Preliminary Geotechnical Report

REVISED PRELIMINARY GEOTECHNICAL REPORT

For

Widening from Two-Lane Highway

To Four-Lane Highway

On

State Route 74 (Ortega Highway)

In Orange County

Between Calle Entradero And

The City of San Juan Capistrano/Orange County Line

12-086900

12-ORA-74-KP 1.7/2.99

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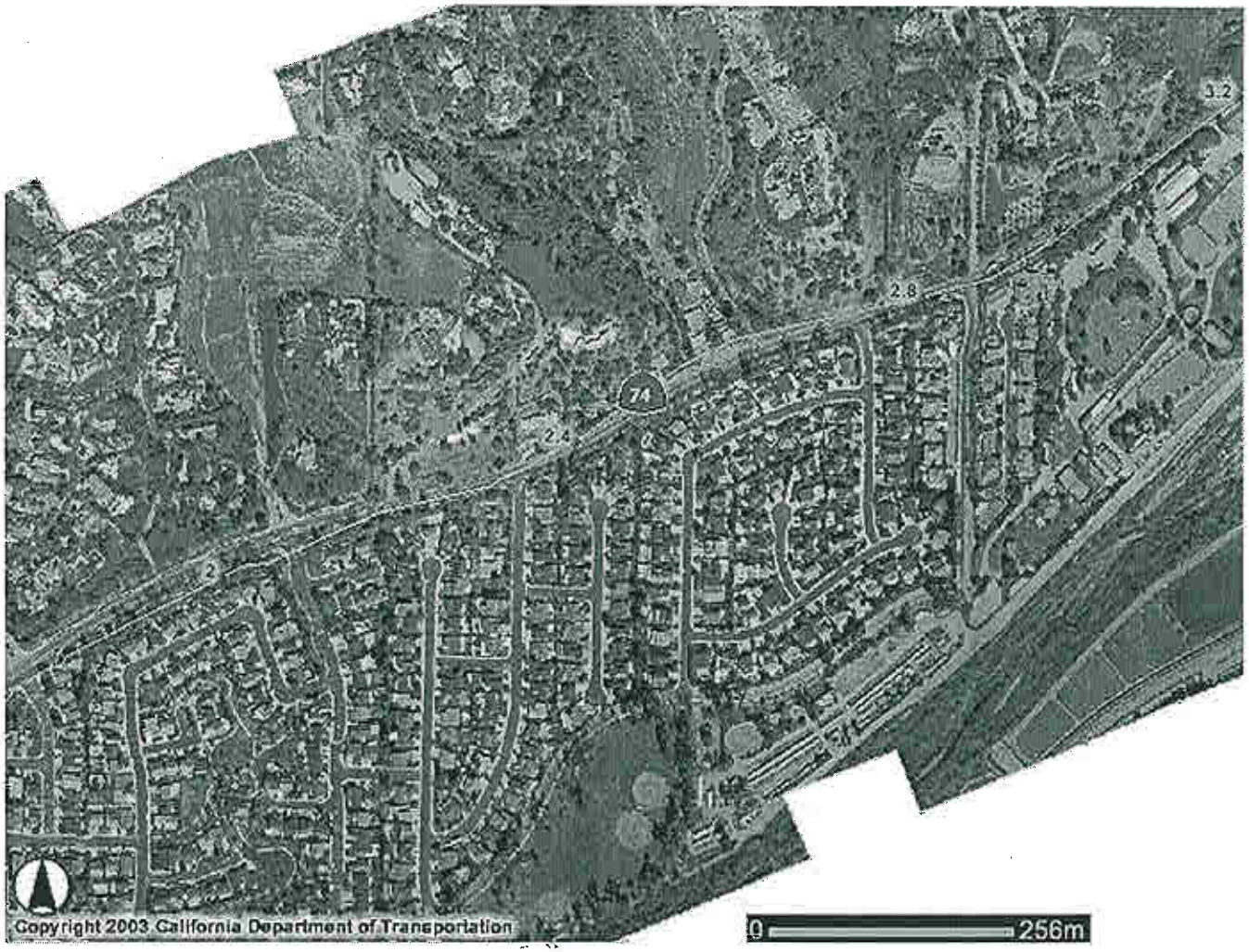
1.0 INTRODUCTION

Per your updated request of July 18, 2006, the Office of Geotechnical Design South 1, Branch D has prepared this Revised Preliminary Geotechnical Report (PGR) for the subject project. This report is limited to an existing literature review and site reconnaissance. For the design phase, a Geotechnical Design Report will be needed, which includes a more detailed site investigation and sampling program to verify site conditions and develop soil and rock parameters to be used for wall design.

The project location is in the City of San Juan Capistrano on State Route 74 between approximate kilopost 1.7 to 2.99 as shown on the Vicinity Map (Figure 1). The project is between Calle Entradero and the City of San Juan Capistrano/Orange County Line. The purpose of the project is to widen the roadway to four lanes with a painted median. There will also be two 1.5-m shoulders. Retaining walls will be necessary on the northern side of the roadway and sound walls will be required on the southern side of the roadway, adjacent to the existing soundwall.



2.0 PERTINENT REPORTS AND INVESTIGATIONS

District 12 has provided us with layout plans of State Route 74 dated March 8, 2006, which show the existing alignment and the proposed alignment. Our literature search yielded several reports and maps, which were utilized in preparing this report.

1) Caltrans, Preliminary Geotechnical Report for Widening from Two-Lane Highway to a Four-Lane Highway on State Route 74 in Orange County Between 0.03 km East of Via Cordova to 0.43 km East of La Pata Road, EA 12-086900, Prepared by OGDS-Branch E, July 2001.
2) Caltrans, Log of Test Borings for Retaining Wall #10, January 1998, Pratt, J.

3.0 DESCRIPTIONS OF EXISTING FACILITIES

The current alignment consists of one lane in each direction. Pavement is generally in good condition. Most of the northerly side of the alignment is in cut section.

4.0 PHYSICAL SETTING

4.1 Climate

Based on climate date available from between March, 1928 to September, 2005, at Laguna Beach, CA, approximately 13 km to the northwest of the project site, the average minimum temperature ranges from 43.1 in January to 59.6 in August. The average maximum temperature ranges from 65.1 in January to 78.0 in August. More than 80% of the average yearly rainfall occurs between the months of November and March. Table 1 provides the climatic summary and yearly updates are available from the Western Regional Climate Center (http://www.wrcc.sage.dri.edu/).

Table 1 – Climate Data for Santa Ana Fire Station (47888)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	65.1	66.0	67.0	69.0	70.8	72.9	76.4	78.0	77.5	74.5	70.3	66.1	71.1
Average Min. Temperature (F)	43.1	44.1	45.8	48.4	53.0	56.0	59.3	59.6	58.2	53.7	47.5	43.4	51.0
Average Total Precipitation (in.)	2.54	2.84	2.07	0.98	0.25	0.11	0.02	0.07	0.26	0.50	1.27	1.96	12.87
Average Total SnowFall (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

4.2 Topography and Drainage

The topography within the project limits generally slopes down from the north to the south. Existing cut and fill slopes typically have slope ratios between 1V:11H to 1V:1.2H. The roadway is at a very shallow grade and increases in elevation from the west to the east.

San Juan Creek crosses the existing alignment from the northeast to the southwest via Lower San Juan Creek Bridge at KP 3.67 and drains into the Pacific Ocean.

4.3 Prior Land Use

According to an aerial photograph taken in 1973, the northerly side of the existing alignment was primarily rural. Agricultural use was observed to the south of the existing alignment.

4.4 Man Made and Natural Features of Engineering and Construction Significance

There is an existing masonry block soundwall on the southern side of the roadway. This wall is to be kept in place, but an extension consisting of clear glass panels that extend above the existing wall will be necessary.

5.0 GEOLOGY

5.1 Regional Geology

The project is located in the Peninsular Ranges geomorphic province at the extreme southeastern margin of the Los Angeles Basin, and lies between the Santa Ana Mountains to the east and the San Joaquin Hills to the west. The Peninsular Ranges geomorphic province is characterized by northwest-southeast trending faults, which are roughly parallel to the San Andreas Fault Zone. This project lies between the Cristianitos Fault Zone at the east end of the project and the Laguna Canyon Fault Zone 6 km to the west. Neither of these faults is considered active.

5.2 Site Geology

The project is underlain by Quaternary alluvium, terrace, and river deposits (Morton, 1974). The subsurface material identified for a retaining wall project approximately 1.2 km to the west was classified as dense to very dense gravelly sand and sandy gravel with scattered cobbles and some areas of silt and clay. Capistrano Formation bedrock was hit below the alluvium and terrace deposits. A detailed subsurface investigation should be conducted to identify the subsurface material during the Geotechnical Design Report phase.

6.0 GEOLOGIC CONSIDERATIONS

6.1 Mineral Resources

There are no known mineral resources in the project area.

6.2 Petrology

The site is underlain by alluvium, silty sands and gravels derived from the San Joaquin Hills. The Capistrano Formation is expected to underlie the upper soil layers.

6.3 Aggregate/Construction Material Sources

There are no known sources of aggregate/construction materials in the project limits.

6.4 Excavation Characteristics

Any excavation necessary for the project can be expected to be carried out by conventional earth moving equipment.

6.5 Erosion

The majority of the materials within the project limits are granular in nature (i.e., sand and gravel). Slopes appear to be well vegetated. Since the cut faces will be protected by walls, no change in the rate of erosion is expected from this project.

6.6 Scour

Scour can occur when a current or flow of water removes mud or granular material from a stream or riverbed. The nearest waterway is the San Juan Creek, which crosses the alignment under the Lower San Juan Creek Bridge. The creek is not expected to pose any risk of scour to the proposed project.

6.7 Ground Water

6.7.1 Sources

The Sand Juan Creek runs through the project site. The creek is a likely source for ground water. The ground water level close to the bridge can be assumed to be similar to the water level in the creek. The investigation for Retaining Wall #10 encountered ground water at an elevation of 34.05 meters (approximately 15 meters below ground surface). Ground water levels should be measured during the investigation for the Geotechnical Design Report.

6.7.2 Effect on Ground water Regime

As the depth to ground water is not known at this time we cannot determine the effect this project will have on the ground water regime, however it is thought to be minimal.

6.8 Seismicity

The site is located in a seismically active area. The geologic processes that have caused earthquakes in the past can be expected to continue. The San Joaquin Hills (SJH) fault with a MCE =7.0 is the controlling fault for this site. This is a reverse/thrust fault located about 9.4 kilometers from the site. The estimated PBA due to a M7.0 event associated with this fault is about 0.5g. The site is underlain by deep soil; the corresponding design PGA should be about 0.42g.

The closest active fault as specified by the Alquist-Priolo Earthquake Fault Zoning Act (APEFZA) is the Whittier-Elsinore Fault. This fault trends in a northwest-southeast direction. A segment of the fault has been zoned active under APEFZA almost 40 km northeast of the project site. Since the project site is not within the confines of the APEFZA zone, the risk of surface rupture at the site is low.

6.9 Tsunamis/Seiches

A tsunami is defined as a gravitational sea wave produced by any large-scale disturbance of the sea floor. Due to the distance from the shore and elevation of the project site, the probability of a tsunami occurring is considered to be low.

A seich is defined as a free or standing wave oscillation of the water surface of an enclosed basin. There is no possibility of this phenomenon expected at this project site due to the large distance from an enclosed body of water.

6.10 Geologic Structure

Alluvium underlies the project. Depth to "bedrock-like" material is not known at this time and will have to be determined during the geotechnical investigation.

6.11 Rockfall and Landslide

Portions of the project area fall within zones that have been identified as being at an increased risk for rockfall and landslides. Due to the low height of rock slopes, the possibility of rockfall and landslides is considered to be low. The project will not increase the risk of rockfall or landslide.

6.12 Geothermal Activity

No known geothermal activity has been identified within the project limits.

6.13 Snow Avalanches

Due to the climate of the project area, the potential of snow avalanches is considered to be none.

7.0 GEOTECHNICAL ENGINEERING CONSIDERATIONS

7.1 General

The geotechnical and geologic aspects discussed in this section are preliminary and are based on information available from other published sources. However, this section discusses the geotechnical and geo-hydrological factors that are critical for the proposed widening and retaining wall. These factors will be required to be studied in detail during the final design stage.

7.2 Liquefaction

Portions of the site are within zones that have been identified as being at an increased risk of liquefaction. The project-specific risk of liquefaction should be addressed in the Geotechnical Design Report.

7.3 Preliminary Foundation Recommendations

Several possibilities exist for the types of retaining walls that may be used for this project. The options listed below are based on preliminary data. Some of these wall types may need to be deleted or amended based on a future geotechnical study. Detailed analysis and design will be provided in the Geotechnical Design Report (see Section 10.1, Future Scope of Work). Tiered and/or plantable walls were not considered due to the excessive right-of-way, cost, and maintenance issues. Plantable modular block walls are also not currently approved by Caltrans, due to the probable inadequate seismic performance.

1.) Type 1 Retaining Wall – A type one retaining wall on spread footing would work in this area. More earthwork is involved for this type of structure because a 1:1 slope is required to be excavated from the back of the spread footing, which must be backfilled and recompacted after construction. Alternatively, temporary shoring or a temporary soil nail wall may be possible instead of excavating a 1:1 back cut. The spread footing of a type 1 wall will take up more right-of-way than a soldier pile or secant pile wall.

2.) Soil Nail Wall –This type of wall is usually less expensive to build than a type 1 wall. Also, a soil nail wall can be built to conform to the landscape, i.e., it does not need to be vertical, which may make it the most aesthetically pleasing option. However, the length of the nails (typically 1.5 times the wall height) requires the most right-of-way of the retaining wall options, and decreasing the slope from vertical would also increase the amount of right-of-way needed. The amount of additional right-of-way, if any, can be more adequately addressed in the GDR, once the nail lengths have been calculated.

3.) Soldier pile wall – This type of wall is constructed by placing piles 6-10 feet apart with lagging spanning the distance between the piles. Lagging may be omitted if the piles are closely spaced and the soil to be retained is cohesive or cemented. Erosion control measures are necessary without the lagging. This type of wall requires almost no additional

right-of-way besides what is taken up by the wall, and the temporary right-of-way needed for construction.

4.) Secant/tangent wall – This type of wall is very similar to the soldier pile wall in all respects, but the piles are touching negating the need for any lagging.

During the GDR phase, the permanent right-of-way, temporary right-of-way for construction must be taken into consideration. Also, the possibility of future land use on the uphill side should be taken into consideration.

It is our understanding that the City of San Juan Capistrano and local residents are very concerned about the aesthetic issues. The type of wall that is chosen must have some sort of aesthetic treatment applied that makes it look like natural material. This will most likely be some form of hand-textured or stamped shotcrete. Staining the shotcrete before or after placement will also be necessary. This type of aesthetic treatment is suitable for any of the walls mentioned above.

The sound walls must be constructed immediately adjacent to the existing property walls, on the highway side. The walls are to consist of materials that will allow penetration of natural light and maintain view corridors of the existing highway. This necessitates a nonstandard design. The proposed alternative is clear acrylic or glass panels supported by metal rods driven into the ground or placed in holes backfilled with cement. The wall design and foundation type will be further refined in the Geotechnical Design Report.

8.0 CORROSION

The corrosivity of soils at the site is unknown. Samples should be tested for corrosivity during the final geotechnical investigation.

9.0 HAZARDOUS WASTE IMPACT

No hazardous waste materials are expected to be encountered within the project site. Should the District Hazardous Waste Unit discover such materials, proposed remedial measures should be reviewed by GDS, since remedial measures may have potential geotechnical implication.

10.0 PRELIMINARY RECOMMENDATIONS

10.1 Future Scope of Work

- A geotechnical investigation program to clarify the engineering characteristics of the soils at the site. Borings and/or cone penetrometer tests (CPT) should be spaced no more than 90 meters apart. Borings should be spaced more closely in areas where a change in the underlying materials is expected. Ground water should be measured during drilling if possible, or via piezometers placed in one or more drilled holes.

- Laboratory testing of soil samples retrieved during the investigation. The laboratory testing may consist of the following test methods:

  - Sieve/Mechanical Analysis – CTM 202, 203
  - Direct Shear – ASTM D3080
  - Plasticity Index – CTM 204
  - Corrosion – CTM 417, 422, 617
  - Consolidation of Soils – CTM 219

- Bearing capacity and design recommendations are to be provided.

- Preparation of a GDR (Geotechnical Design Report) per the latest Caltrans guidelines.

10.2 Excavation Techniques

Excavation is expected to be accomplished by conventional techniques for the entire section and no special treatment of the subgrade is necessary.

10.3 Dewatering

Dewatering is not anticipated during construction since deeper ground water table is expected. However, ground water table at the site will not be determined until the subsurface investigation during the design phase.

10.4 Summary and Conclusions

The following is a summary of our observations based on limited field studies and survey of available literature. The reported numerical values for design parameters will need to be updated based on further detailed geotechnical/geologic investigation that would include subsurface exploration, sampling and laboratory testing.

- The subsurface soils encountered at the site are expected to be alluvium, silty sand and gravel.
- The Maximum Credible Earthquake would be a 7.0 magnitude earthquake on the Newport-Inglewood fault zone. The peak site acceleration would be estimated to be 0.3g.
- Ground water table is not known at this time beneath the project site. Liquefaction potential is considered to be low but should be addressed in more detail in the GDR
- Several retaining wall options are considered feasible at the project site. Aesthetics, cost, and right-of-way must be balanced when choosing an alternative.

11.0 REFERENCES

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