



Subsidence of the King Harbor Breakwater at Redondo Beach

ICCE 2006
San Diego

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Location Map of King Harbor



King Harbor, Redondo Beach



Harbor Amenities

Mole A

Mole B

Mole C

North
Breakwater

South
Breakwater

 = 1/2 Mile



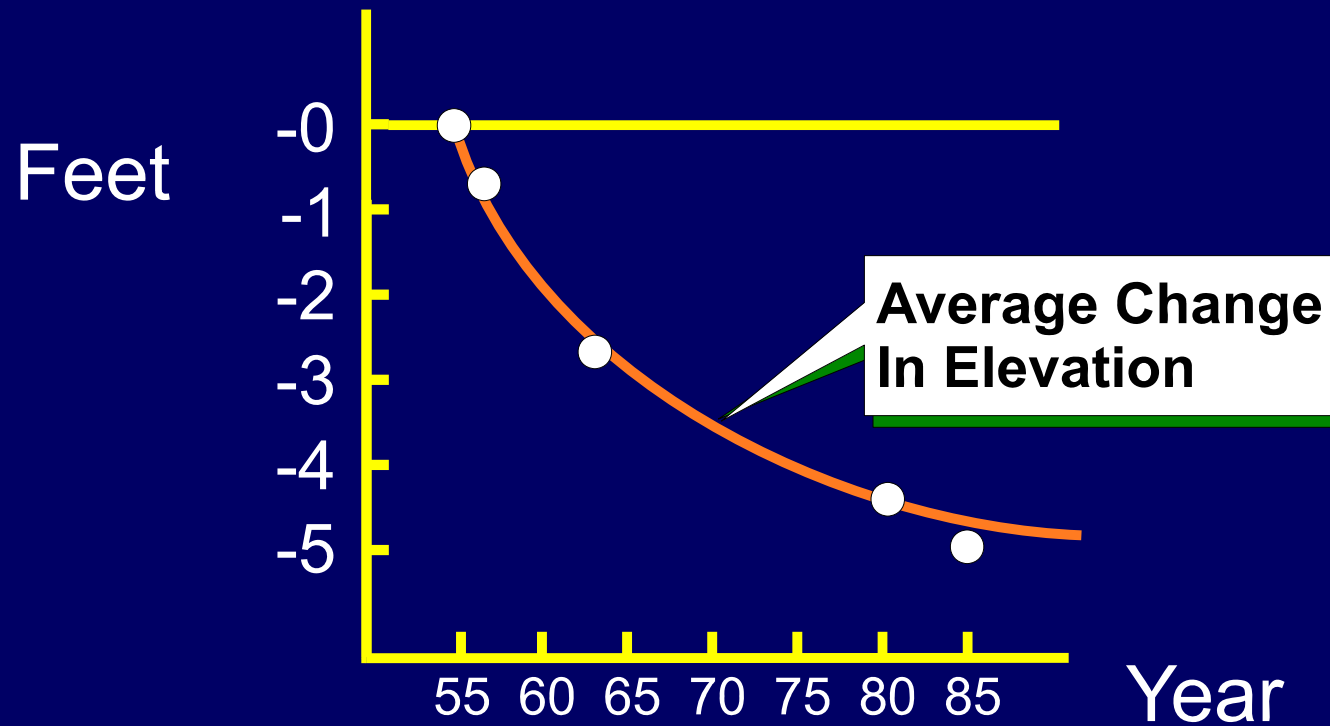
The Great Storm



ICCE 2006
San Diego



North Breakwater Height



● = Breakwater Survey

Source: US ARMY CORPS FIELD BOOKS - H. BEVERLY

Conclusions

Potential adverse effects of regional subsidence and local differential settlement, on the long-term performance of the King Harbor breakwater and inner harbor structures, were predictable based on data existing at the time of their construction.



Conclusions

Data collection and design of the breakwater and interior facilities did not take into account evidence suggesting regional and local developmental constraints.

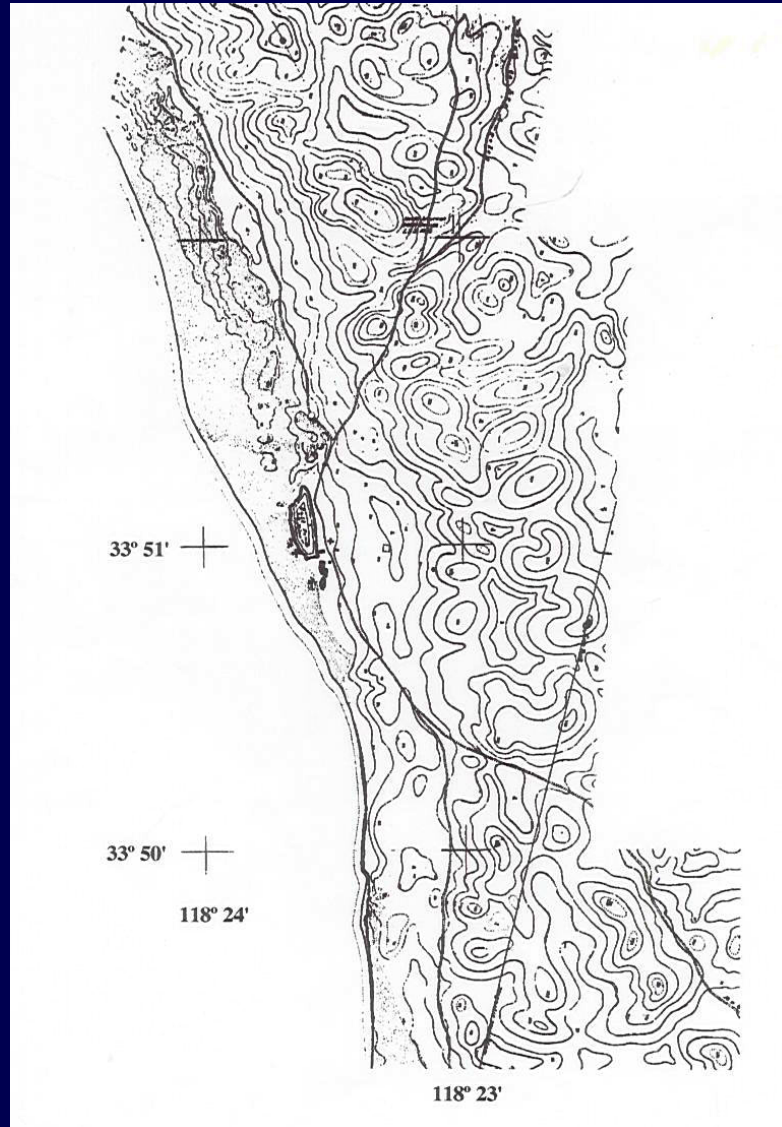


Conclusions

Significant “red flags” due to post construction changes were missed



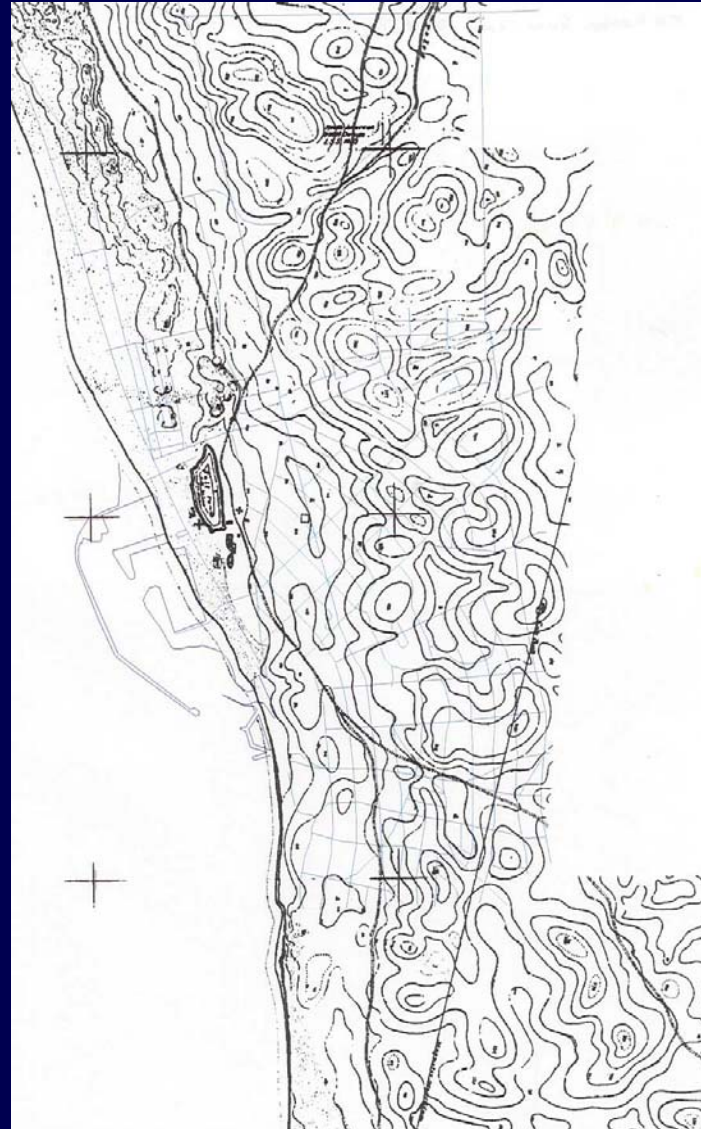
1871 Historical Map by USGS



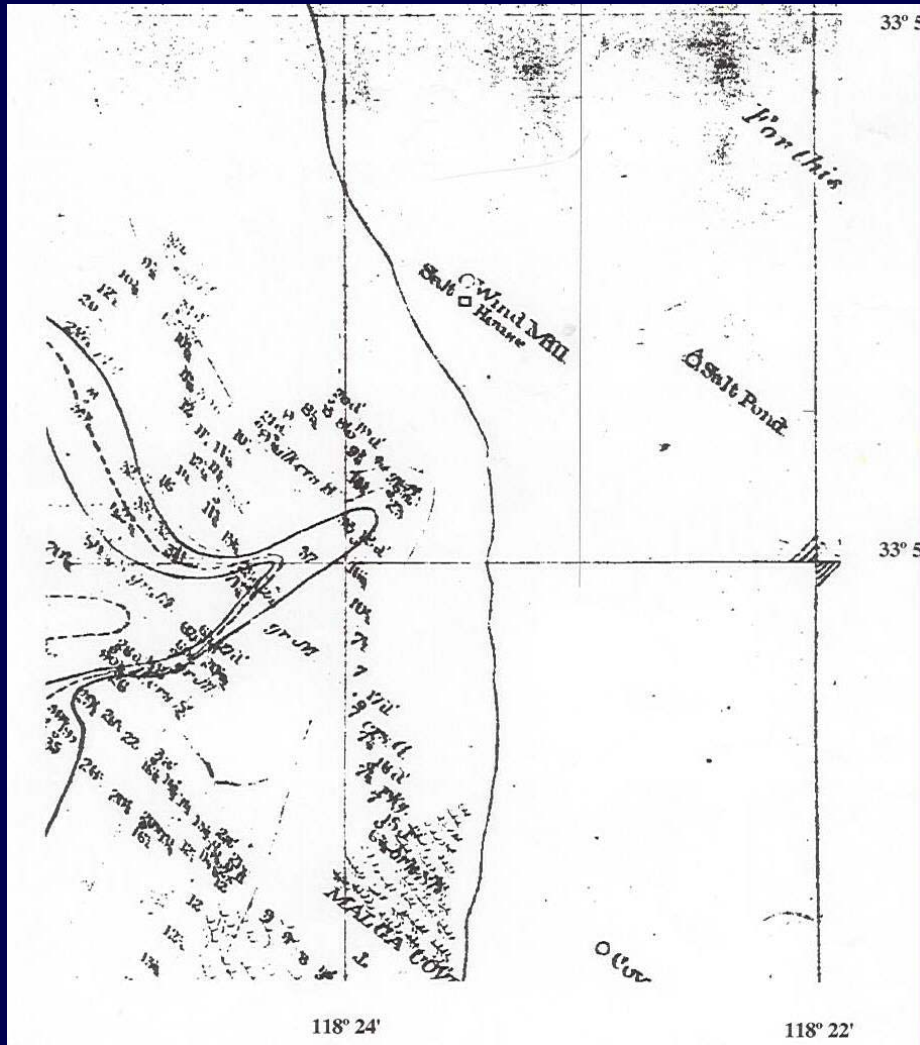
Reference –
U.S. Coast and
Geodetic
Survey No. T-
1231. Surveyed
1871. Original
scale 1:10,000.



Historical Map

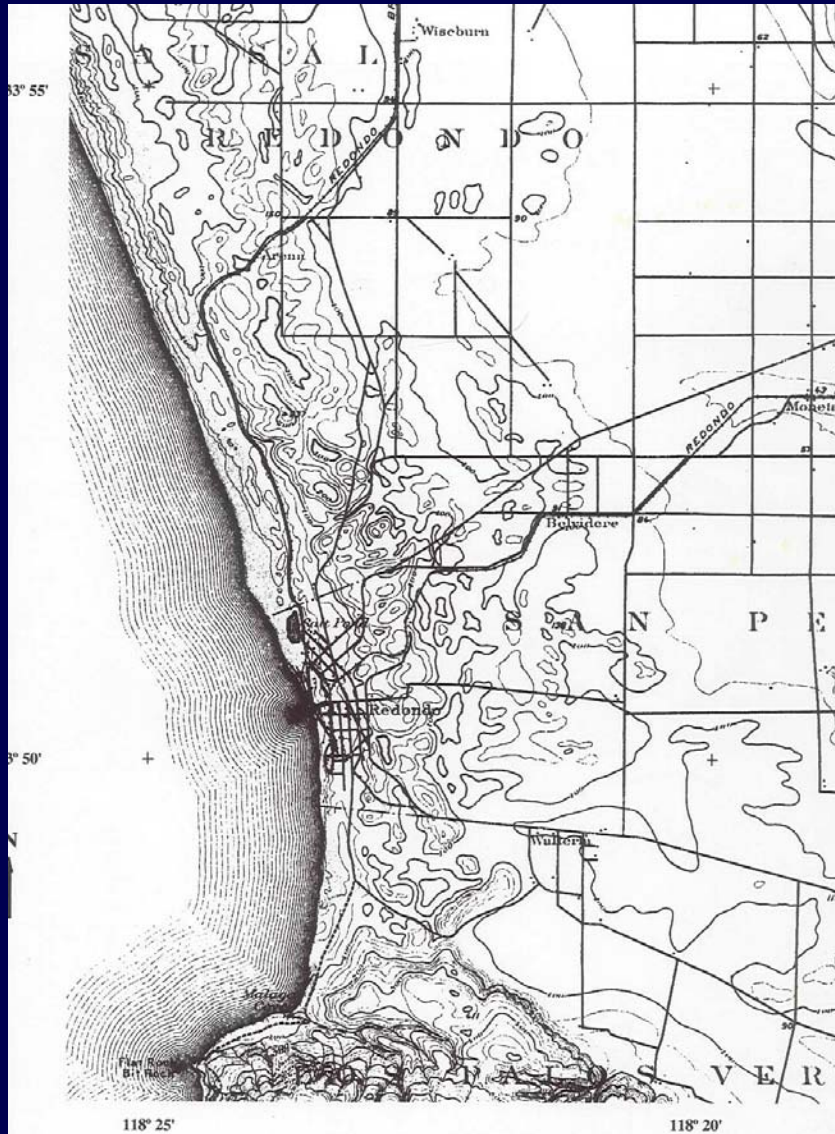


Historical Bathymetry Map of the Area 1875 / 76



Reference –
U.S. Coast and
Geodetic Survey
Hydrographic
Sheet No. 1341a.

1896 Historical Map by USGS



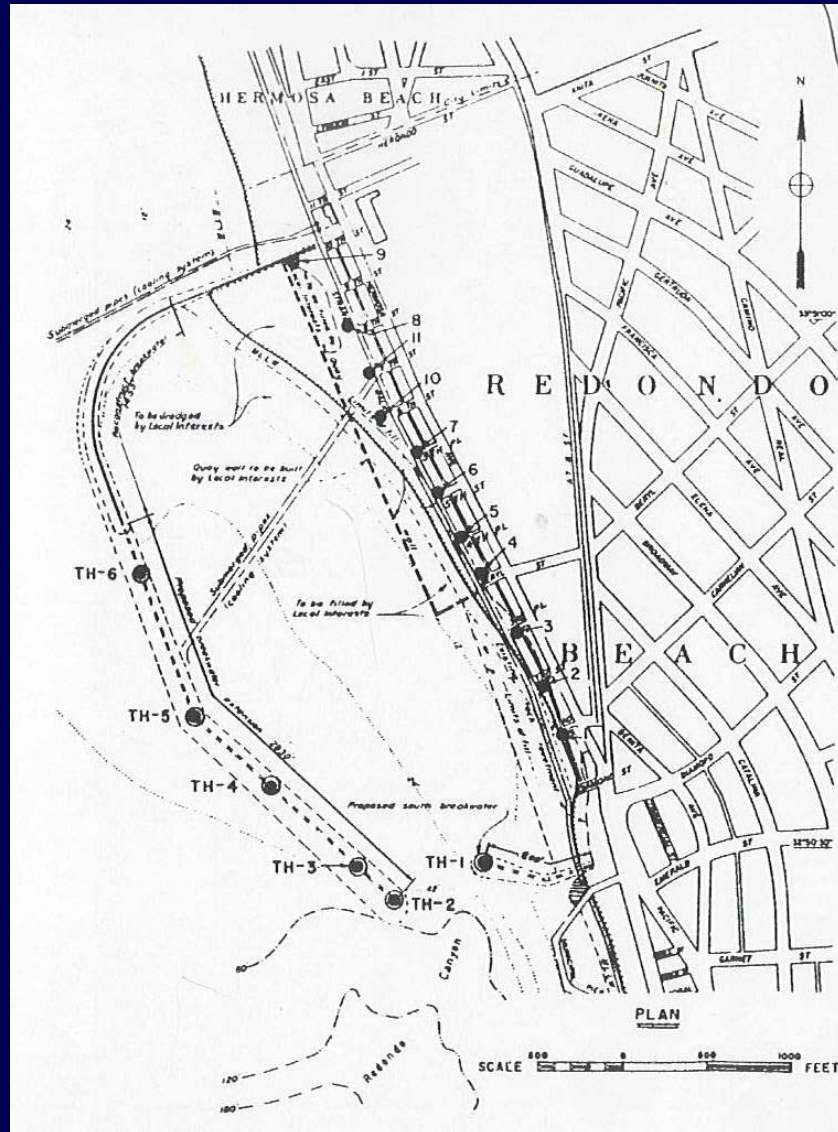
Reference –
USGS
Redondo
Sheet, 1896,
1:62,500

1932 Aerial Photograph

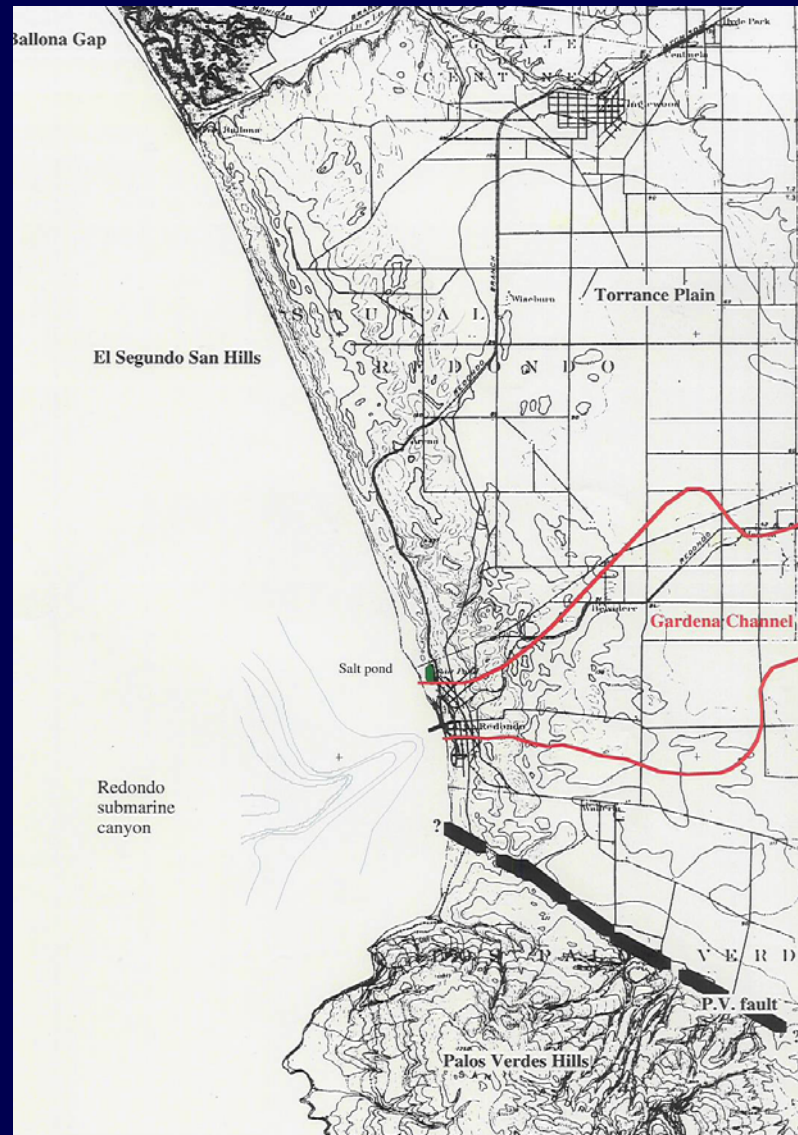


Reference –
Fairchild
Collection,
C-2298, 4,
1932,
approximate
scale 1" = 500'

Pre-1955 Subsurface Data



Potential Developmental Constraints

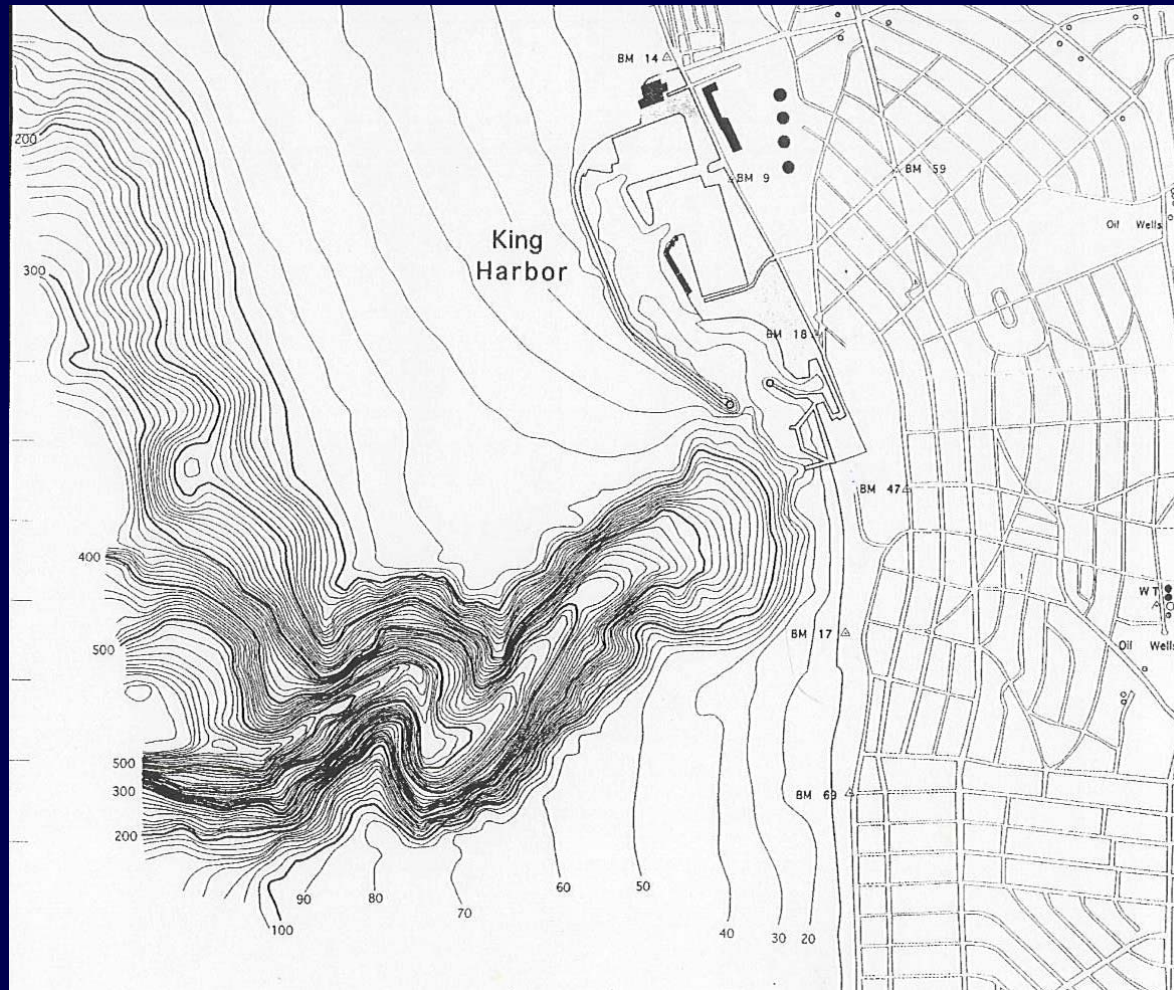


Modern King Harbor with Historical Topography



20' contour 1871

Recent Bathymetry Map of King Harbor



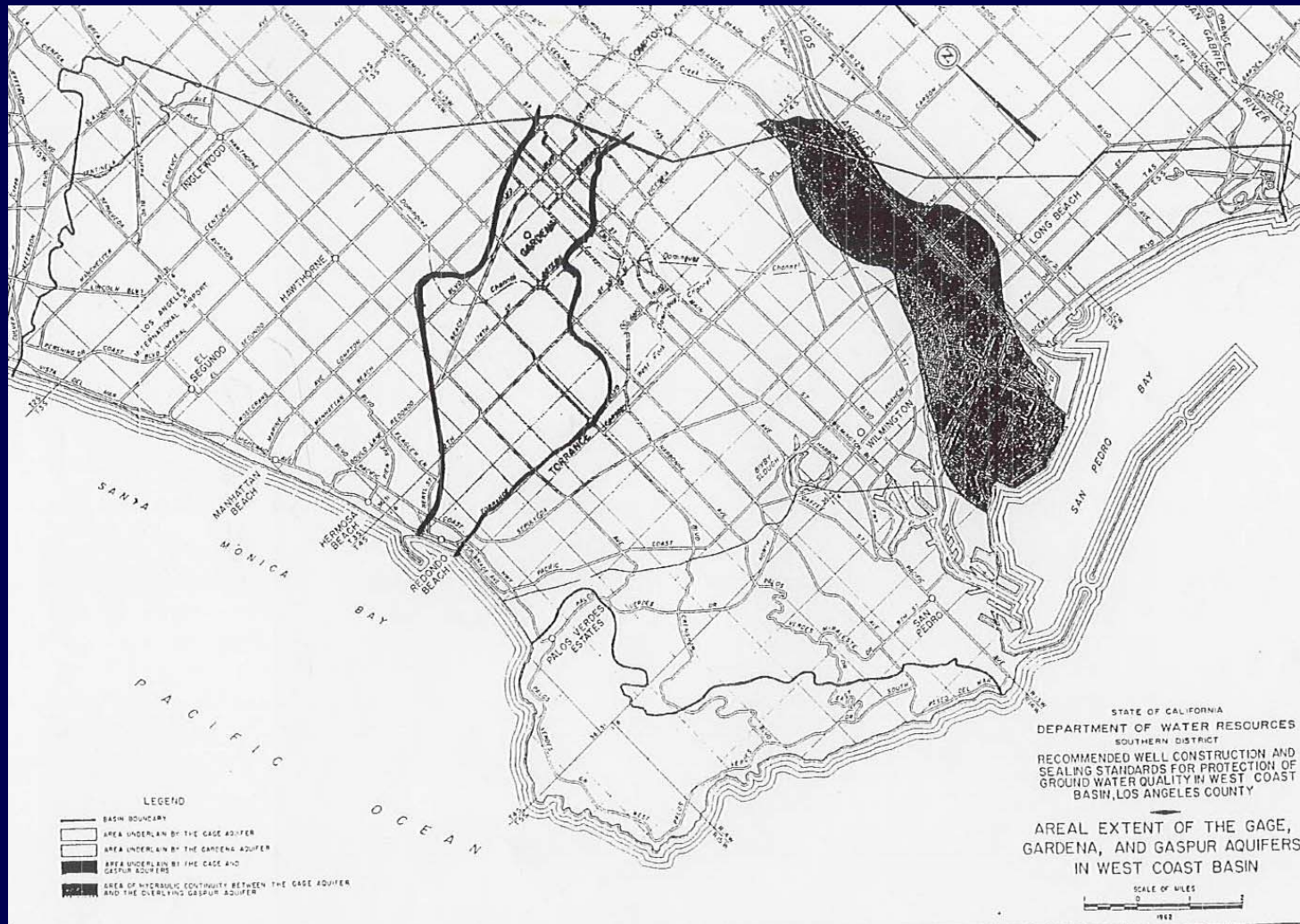
Relationship of King Harbor to Redondo
Submarine Canyon. Contour interval 10 feet.

Changes/Red Flags

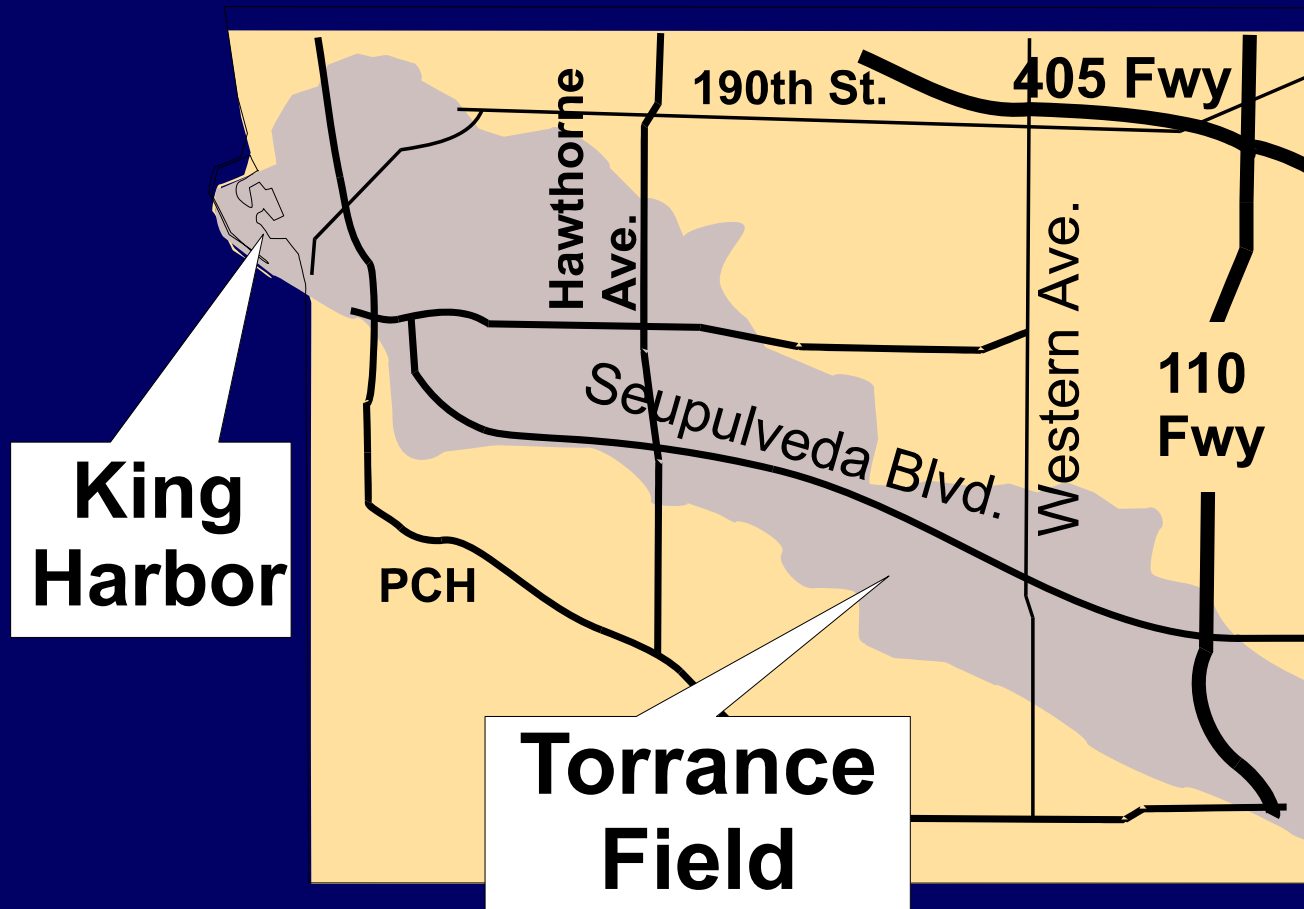


Reference –
Fairchild
Collection,
C-23023, 5:66,
1/17/58,
approximate scale
 $1'' = 1,000'$

1962 Historical Map



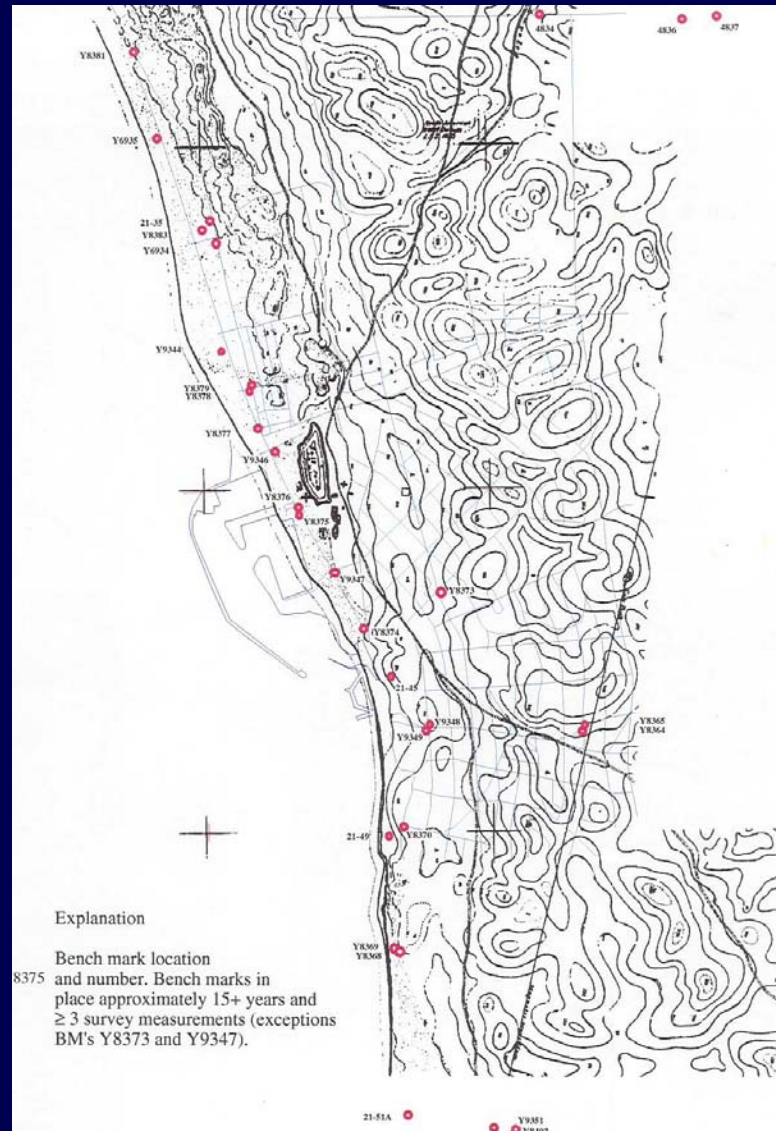
Torrance Oil Field



Source: California Division of
Oil and Gas



Benchmarks Locations in the Area



1928 Benchmark Locations



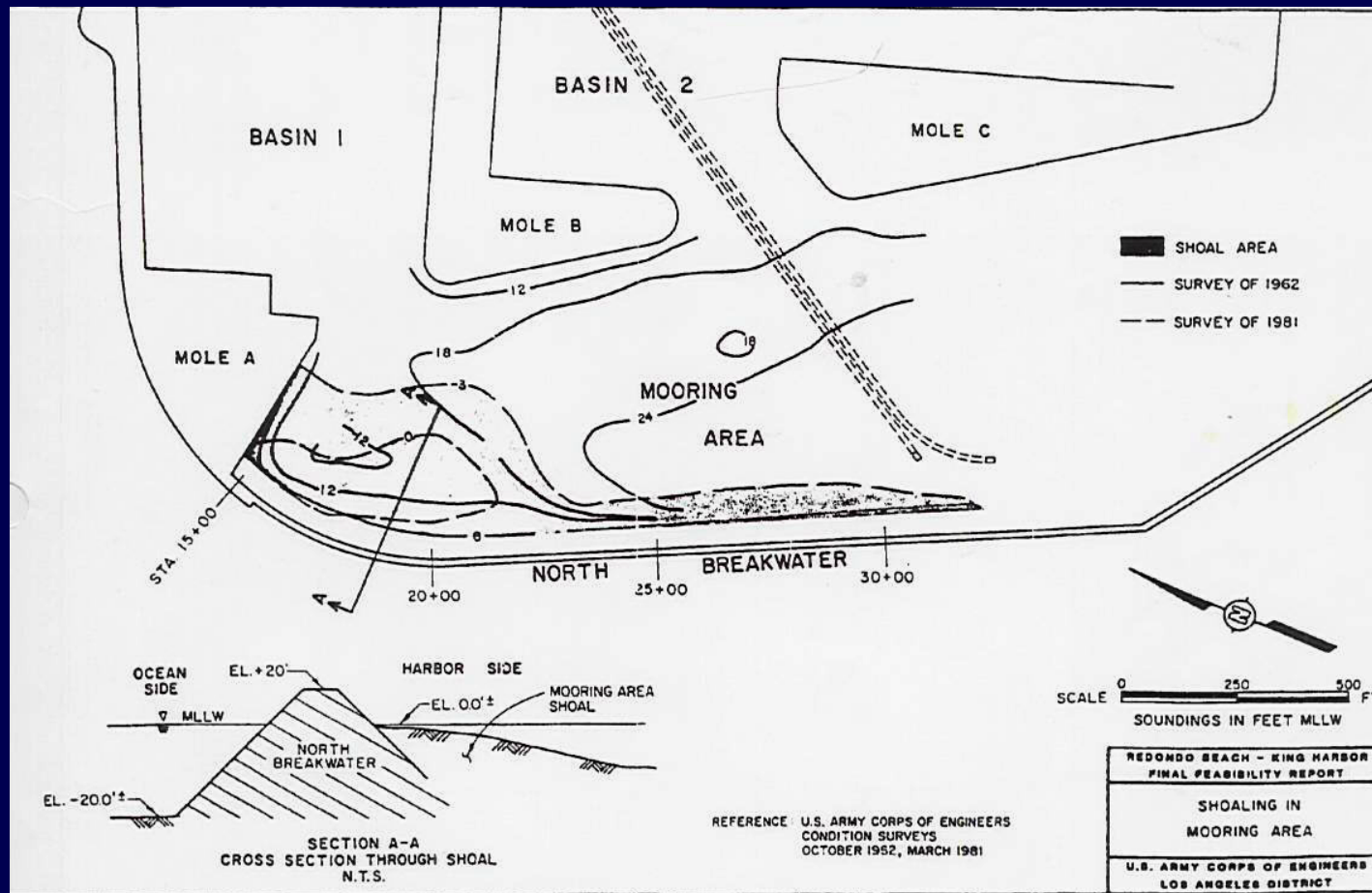
Reference –
C-300, M:22,
1928, approx.
scale 1" = 300'

Topographic
bulge in the
coast line



Bench mark, approximate location, station number and vert. elevation change (ft/yr) in white on photo.

Sand Fill behind Breakwater



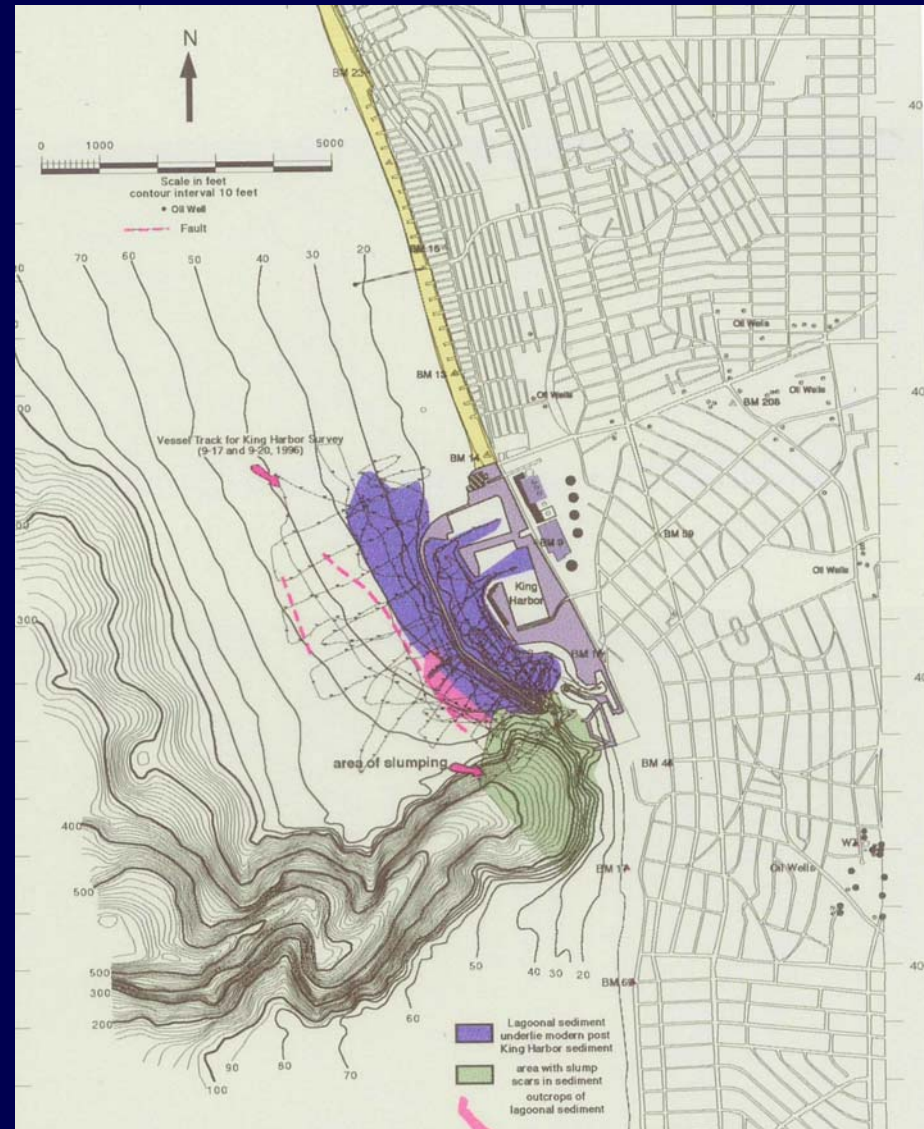
Reference – COE, 1984, Evaluation Report,
Breakwater Improvement at Redondo Beach,
King Harbor, Sept.

Coring Locations

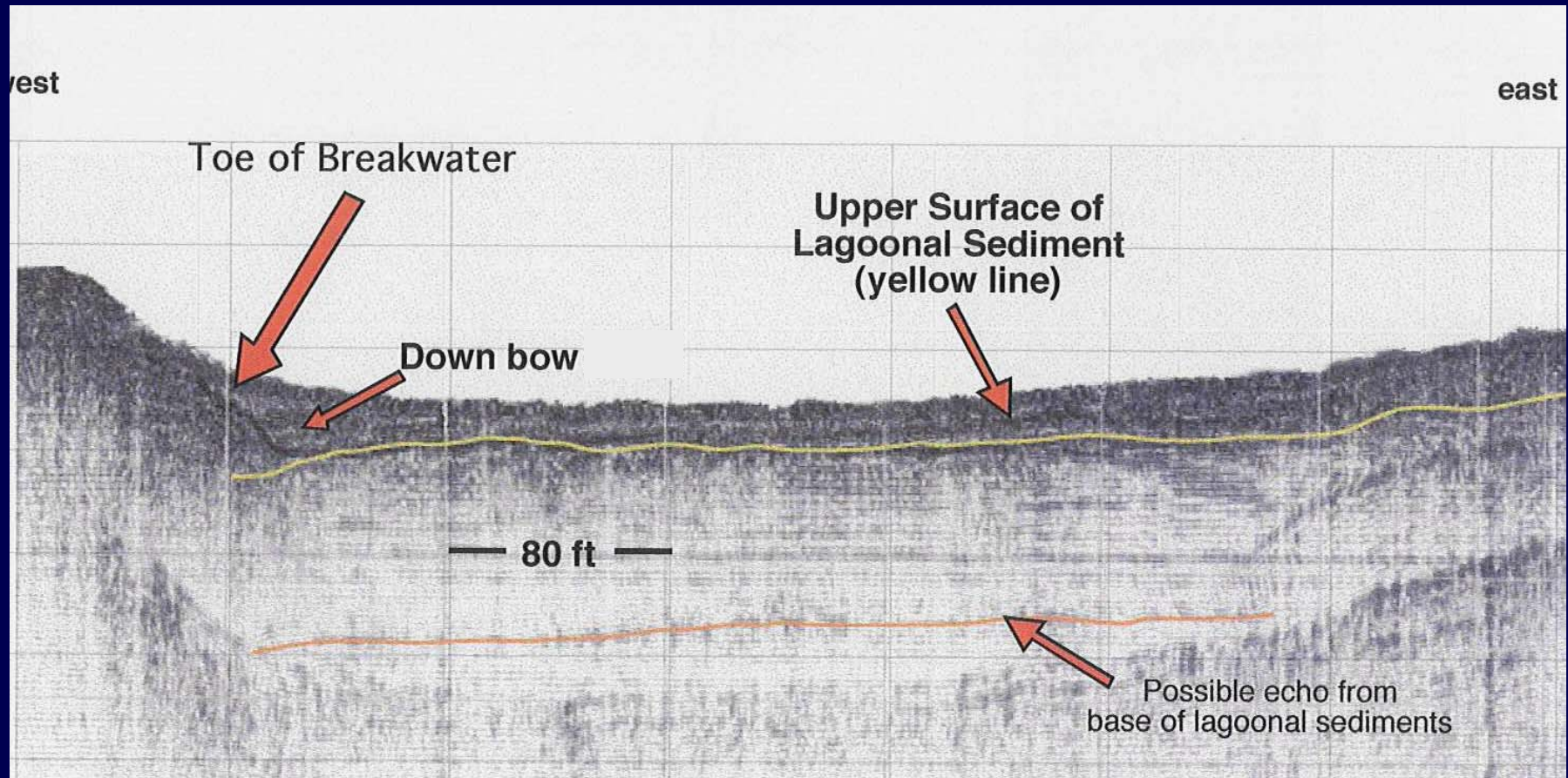


Reference –
Fairchild
Collection,
C-6330, 11,
3/5/40

Relationship of King Harbor to Redondo Submarine Canyon



Results of Sub-bottom Profiling Survey



West to East Profile of King Harbor (water depth 30 ft.; vertical exaggeration 42 to 1)