISTED AS AN ONRW
- EXISTING CUT SLOPE DISTURBED AREA ≈ 3 ACRES
- PROJECT WILL DISTURB ADDITIONAL 3.4 ACRES BY DOING SLOPE ROUNDING @ LOCATION 2, & INSTALLING MESH ABOVE EXISTING CUT SLOPE AREA @ LOCATIONS 4, 5, 6

POSTED BY DATE POSTED TO

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
QUANTITY CALCULATIONS
DC-CEM-4801 (OLD HC-52 REV. 11/92)7541-3520-0

SHEET ____ OF ____

JOB STAMP	ITEM	FILE NO.
	LOCATION	SEGREGATION ❑ YES ❑ NO
	CALC. BY	DATE
	CHK. BY	DATE

RISK LEVEL ASSESSMENT

· TWO SITES, TWO SEASONS

FOR SITE 1 => STAGE 1 (LOCATIONS 1, 2, 5, 6) => SEASON 1 (57 DAY

ASSUME GROUND DISTURBING ACTIVITY STARTS WITH TREE REMOVAL / CLEAR & GRUBB

EI ZONE 27

START CLR & GRUB — JUNE 12, 2015
STABILIZE SLOPES (53 DAYS LATER) — AUG 27, 2015

ISODERANT VALUE = 10

EROSIVITY INDEX VALUES BELOW TAKEN FROM TABLE 1. EROSIVITY INDEX (% EI VALUES EXTRACTED FROM USDA MANUAL 703) EPA FACT SHEET 3.1 REV MARCH 2012

FOR JUNE 12 EI% = 14.2
FOR AUG 27 EI% = 76.0

$$R \text{ FACTOR} = \left(\frac{76.0 - 14.2}{100}\right)(10) = 6.18$$

ISODERENT VALUE

USE FOR PROJECT

FOR SITE 2 => STAGE 2 (LOCATIONS 3 & 4) => SEASON 2 => (52 WDAYS

ASSUME GROUND DISTURBING ACTIVITY STARTS W/ TREE REMOVAL & CLEAR/GRUBB

START CLEAR/GRUBB — MAY 2, 2016
STABILIZE SLOPES (47 DAYS LATER) — JULY 8, 2016

FOR MAY 2, 2016 EI% = 4.0
FOR JULY 8, 2016 EI% = 41.4 (LINEAR INTERPOLATED)

$$R = \left(\frac{41.4 - 4}{100}\right) \times 10 = 3.74$$

POSTED BY ____ DATE ____ POSTED TO ____

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		6.2
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.25
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		8
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		12.4
16	**Site Sediment Risk Factor**		**Low**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Combined Risk Level Matrix

Receiving Water Risk	Sediment Risk: Low	Sediment Risk: Medium	Sediment Risk: High
Low	Level 1	Level 2	
High	Level 2		Level 3

Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please check the attached worksheet or visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: 2006 Approved Sediment-impared WBs Worksheet http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR**	**no**	**Low**
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp		

Checklist SW-1, Site Data Sources

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Information for the following data categories should be obtained, reviewed and referenced as necessary throughout the project planning phase. Collect any available documents pertaining to the category and list them and reference your data source. For specific examples of documents within these categories, refer to Section 5.5 of this document. Example categories have been listed below; add additional categories, as needed. Summarize pertinent information in Section 2 of the SWDR.

DATA CATEGORY/SOURCES	Date
Topographic	
• USGS 7.5 Minute Topo Maps – Mount Dana 7.5', Lee Vining 7.5'	June 2013
Hydraulic	
• Caltrans Division of Environmental Analysis, *Water Quality Planning Tool*, http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx	June 2013
Soils	
• US Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx	June 2013
• Caltrans Geotechnical Report	June 25, 2012
• Caltrans Division of Environmental Analysis, *Water Quality Planning Tool*, http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx	June 2013
Climatic	
• Western Regional Climate Center, http://www.wrcc.dri.edu/	June 2013
Water Quality	
• for 303d listing(2010) Caltrans Division of Environmental Analysis, *Water Quality Planning Tool*, http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx	March 6, 2012
• State Water Resources Control Board, Lahontan Basin Plan, http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/references.shtml	August 2011 amendments
• Caltrans Storm Water Program, http://www.waterboards.ca.gov/water_issues/programs/stormwater/caltrans.shtml	June 2013
• Mono Lake Basin Water Right Decision 1631, http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1631.pdf	September 1994

Other Data Categories	
• California Department of Transportation. Storm Water Quality Handbooks–Construction Site Best Management Practices (BMPs) Manual.	March 2003
• Project Planning Design Guide, Storm Water Quality Handbooks. Caltrans State of California, Department of Transportation.	July 2010

Checklist SW-2, Stormwater Quality Issues Summary

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

The following questions provide a guide to collecting critical information relevant to project stormwater quality issues. Complete responses to applicable questions, consulting other Caltrans functional units (Environmental, Landscape Architecture, Maintenance, etc.) and the District/Regional Stormwater Coordinator as necessary. Summarize pertinent responses in Section 2 of the SWDR.

1.	Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	☒Complete	☐NA
2.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	☒Complete	☐NA
3.	Determine if there are any municipal or domestic water supply reservoirs or groundwater percolation facilities within the project limits. Consider appropriate spill contamination and spill prevention control measures for these new areas.	☐Complete	☒NA
4.	Determine the RWQCB special requirements, including TMDLs, effluent limits, etc.	☒Complete	☐NA
5.	Determine regulatory agencies seasonal construction and construction exclusion dates or restrictions required by federal, state, or local agencies.	☒Complete	☐NA
6.	Determine if a 401 certification will be required.	☒Complete	☐NA
7.	List rainy season dates.	☒Complete	☐NA
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	☒Complete	☐NA
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	☐Complete	☒NA
10.	Determine contaminated soils within the project area.	☐Complete	☒NA
11.	Determine the total disturbed soil area of the project.	☒Complete	☐NA
12.	Describe the topography of the project site.	☒Complete	☐NA
13.	List any areas outside of the Caltrans right-of-way that will be included in the project (e.g. contractor's staging yard, work from barges, easements for staging, etc.).	☒Complete	☐NA
14.	Determine if additional right-of-way acquisition or easements and right-of-entry will be required for design, construction and maintenance of BMPs. If so, how much?	☒Complete	☐NA
15.	Determine if a right-of-way certification is required.	☒Complete	☐NA
16.	Determine the estimated unit costs for right-of-way should it be needed for Treatment BMPs, stabilized conveyance systems, lay-back slopes, or interception ditches.	☒Complete	☐NA
17.	Determine if project area has any slope stabilization concerns.	☒Complete	☐NA
18.	Describe the local land use within the project area and adjacent areas.	☒Complete	☐NA
19.	Evaluate the presence of dry weather flow.	☐Complete	☒NA

Checklist SW-3, Measures for Avoiding or Reducing Potential Stormwater Impacts

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

The PE must confer with other functional units, such as Landscape Architecture, Hydraulics, Environmental, Materials, Construction and Maintenance, as needed to assess these issues. Summarize pertinent responses in Section 2 of the SWDR.

Options for avoiding or reducing potential impacts during project planning include the following:

1. Can the project be relocated or realigned to avoid/reduce impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?	☐Yes	☒No	☐NA
2. Can structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?	☐Yes	☐No	☒NA
3. Can any of the following methods be utilized to minimize erosion from slopes:			
a. Disturbing existing slopes only when necessary?	☒Yes	☐No	☐NA
b. Minimizing cut and fill areas to reduce slope lengths?	☒Yes	☐No	☐NA
c. Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	☐Yes	☒No	☐NA
d. Acquiring right-of-way easements (such as grading easements) to reduce steepness of slopes?	☒Yes	☐No	☐NA
e. Avoiding soils or formations that will be particularly difficult to re-stabilize?	☒Yes	☐No	☐NA
f. Providing cut and fill slopes flat enough to allow re-vegetation and limit erosion to pre-construction rates?	☐Yes	☐No	☒NA
g. Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?	☐Yes	☐No	☒NA
h. Rounding and shaping slopes to reduce concentrated flow?	☒Yes	☐No	☐NA
i. Collecting concentrated flows in stabilized drains and channels?	☐Yes	☐No	☒NA
4. Does the project design allow for the ease of maintaining all BMPs?	☒Yes	☐No	
5. Can the project be scheduled or phased to minimize soil-disturbing work during the rainy season?	☒Yes	☐No	
6. Can permanent stormwater pollution controls such as paved slopes, vegetated slopes, basins, and conveyance systems be installed early in the construction process to provide additional protection and to possibly utilize them in addressing construction stormwater impacts?	☒Yes	☐No	☐NA

Design Pollution Prevention BMPs
Checklist DPP-1, Part 1

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Consideration of Design Pollution Prevention BMPs

Consideration of Downstream Effects Related to Potentially Increased Flow [to streams or channels]

Will project increase velocity or volume of downstream flow?	☐Yes	☒No	☐NA
Will the project discharge to unlined channels?	☐Yes	☒No	☐NA
Will project increase potential sediment load of downstream flow?	☐Yes	☒No	☐NA
Will project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?	☐Yes	☒No	☐NA

If Yes was answered to any of the above questions, consider ***Downstream Effects Related to Potentially Increased Flow***, complete the DPP-1, Part 2 checklist.

Slope/Surface Protection Systems

Will project create new slopes or modify existing slopes?	☒Yes	☐No	☐NA

If Yes was answered to the above question, consider ***Slope/Surface Protection Systems***, complete the DPP-1, Part 3 checklist.

Concentrated Flow Conveyance Systems

Will the project create or modify ditches, dikes, berms, or swales?	☐Yes	☒No	☐NA
Will project create new slopes or modify existing slopes?	☒Yes	☐No	☐NA
Will it be necessary to direct or intercept surface runoff?	☒Yes	☐No	☐NA
Will cross drains be modified?	☐Yes	☒No	☐NA

If Yes was answered to any of the above questions, consider ***Concentrated Flow Conveyance Systems***; complete the DPP-1, Part 4 checklist.

Preservation of Existing Vegetation

It is the goal of the Stormwater Program to maximize the protection of desirable existing vegetation to provide erosion and sediment control benefits on all projects. ☒Complete

Consider ***Preservation of Existing Vegetation***, complete the DPP-1, Part 5 checklist.

Design Pollution Prevention BMPs
Checklist DPP-1, Part 2

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Downstream Effects Related to Potentially Increased Flow

1. Review total paved area and reduce to the maximum extent practicable. ☒Complete
2. Review channel lining materials and design for stream bank erosion control. ☒Complete
   (a) See Chapters 860 and 870 of the HDM. ☒Complete
   (b) Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity. ☒Complete
3. Include, where appropriate, energy dissipation devices at culvert outlets. ☒Complete
4. Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour. ☒Complete
5. Include, if appropriate, peak flow attenuation basins or devices to reduce peak discharges. ☒Complete

Design Pollution Prevention BMPs
Checklist DPP-1, Part 3

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Slope / Surface Protection Systems

1. What are the proposed areas of cut and fill? (attach plan or map) ☒Complete
2. Were benches or terraces provided on high cut and fill slopes to reduce concentration of flows? ☐Yes ☒No
3. Were slopes rounded and/or shaped to reduce concentrated flow? ☒Yes ☐No
4. Were concentrated flows collected in stabilized drains or channels? ☒Yes ☐No
5. Are new or disturbed slopes > 4:1 horizontal:vertical (h:v)? ☒Yes ☐No

   If Yes, District Landscape Architect must prepare or approve an erosion control plan, at the District's discretion.
6. Are new or disturbed slopes > 2:1 (h:v)? ☒Yes ☐No

   If Yes, Geotechnical Services must prepare a Geotechnical Design Report, and the District Landscape Architect should prepare or approve an erosion control plan. Concurrence must be obtained from the District Maintenance Stormwater Coordinator for slopes steeper than 2:1 (h:v).
7. Estimate the net new impervious area that will result from this project. 0.04 acres ☒Complete

VEGETATED SURFACES

1. Identify existing vegetation. ☒Complete
2. Evaluate site to determine soil types, appropriate vegetation and planting strategies. ☒Complete
3. How long will it take for permanent vegetation to establish? ☒Complete
4. Minimize overland and concentrated flow depths and velocities. ☒Complete

HARD SURFACES

1. Are hard surfaces required? ☒Yes ☐No

   If Yes, document purpose (safety, maintenance, soil stabilization, etc.), types, and general locations of the installations. ☒Complete

Review appropriate SSPs for Vegetated Surface and Hard Surface Protection Systems. ☒Complete

Design Pollution Prevention BMPs
Checklist DPP-1, Part 4

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Concentrated Flow Conveyance Systems

Ditches, Berms, Dikes and Swales

1. Consider Ditches, Berms, Dikes, and Swales as per Topics 813, 834.3, and 835, and Chapter 860 of the HDM. ☒Complete
2. Evaluate risks due to erosion, overtopping, flow backups or washout. ☒Complete
3. Consider outlet protection where localized scour is anticipated. ☒Complete
4. Examine the site for run-on from off-site sources. ☒Complete
5. Consider channel lining when velocities exceed scour velocity for soil. ☒Complete

Overside Drains

1. Consider downdrains, as per Index 834.4 of the HDM. ☐Complete
2. Consider paved spillways for side slopes flatter than 4:1 h:v. ☐Complete

Flared Culvert End Sections

1. Consider flared end sections on culvert inlets and outlets as per Chapter 827 of the HDM. ☐Complete

Outlet Protection/Velocity Dissipation Devices

1. Consider outlet protection/velocity dissipation devices at outlets, including cross drains, as per Chapters 827 and 870 of the HDM. ☐Complete

Review appropriate SSPs for Concentrated Flow Conveyance Systems. ☐Complete

Design Pollution Prevention BMPs
Checklist DPP-1, Part 5

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Preservation of Existing Vegetation

1. Review Preservation of Property, Standard Specifications 16.1.01 and 16-1.02 (Clearing and Grubbing) to reduce clearing and grubbing and maximize preservation of existing vegetation. ☒Complete
2. Has all vegetation to be retained been coordinated with Environmental, and identified and defined in the contract plans? ☒Yes ☐No
3. Have steps been taken to minimize disturbed areas, such as locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling? ☒Complete
4. Have impacts to preserved vegetation been considered while work is occurring in disturbed areas? ☒Yes ☐No
5. Are all areas to be preserved delineated on the plans? ☒Yes ☐No

Construction Site BMPs
Checklist CS-1, Part 1

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Soil Stabilization

General Parameters

1.	How many rainy seasons are anticipated between begin and end of construction?	2
2.	What is the total disturbed soil area for the project? (ac)	6.25 acres
	(a) How much of the project DSA consists of slopes 4:1 (h:v) or flatter? (ac)	None
	(b) How much of the project DSA consists of 4:1 (h:v) < slopes < 2:1 (h:v)? (ac)	None
	(c) How much of the project DSA consists of slopes 2:1 (h:v) and steeper? (ac)	6.25
	(d) How much of the project DSA consists of slopes with slope lengths longer than 20 ft? (ac)	5.5
3.	What rainfall area does the project lie within? (Refer to Table 2-1 of the Construction Site Best Management Practices Manual)	7
4.	Review the required combination of temporary soil stabilization and temporary sediment controls and barriers for area, slope inclinations, rainy and non-rainy season, and active and non-active disturbed soil areas. (Refer to Tables 2-2, and 2-3 of the Construction Site Best Management Practices Manual for Rainfall Area requirements.)	☒Complete

Scheduling (SS-1)

5.	Does the project have a duration of more than one rainy season and have disturbed soil area in excess of 25 acres?	☐Yes ☒No
	(a) Include multiple mobilizations (Move-in/Move-out) as a separate contract bid line item to implement permanent erosion control or revegetation work on slopes that are substantially complete. (Estimate at least 6 mobilizations for each additional rainy season. Designated Construction Representative may suggest an alternate number of mobilizations.)	☒Complete
	(b) Edit Order of Work specifications for permanent erosion control or revegetation work to be implemented on slopes that are substantially complete.	☒Complete

(c) Edit permanent erosion control or revegetation specifications to require seeding and planting work to be performed when optimal. ☒Complete

Preservation of Existing Vegetation (SS-2)

6. Do Environmentally Sensitive Areas (ESAs) exist within or adjacent to the project limits? (Verify the completion of DPP-1, Part 5) ☐Yes ☒No

   (a) Verify the protection of ESAs through delineation on all project plans. ☒Complete

   (b) Protect from clearing and grubbing and other construction disturbance by enclosing the ESA perimeter with high visibility plastic fence or other BMP. ☒Complete

7. Are there areas of existing vegetation (mature trees, native vegetation, landscape planting, etc.) that need not be disturbed by project construction? Will areas designated for proposed treatment BMPs need protection (infiltration characteristics, vegetative cover, etc.)? (Coordinate with District Environmental and Construction to determine limits of work necessary to preserve existing vegetation to the maximum extent practicable.) ☐Yes ☒No

   (a) Designate as outside of limits of work (or designate as ESAs) and show on all project plans. ☒Complete

   (b) Protect with high visibility plastic fence or other BMP. ☒Complete

8. If yes for 6, 7, or both, then designate ESA fencing as a separate contract bid line item, *if not already incorporated as part of design pollution prevention work (See DPP-1, Part 5).* ☒Complete

Slope Protection

9. Provide a soil stabilization BMP(s) appropriate for the DSA, slope steepness, slope length, and soil erodibility. (Consult with District/Regional Landscape Architect.)

   (a) Select SS-3 (Hydraulic Mulch), SS-4 (Hydroseeding), SS-5 (Soil Binders), SS-6 (Straw Mulch), SS-7 (Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets), SS-8 (Wood Mulching), other BMPs or a combination to cover the DSA throughout the project's rainy season. ☒Complete

   (b) Increase the quantities by 25% for each additional rainy season. (Designated Construction Representative may suggest an alternate increase.) ☒Complete

   (c) Designate as a separate contract bid line item. ☒Complete

Slope Interrupter Devices

10. Provide slope interrupter devices for all slopes with slope lengths equal to or greater than of 20 ft in length. (Consult with District/Regional Landscape Architect and Designated Construction Representative.)

    (a) Select SC-5 (Fiber Rolls) or other BMPs to protect slopes throughout the project's rainy season. ☒Complete

    (b) For slope inclination of 4:1 (h:v) and flatter, SC-5 (Fiber Rolls) or other BMPs shall be placed along the contour and spaced 20 ft on center. ☒Complete

    (c) For slope inclination between 4:1 (h:v) and 2:1 (h:v), SC-5 (Fiber Rolls) or other BMPs shall be placed along the contour and spaced 15 ft on center. ☒Complete

    (d) For slope inclination of 2:1 (h:v) and greater, SC-5 (Fiber Rolls) or other BMPs shall be placed along the contour and spaced 10 ft on center. ☒Complete

    (e) Increase the quantities by 25% for each additional rainy season. (Designated Construction Representative may suggest alternate increase.) ☒Complete

    (f) Designate as a separate contract bid line item. ☒Complete

Channelized Flow

11. Identify locations within the project site where concentrated flow from stormwater runoff can erode areas of soil disturbance. Identify locations of concentrated flow that enters the site from outside of the right-of-way (off-site run-on). ☒Complete

    (a) Utilize SS-7 (Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets), SS-9 (Earth Dikes/Swales, Ditches), SS-10 (Outlet Protection/Velocity Dissipation), SS-11 (Slope Drains), SC-4 (Check Dams), or other BMPs to convey concentrated flows in a non-erosive manner. This item to be done at PS&E. ☒Complete

    (b) Designate as a separate contract bid line item. ☒Complete

Construction Site BMPs
Checklist CS-1, Part 2

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Sediment Control

Perimeter Controls - Run-off Control

1. Is there a potential for sediment laden sheet and concentrated flows to discharge offsite from runoff cleared and grubbed areas, below cut slopes, embankment slopes, etc.? ☒Yes ☐No

   (a) Select linear sediment barrier such as SC-1 (Silt Fence), SC-5 (Fiber Rolls), SC-6 (Gravel Bag Berm), SC-8 (Sand Bag Barrier), SC-9 (Straw Bale Barrier), or a combination to protect wetlands, water courses, roads (paved and unpaved), construction activities, and adjacent properties. (Coordinate with District Construction for selection and preference of linear sediment barrier BMPs.) ☒Complete

   (b) Increase the quantities by 25% for each additional rainy season. (Designated Construction Representative may suggest an alternate increase.) ☒Complete

   (c) Designate as a separate contract bid line item. ☒Complete

Perimeter Controls - Run-on Control

2. Do locations exist where sheet flow upslope of the project site and where concentrated flow upstream of the project site may contact DSA and construction activities? ☒Yes ☐No

   (a) Utilize linear sediment barriers such as SS-9 (Earth Dike/Drainage Swales and Lined Ditches), SC-5 (Fiber Rolls), SC-6 (Gravel Bag Berm), SC-8 (Sand Bag Barrier), SC-9 (Straw Bale Barrier), or other BMPs to convey flows through and/or around the project site. (Coordinate with District Construction for selection and preference of perimeter control BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

Storm Drain Inlets

3. Do existing or proposed drainage inlets exist within the project limits? ☒Yes ☐No

   (a) Select SC-10 (Storm Drain Inlet Protection) to protect municipal storm drain systems or receiving waters wetlands at each drainage inlet. (Coordinate with District Construction for selection and preference of inlet protection BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

4. Can existing or proposed drainage inlets utilize an excavated sediment trap as described in SC-10 (Storm Drain Inlet Protection- Type 2)? ☐Yes ☒No

   (a) Include with other types of SC-10 (Storm Drain Inlet Protection). ☒Complete

Sediment/Desilting Basin (SC-2)

5. Does the project lie within a Rainfall Area where the required combination of temporary soil stabilization and sediment control BMPs includes desilting basins? (Refer to Tables 2-1, 2-2, and 2-3 of the Construction Site Best Management Practices Manual for Rainfall Area requirements.) ☐Yes ☒No

   (a) Consider feasibility for desilting basin allowing for available right-of-way within the project limits, topography, soil type, disturbed soil area within the watershed, and climate conditions. Document if the inclusion of sediment/desilting basins is infeasible. ☐Complete

   (b) If feasible, design desilting basin(s) per the guidance in SC-2 Sediment/ Desilting Basins of the Construction Site BMP Manual to maximize capture of sediment-laden runoff. ☐Complete

   Designate as a separate contract bid item. ☐Complete

6. Is ATS to be used for controlling sediment? ☐Yes ☒No

   (a) If "yes", then will desilting basin or other means of natural storage be used? ☐Yes ☐No

   (b) If "no", then plan for storage tanks sufficient to hold treatment volume. ☐Comple

7. Will the project benefit from the early implementation of proposed permanent Treatment BMPs? (Coordinate with District Construction.) ☐Yes ☒No

   (a) Edit Order of Work specifications for permanent treatment BMP work to be implemented in a manner that will allow its use as a construction site BMP. ☐Complete

Sediment Trap (SC-3)

8. Can sediment traps be located to collect channelized runoff from disturbed soil areas prior to discharge? ☐Yes ☒No

   (a) Design sediment traps in accordance with the Construction Site BMP Manual. ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Construction Site BMPs
Checklist CS-1, Part 3

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Tracking Controls

Stabilized Construction Entrance/Exit (TC-1)

1. Are there points of entrance and exit from the project site to paved roads where mud and dirt could be transported offsite by construction equipment? (Coordinate with District Construction for selection and preference of tracking control BMPs.) ☒Yes ☐No

   (a) Identify and designate these entrance/exit points as stabilized construction entrances (TC-1 ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

Tire/Wheel Wash (TC-3)

1. Are site conditions anticipated that will require additional or modified tracking controls such as entrance/outlet tire wash? (Coordinate with District Construction.) ☐Yes ☒No

   Designate as a separate contract bid line item. ☐Complete

Stabilized Construction Roadway (TC-2)

3. Are temporary access roads necessary to access remote construction activity locations or to transport materials and equipment? (In addition to controlling dust and sediment tracking, access roads limit impact to sensitive areas by limiting ingress, and provide enhanced bearing capacity.) (Coordinate with District Construction.) ☐Yes ☒No

   (a) Designate these temporary access roads as stabilized construction roadways (TC-2). ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Street Sweeping and Vacuuming (SC-7)

1. Is there a potential for tracked sediment or construction related residues to be transported offsite and deposited on public or private roads? (Coordinate with District Construction for preference of including street sweeping and vacuuming with tracking control BMPs.) ☒Yes ☐No

   Designate as a separate contract bid line item. ☒Complete

Construction Site BMPs
Checklist CS-1, Part 4

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Wind Erosion Controls

Wind Erosion Control (WE-1)

1. Is the project located in an area where standard dust control practices in accordance with Standard Specifications, Section 10: Dust Control, are anticipated to be inadequate during construction to prevent the transport of dust offsite by wind? *(Note: Dust control by water truck application is paid for through the various items of work. Dust palliative, if it is included, is paid for as a separate item.)* ☐Yes ☒No

   (a) Select SS-3 (Hydraulic Mulch), SS-4 (Hydroseeding), SS-5 (Soil Binders), SS-7 (Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets), SS-8 (Wood Mulching) or a combination to cover the DSA subject to wind erosion year-round, especially when significant wind and dry conditions are anticipated during project construction. (Coordinate with District Construction for selection and preference of wind erosion control BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

Construction Site BMPs
Checklist CS-1, Part 5

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Non-Stormwater Management

Temporary Stream Crossing (NS-4) & *Clear Water Diversion* (NS-5)

1. Will construction activities occur within a waterbody or watercourse such as a lake, wetland, or stream? (Coordinate with District Construction for selection and preference for stream crossing and clear water diversion BMPs.) ☐Yes ☒No

   (a) Select from types offered in NS-4 (Temporary Stream Crossing) to provide access through watercourses consistent with permits and agreements.[1] ☐Complete

   (b) Select from types offered in NS-5 (Clear Water Diversion) to divert watercourse consistent with permits and agreements.[1] ☐Complete

   (c) Designate as a separate contract bid line item(s). ☐Complete

Other Non-Stormwater Management BMPs

2. Are construction activities anticipated that will generate wastes or residues with the potential to discharge pollutants? ☒Yes ☐No

   (a) Identify potential pollutants associated with the anticipated construction activity and select the corresponding BMP such as NS-1 (Water Conservation Practices), NS-2 (Dewatering Operations), NS-7 (Potable Water/Irrigation), NS-8 (Vehicle and Equipment Cleaning), NS-9 (Vehicle and Equipment Fueling), NS-10 (Vehicle and Equipment Maintenance), NS-11 (Pile Driving Operations), , NS-13 (Material and Equipment Use Over Water), , and NS-15 (Structure Demolition/Removal Over or Adjacent to Water).[1] ☒Complete

   (b) Verify that costs for non-stormwater management BMPs are identified in the contract documents. Designate BMP as a separate contract bid line item if the requirements in Construction Site Management (SSP 07-346) are anticipated to be inadequate or if requested by Construction. ☒Complete

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[1] Coordinate with District Environmental for consistency with US Army Corps of Engineers 404 and 401 permits and Dept. of Fish and Game 1601 Streambed alteration Agreements.

Construction Site BMPs
Checklist CS-1, Part 6

Prepared by: Cory Freeman Date: Sept. 23, 2014 District-Co-Route: 09 – MNO - 395

PM : 52.3 / 53.7 Project ID (or EA): 09-33500 RWQCB: Lahontan (Region 6)

Waste Management & Materials Pollution Control

Concrete Waste Management (WM-8)

1. Does the project include concrete placement or mortar mixing? ☒Yes ☐No

   (a) Select from types offered in WM-8 (Concrete Waste Management) to provide concrete washout facilities. In addition, consider portable concrete washouts and vendor supplied concrete waste management services. (Coordinate with District Construction for selection and preference of waste management and materials pollution control BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item if the quantity of concrete waste and washout are anticipated to exceed 5.2 yd^3 or if requested by Construction. ☒Complete

Other Waste Management and Materials Pollution Controls

2. Are construction activities anticipated that will generate wastes or residues with the potential to discharge pollutants? ☒Yes ☐No

   (a) Identify potential pollutants associated with the anticipated construction activity and select the corresponding BMP such as WM-1 (Material Delivery and Storage), WM-2 (Material Use), WM-4 (Spill Prevention and Control), WM-5 (Solid Waste Management), WM-6 (Hazardous Waste Management), WM-7 (Contaminated Soil Management), WM-9 (Sanitary/Septic Waste Management) and WM-10 (Liquid Waste Management) ☒Complete

   (b) Verify that costs for waste management and materials pollution control BMPs are identified in the contract documents. Designate BMP as a separate contract bid line item if the requirements in Construction Site Management (SSP 07-346) are anticipated to be inadequate or if requested by Construction. ☒Complete

Temporary Stockpiles (Soil, Materials, and Wastes)

3. Are stockpiles of soil, etc. anticipated during construction? ☒Yes ☐No

   (a) Select WM-3 (Stockpile Management), SS-3 (Hydraulic Mulch), SS-4 (Hydroseeding), SS-5 (Soil Binders), SS-7 (Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets), or a combination as appropriate to cover temporary stockpiles of soil, etc. ☒Complete

(b) Select linear sediment barrier such as SC-1 (Silt Fence), SC-5 (Fiber Rolls), SC-6 (Gravel Bag Berm), SC-8 (Sand Bag Barrier), SC-9 (Straw Bale Barrier), or a combination to encircle temporary stockpiles of soil, etc. (Coordinate with District Construction for selection and preference of BMPs related to stockpiles.) ☒Complete

(c) Designate as a separate contract bid line item if the requirements in Construction Site Management (SSP 07-346) are anticipated to be inadequate or if requested by Construction. ☒Complete

4. Is there a potential for dust and debris from construction material (fill material, etc.) and waste (concrete, contaminated soil, etc.) stockpiles to be transported offsite by wind? ☒Yes ☐No

(a) Select SS-7, temporary cover, plastic sheeting or other BMP to cover stockpiles subject to wind erosion year-round, especially when significant wind and dry conditions are anticipated during project construction. (Coordinate with District Construction for selection and preference of wind erosion control BMPs.) ☒Complete

(b) Designate as a separate contract bid line item. ☒Complete

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Restricted Access

The existing utility dirt road that runs parallel to the project, upslope and approximately 1/8 of a mile west of the project, can not be used to gain access to the project.