EVALUATION OF ROADWAY ALIGNMENT

September 11, 2020
SL10982-3

Client:
Alison and Matt Brynildson
2250 Del Sol Place
Paso Robles, CA 93446

Project name:
Old Creek Road
APNs: 046-031-033 & 046-131-043
Cayucos area, San Luis Obispo County, California

Dear Mr. and Mrs. Brynildson:

1.0 INTRODUCTION

This report presents the results of the geologic evaluation for the proposed roadway improvements providing access to the proposed single-family residence with guesthouse at Old Creek Road, APN: 046-031-033 & 046-131-043, in the Cayucos area of San Luis Obispo County, California. See Figure 1: Area Location Map for the general location of the project area (TopoView, 2020).

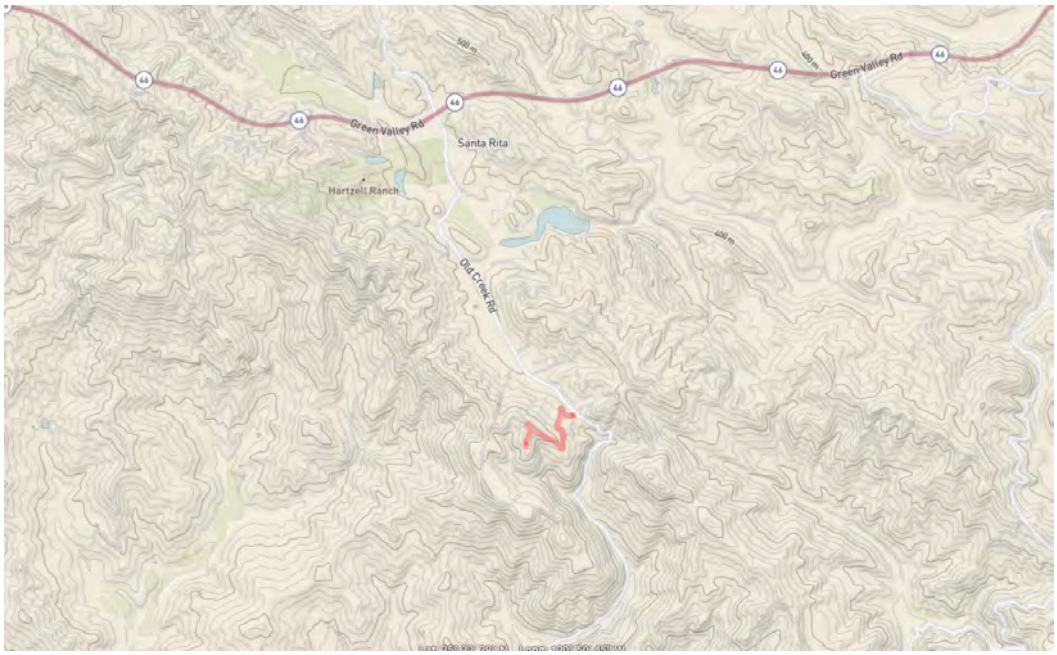

Figure 1: Area Location Map

1.1 Site Description

The roadway improvement extends from Old Creek Road and switchbacks up the slope to the proposed house site at a general elevation varying from 1400 to 1780 feet above mean sea level. The scope of work is limited to roadway improvements. The roadway improvements will hereafter be referred to as the "Site." See Figure 2: Site Map (Walsh Engineering, dated 1/6/20) for the general layout of the Site. The roadway is located along a hillside that drops east and the south. An existing dirt ranch road provides access to the site and the adjacent parcel. Annual grasses, shrubs and assorted trees currently vegetate the Site. Nine borings were previously drilled along the roadway alignment in the referenced Geotechnical Engineering Report (Beacon Geotechnical, 2017). Five additional trenches were excavated along the existing roadway alignment for this report. Boring and trench logs are presented in Appendix A. The location of the borings and trenches are presented in Plates 1 through 4.

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1.2 Project Description

The proposed roadway improvements will consist of widening the existing roadway including associated cuts, fills, retaining walls and resurfacing with either gravel or asphalt. The roadway is to be widened to 20 feet wide with a proposed hammerhead turnout at Station 43+80. It is estimated that grading quantities for the roadway are 8,000 yards^3 of cut and 3,200 yards^3 of fill. Retaining walls are proposed along various uphill and downhill sections of the roadway (see Figure 2 for proposed retaining was extents). Retaining walls are proposed to be up to 9 feet high and keystone retaining walls are proposed to be up to 6 feet high.

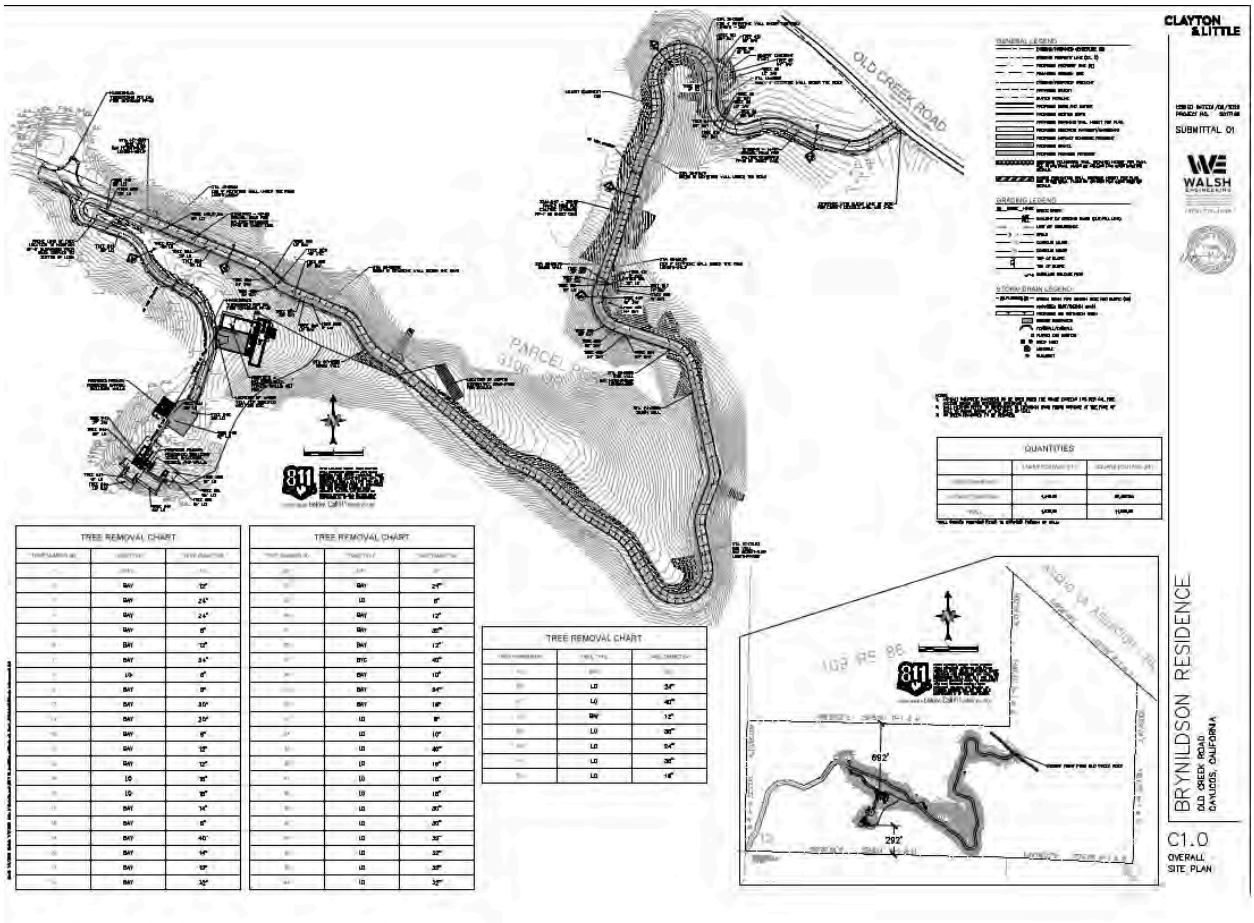

Figure 2: Site Map (Walsh Engineering, dated 1/6/20)

2.0 GEOLOGIC FINDINGS

2.1 Regional Geology

The Site is located in the vicinity of the San Luis Range of the Coast Range Geomorphic Province of California. The Coast Ranges lie between the Pacific Ocean and the Sacramento-San Joaquin Valley and trend northwesterly along the California Coast for approximately 600 miles between Santa Maria and the Oregon border.

Regionally, the Site is located on the Cambrian Slab composed of a large, thick block of Cretaceous age sediments that are surrounded by Franciscan Complex rocks. The Cambrian Slab extends from the Los Osos fault south and northward to the Oceanic Fault.

2.2 Local Geology

Locally, the roadway alignment is located within Diabase and Basalt, Monterey Formation and Toro Formation units as depicted on Plate 1A, Site Engineering Geology Map. Seiders, 1982 and Dibblee, 2006 mapped the Site as underlain by Miocene age Diabase and Basalt (Tb), Miocene age Monterey Formation (Tmm, Tml) and Cretaceous and Jurassic Age Toro Formation (KJt, Ktsh) units. Information derived from the subsurface exploration was used to classify subsurface soil and formational units and to supplement geologic mapping.

2.2.1 Diabase and Basalt

Seiders, 1982 maps a dike of Diabase and Basalt (Tb) extending through a section of the roadway (mapped from Station 26+50 to 27+00). Seiders, 1982 describes the Diabase and Basalt as “Dark-gray, locally amygdaloidal rocks, chiefly sheets and dikes that intrude Tertiary rocks; rare small bodies intrude Cretaceous rocks.” The dike of Diabase and Basalt at the site was encountered to consist of white to light gray diabase (weathers brown to orangish brown along the fractures) observed to highly fractured, conchoidal (“pillow”) fractures, slightly to moderated weathered, and moderately soft to moderately hard. The Diabase and Basalt is observed as a dike through the surrounding Monterey Formation. Plate 2 depicts the dike of Diabase and Basalt (Tb) extending through Station 26+50 to 27+00. Trench logs are presented in Appendix A.

2.2.2 Monterey Formation

Seiders, 1982 maps the western portion of the proposed roadway alignment as within Sandholdt Member of Monterey Formation (Tmm). Seiders, 1982 describes the Monterey Formation as “Calcareous and porcelaneous mudstone – Thin- to thick-bedded, chocolate-brown to buff, calcareous, foraminiferal mudstone, most abundant in lower part of section; locally phosphatic and glauconitic.” The Monterey Formation was mapped throughout the western portion of the site and was encountered within trenches T-1 through T-5 and interpreted within borings B-1 through B-7 (Beacon). The Monterey Formation at the site was encountered to consist of white siltstone (weathers orange along the fractures) observed to highly fractured, slightly to moderated weathered, and moderately soft to moderately hard. Plate 1 through 4 depicts the Monterey Formation (Tmm) throughout the western portion of the roadway alignment. Trench logs are presented in Appendix A.

Seiders, 1982 maps a southeast-northwest trending syncline between the primary and guest house locations. Bedding attitudes were taken throughout the roadway alignment within cut slopes. The location and strike and dip of bedding attitudes taken are depicted in the figures throughout this report. Bedding generally follows the larger synclines mapped; however smaller localized folds were observed within cut slopes.

2.2.3 Toro Formation

Seiders, 1982 maps the eastern portion of the proposed roadway alignment as within Toro Formation (KJt). Seiders, 1982 describes the Toro Formation as “Thin-bedded sandstone and mudstone- Medium-gray to greenish gray, thin-bedded, locally medium-bedded, fine- to medium-grained, graded lithic sandstone interbedded with olive-gray mudstone, in part laminated with fine-grained sandstone.” The Toro Formation was mapped throughout the eastern portion of the site and is interpreted within borings B-8 and B-9 (Beacon). The Toro Formation at the site was encountered to consist of light gray to brown sandstone and mudstone observed to thinly to medium bedded, highly fractured, slightly to moderated weathered, and moderately soft to moderately hard. Plate 1 depicts the Toro Formation (KJt) throughout the eastern portion of the roadway alignment. Trench logs are presented in Appendix A.

Bedding attitudes were taken throughout the roadway alignment within cut slopes. The location and strike and dip of bedding attitudes taken are depicted in the figures throughout this report. Bedding is generally dipping at a high angle to the south.

3.0 LANDSLIDES

The San Luis Obispo County Siesmic Safety Element (County of San Luis Obispo, 1999) maps the site as within a high to very high landslide potential. Dibblee, 2006 and Delattre, 2014 did not map landslides along the roadway alignment. However, during site mapping and review of aerial photography, landslides were observed at various locations along the roadway alignment. There appears to be a moderate potential for localized instability along the proposed roadway improvements. Recommendations to minimize the effects of landslide deposits to the proposed roadway are provided below throughout Section 5. It is also recommended that regular maintenance be performed along the roadway alignment to maintain its functionality. This is very important with respect to maintaining drainage control facilities, as they are the key to maintaining gross and surficial instability of the proposed roadway alignment.

4.0 RECONNAISSANCE MAPPING

The roadway evaluation of begins at Old Creek Road (station 10+00), continues west to a switchback at Station 15+50 where it turns south-south to another switchback at Station 28+00. The roadway then turns to the northwest to the final switchback at Station 43+80, then continues southeast-south to the proposed primary residence and guesthouse. This evaluation was conducted along the existing roadway.

5.0 ROADWAY AREA

The basis for roadway design is the Overall Site Plan prepared by Walsh Engineering (Walsh Engineering, 01/06/2020). Within this alignment are associated cut and fill slopes, retaining walls and drainage features. Based upon a review of the subject plans, grading is anticipated to establish roadway improvements as presented on the project plans.

5.1 Station 10+00 – 15+50

The roadway alignment starts at Old Creek Road (Station 10+00) and extends west along the existing roadway alignment to the first switchback at Station 15+50. Existing cut slopes upslope of the existing roadway expose soil and mudstone and 1:1 to 2:1 (horizontal: vertical) in steepness and 4 to 6 feet high. Localized surficial failures are observed at the base of the existing cut slope in the soil and a larger instability was observed above the roadway at Station 14+30. A drainage channel crosses over the roadway alignment at Station 14+75.

Proposed improvements consist of widening the roadway alignment extending 2:1 cut slopes from Station 14+00 to 15+50 and creating a 2:1 fill slope along the east side. Fill slopes should be keyed and benched in accordance with grading recommendations provided in the Soils Engineering Report. In addition, a 4-foot-high keystone wall is proposed along the east side from Station 14+30 to 15+35. Cut slopes are proposed to be 2:1 (horizontal: vertical) however unstable material at Station 14+30 should be removed. Bedding is observed to be favorable along this section of roadway, however due to the highly fractured nature of the Toro Formation, it is anticipated that surficial spalling will occur as minor talus at the base of the slope. It is recommended that maintenance will be required consisting of removal of talus accumulation especially where it affects surface drainage controls. Surface drainage should be diverted away from fill slopes. It is recommended that erosion control measures and revegetation of fill/cut slopes be implemented immediately after the completion of grading. Gravel is proposed from Station 10+00 to 14+67 and asphalt is proposed from station 14+67 to 15+50.

Plate 1 depicts the location of cut and fill slopes as well as the location of existing failures along this section of roadway. Construction of this section of roadway can be achieved with conventional grading, although localized sections of resistant mudstone should be anticipated.

5.2 Station 15+50 – 28+00

The roadway alignment continues at the switchback at Station 15+50 and extends south along the existing roadway alignment to the second switchback at Station 28+00. Existing cut slopes upslope of the existing roadway expose Toro Formation mudstone and shale to Station 20+60, then Monterey Formation shale from Station 20+60 to 28+00. A dike of diabase is exposed within the cut slope from Station 26+50 to 27+00. Cut slopes are near vertical to 1:1 (horizontal: vertical) in steepness, 3 to 5 feet high, and appear stable. Bedding within the Toro Formation from station 15+50 to 20+60 is dipping 70 to 80 degrees to the south. Cut slopes within the Monterey Formation are primary covered with vegetation however bedding within Trench T-5 exposed bedding dipping 55 degrees to the north. The fill slopes along the east side of the roadway alignment consist of 2 to 3 feet of undocumented fill that maintains established vegetation at an approximate gradient of 1:1 (horizontal: vertical) and appears stable provided that drainage is diverted away from the slope face.

Proposed improvements consist of widening the roadway alignment with associated 2:1 cut and fill slopes. The switchback at Station 15+50 is to be realigned to create a wider radius. Cut and fill slopes are proposed to be 2:1 (horizontal: vertical). Bedding is favorable along this section of roadway, however due to the highly fractured nature of the Toro Formation, it is anticipated that surficial spalling will occur as talus at the base of the slope. Extended cut slopes are proposed from Station 16+00 to 20+60, 32+20 to 24+35 and 27+70 to 28+00. Bedding is favorable along this section of roadway, however due to the highly fractured nature of the Toro Formation, it is anticipated that surficial spalling will occur as talus at the base of the slope. It is recommended that maintenance will be required consisting of removal of talus accumulation especially where it affects surface drainage controls. Retaining walls are proposed from Station 20+66 to 23+20 and 24+35 to 27+70 to a maximum height of 8.4 feet.

Figure 3: Photograph of existing cut slope at Station 17+00

The County of San Luis Obispo Land Use View depicts a landslide extending through the roadway at the existing drainage channel at Station 22+00. Multiple trenches were excavated along the roadway alignment at the site and shallow rock was observed. A landslide was mapped above the roadway however it is assumed the landslide is surficial in nature and doesn't extend to the roadway below. However, the engineering geologist should observe the temporary excavation for the retaining wall to verify the onsite conditions. Additional recommendations may be made at the time of construction. In addition, if conditions vary from those described in this report, the engineering geologist should be contacted.

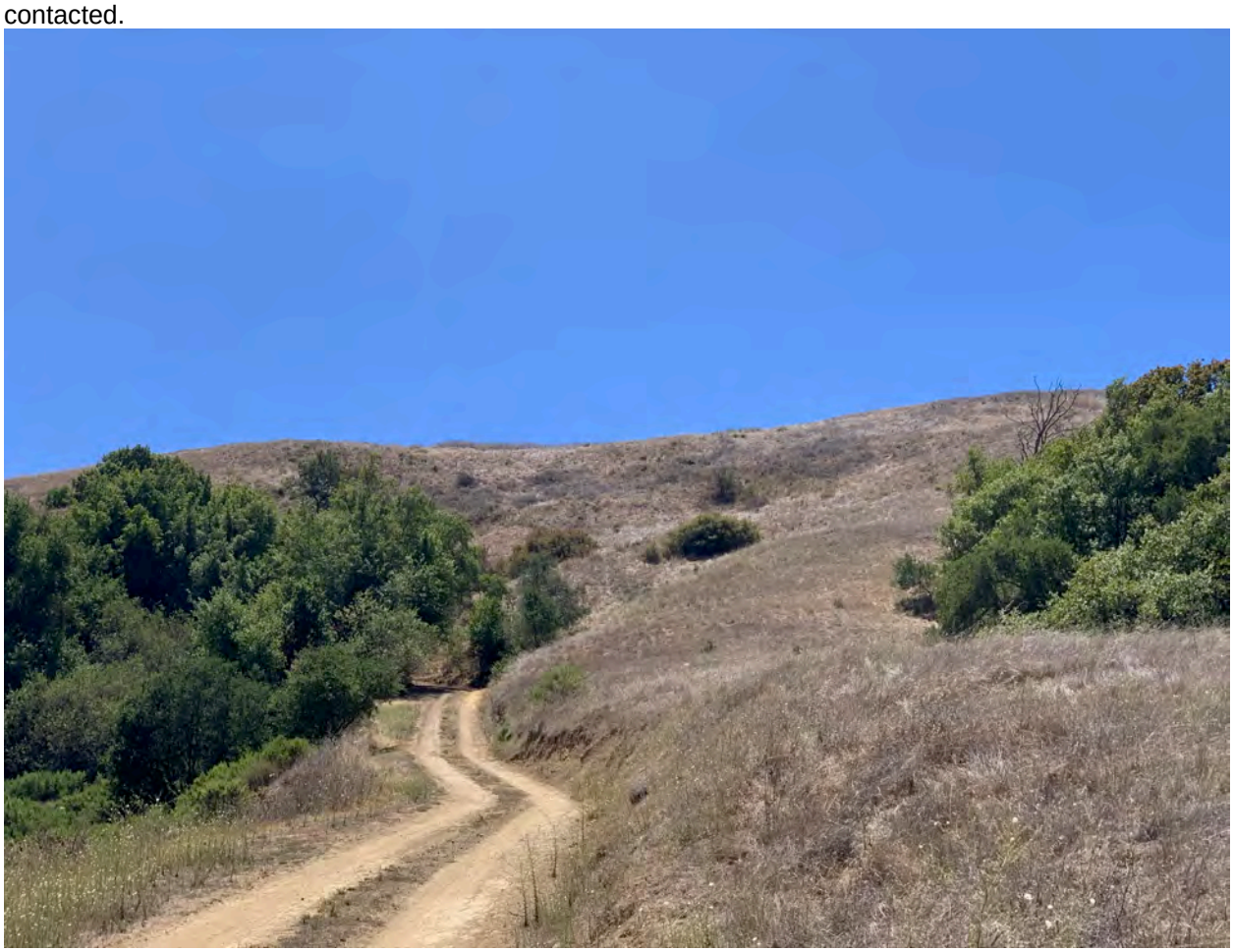

Figure 4: Photograph of mapped landslide above Station 22+00

Localized 2:1 fill slopes are proposed at various locations along this section of roadway. Fill slopes should be keyed and benched in accordance with grading recommendations provided in the Soils Engineering Report. A 3-foot-high keystone wall is proposed along the east side from Station 18+19 to 20+60. In addition, multiple slope failures were observed downslope of the existing roadway alignment (see Plate 1A). Where fill is proposed in the area of the failures, keyways should be founded into competent rock and landslide deposits should be removed and processed as engineered fill. These failures are assumed to be surficial and relatively shallow. Surface drainage should be diverted away from fill slopes (specifically away from the existing failure areas). It is recommended that erosion control measures and revegetation of fill/cut slopes be implemented immediately after the completion of grading. Asphalt is proposed along this section of roadway.

Figure 5: Photograph of roadway at Station 26+00

Plate 1 and 2 depicts the location of cut and fill slopes, retaining walls and failure areas along this section of roadway. Construction of this section of roadway can be achieved with conventional grading, although localized sections of resistant formational material should be anticipated.

5.3 Station 28+00 – 43+80

The roadway alignment continues at the switchback at Station 28+00 and continues northwest along the existing roadway alignment to the final switchback at Station 43+80. Existing cut slopes upslope of the existing roadway expose Monterey Formation shale that are near vertical to 1:1 (horizontal: vertical) in steepness and 5 to 6 feet high. Bedding within the Monterey Formation along this section is dipping 20 to 45 degrees to the south. The fill slopes along the west side of the roadway alignment from Station 28+00 to 36+75 and along the east side of the roadway alignment from Station 36+75 to 43+80, consist of 2 to 3 feet of undocumented fill that maintains established vegetation at an approximate gradient of 1:1 (horizontal: vertical) and appears stable provided that drainage is diverted away from the slope face. A landslide was mapped on the east side (downslope) of the roadway alignment at Station 37+00.

Figure 6: Photograph of cut slopes at Station 37+00

Proposed improvements consist of widening the roadway alignment with associated 2:1 cut and fill slopes. Cut and fill slopes are proposed to be 2:1 (horizontal: vertical). Bedding is favorable from Station 28+00 to 36+75, however due to the highly fractured nature of the Monterey Formation, it is anticipated that surficial spalling will occur as talus at the base of the slope. Bedding is not favorable from Station 36+75 to 41+50. Bedding as observed dipping 20 to 50 degrees to the north. A 9-foot retaining wall is proposed from Station 37+15 to 42+40. Due to the dip of the bedded, cut slopes can be excavated to 2:1 where feasible, however maintenance will be required consisting of removal of talus accumulation especially where it affects surface drainage controls.

Localized 2:1 fill slopes are proposed at various locations along this section of roadway. Fill slopes should be keyed and benched in accordance with grading recommendations provided in the Soils Engineering Report. A 6-foot-high keystone wall is proposed along the east side from Station 38+39 to 42+00. Where fill is proposed in the area of the landslide at Station 37+00, keyways should be founded into competent rock and landslide deposits should be removed and processed as engineered fill. The fill slope appears to be proposed along the head scarp therefore rock should be relatively shallow. Surface drainage should be diverted away from fill slopes (especially in the area of the landslide). It is recommended that erosion control measures and revegetation of fill/cut slopes be implemented immediately after the completion of grading. Asphalt is proposed along this section of roadway to Station 39+80 then gravel to 43+80.

Figure 7: Photograph of landslide below Station 37+00

Plate 2, 3 and 4 depicts the location of cut and fill slopes, retaining walls and failure area along this section of roadway. Construction of this section of roadway can be achieved with conventional grading, although localized sections of resistant formational material should be anticipated.

5.4 Station 43+80 – 49+00

The roadway alignment continues at the switchback at Station 43+80 and extends southeast to the proposed guesthouse then south to the proposed main residence. Existing cut and fill slopes are minor as this section is currently a two-track dirt road to the proposed residence locations. Proposed improvements consist of widening the roadway alignment to 16 feet wide with minor associated 2:1 cut and fill slopes. A hammerhead turnaround is proposed at Station 43+80. Gravel is proposed along this section of roadway.

Plate 4 depicts the location of cut and fill slopes along this section of roadway. Construction of this section of roadway can be achieved with conventional grading, although localized sections of resistant shale should be anticipated

5.5 Slope Stability

A kinetic fracture analysis was performed on the cut slopes at Station 20+50 (data set 1) and Station 37+10 (data set 2) where the proposed cut slope is the greatest height. A discussion of the slope stability analyses is discussed below.

The field investigation consisted of measuring bedding orientations at the existing cut slope. A stereographic analysis was then performed with the bedding orientations and the slope face orientation.

Two data sets were collected in the field consisting of obtaining bedding attitudes and characteristics with the use of a Brunton compass. Table 1 is a list of the fracture measurements obtained in the field.

Data Set	Bedding Dip Direction (azimuth)	Fracture Dip
1	200(b)	80
1	125(b)	75
1	010(f)	85
1	200(b)	70
Data Set	Bedding Dip Direction (azimuth)	Fracture Dip
2	045(b)	45
2	285(f)	45
2	030(b)	40
2	290(f)	55

Table 1: Structural Attitudes (b)-bedding, (f)-fracture

5.5.1 Planar Failure Analysis

According to Norrish and Wyllie, 1996, the four necessary structural conditions for planar failures are:

1. The dip direction of the fracture must be within 20 degrees of the dip direction of the slope face.
2. The dip of the fracture must be less than the dip of the slope face.
3. The dip of the fracture must be greater than the angle of friction of the surface.
4. The lateral extent of the potential failure mass must be defined by the lateral release surfaces that do not contribute to the stability of the mass.

For data set 1, all the attitudes do not meet conditions 1 through 4. Therefore, there is a low potential for planar failures. For data set 2, the conditions are met depicting planar failure. This is observed as the existing cut slopes have eroded back to the bedding dip angle of 45 degrees. As the proposed cut slope is 2:1 (horizontal: vertical), the potential for planar failure will be low due to the higher dip angle than the slope face dip.

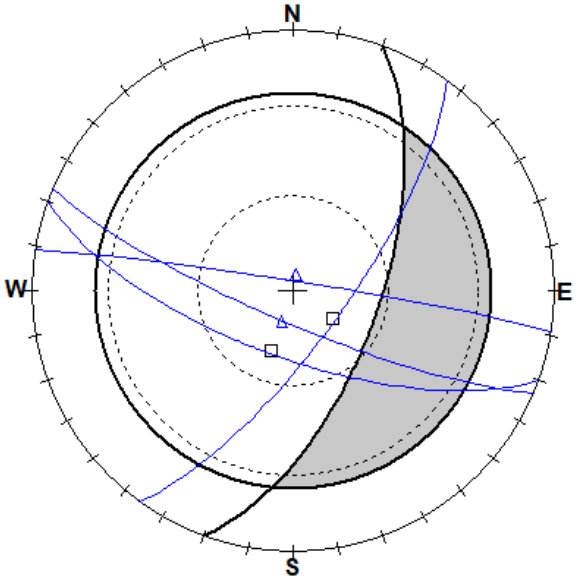

Figure 8: Stereonet (blue arcs depict bedding; bold black arc depicts slope)

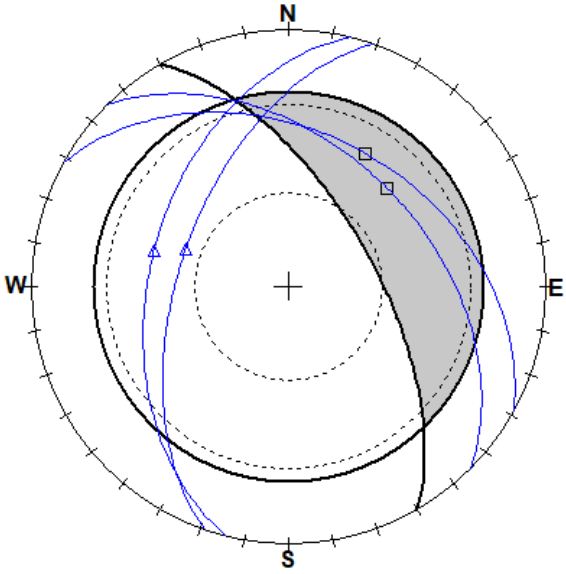

Figure 9: Stereonet (blue arcs depict bedding; bold black arc depicts slope)

5.5.2 Wedge Failure Analysis

The necessary structural conditions for wedge failures are as follows (Norrish and Wyllie, 1996):

1. The trend of the line of intersection must approximate the dip direction of the face.

2. The plunge of the intersection must be less than the dip of the slope face.
3. The plunge of the line of intersection must be greater than the angle of friction.

A kinetic analysis was performed using Markland's Test. Markland's test states 1) the discontinuity must have a dip angle that is steeper than its friction angle, and 2) the discontinuity must daylight from the slope face in a down-dip direction. These two conditions form a crescent-shaped critical zone on a stereonet. For data set 1, all the attitudes do not meet conditions 1 through 3. Therefore, there is a low potential for wedge failures. For data set 2, the conditions are met depicting wedge failure. The potential for wedge failures is observed to be moderate to high. However, due to the thinly bedded nature of the Monterey Formation, these wedge failures would be small in scale (3 to 6-inch blocks). The failure would result in an increase of talus at the base of the slope. A retaining wall is proposed throughout the majority of this section of road. Where cut slopes are proposed, increased maintenance of this talus accumulation will be required.

6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during the development of the Site, GeoSolutions, Inc. should be notified immediately and GeoSolutions, Inc. will provide supplemental recommendations as dictated by the field conditions.

This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and incorporated into the project plans and specifications. The owner or his/her representative is responsible to ensure that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of 3 years without our review nor should it be used or is it applicable for any properties other than those studied. However, many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 3 years.

Thank you for the opportunity to have been of service in preparing this report. If you have any questions or require additional assistance, please feel free to contact the undersigned at (805) 543-8539.

Sincerely,
GeoSolutions, Inc.

Jeffrey Pfost, CEG 2493
Principal Engineering Geologist
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REFERENCES

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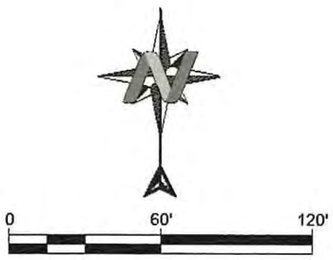
Walsh Engineering, January 6, 2020, Project Plans, Brynildson Residence, Old Creek Road, Cayucos, California, Job No. 2017180

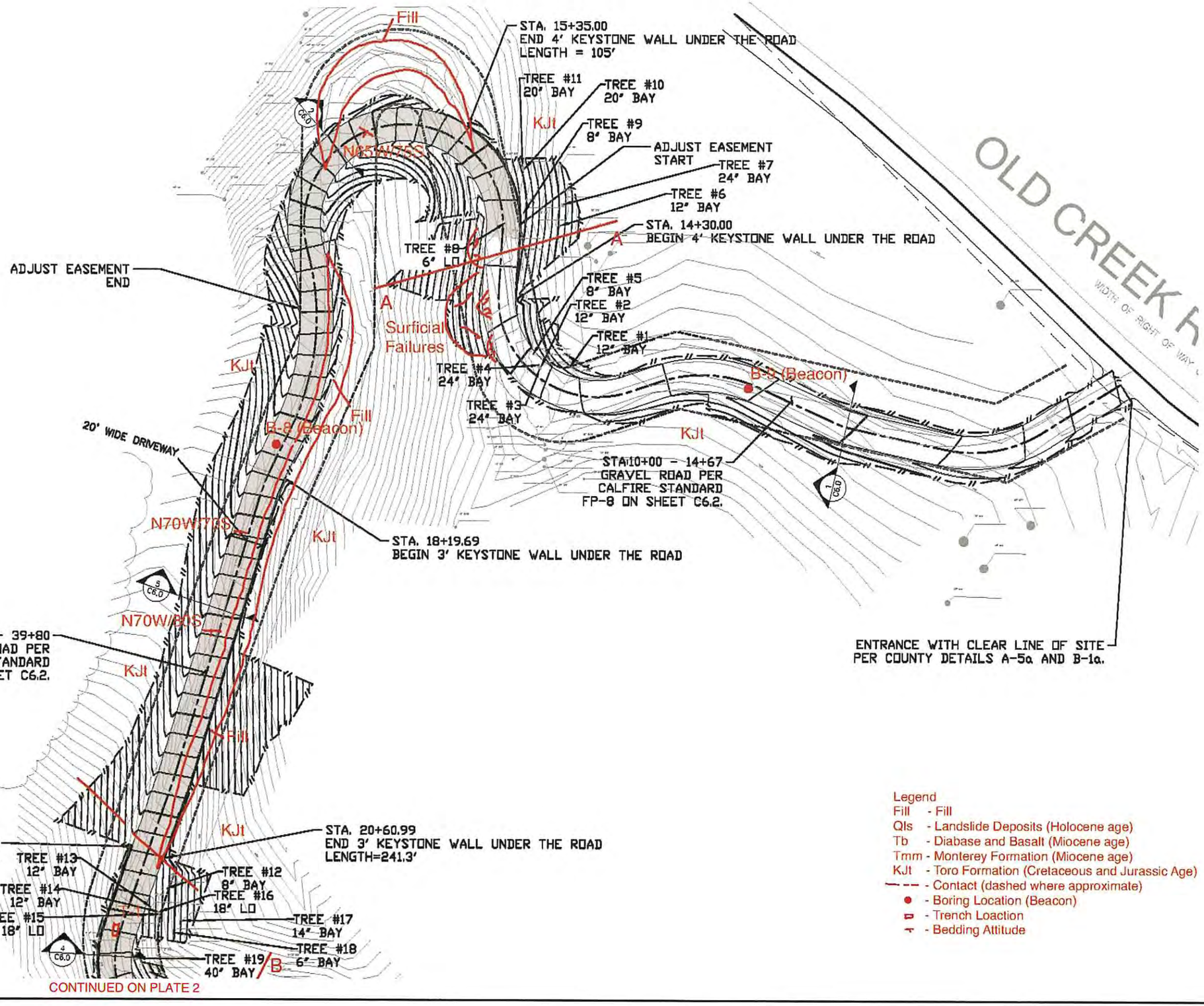
PLATES

Plate 1-4 – Site Engineering Geology Map

Plate 5 – Site Cross Sections

Plate 6 – Regional Geology Map (Seiders, 1982)





Legend

Fill - Fill
Qls - Landslide Deposits (Holocene age)
Tb - Diabase and Basalt (Miocene age)
Tmm - Monterey Formation (Miocene age)
KJt - Toro Formation (Cretaceous and Jurassic Age)
— — — - Contact (dashed where approximate)
● - Boring Location (Beacon)
▭ - Trench Loaction
- Bedding Attitude

PLATE 1

PROJECT SL10982-3

SITE ENGINEERING GEOLOGY MAP

OLD CREEK ROAD, APNs: 046-031-033 & -043
CAYUCOS AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

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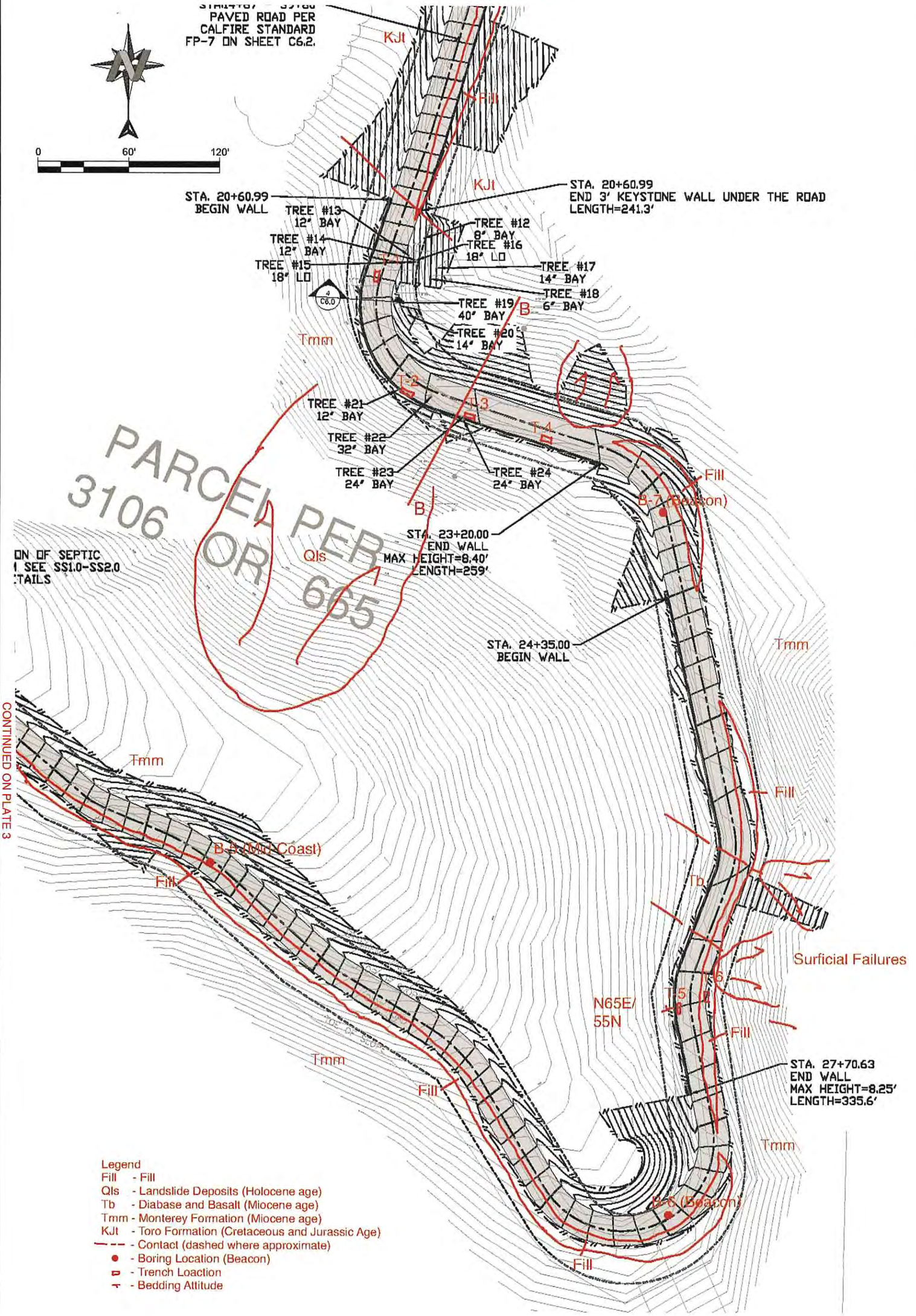

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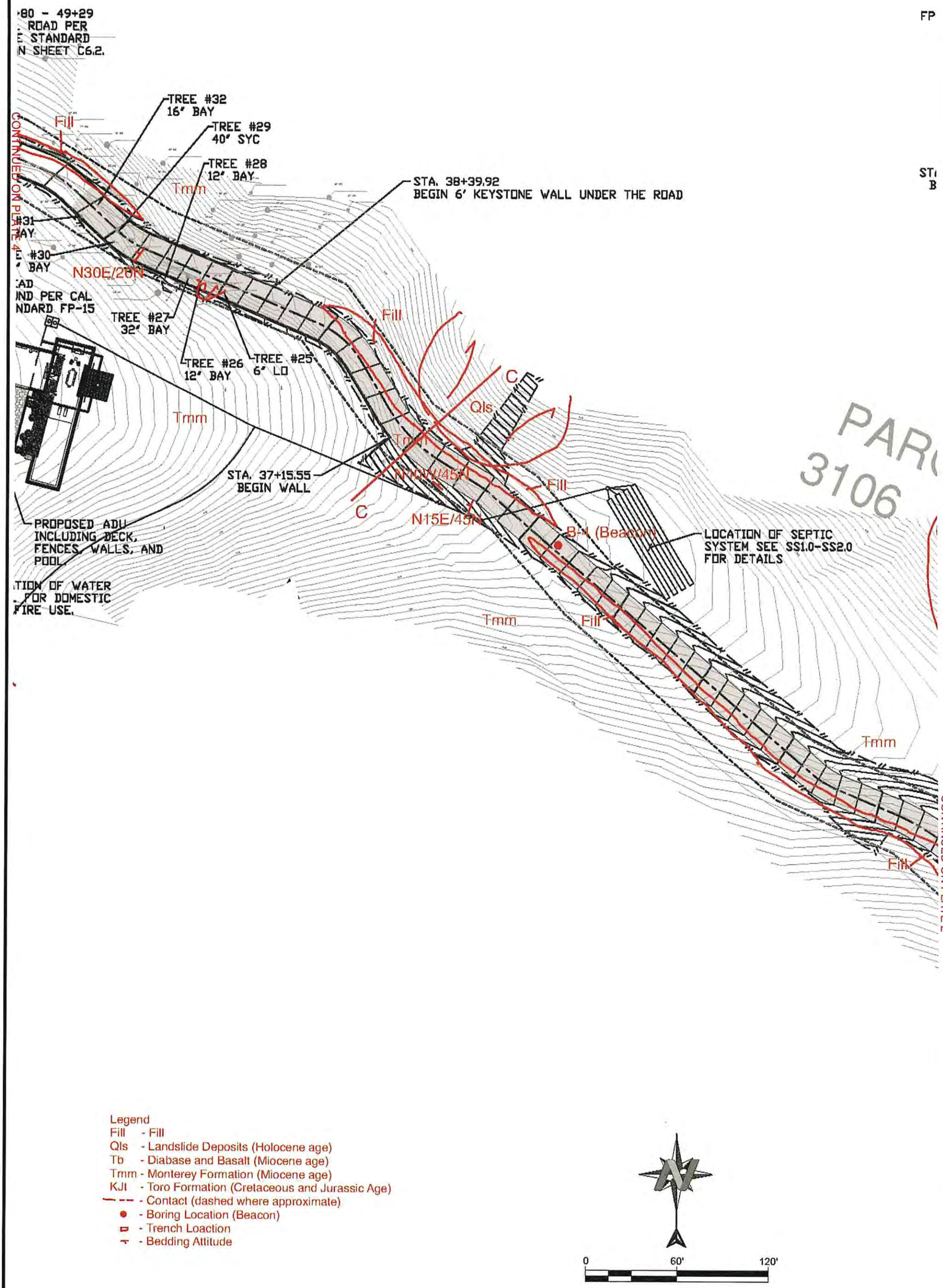
SITE ENGINEERING GEOLOGY MAP

OLD CREEK ROAD, APNs: 046-031-033 & -043
CAYUCOS AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE 2

PROJECT SL10982-3



Legend

- Fill - Fill
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- Tb - Diabase and Basalt (Miocene age)
- Tmm - Monterey Formation (Miocene age)
- KJt - Toro Formation (Cretaceous and Jurassic Age)
- — — - Contact (dashed where approximate)
- ● - Boring Location (Beacon)
- ▭ - Trench Loaction
- ⊤ - Bedding Attitude

0 60' 120'

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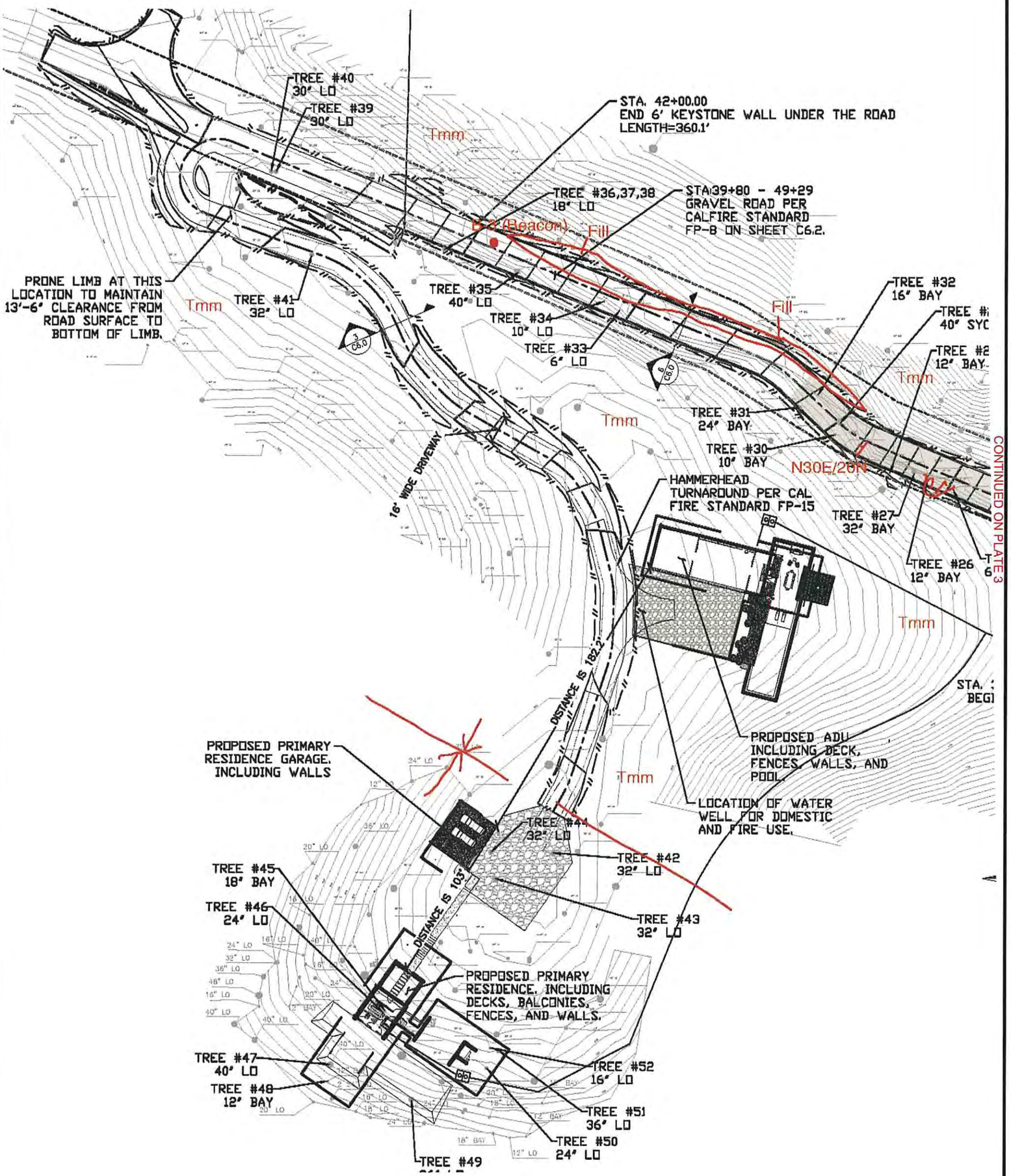
SITE ENGINEERING GEOLOGY MAP

OLD CREEK ROAD, APNs: 046-031-033 & -043
CAYUCOS AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
3

PROJECT
SL10982-3



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0 60' 120'

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SITE ENGINEERING GEOLOGY MAP

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PLATE
4

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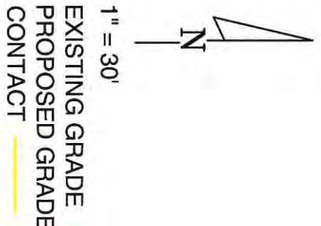
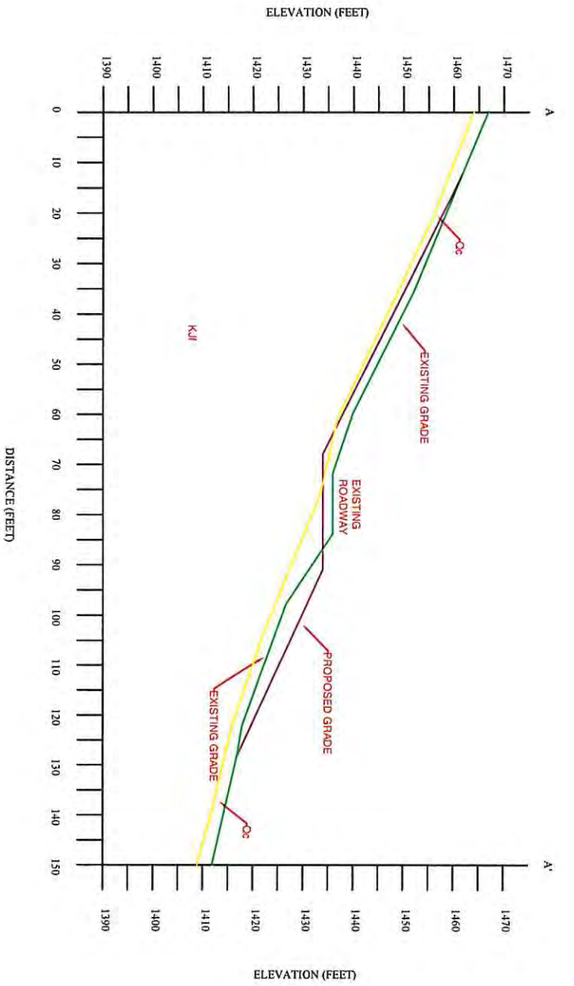
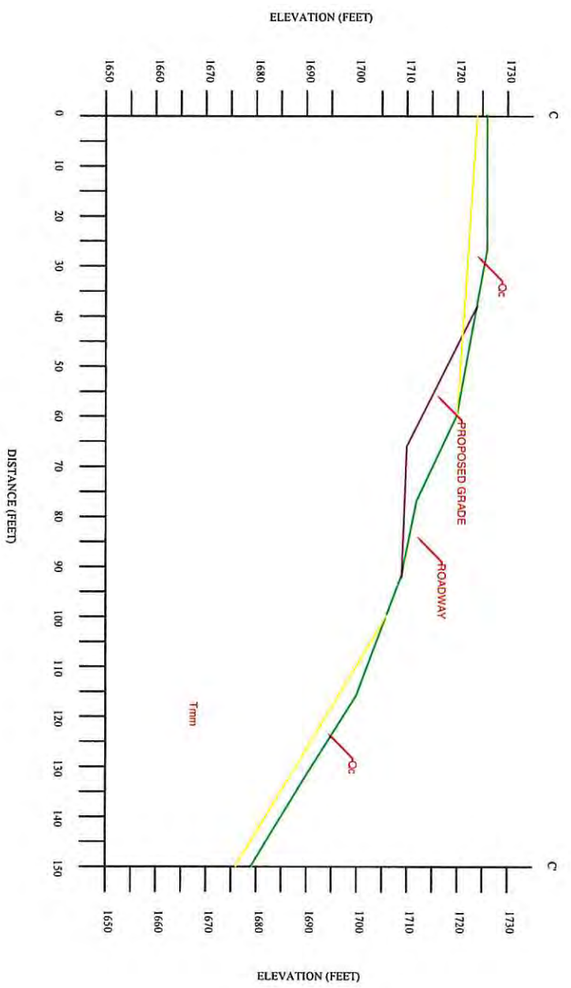
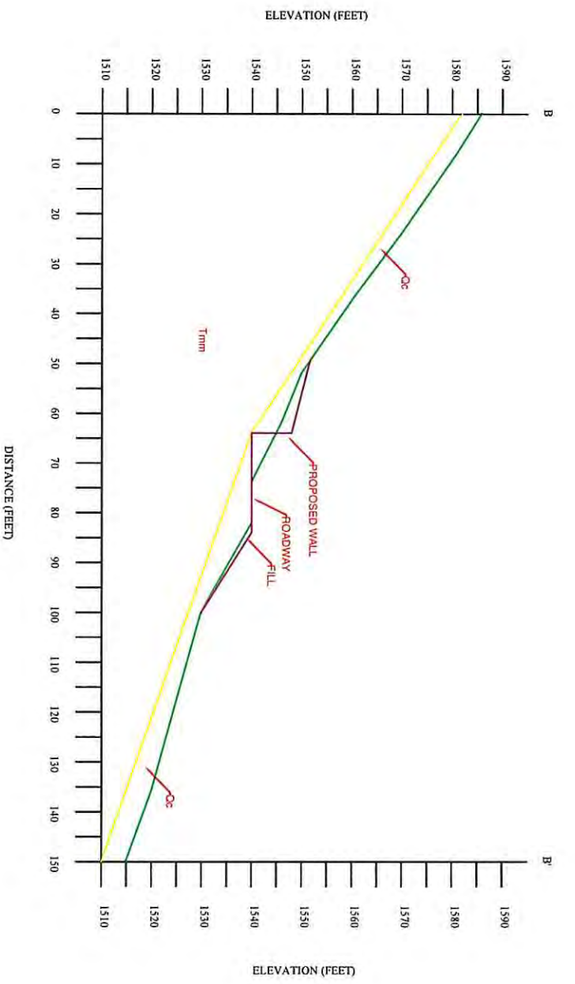
SL10982-3









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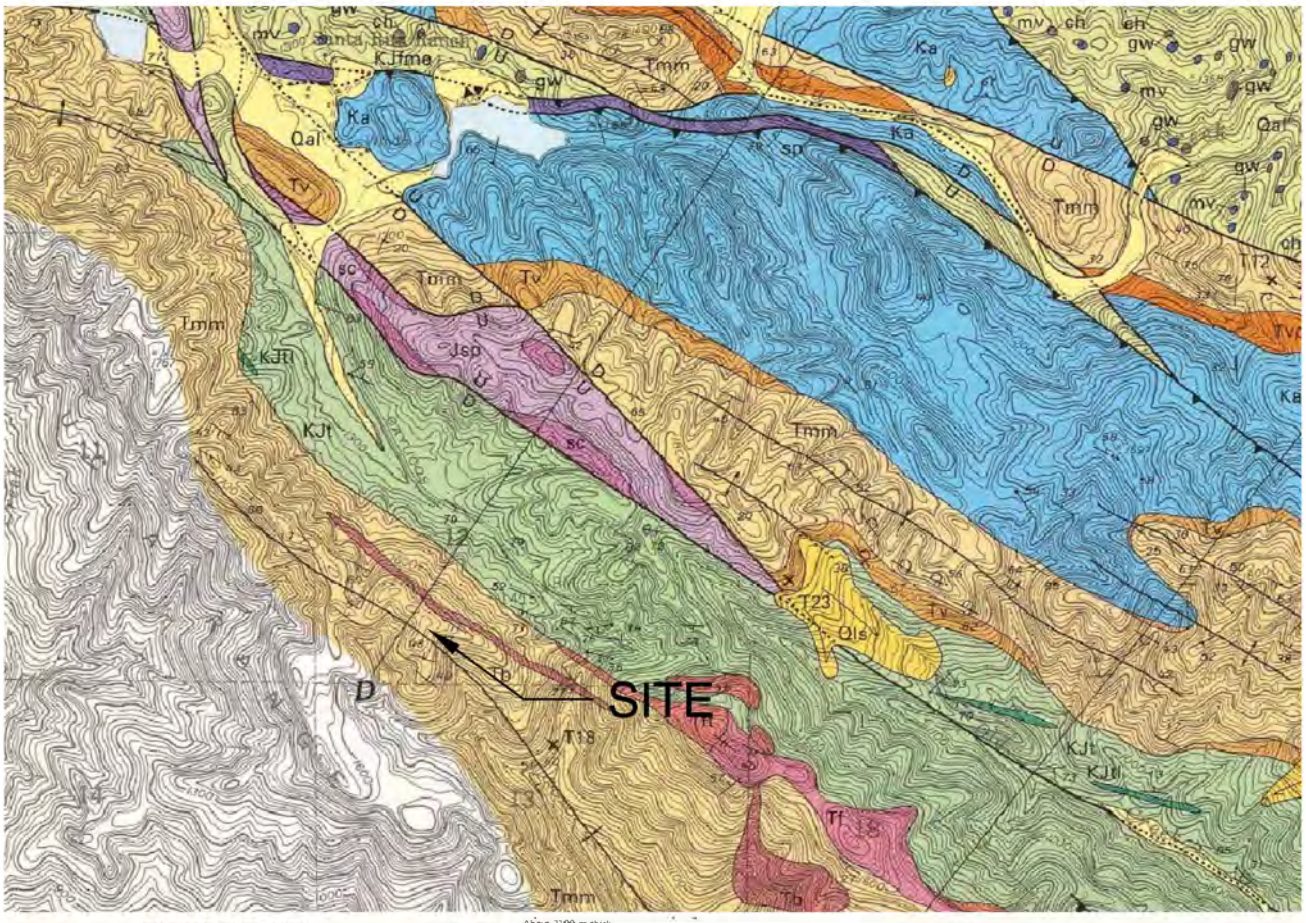
SITE CROSS SECTION

OLD CREEK ROAD, APNs: 046-031-033 & -043
CAYUCOS AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
5

PROJECT
SL10982-2



DESCRIPTION OF MAP UNITS

mw MINE WASTE

Qal ALLUVIUM (Holocene)—Sand, gravel, silt, and mud in flood plains and low terraces along streams

Qls LANDSLIDE DEPOSITS (Holocene)—Unsorted rock and mud debris with characteristic hummocky surface expression. Especially abundant on serpentinite and the Franciscan assemblage. Not all landslide deposits are shown. Arrow indicates direction of movement

Tb DIABASE AND BASALT (Miocene)—Dark-gray, locally amygdaloidal rocks; chiefly sheet sandstone-to-attentrude Tertiary rocks; rare small bodies intrude Cretaceous rocks

Tmm SANDHOLDT MEMBER OF MONTEREY FORMATION (Miocene)—Includes: Calcareous and porcelaneous mudstone —Thin- to thick-bedded, chocolate-brown to buff, calcareous, foraminiferal mudstone, most abundant in lower part of section; locally phosphatic and glauconitic. Thin- to medium-bedded, porcelaneous mudstone most abundant in upper part of exposed section; weathers to light-gray rock of low density locally known as "chalk rock". Locally abundant concretions, lenses, and rare beds of buff to grayish-orange limestone and dolomite. Rare dark-gray chert; mudstone and thick lenses of laminated dark-gray chert. Local graded sandstone beds. About 400 m thickness exposed

Tmmt Tuffaceous mudstone and tuff—Light-gray, thin- to thick-bedded, includes some buff to dark-gray calcareous mudstone. About 200 m thickness exposed

Tms Sandstone—Light-gray to buff, fine- to coarse-grained, calcareous; locally contains fossil shells of small pectens. Maximum thickness about 30 m

Tv VAQUEROS FORMATION (early Miocene and late Oligocene)—Sandstone, yellowish-gray to light-gray, very thick to thick-bedded, fine- to coarse-grained, arkosic, calcareous. Locally pebbly and includes some conglomerate beds in the lower part. Fossil shells of giant pectens, some as large as 17 cm, are common in some places. Rare oyster beds. Thickness ranges from 0 to about 120 m

Tvc Conglomerate member—Pebble, cobble, and boulder conglomerate with subordinate gray sandstone and pebbly to cobbly sandstone. Clasts are chiefly of sandstone and felsic volcanic rocks, but a wide variety of rock types are present. Locally contains boulders of granitic gneiss and marble derived from the base ment of the Salinian block. Thickness ranges from 0 to 100 m

Tf FELSIC VOLCANIC ROCKS (Oligocene)—Includes:
Felsite—Light-gray to grayish-orange, commonly flow-layered, with phenocrysts of quartz and plagioclase. Locally consists of dark-gray perlitic glass. Forms bulbous masses probably representing lava domes and volcanic necks

Tfb Felsic volcaniclastic rocks—Light-gray, grayish-orange, and pale-green felsic tuff, lapilli tuff, tuff breccia, and breccia. In part rich in pumice, in part contains abundant clasts of flow-layered felsite and rf. Thickness ranges from 0 to about 200 m

Tlo LOSPE FORMATION (Oligocene)—Grayish-red, locally grayish-green, thick-bedded pebbly sandstone, sandstone, conglomerate, and mudstone. Largely nonmarine but local medium-gray, calcareous, pebbly sandstone along southern limit of exposure may be marine. Thickness ranges from 0 to about 30 m

Kaps ATASCADERO FORMATION (Late Cretaceous)—Includes:
Pebbly sandstone—Light-gray to light-olive-gray, very thick to thick-bedded sandstone and pebbly to cobbly sandstone. In part shows large-scale crossbedding. Clasts occur both scattered in sandstone matrix and in thin discontinuous beds commonly only one pebble or cobble thick. Subordinate thin- to medium-bedded sandstone with interbedded mudstone. Local conglomerate and rare pebbly mudstone. Fossils of shallow-water origin are common. Exposed thickness about 1800 m

Kam Thin-bedded sandstone and mudstone—Greenish-gray, thin- to medium-bedded, fine- to medium-grained, commonly calcareous, arkosic sandstone and interbedded, olive-gray mudstone. Sandstone commonly displays graded bedding, small-scale crossbedding, and convolute bedding. Locally about 500 m exposed but occurs in several fault blocks with uncertain correlation; aggregate thickness may be greater

Kas Very thick bedded sandstone—Light-gray, coarse-grained arkosic sandstone. Forms conspicuous outcrops on hillsides and ridgecrests. Includes less well exposed thin- to thick-bedded, in part graded, sandstone and mudstone. About 3100 m thick

Kapm About 1100 m thick
Pebbly mudstone—Several thin and one thick lens of very thick to medium-bedded, pebbly to cobbly mudstone and local conglomerate interbedded with subordinate thin- to thick-bedded sandstone and mudstone. Pebbles typically have well-polished surfaces. At one locality on Jack Creek the pebbles are felsic volcanic rocks (80 percent), quartzite, sandstone, and mudstone (8 percent), chert (7 percent), and granitic rocks (5 percent). Locally about 450 m thick

Ka Thick-bedded sandstone—Light-gray to greenish-gray, fine- to coarse-grained, commonly calcareous, arkosic sandstone. Chiefly thick-bedded, but includes considerable volumes of thin- to medium-bedded and very thick bedded sandstone. Locally pebbly; includes some pebble conglomerate. Graded bedding very common. Subordinate interbedded olive-gray mudstone. Locally about 1200 m thick but occurs in several fault blocks with uncertain correlations; aggregate thickness probably greater

Kac Conglomerate—Very thick bedded pebble, cobble, and boulder conglomerate. Thick lens of conglomerate on Cayucos-Templeton Roadis composed chiefly of clasts of felsic volcanic rocks (63 percent), granitic rocks (27 percent), and quartzite and sandstone (10 percent). Thick lenses of conglomerate at east edge of map area are rich in boulders of sandstone and felsic volcanic rocks. Locally at least 300 m thick

Ks Sandy conglomerate—Two stratigraphically equivalent lenses of pebbly to cobbly sandstone, sandy conglomerate and conglomerate. Maximum thickness about 130 m

FRANCISCAN ASSEMBLAGE (Late and Early Cretaceous and Jurassic)—Includes:

KJfsg Conglomerate—Poorly sorted pebble, cobble, and boulder conglomerate rich in clasts of graywacke and containing a variety of clasts apparently derived from older parts of the Franciscan assemblage (Cowan and Page, 1975)

KJfg Graywacke—Grayish-yellow-green to greenish-gray, thick-bedded, medium- to coarse-grained lithic sandstone and subordinate thin- to medium-bedded sandstone and interbedded olive-gray mudstone. Mapped in larger tectonic inclusions in melange

KJfmv Mafic volcanic rocks—Mafic lava, volcaniclastic rocks and dikes. Indistinguishable from unit Jmv. Occurs as tectonic inclusions within melange

KJfm Melange—Pervasively sheared dark-gray shale matrix containing various types of tectonic inclusions, commonly highly fractured, ranging from pebble size to mappable units. Not all mappable units are shown. Inclusions include: graywacke (gw); poorly sorted conglomerate rich in clasts of graywacke (cgl); moderately sorted conglomerate rich in clasts of chert (cg-ol); mafic volcanic rocks (mv); green or red, thin- to medium-bedded radiolarian chert (ch); serpentinite (sp); silica-carbonate rocks lack, gabbro (gb), diabase (db); greenschist (gs); amphibolite (am); gneiss (gn); blueschist (bs); phyllite (ph), intermediate volcanic rocks (iv); felsic volcanic rocks (fv); vein quartz (qz); and plagioclase (pg)

KJt TORO FORMATION (Early Cretaceous and Late Jurassic)—Thin-bedded sandstone and mudstone—Medium-gray to greenish-gray, thin-bedded, locally medium-bedded, fine- to medium-grained graded lithic sandstone interbedded with olive-gray mudstone, in part laminated with fine-grained sandstone. Sandstone commonly calcareous; mudstone locally contains limestone concretions. Exposed thickness about 1200 m. Locally includes

Kl Limestone—Lenses of light- to medium-gray, thick-bedded, microcrystalline limestone, locally with scattered shell fragments. Lenses to about 10 m thick

KJtc Chert-pebble conglomerate—Lenses of moderately sorted pebble to cobble conglomerate interbedded with subordinate thin- to thick-bedded sandstone, in part pebbly; rare pebbly mudstone. Pebbles are well-rounded, clasts are moderately well imbricated. Clasts consist chiefly of chert (60-70 percent), quartzite (10-30 percent), mudstone (2-12 percent), and sandstone (1-7 percent). Lenses to about 30 m thick

Jch BEDDED CHERT (Late Jurassic)—Olive-gray, yellowish-gray, and grayish-yellow-green, thin- to medium-bedded, very impure, tuffaceous, radiolarian chert. Thickness 0 to about 100 m, generally less than 10 m thick

Jmv MAFIC VOLCANIC ROCKS (Jurassic)—Grayish-green basaltic lava, in part pillowed, basaltic volcanic breccia, and abundant diabase dikes; local gabbro. Pervasively altered to low-grade metamorphic mineral assemblages

Jsp SERPENTINITE (Jurassic)—Serpentinized ultramafic rocks, massive to intensely sheared, with dikes, commonly fragmented, of gabbro, diabase, and diorite, in part altered to rodingite. Locally includes silica-carbonate rocks (sc)

Contact

Fault—Dotted where concealed. U, upthrown side; D, downthrown side. Arrows show relative horizontal movement. In cross sections, dashed where approximately located

Thrust fault—Bar and ball where concealed. Sawteeth on upperplate. Indicates fault interpreted to have had low original angle of dip; most thrust faults now have steep dips as a result of later folding; some thrust faults have later reverse or normal movement. In cross section, T indicates movement toward observer; A, movement away from observer

Anticline—Showing trace of axial plane; dotted where concealed

Syncline—Showing trace of axial plane; dotted where concealed

Strike and dip of beds—Ball indicates tops of beds are known from sedimentary structures; ball shown on top side of vertical beds
- Inclined
- Vertical
- Horizontal
- Overturned

Strike and dip of flow layering in felsite
- Inclined
- Vertical

Approximate strike and dip of shear planes

Area of rock alteration—Rocks are bleached and show thin reddish-brown net veins; occurs around some quicksilver deposits

Qy Quarry—at, fluorite

Hg Abandoned mine or quarry—Hg, quicksilver

Adit

Cr Prospect pit—Cr, chromite

M13 Fossil locality—See table 1

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REGIONAL GEOLOGY MAP

(SEIDERS, 1982)

OLD CREEK ROAD, APN'S: 046-031-033 & -043, CAYUCOS AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
6

PROJECT
SL10982-3

APPENDIX A

Boring Logs (Beacon)

Trench Logs

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 1
Auger Diameter: 4”
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Stiff			Dark brown sandy clayey silt	ML	B1
	SPT	8	↓		+2%	↓		
			↓			↓		
	SPT	34	Hard		-1%	Light brown sandy clayey shale	ML	B2
			↓			↓		
5	SPT	32	↓		-2%	↓		
			↓			↓		
			↓			↓		
			↓			↓		
			↓			↓		
10			↓			↓		
			↓			↓		
			↓			↓		
			↓			↓		
			↓			↓		
15						Total Depth @ 15.0’		
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered** SAMPLE TYPE
Time Depth SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 2
Auger Diameter: 4"
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Stiff			Dark brown sandy clayey silt	ML	B1
	SPT	5	↓		+2%	↓		
			Hard			Light brown sandy clayey shale	ML	B2
	SPT	35	↓		+1%	↓		
			↓			↓		
5			↓		+1%	↓		
			↓			↓		
			↓			↓		
			↓			↓		
			↓			↓		
10						Total Depth @ 10.0'		
15								
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered**
Time Depth

SAMPLE TYPE
SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 3
Auger Diameter: 4”
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Stiff			Dark brown sandy clayey silt	ML	B1
	SPT	39	Hard		-1%	Light brown sandy clayey shale	ML	B2
5	SPT	42			-3%			
10						Total Depth @ 10.0’		
15								
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered** SAMPLE TYPE
Time Depth SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 4
Auger Diameter: 4”
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Stiff			Dark brown sandy clayey silt	ML	B1
	SPT	35	Hard		+1%	Light brown sandy clayey shale	ML	B2
5	SPT	38			-1%			
10						Total Depth @ 10.0’		
15								
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered**
Time Depth

SAMPLE TYPE
SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 7
Auger Diameter: 4"
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Stiff			Dark brown sandy very clayey silt	ML	B3
	SPT	6	↓		+2%	↓		
			Hard			Light brown sandy very clayey shale	ML	B4
	SPT	38	↓		11%	↓		
15						Total Depth @ 15.0'		

GROUNDWATER **Not Encountered**
Time Depth

SAMPLE TYPE
SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 8
Auger Diameter: 4"
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Loose			Dark brown silty very clayey sand	SM-SC	A1
			Dense			Brown silty clayey sandstone	SM-SC	A2
	SPT	44			-3%			
5								
10								
15						Total Depth @ 15.0'		
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered**
Time Depth

SAMPLE TYPE
SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

LOG OF BORING
for:

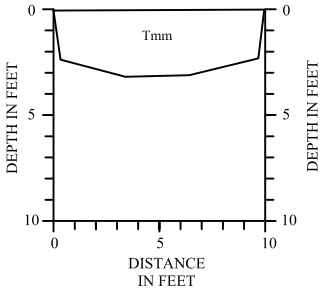
Site Location: San Luis Obispo County, CA Old Creek Road APN 046-031-033 F-101569
Driller/Helper:
Rig Type: Giddings #10 SCS BORING NO. 9
Auger Diameter: 4”
Date: April 26, 2017

Depth (ft.)	Blow Type	Blows per ft.	Drilling comments	Voids	Moisture	Description	USCS	Beacon Soil ID
0			Loose			Dark brown silty very clayey sand	SM-SC	A1
	SPT	5			+6%			
	SPT	33	Dense		+2%	Brown silty clayey sandstone	SM-SC	A2
5	SPT	40			+1%			
10						Total Depth @ 10.0’		
15								
20								
25								
30								
35								
40								
45								
50								

GROUNDWATER **Not Encountered**
Time Depth

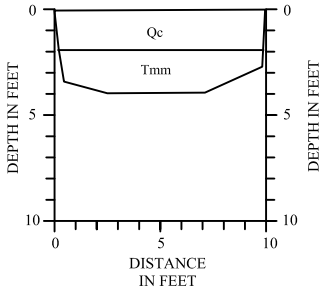
SAMPLE TYPE
SPT=Standard Penetration Test (uncorrected value, N/**corrected value, N**)

T-1
TD@3.0 FT.



Monterey Formation, light brown mudstone, slight to moderately weathered, thinly bedded, highly fractured

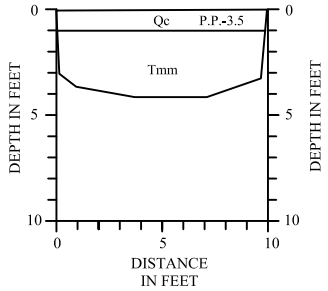
T-2
TD@4.0 FT.



Silty CLAY, light brown, slightly moist, colluvium

Monterey Formation, light brown to gray mudstone, slight to moderately weathered, highly fractured to friable

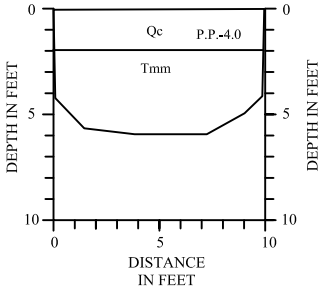
T-3
TD@4.0 FT.



Silty CLAY, light brown, slightly moist, colluvium

Monterey Formation, light reddish brown mudstone, highly fractured to friable

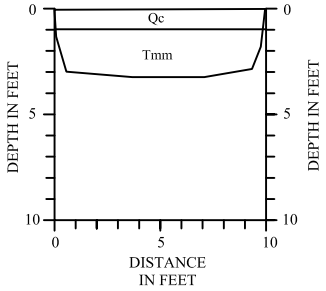
T-4
TD@6.0 FT.



Silty CLAY, dark to light brown, slightly moist, colluvium

Monterey Formation, white, severely weathered sandstone and mudstone, caliche throughout

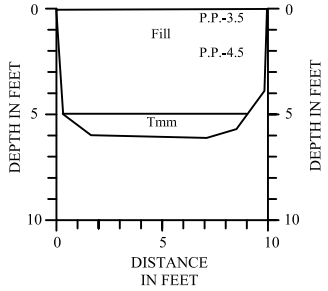
T-5
TD@3.0 FT.



Sandy CLAY, light brown, slightly moist, colluvium

Monterey Formation, light brown shale, highly fractured. slightly weathered, thinly bedded

T-6
TD@6.0 FT.



Sandy CLAY, dark brown, slightly moist, fill

Monterey Formation, light brown shale, highly fractured. slightly weathered, thinly bedded

NO SCALE

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TRENCH LOGS

OLD CREEK ROAD, APNs: 046-031-033 & -043
CAYUCOS AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

LOGS
1

PROJECT
SL10982-3