GROUP DELTA CONSULTANTS

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Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

Project No. I-181-03
January 22, 1999

BOYLE ENGINEERING CORPORATION
7807 Convoy Court, Suite 200
San Diego, California 92111

Attention: Mr. Clark Fernon, Project Manager

DRAFT TYPE SELECTION REPORT
RANCHO SANTA FE FARMS OVERCROSSING
STATE ROUTE 56
SAN DIEGO, CALIFORNIA
11-SD-56-KP 3.3 TO 10.5, EA 172820

Gentlemen:

We are transmitting five copies of our preliminary geotechnical type selection report for the Rancho Santa Fe Farms Overcrossing, on the Middle Segment of the proposed State Route 56 alignment in San Diego, California. Laboratory testing is currently underway. A final Type Selection Report will be issued at the completion of the laboratory testing. Based on our assessment of the site conditions, we do not anticipate significant changes in our conclusions.

We appreciate the opportunity to be a part of your design team for this project. If you have any questions or require additional information, please call.

Very truly yours,
GROUP DELTA CONSULTANTS, INC.

REGISTERED PROFESSIONAL ENGINEER
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DRAFT TYPE SELECTION REPORT
RANCHO SANTA FE FARMS OVERCROSSING
MIDDLE SEGMENT, STATE ROUTE 56
SAN DIEGO, CALIFORNIA
11-SD-56-KP 3.3 TO 10.5, EA 172820

1.0 INTRODUCTION

1.1 Background

This Type Selection Report is based on a geotechnical investigation performed by Group Delta Consultants, Inc. (GDC) to provide recommendations for the foundation design of the Rancho Santa Fe Farms Overcrossing. The bridge structure is part of the Middle Segment of the proposed State Route 56 (Ted Williams Freeway), extending from Rancho Penasquitos to Carmel Valley, in the City of San Diego, California (See Site Location Map, Figure 1).

The County and City of San Diego and California Department of Transportation (Caltrans) District 11, have authorized improvements of the Middle Segment of State Route 56. The development limits for the overall Route 56 improvement project extend from Interstate Highway 15 (Escondido Freeway) in Rancho Penasquitos to Interstate Highway 5 (San Diego Freeway) in Carmel Valley. The Middle Segment contains 7 proposed bridges, and extends from metric Station 45+13.527 on the west (in Carmel Valley) to metric Station 109+00 on the east (near Rancho Penasquitos).

Our understanding of the proposed project is based on the following drawings provided by Boyle Engineering: 1:2000 scale plan and profile entitled "SR-56 Selected Alignment," dated August 10, 1998, and "Planning Study" drawings for the proposed bridges dated 1-98 through 9-98.

1.2 Existing Facilities and Proposed Improvements

1.2.1 Existing Facilities

The site of Rancho Santa Fe Farms Overcrossing is located where the proposed SR-56 alignment will pass under the alignment of existing 2-lane Rancho Santa Fe

Farms Road. The existing roadway is paved with AC. Existing development at the site consists of two nurseries, which use the area surrounding the proposed overcrossing for growth and storage of plants, including several greenhouses. A residential development, consisting of luxury single family residences, is located about 200 m south of the overcrossing. Water and sewer lines are buried beneath the pavement on the east side of Rancho Santa Fe Farms Road, and numerous irrigation lines are buried off the sides of the roadway. Measures to protect-in-place or relocate existing utilities will be required prior to bridge construction. The Planning Study General Plan for the bridge and a Topographic Map of the bridge site are presented in Figures 2 and 3, respectively.

1.2.2 Proposed Bridge

The proposed improvements consist of Rancho Santa Fe Farms Overcrossing, where Rancho Santa Fe Farms will pass over the proposed Route 56 alignment (Figure 2, General Plan). Centerline stationing and elevations at the intersection are as follows: SR-56 (STA. 82+46.774, El. 90.009 m), Rancho Santa Fe Farms (STA. 2+32.995, El. 100.401).

The bridge will be a two-span, cast-in-place prestressed concrete box-girder structure supported by abutment fills on the north and south and a 2-column central bent in the median of SR-56. Span lengths are currently planned at 36.728 m for the northern span, and 41.790 m for the southern span. The bridge deck measures 78.518 m along the centerline of Rancho Santa Fe Farms, and is 15.760 m wide. The alignment of Rancho Santa Fe Farms will be skewed relative to the SR-56 alignment at about 18 degrees. Abutment slopes are proposed at 1:1.5 (vertical to horizontal) , with heights on the order of 8 to 10 m. The upper portion of the slope at both abutments will be fill, and the lower portion will be cut. Slope paving is not indicated on the Planning Study drawings.

We anticipate that Abutment 1 and Abutment 3 may be supported on spread footings founded in the abutment fills. Bent 2 may be supported on spread footings founded in dense formational soils. Details of our preliminary foundation recommendations are presented in Section 4.1 of this report.

1.2.3 Design Foundation Sizes and Loads

No data is available on foundation loads at this time.

1.2.4 Existing and Proposed Cut/Fill Slopes

Fill was placed at the overcrossing site to allow existing Rancho Santa Fe Farms Road to span an east-west trending alluvial drainage (Figure 3). A small descending 1:2 fill slope, with maximum height on the order of 3 m, exists along the southeast edge of the proposed bridge. This slope will be removed by cuts during grading of SR-56.

A cut slope, associated with construction of the southerly adjacent subdivision, exists about 150 meters southwest of the proposed bridge. The slope has a maximum height of about 4 to 5 meters, an inclination of about 1:4.5, and exposes native formational material. The slope is landscaped and heavily vegetated, and shows no signs of distress or erosion.

The fill-over-cut slopes to be constructed below the abutments are proposed at a 1:1.5 (Vertical: Horizontal) gradient, and will be about 8 to 10 m in height. The lower 3 to 4 m of slope will be cut exposing 1 to 2.5 m of existing fill soils underlain by native formational materials. Slope paving is not indicated on the current plans. Mainline SR-56 slopes to the east and west of the bridge will be cut slopes inclined at 1:2.

2.0 FIELD AND LABORATORY INVESTIGATION

2.1 Field Exploration Program

To investigate the subsurface conditions at the bridge site, three 20.3 cm diameter hollow-stem auger borings were drilled on December 31, 1998, to depths between 9.4 and 16.9 m below existing grade. The location of these borings are presented in Figure 3. Bulk and drive samples were taken during the drilling operation at selected depths for identification and laboratory testing. All drive samples were advanced with a 63.5 kg hammer dropped from a height of 76.2 cm. The sampler

penetration resistance, or number of blows, to advance the sampler 30 cm was measured and recorded on the boring logs to assess the in-place density or consistency of the site soils.

Intact samples were obtained with a 6.15 cm I.D., 7.62 cm O.D., California Ring Drive Sampler. Representative samples were obtained from cuttings from the auger as well as a Standard Penetration Test (SPT) drive sampler. Samples were visually identified and classified in the field in accordance with the Unified Soil Classification System (USCS), placed in moisture tight containers, labeled, and taken to the laboratory for further inspection and testing. Pocket penetrometer tests were performed on cohesive ring samples. Boring logs are presented in Appendix A.

2.2 Laboratory Testing Program

Selected samples were tested in the laboratory to measure relevant engineering properties. Testing was performed in general accordance with applicable Caltrans testing methods, where appropriate. The following types of tests were performed:

- Moisture Content and Dry Density
- Grain-Size Distribution
- Liquid and Plastic Limits
- Direct Shear
- Corrosivity (pH, minimum resistivity, Sulfates, Chlorides)
- Pocket Penetrometer

The results of the laboratory tests are presented in Appendix B. (To be completed)

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Climatic Conditions

The project is located in the Carmel Valley area of the City of San Diego, California. Elevations in the vicinity of the Overcrossing range from approximately 75 to 100 m above mean sea level (MSL). The annual rainfall ranges from approximately 30 to 38 cm with over 95% of all precipitation occurring between October and May. The area has a semi-arid climate with average high temperatures during the year ranging

from 15 to 21 degree C during the winter months to 27 to 32 degree C during the summer months. Average lows are generally 0 to 7 degrees C during the winter months, to 10 to 17 degrees C in the summer. Soil freeze/thaw conditions are not known to exist within the project alignment.

3.2 Subsurface Conditions

3.2.1 Geology and Soil Conditions

The project site lies within the Peninsular Ranges Geomorphic Province of California, in the coastal plain area of San Diego. The mesa topography of the coastal plain is characterized by low hills and ridges dissected by intervening alluvial canyon drainages. This area is generally underlain by terraced coastal sedimentary formations of Quaternary to Tertiary age. These formations are overlain locally by Holocene (recent) overburden deposits such as alluvium, slopewash, and man-placed fill soils.

The proposed bridge will follow the alignment of existing Rancho Santa Fe Farms Road, as shown in Figure 3. Test borings indicate that the bridge site is underlain by about 1.5 to 3.2 m of man-placed fill likely associated with grading of the existing roadway. The fill soils at the bridge site are underlain by Eocene sedimentary formational material of the Torrey Sandstone (Tt). The geologic units encountered are described below.

3.2.1.1 Fill (Qf)

Our test borings encountered fill soils to depths of 1.5 to 3.2 m below existing grade at the bridge site. Fill thickness is about 1.5 to 1.6 m at Abutments 1 and 3, deepening to about 3.2 m at Bent 2. Presumably this fill was placed during roadway construction, and compaction data should be available from the City of San Diego.

The fill soils are generally characterized as moist, medium dense to dense, mottled light brown /gray / orange, clayey sands (SC), with a trace of gravel. Equivalent Standard Penetration Test (SPT) blowcounts measured in the fill range from 20 to 35, with an average value of 26.

3.2.1.2 Torrey Sandstone (Tt)

Torrey Sandstone was encountered in our test borings at depths between 1.7 and 3.2 m below existing grade, corresponding to El. 95.3 m at Abutment 1, El. 92.8 m at Bent 2, and El. 93.8 m at Abutment 3. This unit is characterized as very dense, moist, mottled light brown/ gray/ orange, clayey sand (SC), locally with weak to moderate cementation, and occasional thin interbeds (<0.3 m) of hard, moist, olive-gray, silty clay (CL). Equivalent SPT blowcounts measured within the Torrey Sandstone were generally greater than 60 blows per 0.3 meters. The bottom of footing at Bent 2 will be founded within this unit.

3.2.2 Groundwater

Groundwater was not encountered in our test borings. Due to variations in rainfall and surface infiltration, it is possible that perched groundwater conditions could be encountered locally within the fill or formational soils.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Proposed Foundations

We anticipate that Abutments 1 and 3 will be supported on spread footings founded in the abutment fill, with footing elevations at about El. 97.5 m at Abutment 1 and El. 94.5 m at Abutment 3. We anticipate that Bent 2 may be supported on spread footings founded in formational soils near El. 88.5 m.

Based on our field exploration, the subsurface conditions at the bridge site consist primarily of medium dense to dense compacted fill underlain by very dense clayey sands with interbeds of hard overconsolidated clays. From a foundation standpoint, the formational soils where encountered at and below the proposed foundation elevations will provide good bearing support. It is our opinion that the abutment foundations can be supported in compacted fill, both existing and new, and the bent foundations can be supported in the formational materials.

For footings founded in formational materials, the base of the excavation should be clean and free of loose debris, and the upper 0.15 m scarified and recompacted.

Minor dewatering of the footing excavations may be required during construction, if perched water is found. Bent footings on near-level ground should have a minimum embedment of 1.5 m below lowest adjacent grade to provide improved bearing, lateral, and uplift capacity.

For bent footings supported in the formational soils as recommended, we recommend a preliminary net allowable bearing capacity of 480 kPa.

For abutment footings supported in compacted fill, the compacted fill placed within 1 m below the bottom of the footings should not contain materials larger than 76 mm across, and should be compacted to a minimum relative compaction of 95%. The abutment footings should have a minimum setback of 2 m from the face of the slope. The bottom of footing should be embedded a minimum of 1.5 m below the slope face directly above the outside edge of footing to provide improved bearing, lateral, and uplift capacity. All fills under foundations or behind abutment walls should be compacted in accordance with Caltrans Standard Specifications for structural backfill.

For abutment footings adjacent to 1:1.5 slopes, we recommend an allowable net bearing capacity of 215 kPa, assuming minimum embedment as described above. If additional bearing capacity is desired, the footings may be deepened. For each additional 0.3 m of embedment below the minimum of 1.5 m, the allowable bearing pressures may be increased by 25 kPa.

4.2 Settlement

Both abutments are anticipated to be supported in 1 to 3 m of fill over formational soils. We estimate the settlement of the abutment footings to range between 1.2 cm and 3 cm. Settlement of footings is expected to occur rapidly, and the majority of settlement should occur shortly after application of the structural loads. The bent footing is founded in formational soils and the settlement is expected to be less than 1.2 cm. Total differential settlement between the abutment and bent footings is on the order of 1.8 cm. Post-construction differential settlements between bents and abutments are estimated to be less than 1.25 cm. These settlement estimates

assume that the footings have been designed for the allowable bearing pressures given in Section 4.1.

4.3 Seismic Design Considerations

4.3.1 Ground Surface Rupture

The site is not located within the Alquist Priolo Fault zone. No faults were discovered on the site during our field investigation. Faults are not mapped as crossing the site or projecting towards the site in the geologic literature reviewed. As such, the possibility of ground rupture at the site is extremely remote.

4.3.2 Seismic Shaking

The site is located in a moderately-active seismic region of southern California that is subject to significant hazards from moderate to large earthquakes. Ground shaking due to nearby and distant earthquakes should be anticipated during the life of the facilities. The controlling fault for this project is the Rose Canyon Fault, located a distance of about 12 km from the site. The fault has a maximum credible earthquake magnitude of 7.0. Based on the Caltrans 1996 California Seismic Hazard Map, we recommend using a PGA of 0.3g for design. Depth to bedrock may be taken as 3 to 25 meters.

Response spectra at the bridge site should be selected in accordance with Applied Technology Council (ATC-32: Improved Seismic Design Criteria for California Bridges: Provisional Recommendations, 1996) for soil profile Type C, with an applicable earthquake magnitude of 7.25 $\pm$0.25, and a PBA of 0.3 g (Figure R3-5 of ATC-32).

4.3.3 Secondary Seismic Effects

Secondary seismic effects for any site include liquefaction, seismic compaction, settlement, and slope instability.

Liquefaction involves a sudden loss in strength of a saturated, cohesionless soil (predominantly sand) caused by cyclic loading such as an earthquake. This results in temporary transformation of the soil to a fluid mass. Typically, liquefaction occurs in

areas where groundwater is less than 9 m from the surface and where the soils are composed predominantly of poorly consolidated fine sands. Due to the lack of permanent groundwater table, and fines content and relative density of the soils at the site, the risk of liquefaction at the site is considered extremely remote.

Settlement of dry sands can be caused by the cyclic loading of an earthquake. A procedure for estimating the probable settlement of dry sands was developed by Seed and Silver (1972). This procedure was reviewed by Tokimatsu and Seed (1987). Based on this procedure and the relative density of the soils at the project site, the settlement of dry sands at the site are not expected to be significant.

Slope instability, in the form of landslides and mudslides, is a potential adverse impact associated with seismic shaking. The proposed 1:1.5 fill-over-cut slopes at the abutments, if properly compacted, keyed at the toe, and benched into competent materials, are anticipated to be stable under seismic shaking.

4.4 Excavation Characteristics

Based on drilling characteristics and our experience in the area, the formational soils underlying the site may be excavated with medium to heavy effort by conventional heavy-duty grading equipment. The planned excavations may encounter minor to moderate amounts of cemented concretions within the formational soils which may require localized heavy ripping effort. Minor perched water conditions could be encountered in excavations.

4.5 Permanent Slopes

Unpaved slopes, about 8 to 10 m high, with a gradient of 1:1.5 are planned below the bridge abutments, while 1: 2 unpaved slopes are planned for mainline Route 56 slopes. The proposed fill-over-cut slopes at the abutments are anticipated to be grossly stable, if fills are keyed at the toe and benched into the competent formational soils or existing compacted fill. Unpaved slopes will be subject to surficial erosion and rilling if subjected to heavy rainfall.

Planting of the unpaved slopes with appropriate, drought tolerant vegetation (using minimal irrigation) should be done as soon as possible after excavation / fill placement to guard against surficial erosion. Care should be taken not to allow surface water to flow over the slope face in an uncontrolled manner.

4.6 Scour

The bridge site is not within an alluvial drainage, therefore, scour is not an issue.

4.7 Soil Corrosivity

To be submitted later.

5.0 REFERENCES

California Department of Conservation, Division of Mines and Geology, 1994, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps, Special Publication 42.

Caltrans, 1995, Standard Specifications, Business, Transportation and Housing Agency.

Mualchin, L., 1996, California Seismic Hazard Map (1996), Based on Maximum Credible Earthquakes (MCE).

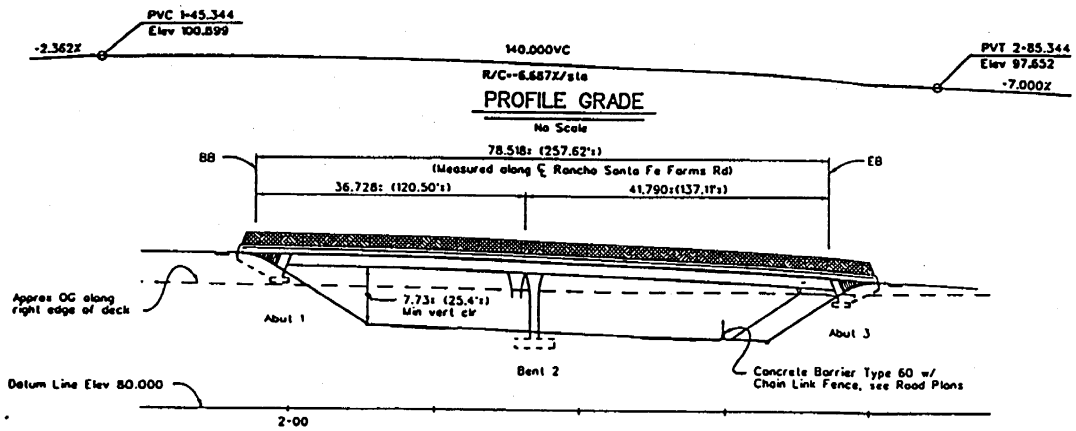
Seed, H.B. and Silver, M.L., 1972, Settlement of Dry Sands During Earthquakes, J. of Soil Mech. Found. Div., ASCE, Vol. 98, No. 4, pp. 381-397.

Tokimatsu, K. and Seed, H.B., 1987, Evaluation of Settlements in Sands Due to Earthquake Shaking, J. of Geotech. Eng. Div., ASCE, Vol. 113, No. 8.

6.0 LIMITATIONS

The report, exploration logs, and other materials resulting from Group Delta's efforts were prepared exclusively for use in designing the proposed project. The report is not intended to be suitable for reuse on extensions, or modifications of the project, or for use on any other development, as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only.

Our recommendations and evaluations were performed using generally accepted engineering approaches and principles available at this time, and the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical engineers practicing in this area. No other representation, either expressed or implied, is made.

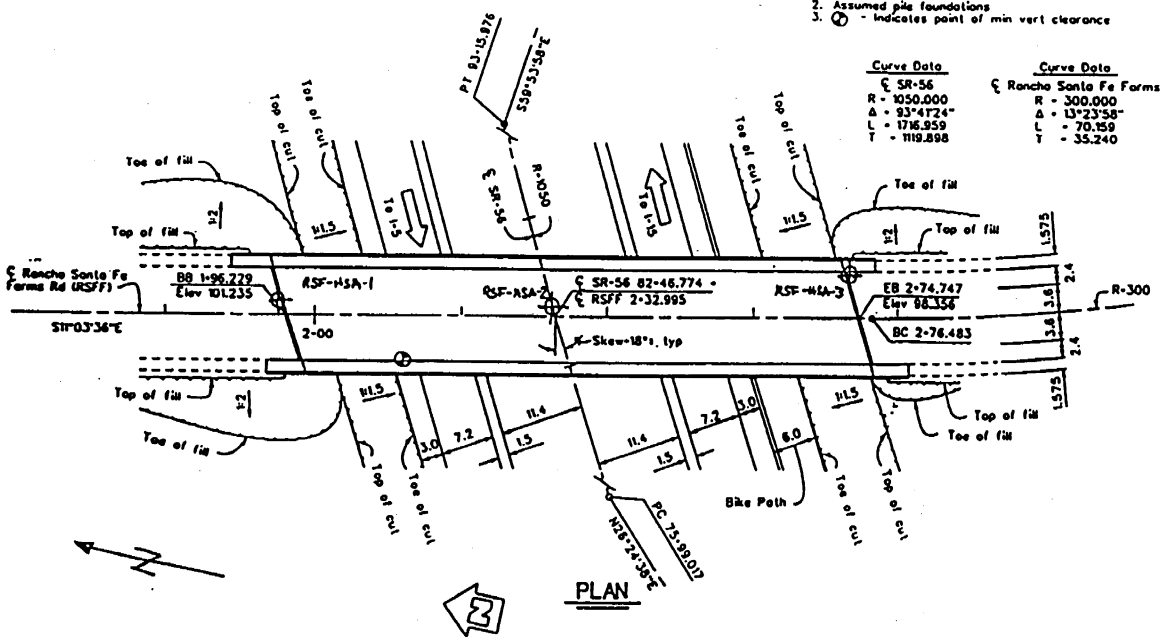


PROFILE GRADE

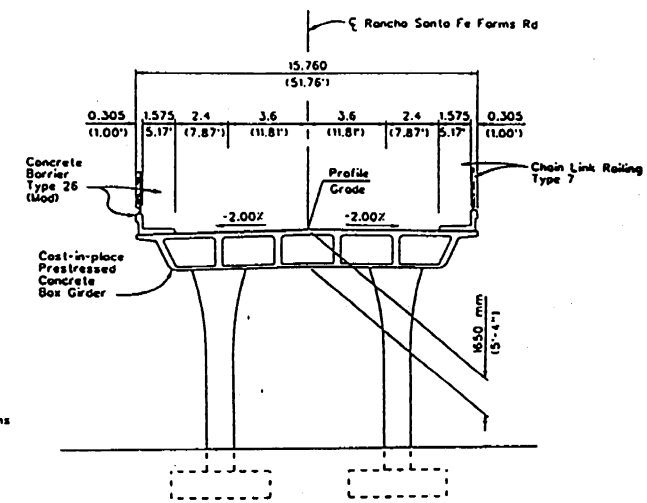
No Scale

ELEVATION

Notes:
1. No traffic at the site
2. Assumed pile foundations
3. ⊗ - Indicates point of min vert clearance



PLAN



TYPICAL SECTION

1 : 200

Date of Estimate	9/98
Structure Depth	= 1.650 m
Length	= 78.520 m
Width	= 15.76 m
Area	= 1,237 sq m
Cost /sq m including 10% Mobilization & 25% Contingency	= $ 915
(Cost / sq ft)	= $ 85
Total cost	= $ 1,131,855

McDANIELENGINEERING

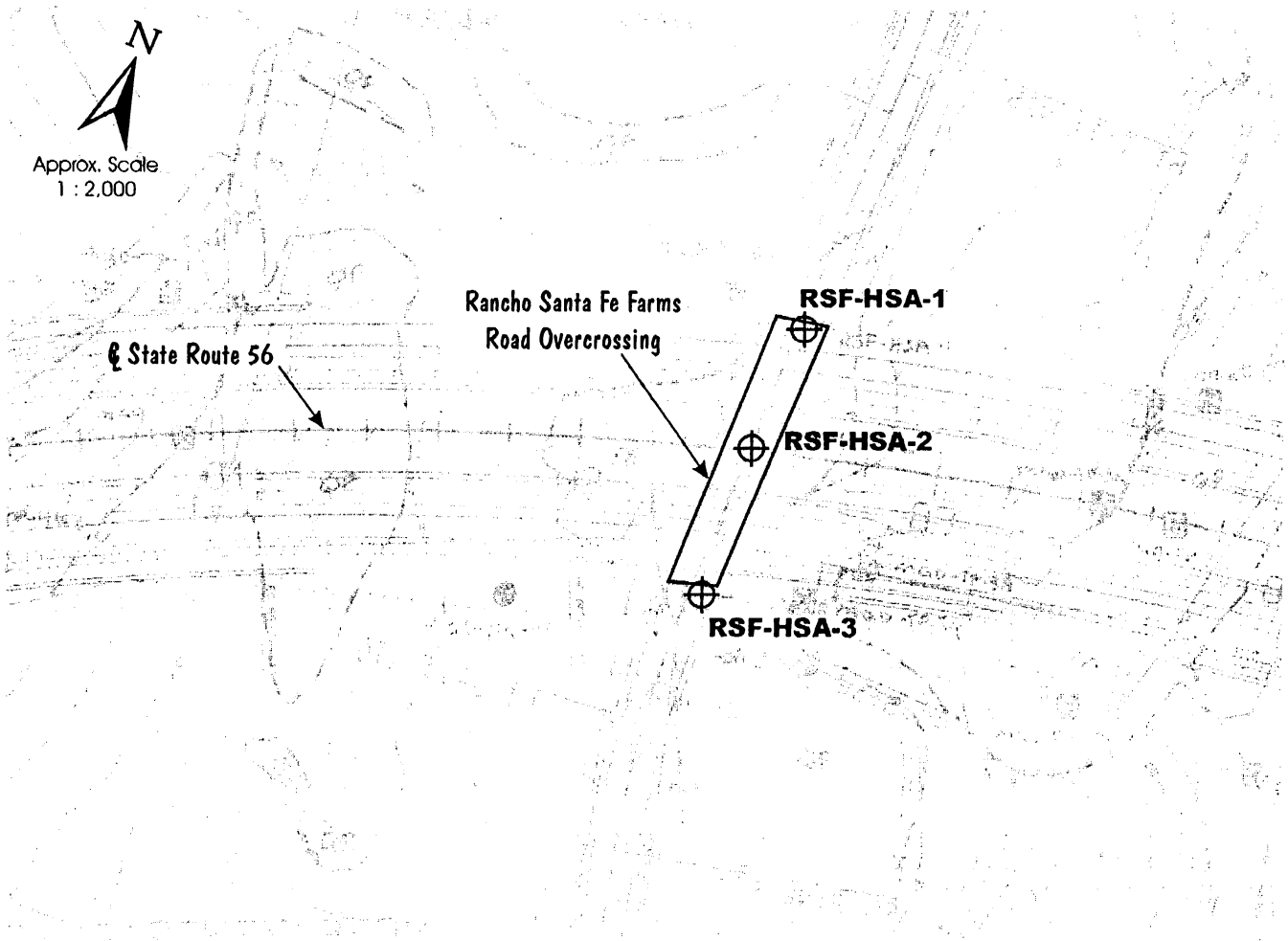
GROUP DELTA

GDC Project No. I-181

State Route 56
Middle Segment Bridges
Rancho Santa Fe Farms OC

GENERAL PLAN

Figure 2



LEGEND

- ⊕ Hollow Stem Auger Boring
- Bucket Auger Boring
- ⊠ Backhoe Test Pit

Reference:
The base map is from Boyle Engineering
SR-56 Selected Alignment, 8-10-1998

GROUP DELTA CONSULTANTS

GDC Project No. I-181
State Route 56
Middle Segment Bridges
Rancho Santa Fe Farms Rd. OC
EXPLORATION LOCATION MAP
Figure 3

Appendix A

FIELD INLET.

(1)

BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 96.8 M	BORING NO.: RSF-HSA-B-1
DRILL RIG: CME 85	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	

				DESCRIPTION	N$_{SPT}$
				M-DENSE, DAMP, MOTTLED LT. BROWN/GRAY/ORANGE CLAYEY SAND (SC) FILL W/TRACE GRAVEL	NO SURFACE SAMPLE DUG DOWN 5' TO LOCATE IRRIGATION LINE.
5	1	CA	25/60	V-DENSE, DAMP, MOTTLED LT GRAY-BROWN/ORANGE CLAYEY SAND (SC) TT FORMATION	78
10	2	SP	20/30/40		70
15	3	CA	20/60		>80
20	4	SP	30/50	BECOMES BROWNER IN COLOR	>100

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 2181-3 | SR56 | FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 96.8m	BORING NO.: RSF-HSA-1
DRILL RIG: CME 95	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP: 30"	

				DESCRIPTION	
	4	SP	30/5"	V. DENSE, DAMP, MOTTLED BROWN/ORANGE/GRAY CLAYEY SAND (SC) TT/TD FORMATION	7100
25	5	CA	70/6"		7100
30	6	SP	26/5.5"	HARD, DAMP, OLIVE GRAY, SILTY CLAY (CL) TT/TD FM	7100
				BOH @ 31' NO GW	
35					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I181-3	SR56	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: CAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 96.0m	BORING NO.: RSF-HSA B-2
DRILL RIG: CME 85	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP:	

			DESCRIPTION	N spt
			RSF	
1	CA	10/10/20	M. DENSE TO DENSE, DAMP, MOTTLED BROWN/GRAY/ ORANGE, CLAYEY SAND (SC) FILL	20
			+/- TRACE OF GRAVEL	
2	SP	16/23/10		35
3	CA	10/39/50	V. DENSE, DAMP, MOTTLED BROWN/GRAY/ORANGE CLAYEY SAND (SC) TT/TD FORMATION	54
4	SP	30/100		>100
5	CA	6"/6"		>100

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.:		FIGURE NO.:
181-3	SR56	

GROUP DELTA CONSULTANTS, INC.
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BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 96.0 m	BORING NO.: RSF-HSA 2
DRILL RIG: CME 85	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP: 30"	

				DESCRIPTION	
				RSF -	
20	5	CA	60/6"	V. DENSE, DAMP, MOTTLED BROWN/GRAY/ORANGE CLAYEY SAND (SC) TT/TD FORMATION	7100
25	6	SP	30/6"		7100
					>100
30	7	CA	70/6"	INCREASED CLAY & SILT.	
					7100
35	8	SP	30/6"		
					7100
40	9	CA	80/6"		

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.:		FIGURE NO.:
1191-3	SR56	

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 96.0 m	BORING NO.: RSF-HSA 2
DRILL RIG: CME 85	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	

DESCRIPTION

RSF

40	9	CA	80	V. DENSE, DAMP, MOTTLED BROWN/GREY/ORANGE CLAYEY SAND (SC) T/TD FORMATION	7100
				HARD DRILLING CEMENTED ZONE	
45	10	SP	55/6"		7100
				HARD DRILLING CEMENTED ZONE	
				V. DENSE, DAMP, MOTTLED BROWN & GREY CLAYEY SAND AND OLIVE GREY CLAY (SC/CL)	
50	11	SP	50/6"	CEMENTED ZONE NO RECOVERY W/CAL SWITCHED TO SPT.	7100
55	12	CA	50/4"		7100
				BOH @ 55'4" NO GW	

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-1813 SRS6 FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 95.5 M	BORING NO.: RSF-HSA B-3
DRILL RIG: CME 85	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP: 30"	

			DESCRIPTION	
1	CA	10/15/19	DENSE, DAMP, MOTTLED BROWN/GRAY/ORANGE, CLAYEY SAND (SC) FILL	23
2	SP	30/35/30	V. DENSE, DAMP, MOTTLED BROWN/GRAY/ORANGE CLAYEY SAND (SC) T_T/T_D FORMATION	65
3	CA	16/9	SAME	>65
4	SP	28/62	OCCASIONAL CLAY CHUNKS	>100
5	CA	30/65		>85

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1181-3	SR56	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: GAS	DATE DRILLED: 12/31/98	BORING ELEVATION: 95.5m	BORING NO.: ESF-HSA 3
DRILL RIG: CME 85	BORING DIAMETER: 8"/HSA	HAMMER WT.: 140 lb DROP: 30"	

				DESCRIPTION	
20					
	S	Ca	30/6S	V. DENSE, DAMP, MOTTLED BROWN/GRAY/ORANGE CLAYEY SAND (SC) W/OCCASIONAL CLAY CLUMPS	785
				T/TD FORMATION	
25	6	SA	30/6S		7100
					7100
30	7	Ca	35/60/4"		
					775
35	8	Ca	31/5B		
				BOH @ 36' NO GW	

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1181-3	SR56	FIGURE NO.:

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