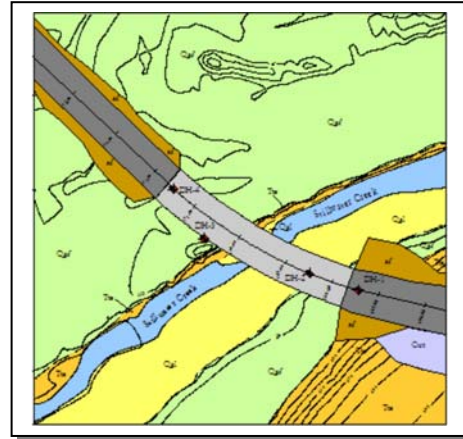


## REPRESENTATIVE PUBLIC WORKS & ENERGY PROJECTS

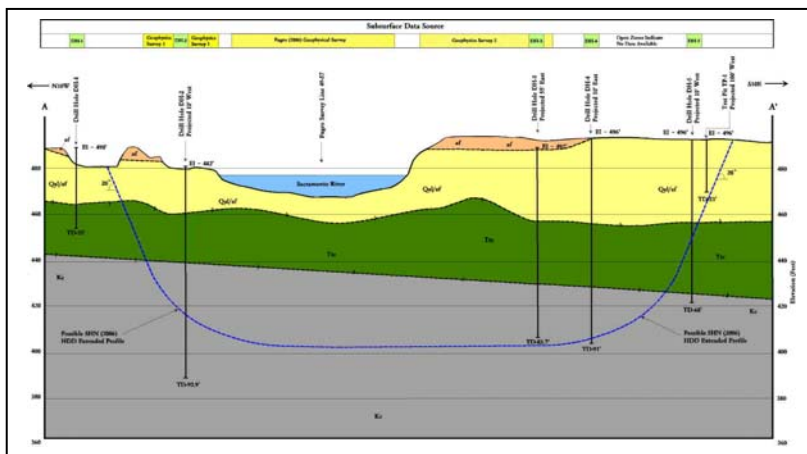
### **STILLWATER BRIDGES, STILLWATER BUSINESS PARK Geotechnical Engineering**

CGi performed geotechnical studies of proposed 300-foot-long and 450-foot-long reinforced concrete, box girder bridges spanning Stillwater Creek at the northern and southern entrances, respectively, to the Stillwater Business Park in Redding. The purpose of the studies was to characterize the geotechnical and subsurface information in the vicinity of the proposed bridge foundations and to provide geotechnical recommendations for the design and construction of the bridge foundations. To perform our studies, we excavated numerous deep drill holes using multiple methods and multiple drill rigs, performed geophysical surveys, conducted an extensive laboratory testing program, evaluated seismic design criteria including response spectra, performed extensive axial and lateral pile, and pile group interaction analyses for a variety of pile types, and presented geotechnical recommendations for the design of the projects.



### **NORTH MARKET FORCE MAIN Geotechnical Engineering**

This \$2-million project consisted of the horizontal directional drilling (HDD) and emplacement of a new sewer force main beneath the Sacramento River in the City of Redding. CGi provided geotechnical and engineering geological services to characterize the type and engineering properties of soil and rock materials that would be encountered during the twin 1,800-lineal-foot HDD crossings.



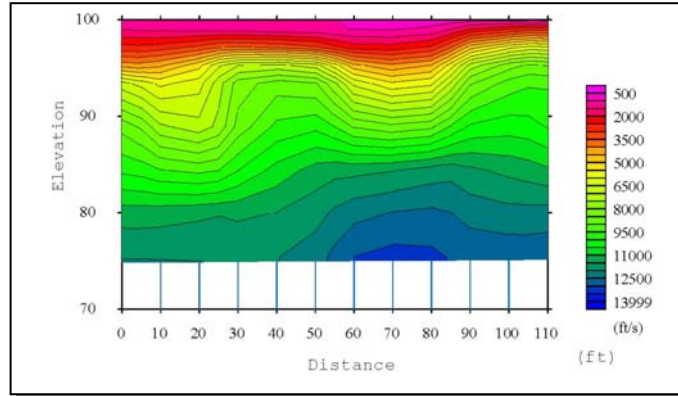
Our services included onshore and over-water geophysical surveys, an extensive drilling and sampling program, deep test pits to observe cobble and boulder dimensions, and an elaborate geotechnical laboratory testing program. Using those data, we

estimated depth to critical subsurface rock materials and performed a hydraulic fracturing (frac-out) analysis for the HDD operation. Our services were completed on time and within budget. The project was successfully constructed in 2007 with encountered subsurface conditions being very close to conditions projected within our study.

## TELEPHONE FLAT GEOTHERMAL PROJECT

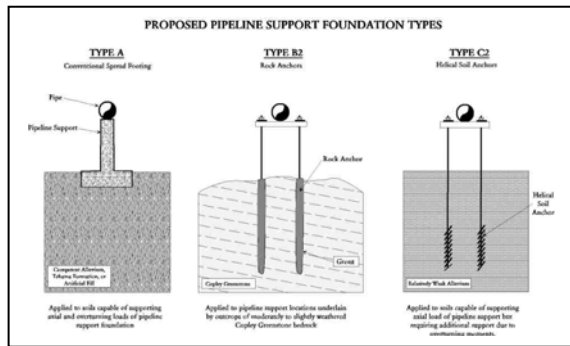
### Geotechnical Engineering

Calpine Corporation retained CGI to perform geotechnical characterization and engineering for the design and construction of the proposed Telephone Flat Geothermal project located on volcanic terrain near Medicine Lake, Siskiyou and Modoc Counties, California. The project consisted of the design of up to a 130 megawatt (MW) geothermal power plant located about two miles southeast of Medicine Lake. Associated with the power plant were 16 pads to accommodate drilling, and extraction or injection well development operations, extensive layout of pipelines and roads from the pads to the powerplant, and transmission towers to link the powerplant to the electrical grid distribution system. CGI performed extensive subsurface exploration and geophysical surveys to assess the depth to volcanic rock, rippability of that rock, and preliminary geotechnical engineering for foundation design.



## JENNY CREEK LIFT STATION AND SEWER PIPELINE

### Geotechnical Engineering



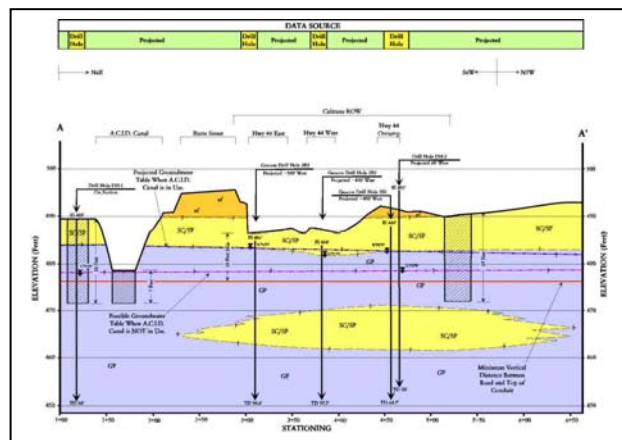
CGi is providing geotechnical engineering services for the design and construction of a new sewer lift station and pipeline along Jenny Creek within the City of Redding. The 2,600 gpm lift station is designed to extend to a depth of over 20 feet and will consist of cast-in-place or precast reinforced concrete. The proposed gravity sewer pipeline, which was constructed in 2008, replaced an existing buried and above-ground pipeline that extends along the Jenny Creek drainage. Due to limited access conditions, geotechnical recommendations for new pipeline

supports along Jenny Creek were based upon detailed geologic mapping, rock quality assessments, geophysical refraction surveys, and hand auger excavations. Based on those evaluations geotechnical recommendations for pipeline support types and design were provided.

## BUTTE STREET PIPELINE RAMMING PROJECT

### Geotechnical Engineering

The City of Redding retained CGI to evaluate the feasibility of a number of different trenchless emplacement methods for a new pipeline extending beneath State Highway 44. The 350-foot drive was constrained by the presence of shallow groundwater, a minimum vertical separation between the top of the pipeline casing and the surface highway grade, and the location of private properties and structures relative to the alignment. CGI



evaluated five different trenchless methods and associated construction costs and provided recommendations to the City. Once pipe ramming was identified as the preferred alternative, CGI performed an extensive exploration and characterization study to estimate subsurface geotechnical conditions that would be encountered during construction. Based on those services, CGI developed design and construction recommendations for the installation of the pipeline.

## **FOURMILE HILL GEOTHERMAL PROJECT**

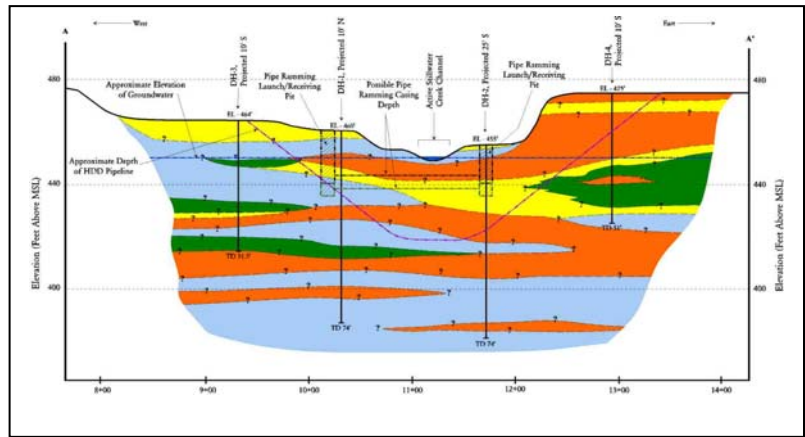
### **Geotechnical Engineering**

Calpine Corporation retained CGI personnel, while working for others, to perform geotechnical characterization and engineering for the design and construction of the proposed Fourmile Hill Geothermal project located on volcanic terrain near Medicine Lake, Siskiyou County, California. The project consisted of the design of a 49.9 megawatt (MW) geothermal power plant located about three miles northwest of Medicine Lake. Associated with the power plant were numerous pads to accommodate drilling, and extraction or injection well development operations, extensive layout of pipelines and roads from the pads to the powerplant, and transmission towers to link the powerplant to the electrical grid distribution system. According to the most recent map made available to us, 16 well pads are proposed for this project. CGI personnel performed extensive subsurface exploration, including a number of deep drill holes, and geophysical surveys to assess the depth to volcanic rock, rippability of that rock, and preliminary geotechnical engineering for foundation design.

## **STILLWATER BUSINESS PARK TRENCHLESS STUDIES**

### **Geotechnical Engineering**

In order to provide water and possibly electrical utility service to the proposed Stillwater Business Park, those utilities need to cross Stillwater Creek in an area where there are no bridges or other improvements. Because of environmental constraints, the City is forced to utilize trenchless technology to construct the utilities across the creek. CGI was retained to provide a preliminary assessment of trenchless methods that could be



used to install up to about an 18-inch diameter water pipeline. Methods evaluated included microtunneling, pipe ramming, horizontal directional drilling, jack-and-bore, and pipe jacking.

## **CITY OF SHASTA LAKE CIVIC CENTER**

### **Geotechnical Engineering**

CGI provided a preliminary geotechnical study for the design and construction of the City of Shasta Lake Civic Center. The project will include a Sheriff substation, City Hall, museum, library, and cultural/community facilities. Ancillary uses include parking, access roads, and neighborhood buffer areas.

## **ISHI CONSERVATION CAMP FACILITY REPLACEMENT**

### **Geotechnical Engineering**

CGI was retained by Nichols, Melburg, & Rossetto to conduct a geotechnical investigation for the facility replacement at the Ishi Conservation Camp near Paynes Creek, California. The project will



consist of demolishing of selected existing camp facilities, and design and construction of a new kitchen/mess hall, inmate and California Department of Forestry and Fire Protection (Cal Fire) barracks, laundry/warehouse building, inmate hobby building, Cal Fire and California Department of Corrections and Rehabilitation (CDCR) offices, inmate training/recreation rooms, CCV/ECT, fire engine, and MDFU garages, maintenance/woodshop building, staging area restroom facility, generator/pump/storage building, covered vehicle wash rack and a dozer shed, as well as associated paving, utilities, landscaping and other appurtenant features as required. The proposed improvements are located across the majority of the project site. The improvements will encompass 14 new structures having an area of about 57,000 ft<sup>2</sup>, along with ancillary improvements such as 2 acres of new roadways and parking areas. The proposed structures will be one or two stories and will probably be constructed using stick or metal framing, or concrete masonry units (CMU). In addition, the structures will be supported on shallow foundation systems (spread footings). Services provided include conducting the geotechnical investigation and preparation of the geotechnical engineering report.