A CLOSER LOOK: SOIL TESTING – UNDERSTANDING THE UNDERGROUND

The potential construction of an approximately 40-mile tunnel and its supporting facilities first starts with understanding the territory. Soil testing is important to developing alternative designs of the proposed Delta Conveyance Project and understanding the potential environmental impacts and feasibility of mitigation. Soil testing is also essential to selecting a tunnel alignment and boring machines with the appropriately designed cutterheads and lining systems as well as to fine-tuning the designs of the proposed Delta Conveyance Project's two intake structures on the Sacramento River and new facilities in the South Delta to connect to the existing State Water Project. The Delta Conveyance Design and Construction Authority (DCA), working at the direction of the Department of Water Resources (DWR), is conducting the soil explorations testing that will provide new knowledge of the region's geology.

Delta Geology: Influenced by the Sierra, Coast Ranges and Sea Level Rises

The Delta's geology has been shaped over thousands of years in part by the granitic rock of the Sierra Nevada range to the east and the Coast Ranges to the west, with a 3- to 6-mile-thick layer of sedimentary deposits overlying deeper bedrock. The Delta's peats and organic soils, which began to form about 11,000 years ago as sea level rise created the tule marshes, exist just below the ground surface to as deep as 65 feet in the western Delta. Tunnel construction would occur approximately 150 feet below the surface. Identifying the precise geological characteristics along potential Delta Conveyance Project alignments is foundational to a successful and safely constructed project, if the proposed Delta Conveyance Project is approved by DWR.

Soil Testing: Two Methods...

Identifying soil characteristics along the potential Delta Conveyance Project alignments can be performed by applying two common methods. One option is to sample at a test site through vertical borings that range from 50 to 300 feet deep and are typically 4 - 8 inches in diameter. Soil is collected and tests are performed at select depths, a geologist documents observations, and soil is sent to a laboratory for additional testing. Another option is to perform a Cone Penetration Test, where an approximately 1.5-inch diameter cone is pushed as deep as 200 feet into the ground. The tip and sleeve of the descending cone detect changes in friction and pressure. These measurements reveal various characteristics about the soil.

...And Two Phases

Limited soil testing commenced in 2020, to inform the development of the proposed Delta Conveyance Project's Environmental Impact Report and increase the understanding of subsurface conditions Delta-wide. This testing involves up to 223 soil borings and 103 cone penetration tests and considers data gaps for several alternative conveyance alignments. If the Delta Conveyance Project or other project alternative is approved, a far more extensive soil investigation would be needed to fully understand the soil conditions and complete design for the approved alignment following the completion of the environmental review.

Soil can be tested with two methods:

- Collecting soil with vertical borings as shown above
- Probing the ground using a Cone Penetration Test

Putting Soil to the Test

Information gathered during soil testing is imperative to developing an accurate understanding of the subsurface conditions of the area. Collected soil boring samples are shipped for storage and laboratory testing, which is performed to better understand the mechanical properties and chemical compositions of the material. Among the tests performed are strength testing, quantification of organic content, carbon dating, abrasivity and corrosivity testing, and moisture, density, and grain size analyses. Test results assist engineering teams in identifying potentially problematic soils and their locations and extent, including peat and soils with high organic content, zones susceptible to liquefaction, layers characterized by high capacity for groundwater flow, as well as presence of dissolved gasses. Each of these characteristics assist the DCA and DWR engineering teams in evaluating alternatives and design of facilities by providing the information necessary to consider feasibility of construction methodologies and the placement of important tunnel features.

Native American Coordination: Site Surveys

The Delta is home to numerous Native American Tribes who subsisted on the natural resources of the landscape. Many Delta levees, for example, were initially constructed using available materials nearby which could have included items associated with Native American habitation. The DCA coordinates with Tribal representatives as well as archeologists to inspect testing sites. If a potential cultural resource or Tribal cultural resource is observed within the area planned for investigation, the testing location will be moved to reduce the potential for cultural resource impacts.

Wildlife: A Comprehensive Habitat Assessment

A qualified team of biologists conducts a habitat assessment prior to performing any soil investigations. A biologist is also on site during all project activities. These specialists are trained to detect habitat for any number of species, such as the California tiger salamander, the California red-legged frog, western spadefoot, western pond turtle and giant garter snake. Bird species of interest include sandhill cranes, burrowing owls, Swainson's hawks and tricolored blackbirds. As an example of protecting these natural resources, if a nesting bird is identified in the area, a "no-activity" buffer is established to ensure that the birds are not disturbed during work activities.

Farmland Testing: Leave No Trace

Testing requires temporary access to both public and private properties, some of which are agricultural lands. The DCA staff works closely with landowners to avoid interfering with farming or harvest operations. The farmland upon which the soil investigation takes place is returned to its original state. The site of the boring or cone penetration is filled with a cement grout material, per industry standards, until approximately five feet below the surface. The top five feet is filled with topsoil to support continued agricultural uses. No building structures or trees are removed for sites temporarily accessed. Any impacted fencing, irrigation, or other existing infrastructure is repaired and replaced.