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Summary of Qualifications Geotechnical Instrumentation Installation and Monitoring

INTRODUCTION

Group Delta Consultants, Inc. (GDC) would like to present this summary of qualifications for geotechnical instrumentation installation and monitoring. Please forward this information to your project managers and estimators.

SUMMARY OF QUALIFICATIONS

Group Delta Consultants, Inc. (GDC) is a geotechnical consulting engineering firm with offices located in Orange, Los Angeles and San Diego Counties. Our firm has more than 80 professionals consisting of civil and geotechnical engineers, engineering geologists, laboratory and field technicians. In addition, we have an excellent relationship with most major instrumentation manufacturers.

GDC is committed to provide high quality services. Our staff is highly qualified, reliable and responsive to time sensitive projects that require a quick turn around. We are proficient in installation and monitoring of:

- Inclinerometers
- Extensometers
- Strain gauges
- Data loggers
- Piezometers
- Load cells
- Settlement monument plates
- Tiltmeters
- Crack monitors
- Seismometers and other monitoring instruments.

Our instrumentation project experience includes tunnels, major excavations, and pipelines. Selected projects are:

- ♦ Brighwater Water Tunneling Project, Seattle, Washington (piezometers, inclinometers, extensometers)
- ♦ Middle Fork Water Shaft Re-aligning Project, Foresthill, California (strain gauges, load cells, piezometers)
- ♦ North Outfall Sewer, Los Angeles, California (inclinometers, extensometers, string gauges, observation wells)
- ♦ East Central Interceptor Sewer, Los Angeles, California (inclinometers, extensometers, strain gauges, observation wells)

- ♦ Northeast Interceptor Sewer – Los Angeles, California (inclinometers, extensometers, settlement points, piezometers, observation wells)
- ♦ Eastside LRT, Los Angeles, California (strain gauges, inclinometers, extensometers, observation wells, data loggers)

Currently on-going projects are:

- ♦ Newport Trunk Sewer Project (inclinometers)
- ♦ Joint Outfall C Unit 1 (extensometers, data loggers)

Selected project sheets are attached as part of this SOQ.

Over 23 years in business, we have established an impeccable record of completing projects on schedule and within budget for our clients in the public and private sectors. This approach and our unique design methods results in a record 80% repeat business. At Group Delta, we have continuously been a part of teams who win various awards and recommendations in the public and private sectors.

We look forward to working with you. Please feel free to call us if you have any questions.

Sincerely,
Group Delta Consultants, Inc.



Shah Ghanbari, P.E.
President

Corporate Summary

Firm's Name: Group Delta Consultants, Inc.

Firm Type: California Corporation

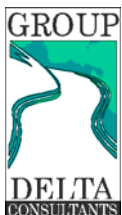
Year Established: 1986

Certification: MBE City of Los Angeles
SBE, State of California

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Northeast Interceptor Sewer (NEIS)

Los Angeles, California

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The Northeast Interceptor Sewer (NEIS) is a major sewer tunnel approximately 8.5-km long, extending northward from the east terminus of the NOS-ECIS sewer located just east of the Los Angeles River, near Mission Road to the intersection of San Fernando Road and Eagle Rock Boulevard. The NEIS corridor is located within the densely developed and populated area of the City of Los Angeles. It was built to provide a downstream outlet for the proposed Eagle Rock Interceptor Sewer (ERIS).

The work for this project was accomplished by tunneling with the Earth Pressure Balance (EPB) method using Tunnel Boring Machines (TBMs). In addition to tunneling, the project required four work shafts/diversion structures and seven drilled maintenance shafts. The project was constructed in soft ground conditions in primarily alluvial soil conditions. An extensive geotechnical instrumentation program was in place during construction. GDC installed the instrumentation equipment for TSFJK JV, who monitored the construction.

GDC's responsibilities included the geotechnical instrumentation and installation of 23 multipoint extensometers, 24 inclinometers, 220 borros-type settlement points, and 12 piezometers. In addition, tiltmeters were installed at critical historic bridge structures and buildings. The extensometers and inclinometers were concentrated at the shaft excavations and freeway crossings. Responsibility included initial readings of each instrument before turning instruments over to the City of Los Angeles for monitoring.

Eastside LRT

Los Angeles, California

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The Eastside LRT is a southeasterly extension of the Pasadena Gold Line (formerly Blue Line) from Union Station passing through the cities of Los Angeles and East Los Angeles, and is 5.8 miles long.

The project consists of at-grade alignment, four existing bridges, one 456-ft long new bridge across US 101, and a tunnel section (1.8 miles).

GDC provided geotechnical instrumentation installation for this project. Geotechnical instrumentation included:

- Technical Submittals;
- 2900 feet of borehole Extensometers (3 points);
- 1500 feet of Inclometers
- Tape Extensometers;
- Strain Gauges (12 load instrumentation zones and 4 levels); Over a 1000 Building and Ground Settlement Reference Points;
- 295 feet of Deep Bench Marks;
- 660 feet of observation wells; and
- Data loggers

In addition to geotechnical instrumentation we have provided full range of geotechnical investigation foundation recommendations and seismic design.

Our work has been reviewed and accepted by City of Los Angeles and Caltrans.

Middle Fork Surge Shaft Project

Foresthill, California

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The 17-kilometer long Middle Fork Tunnel is a hydro-power/water pressure tunnel in northern California. The tunnel has a 10 feet diameter, 600 feet deep surge shaft at the tunnel downstream, located in a remote area of the Sierra Mountains. The shaft, made out of 2-ft thick non-reinforced concrete, had been deteriorating and leaking. The project consisted of preventing the leakage by placing an 8-ft diameter, 550-ft long, 0.75-inch thick steel liner inside of the existing surge shaft, then filling the void with concrete.

Instrumentation monitoring of this unique project consisted of:

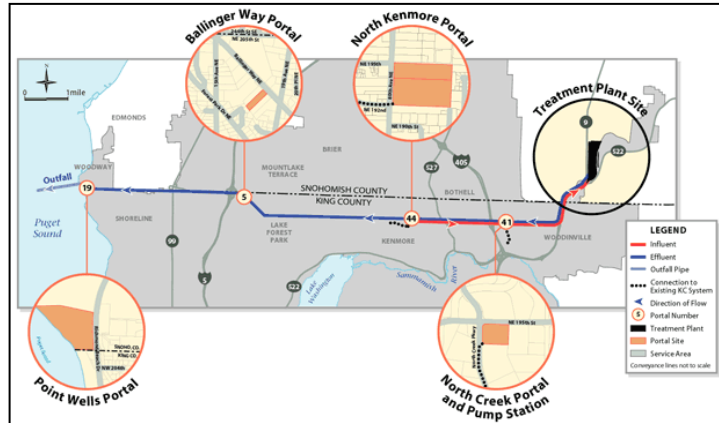
- 72 Strain Gauges
- 6 Piezometers
- 4 Load Cells

Monitoring of the steel liner movement after the installation was conducted with a total of 72 strain gauges. Total of 6 piezometers were installed between the existing concrete shaft and new steel liner to monitor the change of water level in the annulus, and verify that the leakage of the surge shaft has stopped. The liner load that was supported by a steel frame during installation and grouting was monitored with 4 load cells. The monitoring was achieved with systems of multiplexers and data loggers. GDC provided installation, monitoring and interpretation of the recorded data.

BRIGHTWATER EAST TUNNEL

Bothell, Washington

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This project is part of a \$705 million wastewater conveyance system which will include the East tunnel, the Central tunnel and a West tunnel totaling 13 miles of conveyance in King County, Washington.

The East Tunnel Contract of the conveyance system consists of 14,050 feet of precast concrete segmentally-lined tunnel with an inside diameter of 16 feet 8 inches ID tunnel containing four pipes & three fiber optics cables; construction of launch & receiving shafts; pump station excavation & shoring; 2,400 LF micro tunnel connecting the North Creek tunnel shaft to the existing pump station.

GDC Role:

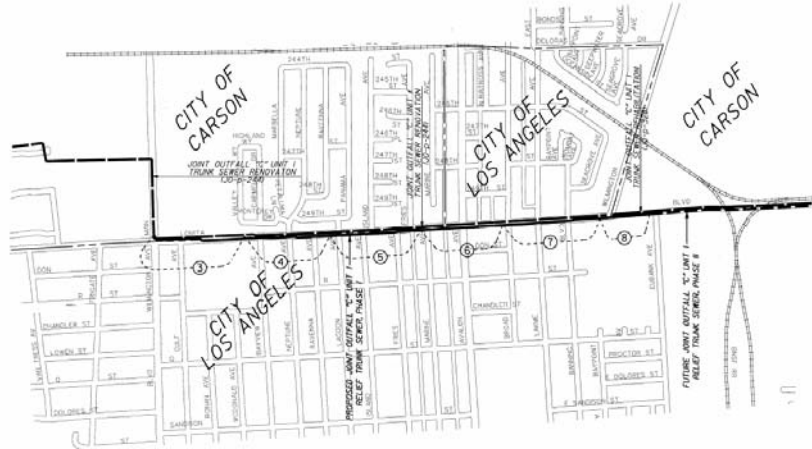
GDC provided geotechnical instrumentation installation for this project. Geotechnical instrumentation included:

- Technical Submittals;
- Observation wells;
- Piezometers;
- Three point Rod Extensometers;
- Inclometers.

Joint Outfall "C" Unit 1 Relief Trunk Sewer

City of Los Angeles, California

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Joint Outfall "C" Unit 1 project consist of installation of a 5,600 feet long, 90-inch diameter lined Rubber Gasketed Reinforced Concrete (RGRC) pipe along Lomita Avenue in City of Los Angeles and City of Carson, California. The pipe will be installed by a tunneling method. The tunnel invert is at about 20 feet below the ground surface.

GDC is installing 22 two-point extensometers with fiberglass rods at 7 feet below the ground surface and at 5 ft above the crown of the tunnel for monitoring of vertical movement during tunnel excavation along the city street.

All data is monitored via data loggers installed inside of the extensometer traffic boxes. The data is collected via cell phone modem data line and transmitted from the data logger to GDC's office via antenna installed on the traffic box lid. This approach allows uninterrupted flow of traffic and almost continuous collection of the data. Remote collection of the data also minimizes the project cost including site visits and traffic control for street lane closure that would otherwise occur.

Borehole drilling and all instrumentation and data presentation is provided and coordinated by GDC.

East Central Interceptor Sewer (ECIS)

Los Angeles, California

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The North Outfall Sewer – East Central Interceptor Sewer (NOS-ECIS) is a major sewer tunnel approximately 11.5 miles long furnished with an 11 feet inside diameter pipe. The NOS-ECIS corridor is located in a densely developed area within the central and southern sections of the City of Los Angeles. This area generally lies south of I-10, north of Imperial Highway, east of La Cienega Boulevard and west of the Los Angeles easterly city limits.

The project was constructed in soft ground conditions in primarily alluvial soil conditions. An extensive geotechnical instrumentation program was set in place during construction. Group Delta Consultants installed and initialized the instrumentation equipment for KSTFK JV, who will utilize the readings for their own use.

Group Delta installed 270 multipoint extensometers, 19 inclinometers, and 8 observation wells from September 2001 to August 2002. Our responsibility included initial readings of each instrument before turning instruments over to the City of Los Angeles for monitoring.

In addition, we were responsible for the instrumentation of the shaft excavation struts with strain gages and monitoring stresses on the struts. Group Delta Consultants monitored the strain gages at the shaft excavations until the completion of the project. The monitoring of strain gages had been accomplished by using remote digital transmission of data from the excavation sites to our office in Orange County.