

CITY OF LONG BEACH

DEPARTMENT OF OIL PROPERTIES

C-13

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September 7, 2004

HONORABLE MAYOR AND CITY COUNCIL
City of Long Beach
California

SUBJECT: Elevation Changes in the City of Long Beach, November 2003 to May 2004

DISCUSSION

The City of Long Beach, through the Department of Oil Properties (DOP), supervises Wilmington Oil Field oil production and water injection, and monitors subsidence control operations. Spirit leveling elevation surveys have been conducted at least semi-annually since 1965. The eleven permanent-station Long Beach Global Positioning System (GPS) Deformation Network was completed in Spring 2003 and is now being fully utilized in combination with mobile GPS survey equipment to conduct the DOP semi-annual elevation surveys.

This report covers bench marks surveyed in May 2004 and compares elevation changes that have occurred since completion of the November 2003 and May 2003 surveys. These data are also compared with earlier semi-annual data for analysis of trends. The surveyed area includes the Harbor District, Civic Center, Central City, and Alamitos Bay.

City elevations were stable or increased slightly in elevation. The minor elevation increase was 0.05 feet (0.60 inches) along the southern portion of Cherry Avenue. Areas outside oil operations were stable. This six-month survey period is interpreted to be an "up survey period" affected by non-oil operating influences, most likely related to movement of the entire Long Beach area due to other earth forces. The amount of change due to earth forces is minimal and should not cause concern.

Within the Harbor District, the eastern portion of Pier T experienced a localized minor elevation loss of -0.03 feet (-0.36 inches) due to construction. Outside the oil field limits, the southernmost edge of Pier J lost -0.033 feet (-0.396 inches) in elevation. The curtailed Tar II steam flood area around Henry Ford Avenue lost up to -0.038 feet (-0.456 inches) of elevation. Alamitos Bay and Naples and the oil islands, except for Grissom, remained stable for the period. Island Grissom elevation change is associated with the Cherry Avenue elevation increase.

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The area of greatest elevation loss in the oil field is centered over the Tar II reservoir that had been injected with steam. The high temperatures were found to cause compaction of a few rock layers. An active program of water injection and production is slowly cooling the reservoir in an attempt to mitigate future elevation losses. Due to the relative stability of the remainder of the oil field, no further changes in injection rates are being contemplated.

Studies by the City's subsidence control engineers, geologists, and consultants show that the bench marks may appear to rise and fall in such a manner as to make an entire survey either optimistic (up) or pessimistic (down). These changes in bench mark elevations can be seasonal or random and may be associated with tidal cycles, temperature changes, and/or tectonic changes. Repressuring operations and the resulting rebound alter or mask these patterns from time to time. Surface elevations in a rebounded area can be expected to fluctuate under changing water flood conditions.

TIMING CONSIDERATIONS

City Council action on this matter is not time critical.


FISCAL IMPACT

Not applicable.

IT IS RECOMMENDED THAT THE CITY COUNCIL:

Receive and file the attached report: Elevation Changes in the City of Long Beach, November 2003 to May 2004.

Respectfully submitted,

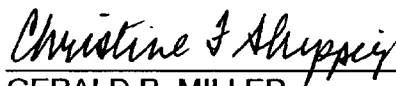


CHRISTOPHER J. GARNER
DIRECTOR OF OIL PROPERTIES

CJG/RKK
SUB 906.000

Attachment

APPROVED:


GERALD R. MILLER
CITY MANAGER