

Making waves under Long Beach

Seismic devices help expert sound out city's foundation.

Kristopher Hanson, Long Beach Press Telegram, 5-6-11

LONG BEACH - Surveyors are close to wrapping up an intensive year-long study of fault lines and oil and natural gas deposits deep beneath the surface of Long Beach and Signal Hill.

The survey is mapping a 22-square-mile section of the earth's crust with state-of-the-art technology expected to provide a high-resolution 3D image up to 40,000 feet below the surface.

Geologists plan to use the data to better understand seismological conditions, ground movement and the best locations for future oil and gas drilling.

"This is very, very sensitive equipment that provides something similar to an ultrasound of the earth's crust," said Dan Hollis, a geophysicist with NodalSeismic, the Signal Hill-based firm conducting the study.

NodalSeismic has been surveying streets, fields and other property with four specially designed trucks since June.

"This survey will result in a very high-quality picture of fault lines, how the ground moves ... and may eventually yield information about areas that contain oil and gas."

The U.S. Geological Survey has estimated about 2 billion barrels of oil remain in the Los Angeles Basin, of which a significant portion may rest in what's known as the Wilmington Field, an area stretching from Palos Verdes Peninsula to Seal Beach.

The survey covered a portion of the field running along the Newport-Inglewood Fault line in Long Beach, which produced the 6.3-magnitude 1933 "Long Beach Earthquake," which ruptured along a path dotted with hundreds of oil derricks at the time, when drilling was producing more than 100,000 barrels per day.

Production has since dropped to about 40,000 barrels per day across all Long Beach, Signal Hill and the harbor, though significant reserves are believed to remain.

"It's going to take several months to download the images, analyze them, and oil companies will then determine if there are targeted areas worth exploring," Hollis said. "But it's my guess there's a better-than-average possibility new oil and gas pockets will be found."

If pockets are indeed discovered, exploratory drilling wouldn't begin for more than a year, however.

As for the surveying, NodalSeismic expects to wrap up by late May or early June.

The company's trucks have been studying areas around downtown and West Long Beach in recent weeks, and previously covered an area stretching roughly from 36th Street and Long Beach Boulevard to Redondo Avenue and Pacific Coast Highway, said Diane Ripley, a consultant doing community outreach with Signal Hill Petroleum, which is funding the project, to impacted neighborhoods.

Residents and businesses are notified a week before trucks arrive. Once on site, the vehicles push a large metal plate onto the ground and that shoots vibrations deep into the earth's surface.

The shaking is much less severe than previous geophysical surveys conducted in early 2006, when residents complained the machines were pounding so heavily they cracked walls, knocked pictures askew and rattled items off shelves.

The new technique produces less than half the previous vibration level, and does not pound or hammer the earth's surface.

"People aren't reporting any major issues with the (new) surveys," Ripley said. "There's no massive pounding or tremors."

The surveying works by monitoring 5,300 small, high-tech devices known as nodes, which record acoustic waves, or echos, caused by high-intensity vibrations provided by NodalSeismic trucks.

Like ultrasound machines used in medical procedures, the subsurface acoustic imaging provides detailed information about the density of sedimentary rock, fault lines and bends and deep-surface oil, gas and water pockets.

The nodes are placed 330 feet apart, a few inches underground, and record information around the clock.

By comparison, the California Integrated Seismic Network, which performs similar surveying, stations monitors about six miles apart on average.

Extremely sensitive to any underground movement, the local nodes picked up the 9.0-magnitude earthquake that struck off the coast of northern Japan on March 11.

"That actually caused some ground movement here, even though it wasn't felt," Hollis said. "We picked up vibrations about 11 minutes after the quake struck, and even though the (underground) movement was minor, it's data we can use to better understand how the ground will react when a quake strikes here."

NodalSeismic shared the Japan quake info with the seismological department at CalTech in Pasadena. The firm plans to share more data with CalTech when surveying ends.

"The geophysical image will show layered sedimentary rock near the surface and how it drapes over older, deeper crystalline rock," Hollis said. "(Current research) shows the sedimentary rock is folded, bent and broken (faulted) by the Newport-Inglewood Fault Zone that runs through the survey area."

Seismic survey nearly done

What: A year-long survey of the earth's crust, geophysical properties and potential oil and natural gas projects has entered its final weeks, with work remaining in downtown and Westside Long Beach neighborhoods.

Where: 22 square miles of Long Beach and Signal Hill

Equipment: Four specially designed trucks shoot vibrations up to 40,000 feet into the ground, which sends echoes to 5,300 small listening devices that collect data which will be used to create a three-dimensional map of the region, its fault lines and gas and oil pockets.

Research: Data from these devices, known as nodes, will be turned over to oil companies and the California Institute of Technology, which plans to study the imaging to learn more about local geological conditions, earthquake zones and new seismic faults or splinters emanating from the Newport-Inglewood Fault Zone.