



Agenda Item #: _____

Staff Report

City of Manhattan Beach

TO: Honorable Mayor Powell and Members of the City Council

THROUGH: David N. Carmany, City Manager

FROM: Jim Arndt, Public Works Director
Juan Price, Maintenance Superintendent
Sona Kalapura, Environmental Programs Manager

DATE: June 19, 2012

SUBJECT: Approval of a Proposal to install Beach Width Measurement Benchmarks and Historical Markers on the Manhattan Beach Pier

RECOMMENDATION:

Staff recommends that the City Council approve a proposal to install Beach Width Measurement Benchmarks and Historical Markers on the Manhattan Beach Pier and provide direction to staff.

FISCAL IMPLICATION:

If approved, the design and materials of this project will be paid for directly by the Manhattan Beach Historical Society. Budgeted staff time of approximately \$1000 will be involved to prepare the site and install the beach-width measurement markers.

BACKGROUND:

During the prior century, naturally occurring alongshore littoral flow and human intervention in the southern part of Santa Monica Bay have resulted in a widening of the Manhattan Beach sand surface, with beneficial impacts for the community. The Manhattan Beach Historical Society seeks to educate the public on this phenomenon, with a special emphasis on the City's Centennial by installing benchmarks and historical plaques on the Manhattan Beach Pier.

Littoral Drift and Human Intervention

Mr. George Reppucci has researched the reasons why the width of Manhattan Beach more than doubled in the past century. He found that southerly littoral drift transports sand along the coastline from Santa Monica Bay beaches to the north. Large quantities of sandy sediment deposited on these beaches since 1938 from construction projects associated with the Hyperion Treatment Plant, Scattergood Power Plant, and Marina Del Rey have increased sand deposited on Manhattan Beach. Manmade jetties, groins and breakwaters, both north and south of Manhattan Beach, have resulted in a compartmentalization of the shoreline, effectively reducing littoral drift and improving sand retention at Manhattan Beach. Nourishment of beaches to the north has greatly benefited the City by widening Manhattan Beach and the manmade shoreline structures keep the width relatively stable.

DISCUSSION:

Mr. Reppucci, with the assistance of the Manhattan Beach Historical Society, has conducted a significant amount of research into why Manhattan Beach is much wider now than in the past.

Based on historical images, as shown in Attachment A, Mr. Reppucci determined that the beach-width has more than doubled since the incorporation of the City of Manhattan Beach. In 1912, the beach-width at the pier was approximately 180 feet. Currently, the beach width is more than 400 feet. In recognition of the City's Centennial celebration, the group would like to install an educational display on the Manhattan Beach Pier to increase public awareness of changes in beach width in the past and future.

Educational Display

The display would consist of a 1 x 2 foot informative plaque on the east end of the Pier adjacent to the lifeguard tower that would introduce the exhibit to visitors. If approved, the plaque would be mounted on a stand and bolted to the Pier deck. It would be engraved with a Pier plan view showing the locations of the benchmarks placed in the Pier deck and the two historical beach width markers mounted on the side curb under the railing.

Similar to the existing circular volleyball plaques in the Pier deck, the beach-width benchmarks would be made from bronze to ensure durability, and will be 4 inches in diameter. The benchmarks would be placed every 50 feet, from 100 feet to 600 feet along the Pier, allowing visitors to estimate the current beach width as they walk on the Pier. Two 4 x 6 inch rectangular historical markers will be placed at the 180 foot and 430 foot points so visitors can compare their width estimate to the beach width in 1912 and 2012. Draft artwork displaying images of the benchmarks, historical markers, and informative plaque are included in Attachment B.

Discussion has been initiated with the Roundhouse Aquarium board to have further details of the project, including factors that led to the increased beach width, available at their facility. Information on collaborative actions the City and government agencies at the federal, state and county levels need to take in order to maintain beach width in the future will be provided.

Staff has met with Mr. Reppucci and found there are no technical concerns or conflicts with installing the benchmarks or plaque on the Pier. There is an educational benefit from the program that ties into the missions of the City's Centennial efforts and environmental programs, as well as the Roundhouse Aquarium. All funding for materials for the display will be provided by the Manhattan Beach Historical Society. Should the project be approved, the goal for installation is no later than August 17, 2012.

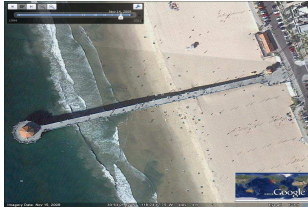
CONCLUSION:

Staff recommends that the City Council approve this proposal to install Beach Width Measurement Benchmarks and Historical Markers on the Manhattan Beach Pier.

Attachments

- A. Presentation: Determination of Manhattan Beach Width Change from a Century of Images
- B. Artwork: Benchmarks, Historical Markers, and Informative Plaque

Determination of Manhattan Beach Width Change from a Century of Images*



George M. Reppucci
Westwind Engineering
Redondo Beach, CA
greppu@verizon.net

**Why is Manhattan Beach so much wider now than in the past?*

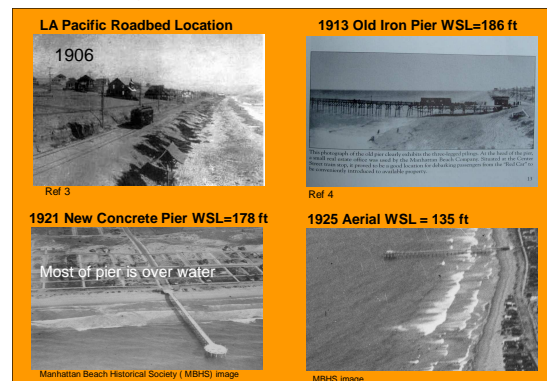
Introduction

- Twenty seven Manhattan Beach images acquired over the past 100 years were used to determine beach width change.
- All Images include Manhattan Beach Pier
- Nourishment of upcoast beaches on Manhattan Beach width is summarized
- Public awareness of beach width change to be enhanced by benchmarking the pier

Methodology

- Analyze beach width from 27 images that show the Manhattan Beach pier covering the period from 1913 to 2011
- Beach width was scaled from historical images using the known pier length.
- Beach width determined from Google Earth images (1994 through 2011) used Google Earth “ruler” distance measuring tool
- Measurements made from wet sand line (WSL) to east end of pier

Images Show Narrower Beach



Sometimes Much Narrower!

- Image shows buildings which were located west of the present day bike path and Strand at east end of Pier.
- The waterline is lapping at building foundations and almost no beach width exists at high tide



MBHS image

H2O 05302012

5

1938 Was An Eventful Year

- Ballona Creek North and South rubble jetties constructed (replaced wood pile jetties)
- Hyperion Dune nourishes Dockweiler Beach (1.8 million cu yd); funded by WPA.
- Redondo Beach King Harbor north breakwater construction underway
- Twin storms (Feb 27-Mar 4th >10 in. rain; 22.5 in. mountains) flood LA area leading to concrete channelization of rivers and construction of more flood control dams

H2O 05302012

6

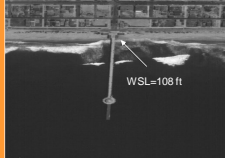
Historical Images

1928 Pier w/extension WSL=157 ft



Ref 4

June 12, 1938 US Army Corps of Engrs



WSL=108 ft

1930 Aerial WSL = 177 ft



MBHS image

1946 Aerial WSL =250 ft



MBHS image

H2O 05302012

7

1930-1945 Santa Monica Bay History

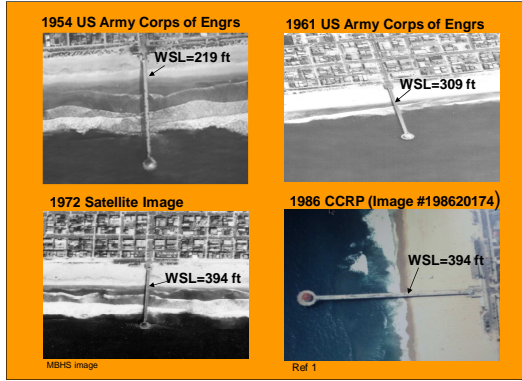
- **1930** – LA City Council directs City Engineer to study protection and development of the city's beaches.
- **1934 & 1935** – Engineers recommend doubling beach width using 56 million cu yd of sand from city owned dunes (LAX & Hyperion). No action (Great Depression)
- **1940**, Santa Monica breakwater blamed for Venice Beach erosion. Another report recommends 12 million cu yds be placed on beaches from Santa Monica to El Segundo. No action (too impractical/visionary)
- **1943/1945**- Venice Beach small fill proves nourishment works. State Health Commission quarantines 10 miles of Santa Monica Bay Beaches (Hyperion raw sewage)
- **1945**- The Commission secures court order to construct sewage treatment plant (Hyperion)

(Ref 7)

H2O 05302012

8

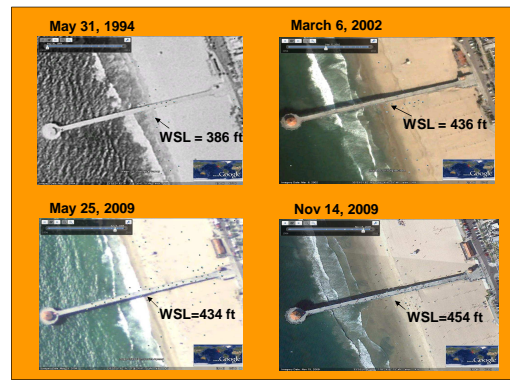
Historical Images



H2O 05302012

9

Google Earth Images of MB Pier



H2O 05302012

10

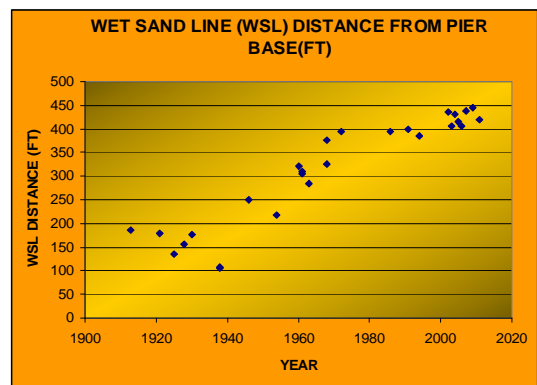
Google Earth Image - Date 3/8/2011



H2O 05302012

11

Manhattan Beach Width From 27 Images



H2O 05302012

12

LA River Primary Source of El Segundo Dune Field Sand (Pre-1825)

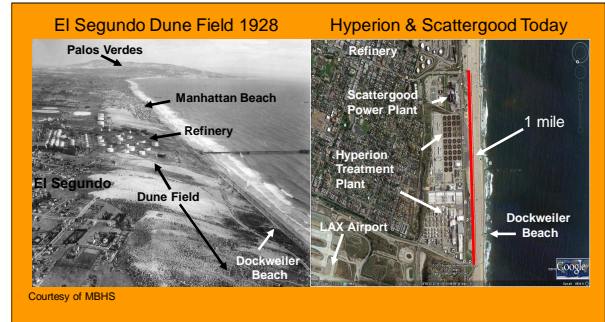


(Refs. 6,8,11,12)

H2O 05302012

13

El Segundo Dunes Before and After Hyperion



Courtesy of MBHS

H2O 05302012

14

Beach Nourishment North of Manhattan

Date	Placement Site	Sand Source	Sand Quantity cu yd
1938	Dockweiler Beach	Hyperion	1,800,000
1945	Venice Beach	Hyperion	150,000
1947	Venice-Dockweiler Beach	Hyperion	13,900,000
1956	Dockweiler Beach	Scattergood	2,400,000
1960-62	Dockweiler Beach	Marina Del Rey	3,200,000
1963	Dockweiler Beach	Marina Del Rey	6,900,000
1984	El Segundo	Offshore	620,000
1988	Dockweiler Beach	Hyperion	155,000
1988-89	El Segundo	Hyperion	945,000

(Refs 2,10,12,14)

Total = 30 million cu yds

H2O 05302012

15

Upcoast Nourishment Benefits Manhattan Beach

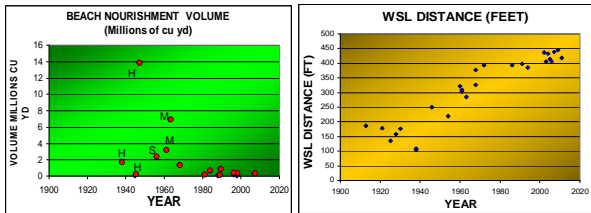
- Southward littoral transport of sediment from operations associated with:
 - Several Hyperion construction projects that salvaged sand from dunes west of El Segundo for placement on the beaches
 - Marina Del Rey construction and harbor entrance dredging operations
 - Scattergood steam plant site construction

(Refs. 2, 5 ,9,10,12,14)

H2O 05302012

16

Beach Nourishment North of Manhattan Beach Widens Manhattan Beach 250 Ft (approx.)



30 million cu yds of sand added to Venice and Dockweiler Beaches from 1947 to 1963

H = Hyperion
M = Marina Del Rey
S = Scattergood

Manhattan Beach width increases by approximately 250 ft. from 1940s to 1970s
Beach width has been relatively stable for 50 years

H2O 05302012

17

Why is Manhattan Beach width so stable?

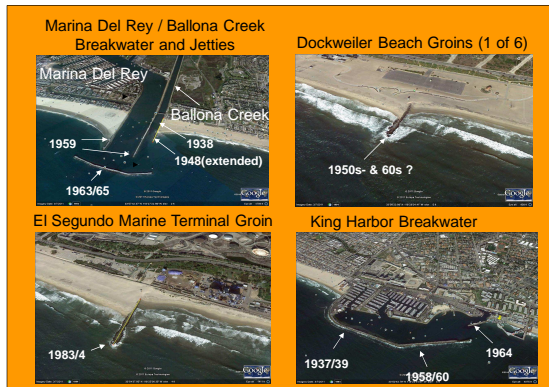
- Numerous breakwaters, groins, and jetties along the coast from Santa Monica to King Harbor were constructed in the last century
- These structures have significantly reduced littoral sediment transport to the Redondo Submarine Canyon

(Refs 5,10,12)

H2O 05302012

18

Breakwaters & Groins Reduce Littoral Drift



H2O 05302012

19

Manhattan Beach Future Width

- Marina Del Rey dredging now underway (1 million cu yd) includes some Dockweiler Beach offshore nourishment (majority is unsuitable and goes to Port of Long Beach)
- Natural sand sources such as Ballona Creek and Santa Monica Mountain Canyons provide insufficient sediment (Ref 12)
- Sea level rise as much as 4 ft (model ave.) by end of century (Ref. 13)
- Manhattan Beach will likely narrow given reduced natural sediment nourishment and sea level rise
- Except for the dunes west of LAX, dune fields that provided sand for beach nourishment are gone or exist beneath the beach cities
- At some time in the future, harvesting LAX dunes may be the best option to maintain beach width

H2O 05302012

20

LAX Dunes-Potential Future Sand Source



(Refs. 7,12)

H2O 05302012

21

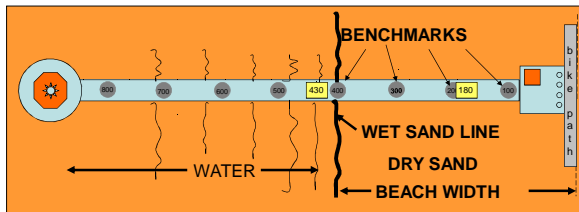
Summary and Conclusions

- Manhattan Beach width increased approximately 250 ft due to Venice and Dockweiler Beach nourishment operations conducted 50-70 years ago.
- Increase persists because southward littoral drift is significantly reduced by coastline structures built in the last century.
- Increased width is mainly due to human intervention and is a major coastal engineering success story
- Close coordination by federal, state, county, and MB city is required so future nourishment opportunities, essential to maintain beach width, are not missed.

H2O 05302012

22

MB PIER AS A BEACH WIDTH YARDSTICK ("Beach width measurement for the masses")



Benchmarks allow Comparison of present measurement with the markers showing beach width in 1912 (180ft) and 2012 (430 ft)

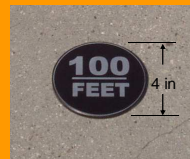
= Historical Markers for 1912 and 2012

H2O 05302012

23

BENCHMARK CONCEPTS

- Etched granite (weatherproof) plaques embedded in pier deck, one every 50 feet from pier base to 800 feet west.
- Plus two special Centennial plaques at 180 and 430 ft to show beach width in 1912 & 2012

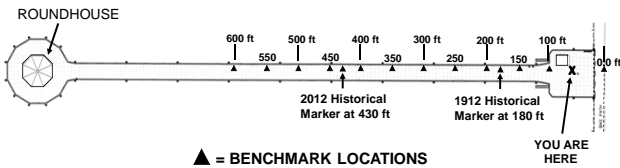


H2O 05302012

24

MANHATTAN BEACH PIER BENCHMARKS

HOW WIDE IS THE BEACH TODAY?



▲ = BENCHMARK LOCATIONS

USE BENCHMARKS TO DETERMINE THE DRY SAND BEACH WIDTH

MANHATTAN BEACH HISTORICAL SOCIETY

H2O 05302012

25

REFERENCES

- Adelman, Kenneth and Gabrielle, California Coastal Records Project (CCRP): <http://www.californiacoastline.org/>
- Brodour, SM and Walker, JR, "The California Beach Nourishment Success Story", In 6th National Conf., Proceedings, Tai L.S., editor, Feb. 1993, St. Petersburg, FL, Shore and Beach Preservation Association, p239-258
- Dennis, Jan, "A Walk Beside The Sea", A History of Manhattan Beach, 1987, Janston Studio, Manhattan Beach CA
- Dennis, Jan, "Images of America - Manhattan Beach Pier", 2005, Arcadia Publishing Co., San Francisco CA
- Flick, Reinhard B., "The Myth and Reality of Southern California Beaches", July 1993, Scripps Institute of Oceanography, La Jolla, CA 92093-0209, California Department of Boating and Waterways
- Gumprecht, Blake, "The Los Angeles River", The Johns Hopkins University Press, Baltimore, MD., p. 215, 1999
- Johnson, A.G., "Santa Monica Bay Shoreline Development Plans", Proc. of 1st International Conf. on Coastal Engineering, Long Beach, CA, pp 271-276, October, 1950
- Keryon, Edgar B., Jr., "History of Ocean Outlets, Los Angeles Flood Control District", Proc. 1st International Conf. on Coastal Engineering, Long Beach CA, pp 277-282, October, 1950,
- Leidersdorf C.B., Hollar R.C. and Woodell G.; "Beach Enhancement Through Nourishment and Compartmentalization: The Recent History of Santa Monica Bay, 1933, Proc. 8th Annual Symposium on Coastal and Ocean Management, American Shore & Beach Preservation Association, pp.71-85
- Leidersdorf, C.B.; "Human Intervention With The Beaches of Santa Monica Bay", Shore and Beach, Vol 62, No.3, July 1994,
- Martoni, Rudi et al., "Down Memory Lane The Los Angeles Coastal Prarie and Its Vernal Pools", Presented at 2nd Interface Between Ecology and Land Development in California, Occidental College, April 18 &19, 1997
- Weigel, Robert L., "Ocean beach Nourishment on the USA Pacific Coast, Shore and Beach, January, 1994
- State of California Interim Sea Level Rise Guidance Document, October, 2010
- "California Beach Restoration Study", Department of Boating and Waterways, January, 2002 , Sacramento, CA

H2O 05302012

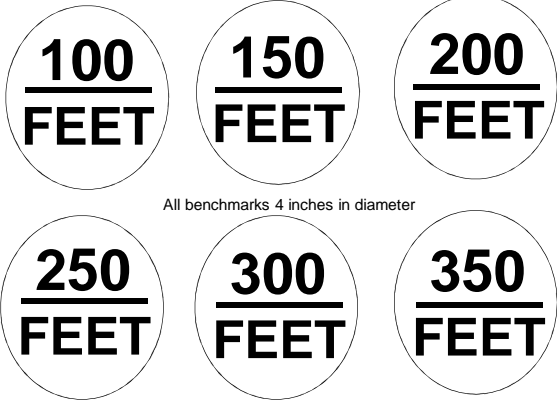
26

Acknowledgements

- **Dr. Craig Leidersdorf** of Coastal Frontiers Corp. for generously sharing his technical expertise
- **Steve Meisenholder** of the Manhattan Beach Historical Society for his helpful critiques and generous assistance providing many historical images used in this study.
- **Joe Ryan** of the US Army Corps of Engineers for his support in retrieval of archived images
- **Google Earth** for providing easily accessible Manhattan Beach Pier satellite images complete with distance measuring tools

H2O 05302012

27

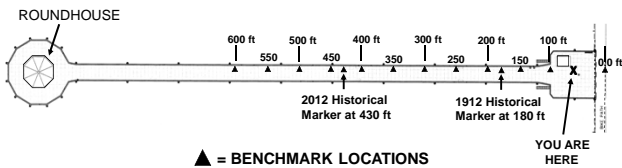


1912 Historical Marker (4 X 6 Inches)



MANHATTAN BEACH PIER BENCHMARKS

HOW WIDE IS THE BEACH TODAY?



USE BENCHMARKS TO DETERMINE THE DRY SAND BEACH WIDTH

MANHATTAN BEACH HISTORICAL SOCIETY