

August 2002

# Foundation Drilling

Anderson Drilling Scores  
on the "18th Hole"

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FOUNDATION DRILLING

# Anderson Drilling Scores on the 18th Hole Near Palos Verdes, California

By Dan Cadenhead, President  
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When someone hears that you are drilling holes at a golf course they automatically assume that you are involved with the installation of a catch fence for the driving range, or maybe drilling those “big” holes for the cups on each of the greens. Neither was the case on a recently completed job for ADSC Contractor member, Anderson Drilling at the Ocean Trails Golf Course. This beautiful facility lies along the Southern California coastline, on the Palos Verdes Peninsula, just South of the Los Angeles basin.

Any true golfer would get misty eyed, and they would be proud to learn of the recent efforts to save the all important 18th hole from falling into the Pacific Ocean. On June 1, a landslide that included a portion of the golf course that encompassed the 18th hole began moving slightly, and on June 2 at 11:30 a.m. it suddenly moved 50' southward toward the

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*Aerial view of the Ocean Trails Golf Course.*

ocean. During the next 12 months no less than six geotechnical firms representing different parties performed extensive investigations and analysis to determine the slide boundaries, causation and repair options available to the owners of the Ocean Trails Golf Course. It was

ultimately determined that the ancient slide mass, moved on a 4-6" thick layer of bentonite clay. The investigators generally agreed that leakage from a 1955 era sewer pipe that crossed the entire site substantially contributed to the slide movement. The wetted clay layer became the proverbial “slippery slope” for the 18th hole.

The landslide mass moved southward leaving behind a horseshoe shaped feature, open-end toward the ocean. A

large down-dropped “graben” or ditch filled the area between the headscarp and the main slide block. Many open fissures and secondary scarps were created within the main block as the slide moved and broke apart. Some of the deepest fissures extended nearly 90 feet in depth.

The slide damaged everything within its boundaries including - the bluff trail and bikeway, the pre-existing and restored habitat, the marine environment, a favorite surfing location, and ... the 18th hole of the golf course. The slope on the eastern edge of the point was affected when the landslide removed the rock below it, but fortunately the 19th hole, or better known as “the clubhouse,” was not affected. An inclinometer between the clubhouse and the slide has shown no movement.

The owners of Ocean Trails Golf

*(continued on page 3)*

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Course realized that, although the golf scores were low, they were going to have to make the facility a complete eighteen-hole course again. Converse Consultants was chosen by the owners to lead the geotechnical repair design efforts. Once completed, they proposed a plan to permanently stop the affected area from

any further movement. This was to be done by installing a series of shear pins that would extend through the ancient landslide mass, sandstone and bentonite layers, and into the competent bedrock formation below.

The approved landslide mitigation design incorporated the use of shear pins to permanently stop the slide movement and allow for reconstruction of the affected 18th hole. The shear pins consisted of 115 shafts at 42-

inch diameter drilled to approximately 106 feet in depth. As each shaft was excavated to the designed tip a 36-inch diameter casing, 1-1/2 inch thick by 20 feet in length was installed to the bottom of the shaft. A mixture of 4,000 psi concrete was then placed to completely encase the steel casing. Finally, the balance of the shaft was backfilled with a lean sand/cement mixture to near the surface. The intent of the repair design was to get approximately 10 feet of the steel anchor pins into and



*Wirth ECO 35 installs shear pin.*



*"Big Stan Moving" to a new shear pin location.*

through the slide plane creating a disruption along the continuous slick bentonite clay surface thereby prohibiting any future movement along the failure plane.

The design necessitated significant quality control measures. First, it was very important to identify the exact location of the bentonite layer to ensure sufficient penetration into the competent bedrock formation. This was accomplished through the combined efforts of the General Contractor and the Geotechnical Engineer by having the geologist down-hole log the majority of the drilled shafts. Second, the elevation and alignment of the steel shear pin was of the utmost importance. Selected shafts were monitored with an inclinometer to insure plumbness, and the designer closely monitored all placement and centering efforts.

In September of the following year,

*(continued on page 4)*



*"Big Stan" and Mantis crane overlooking Pacific Ocean.*

several drilling contractors were asked to quote this project. Anderson Drilling's scope of work was to include a turnkey installation of the shear pins. Given the variable nature and consistency of the broken and blocky landslide materials, it was difficult to quantify the extent of loose or caving conditions, as well as the potential problems associated with

drilling the Monterey bedrock formation, which can be very difficult to drill through in its natural competent state. Another challenge we faced was the steel casings were a long lead-time item, which unfortunately meant that the construction schedule

was going to be compressed. Ultimately, the owners were asking Anderson Drilling to complete the entire shear pin installation in only six weeks time.

With much concern, we began work on Friday, the 13th of October. The steel casings had arrived, but the owner was still lacking permit authorization for concrete placement within the shafts. Fortunately, one week later we were permitted to begin placing concrete in the shafts. To meet the fast

paced production schedule, we elected to use our **Big Stan**\* drill unit as the primary drilling machine for the project. This machine, built in house, produces over 530,000 ft/lbs of torque, and can crowd with over 70,000 lbs of down-force. To insure our conformance with the owner's aggressive schedule, we also mobilized and drilled with our **Wirth ECO-35** hydraulic drill unit\*. The steel casings were hoisted and set into location with our **Mantis 35 ton** crawler / hydro crane\*. The primary tooling used for this project, were rock augers manufactured by **Champion Equipment**\*.

Throughout our efforts we experienced a significant amount of caving throughout the landslide area. The



*Crew setting shear pin.*



*Geologist prepares for down-hole inspection.*

localized zones of caving material were drilled through, filled with a lean mix of sand and cement, then re-drilled the following day. Some shafts required several repeats of this procedure to finally get to the competent Monterey bedrock formation. As you can imagine, this necessitated a continuous dance of drill rigs, con-

*(continued on page 5)*



Crew installs inclinometer.

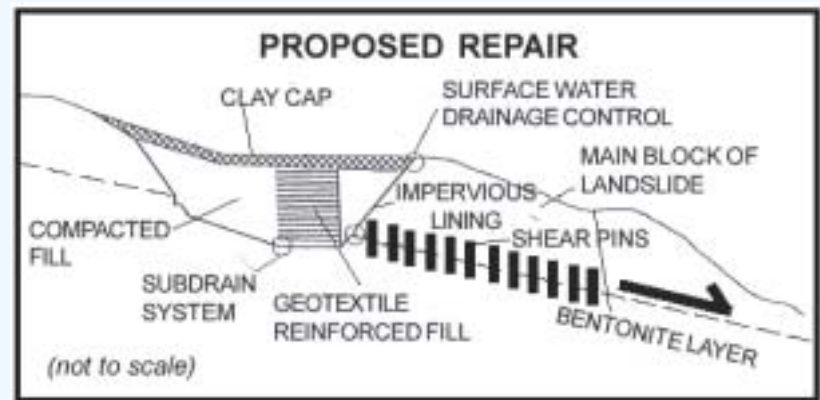
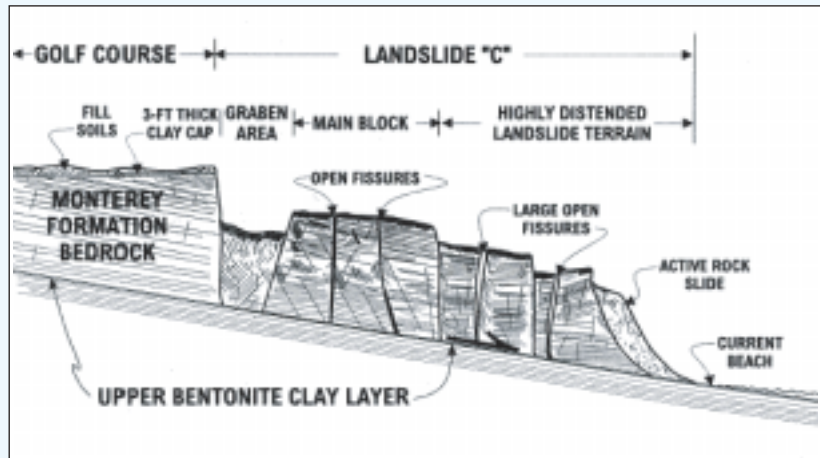
crete trucks, and cranes over a relatively small area.

A special thanks is in order, to all of those that made this project such a success. From the Owner, Designer, and General Contractor, to the Project Supervisor and all of his suppliers, associates and crews, the coordination of efforts have produced a successful job, on budget, and ahead of schedule.

As is the case with most drilling projects, the finished product lies well below the surface. I am guessing that when Joe golfer lines up for his approach shot on the 18th hole overlooking the Pacific Ocean, he will only have one hole on his mind. Only a few of us will truly appreciate the efforts of so many to make life just a little nicer.

*Dan Cadenhead is a member of the ADSC Board of Directors, serving as the Association's Treasurer. He is the Chairman of the ADSC Drilled Shaft Committee.*

*\*Indicates ADSC Associate Member.■*



### Project Team

Job Name/Owner:	Ocean Trails Golf Course Rancho Palos Verdes, California
Owners Representative:	Jeff Kaplinski – Project Manager
Designer:	Converse Consultants Costa Mesa, California Mark Schluter – Sr. Geologist
General Contractor:	J.W. Sutter, Inc. Agoura, California Joe Sutter – President Antonio Galindo – Chief Estimator
Anderson Drilling:	Mike St. Germain – Area Manager Pat Anderson – Project Superintendent



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