

SUNSET BEACH RSM INVESTIGATIONS

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State of Hawaii Department of Land and Natural Resources

US Army Corps of Engineers, Honolulu District



SUNSET BEACH RSM SHORELINE CHANGE ANALYSIS

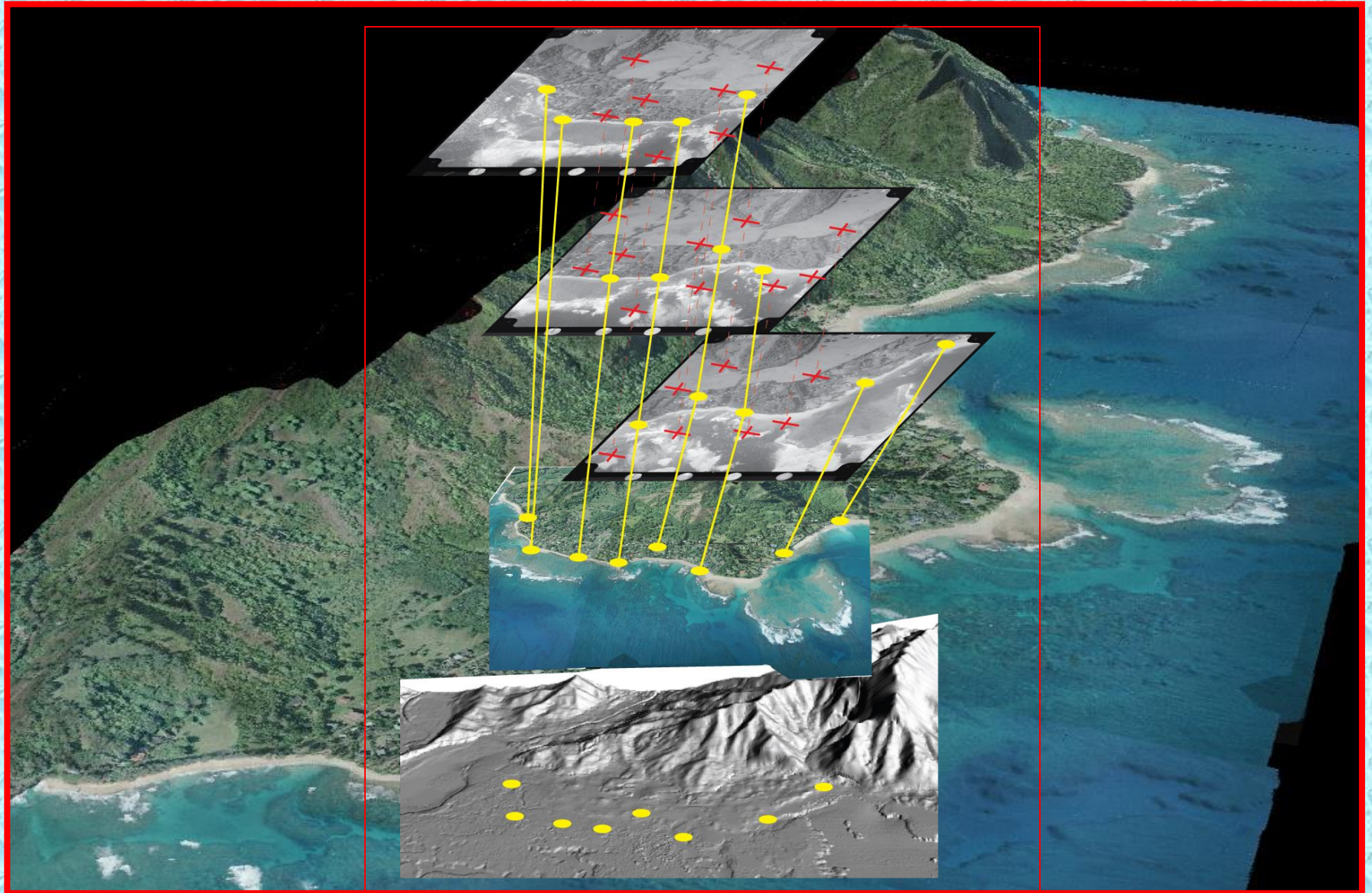
Tom Smith
Honolulu District

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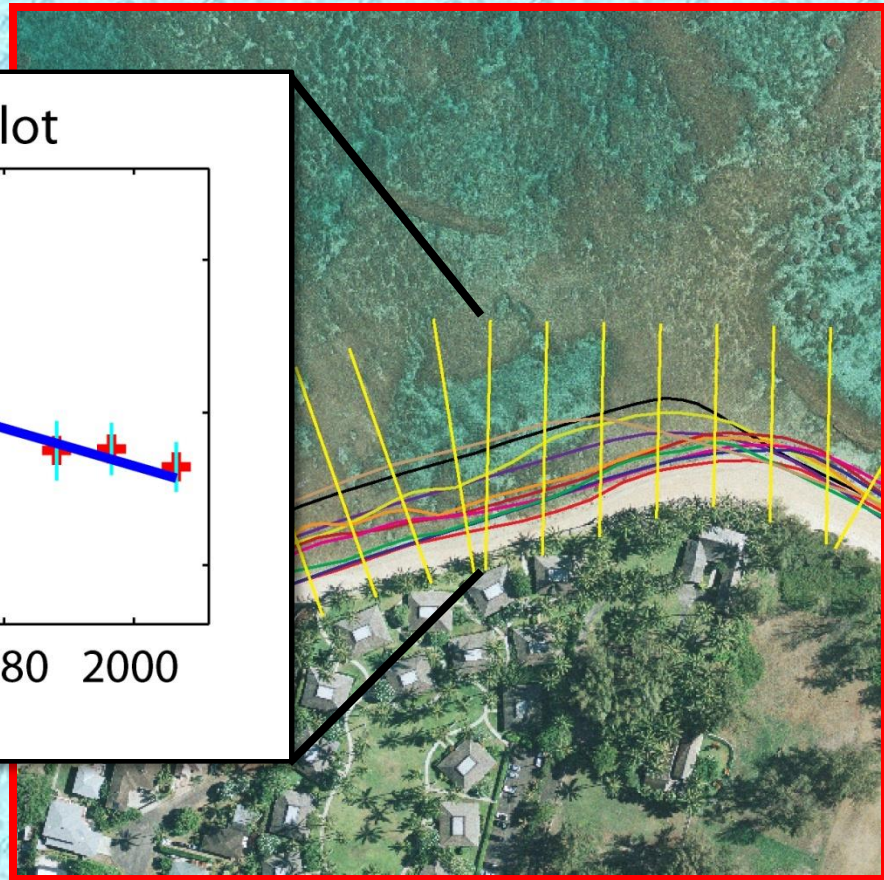
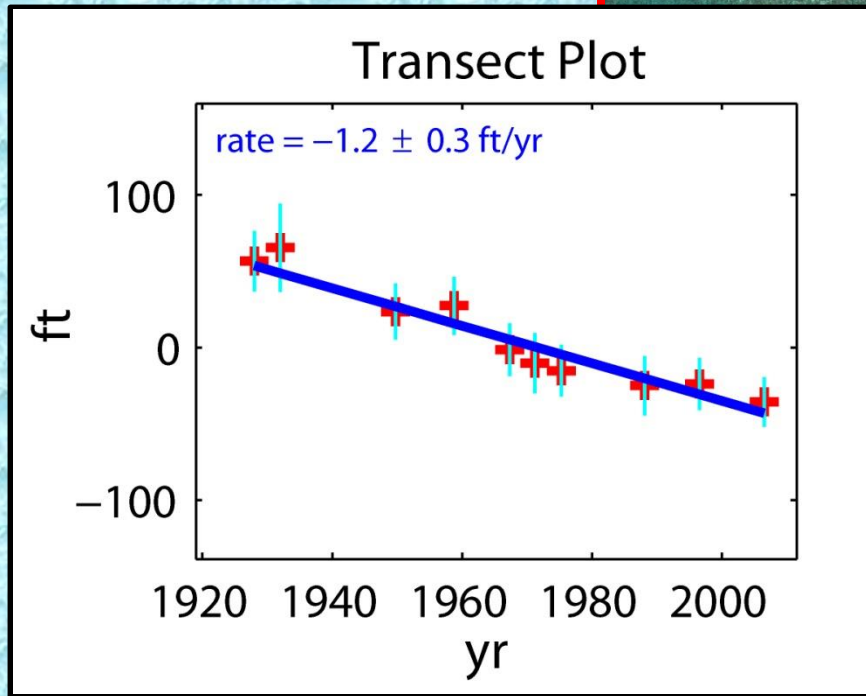
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HISTORICAL AERIAL PHOTOGRAMMETRY



MAPPING HISTORICAL SHORELINES



portion of an aerial photo mosaic

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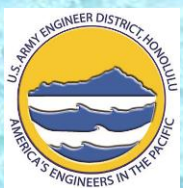
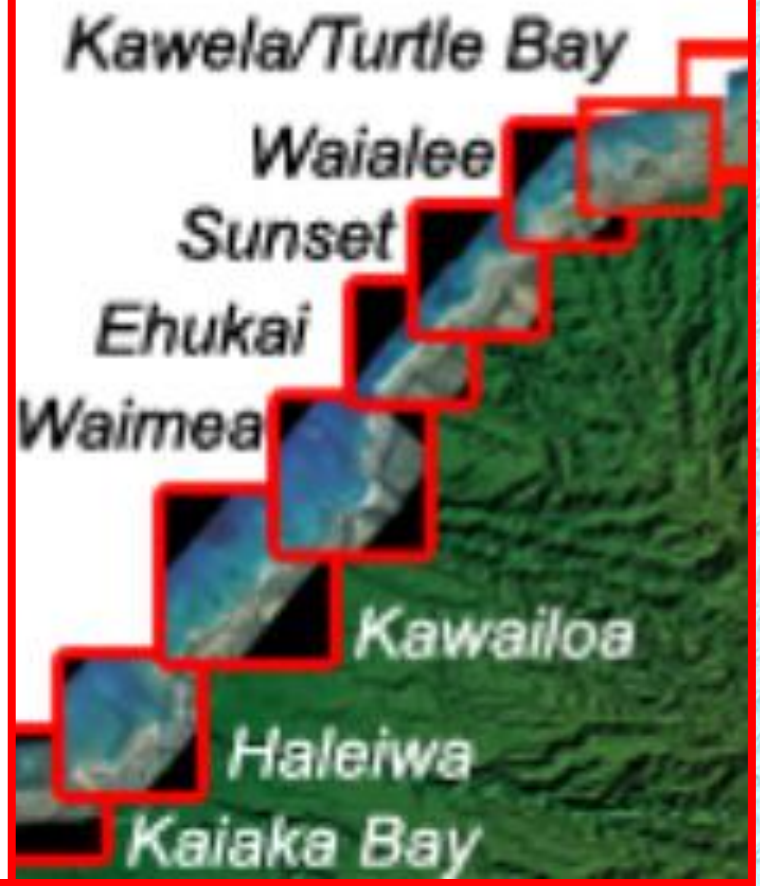
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OAHU COUNTY SHORELINE DATABASE

HISTORICAL SHORELINES

-  1928
-  T-sheet 1932
-  May 1949
-  Apr 1967
-  Jan 1971
-  Apr 1975
-  Feb 1988
-  Jul 1996
-  Jul 2006



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Ehukai, Oahu, Hawaii

AREA DESCRIPTION

The Ehukai shoreline study area (traverses 0 – 117) is on the north shore of Oahu and is the site of world famous big wave surf breaks including Rock Pile, Pipeline, and Rocky Point. Ehukai is the southern portion of a continuous (4 mi long) beach composed of carbonate sand, and characterized by occasional outcrops of limestone and basalt. The area is exposed to swells from the north Pacific in winter months and easterly tradewind waves year-round.

Large winter swell causes dramatic changes in shoreline position that largely recover the following season. Because of this, shoreline change rates at Ehukai have high uncertainty due to short-term variations in shoreline position. Despite wide variations in beach width, the vegetation line has remained approximately stable since 1928. The high rate uncertainty and stable vegetation line suggest that the shoreline has remained approximately stable over the long-term or that seasonal variations are masking the true long-term change. These characteristics may also reflect shoreline stabilization by armoring that holds the vegetation line in place. In particular, the beach between Ehukai Beach Park and Rocky Point (around transect 77) has grown narrow and should be monitored for further sand loss as seen with the July 2006 shoreline.

Much of the beach typically loses two-thirds of its summer-time width in winter (see Jan 1971 and Feb 1988 shorelines), especially from Rock Pile to Pipeline and at Rocky Point. Short-term erosion is a significant hazard to beach-front homes, especially in winter with run-up from large waves. A number of beach-front homes were destroyed during a massive winter 1969 swell.

Previous studies by Hwang (1981) and Sea Engineering (1988) found little net change in the vegetation line at Pupukea-Paumotu 1949 – 1988. Hwang found the water line varied by over 100 feet in several locations.

For more information see: <http://www.soest.hawaii.edu/asp/coasts/oahu/>

Hwang, D. (1981), "Beach changes on Oahu as revealed by aerial photographs." State of Hawaii, Department of Planning and Economic Development.

Sea Engineering (1988), "Oahu shoreline study." City and County of Honolulu, Dept of Land Utilization.

SHORELINE CHANGE RATES

- Accretion Rate
- Erosion Rate

Historical shoreline positions are measured every 66 ft along the shoreline. These sites are denoted by yellow shore-perpendicular transects. Changes in the position of the shorelines through time are used to calculate shoreline change rates (ft/yr) at each transect location.

Annual shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of beach erosion, while blue bars indicate a trend of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary, transects have been purposely deleted to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere.

The ST method is used to calculate shoreline change rates for the study area. The rates are smoothed along shore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transects. For more information on erosion rate methods and results see: <http://www.soest.hawaii.edu/asp/coasts/oahu/index.asp>

HISTORICAL SHORELINES

- 1928
- T-sheet 1932
- May 1949
- Apr 1967
- Jan 1971
- Apr 1975
- Feb 1988
- Jul 1996
- Jul 2006
- Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified and georeferenced aerial photographs and National Ocean Survey (NOS) topographic survey charts. The low water mark is used as the historical shoreline, or shoreline change reference feature (SCRF).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

The preparation of this poster was funded in part by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resources, Department of Natural Resources, National Ocean Service, National Oceanic and Atmospheric Administration, United States Department of Commerce, through the Office of Planning, State of Hawaii.

2010
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<http://www.soest.hawaii.edu/asp/coasts/oahu/>



Sunset Beach, Oahu, Hawaii

AREA DESCRIPTION

The shoreline fronting the community of Sunset Beach (transects 119 – 269) on the north shore of Oahu is the site of world famous big wave surf breaks including Sunset and Wai'oli. The area is exposed to swells from the north Pacific in winter months and easterly tradewind waves year-round. Sunset Beach is the central portion of a continuous (4 mi long) beach composed of carbonate sand, and characterized by occasional outcrops of limestone that may be intermittently buried or exposed by shifting sand.

Shoreline change rates at Sunset Beach (1928 – 2006) are mostly low (< 1 ft/yr). Large winter swell causes dramatic changes in shoreline position that largely recover the following season. Because of this, shoreline change rates at Sunset Beach have high uncertainty due to short-term variations in shoreline position. Despite wide variations in beach width, the vegetation line has remained approximately stable since 1928. The high rate uncertainty and stable vegetation line suggest that the shoreline has remained approximately stable over the long-term or that seasonal variations are masking the true long-term change. These characteristics may also reflect shoreline stabilization by armoring that holds the vegetation line in place.

Short-term erosion is a significant hazard to beach-front homes, especially in winter with run-up from large waves. A number of beach-front homes were destroyed during a massive winter 1969 swell.

Previous studies by Hwang (1981) and Sea Engineering (1988) found little net change or small seaward growth of the vegetation line at Sunset Beach 1949 – 1998, except at Sunset Beach Park and at the west end of Kaunala Beach where the vegetation line eroded. The vegetation line has since recovered at Kaunala Beach (1988 – 2006).

For more information see: <http://www.soest.hawaii.edu/asp/coasts/ohau/>

Hwang, D. (1981). "Beach changes on Oahu as revealed by aerial photographs." State of Hawaii, Department of Planning and Economic Development.

Sea Engineering (1988). "Oahu shoreline study." City and County of Honolulu, Dept. of Land Utilization.

SHORELINE CHANGE RATES

- █ Accretion Rate
- █ Erosion Rate

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Annual shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of beach erosion, while blue bars indicate a trend of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary, transects have been purposely deleted to maintain consistent along-shore spacing. As a result, transect numbering is not consecutive everywhere.

The ST method is used to calculate shoreline change rates for the study area. The rates are smoothed along shore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transects. For more information on erosion rate methods and results see: <http://www.soest.hawaii.edu/asp/coasts/ohau/index.asp>

Shoreline Change Rate (ft/yr)

HISTORICAL SHORELINES

- █ 1928
- █ T-sheet 1932
- █ May 1949
- █ Sep 1961
- █ Apr 1967
- █ Jan 1971
- █ Apr 1975
- █ Jun 1975
- █ Feb 1988
- █ Jul 1996
- █ Jul 2006

█ Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified and georeferenced aerial photographs and National Ocean Survey (NOS) topographic survey charts. The low water mark is used as the historical shoreline, or shoreline change reference feature (SCRFF).

Movement of the SCRFF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.



1198204e UTM coordinates
158°04'10" W Longitude coordinates

The information on this document was prepared in part using data provided by the following organizations:

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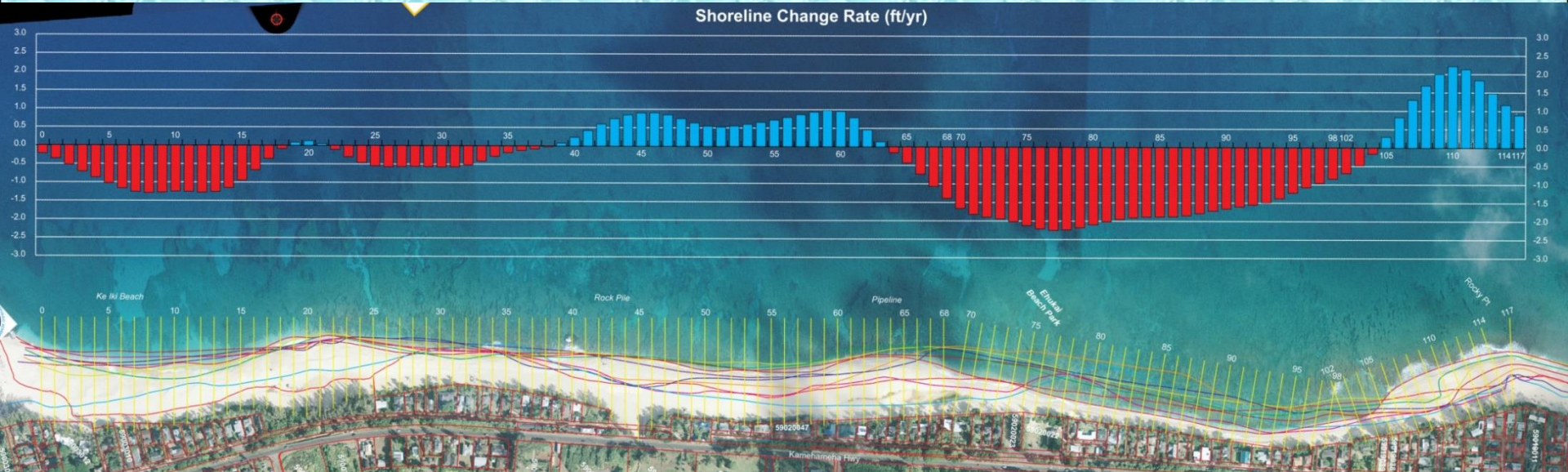
Charles Fletcher, Bradley Roman, Matthew Darbee, Siang-Chyn Linn, Matthew Dyer
 University of Hawaii Coastal Geology Group
 School of Ocean and Earth Science and Technology
 1680 East Wahi Rd., Honolulu, HI 96822, U.S.A.
<http://www.soest.hawaii.edu/asp/coasts/ohau/>

Oahu

Scale 1:3000



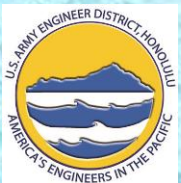
REACH 1 (Ke Iki Beach to Rocky Point)



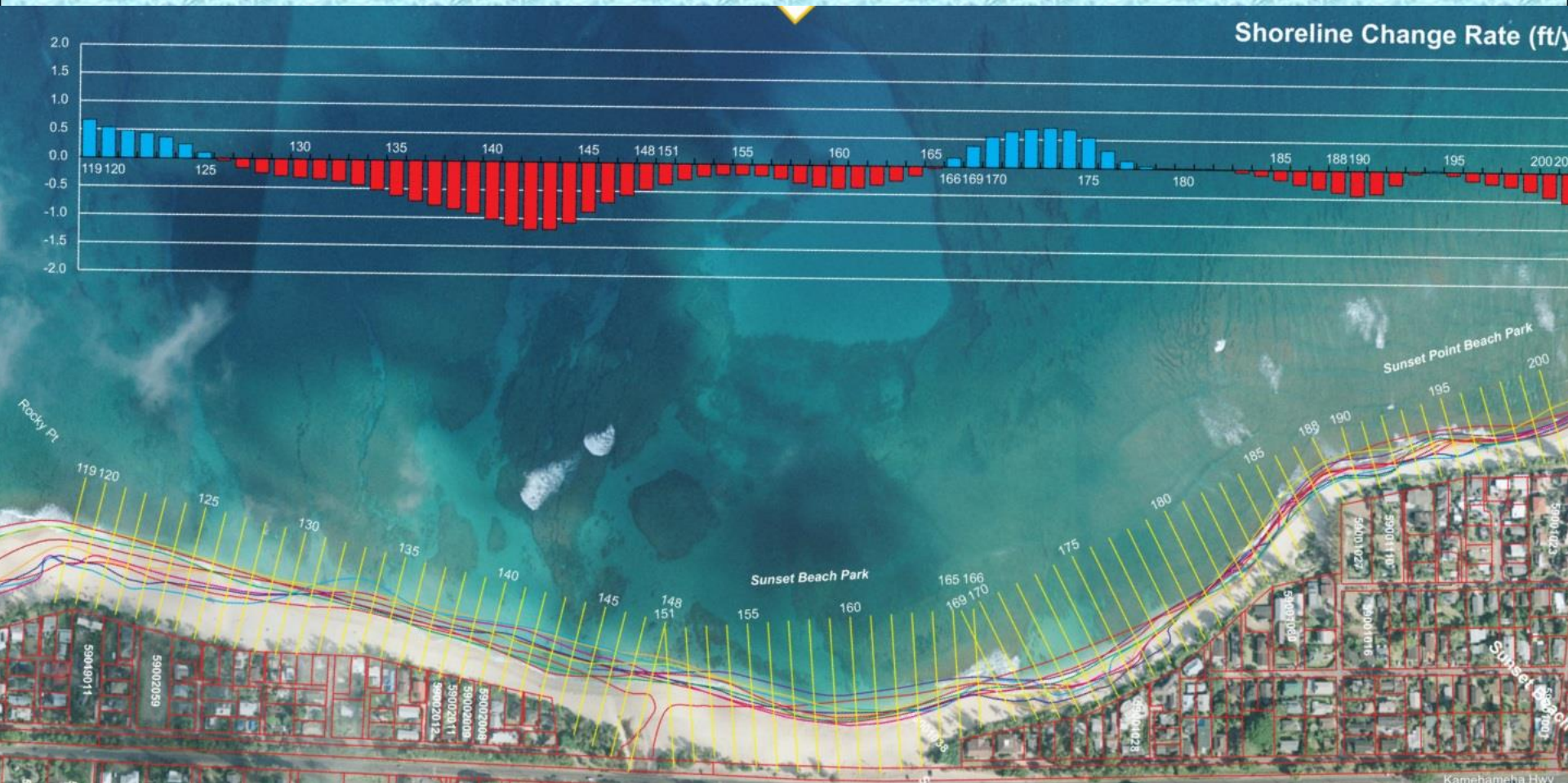
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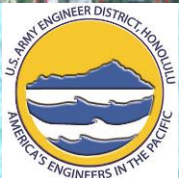
REACH 2 (Rocky Point to Sunset Point)



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REACH 3 (Sunset Point to Velzyland)

(ft/yr)



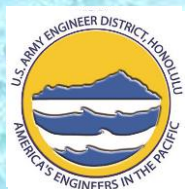
VOLUME CHANGE

1948 – 2006

57 years

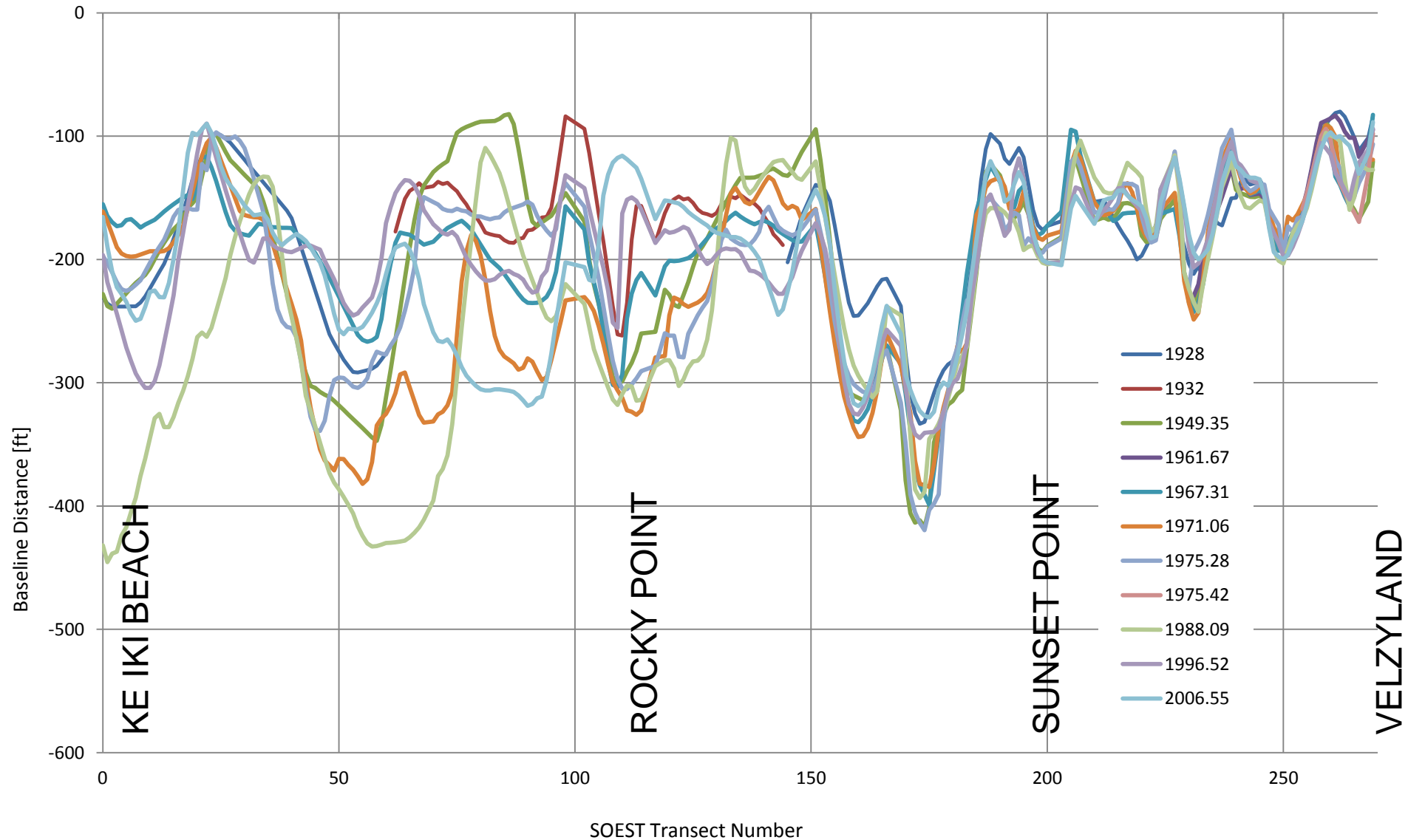
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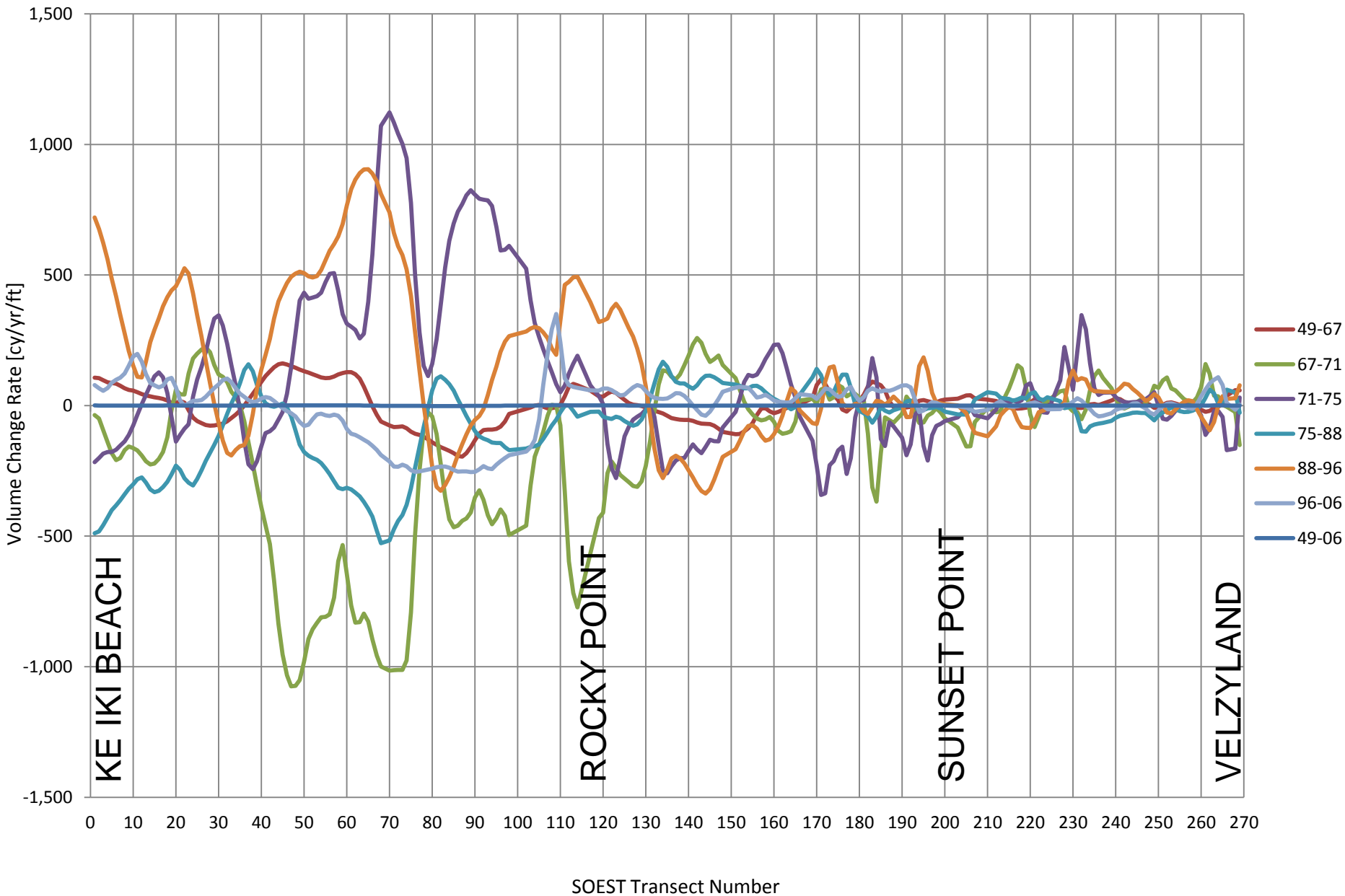


SUNSET BEACH REGION

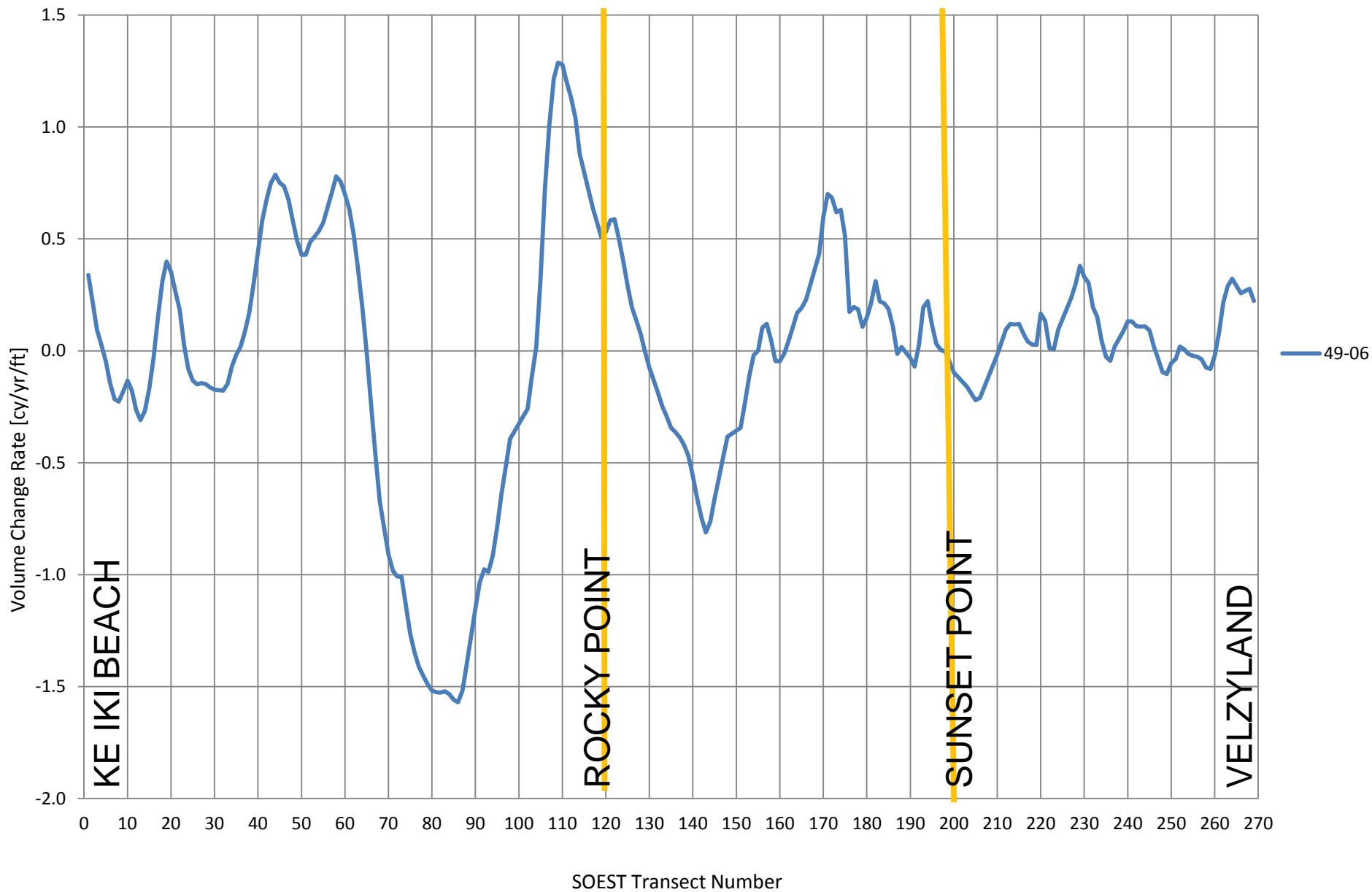
Shoreline Toe Positions from 1928 to 2006



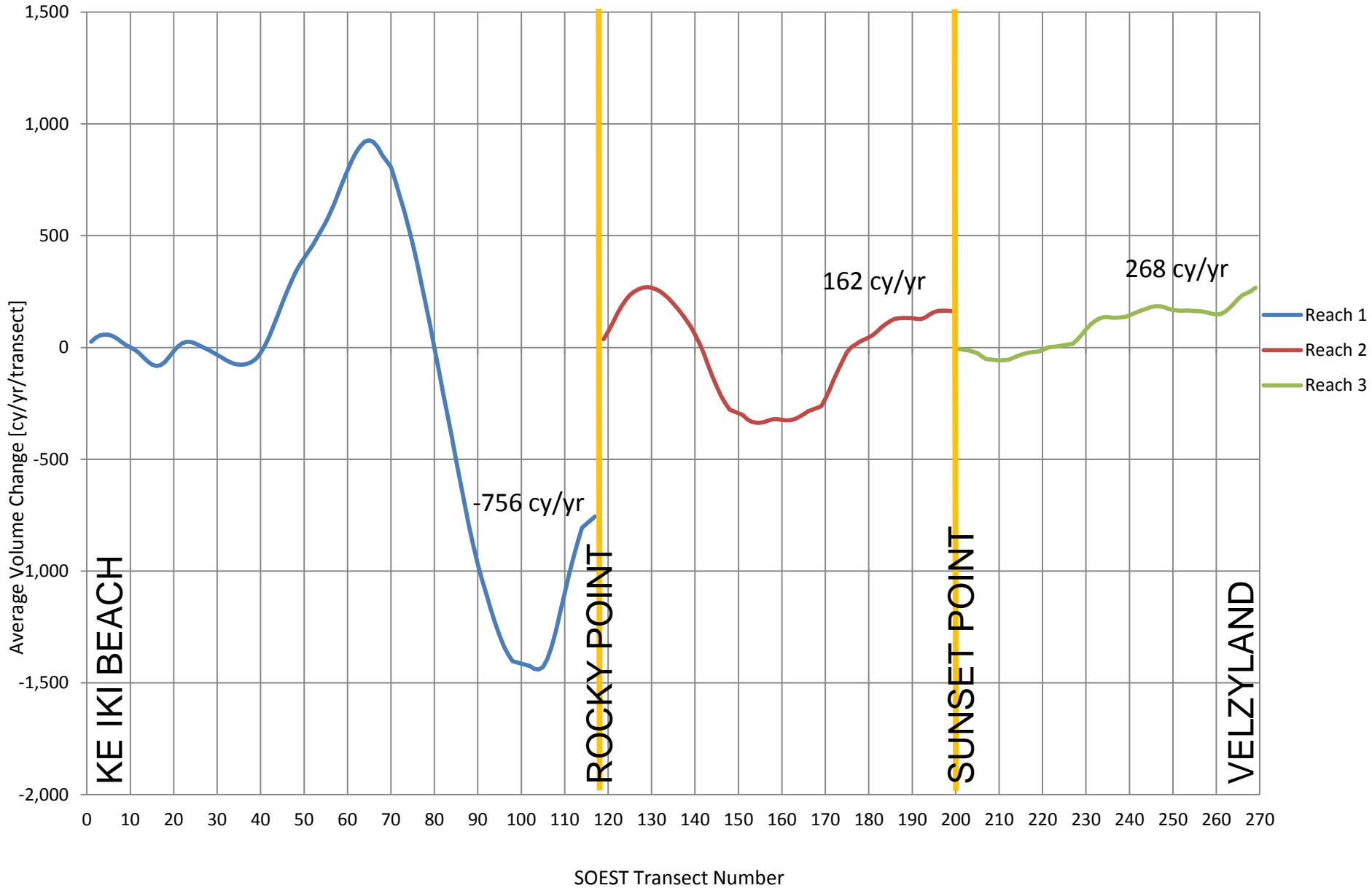
Sunset Beach Region: Transect Volume Change Rate for Various Time Periods



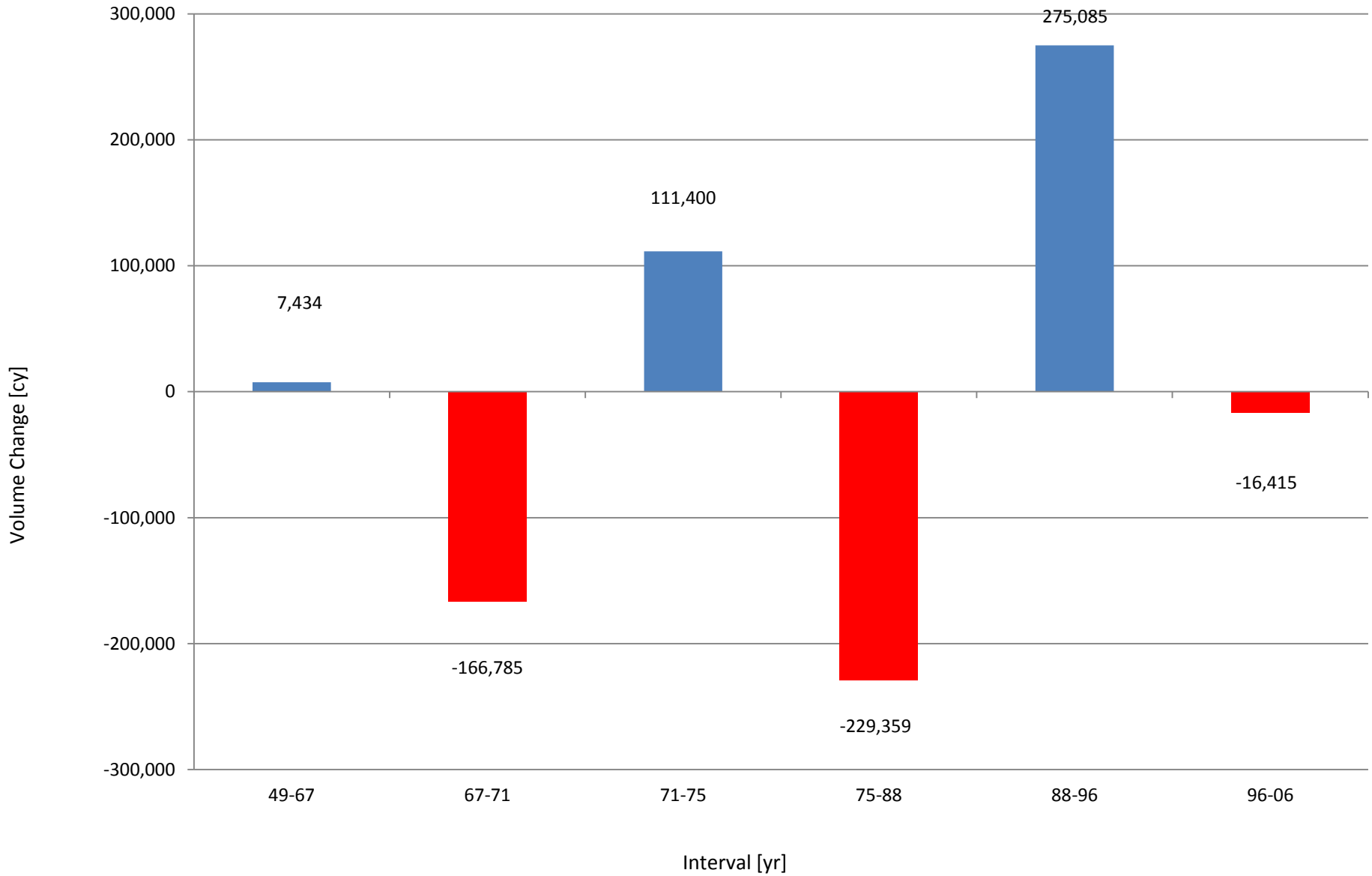
Sunset Beach Region: Transect Volume Change Rate from 1949 to 2006



Sunset Beach Region: Cumulative Transect Volumes from 1949 to 2006 (by reach)



Sunset Beach: Volume Change Based on Shoreline Change



SHORELINE CHANGE

1975 – 2006

31 years

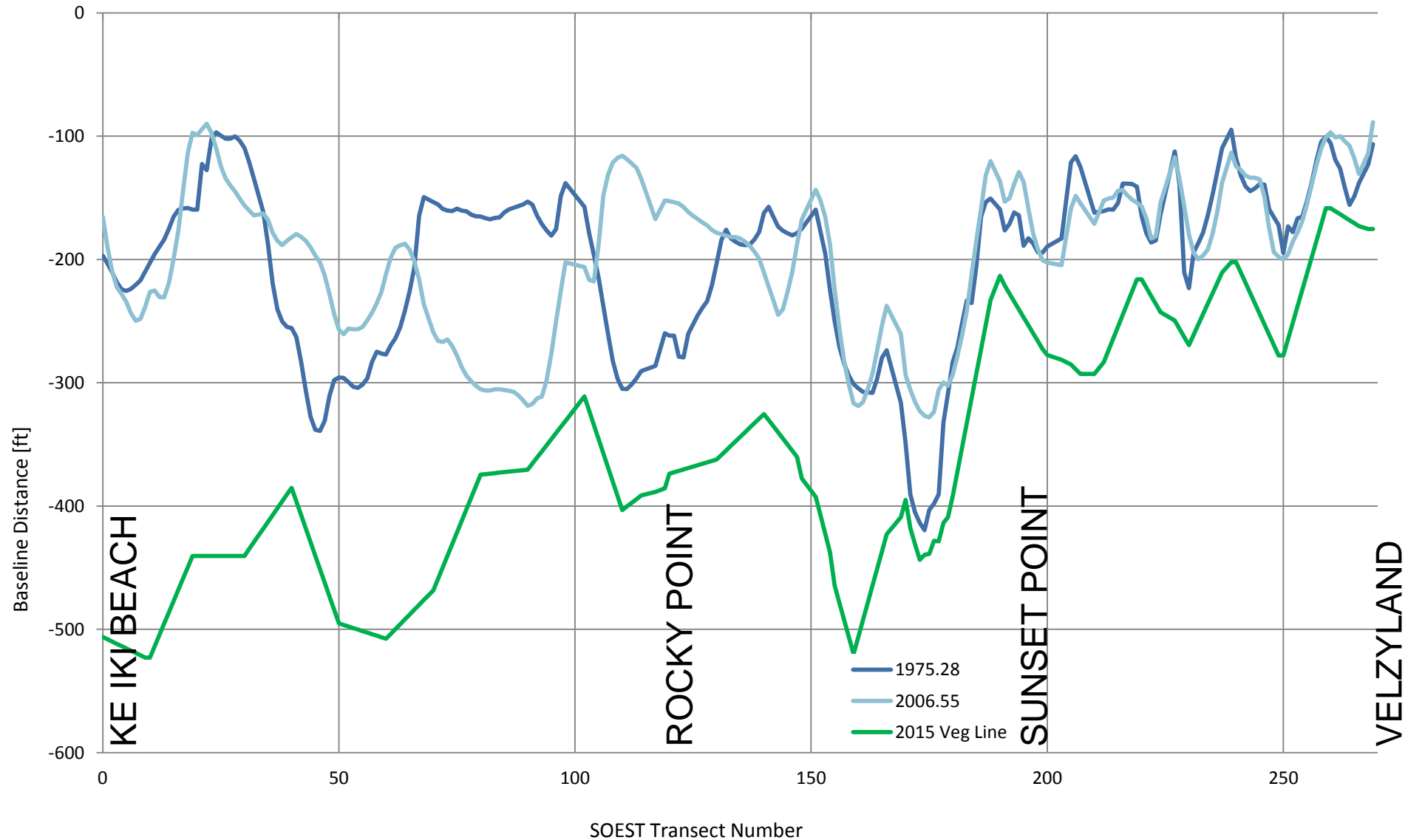
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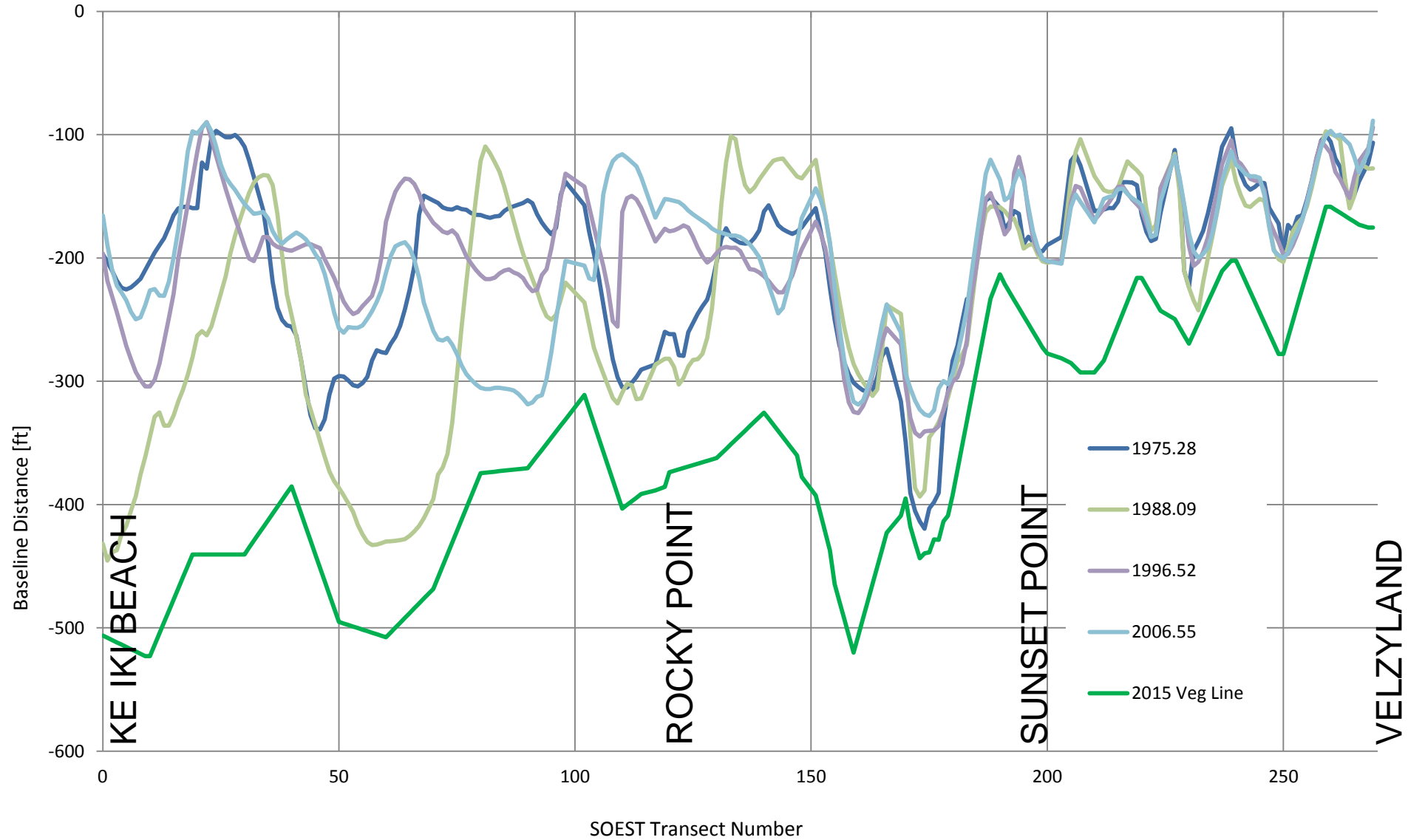
SUNSET BEACH REGION

Shoreline Toe Positions for 1975 and 2006



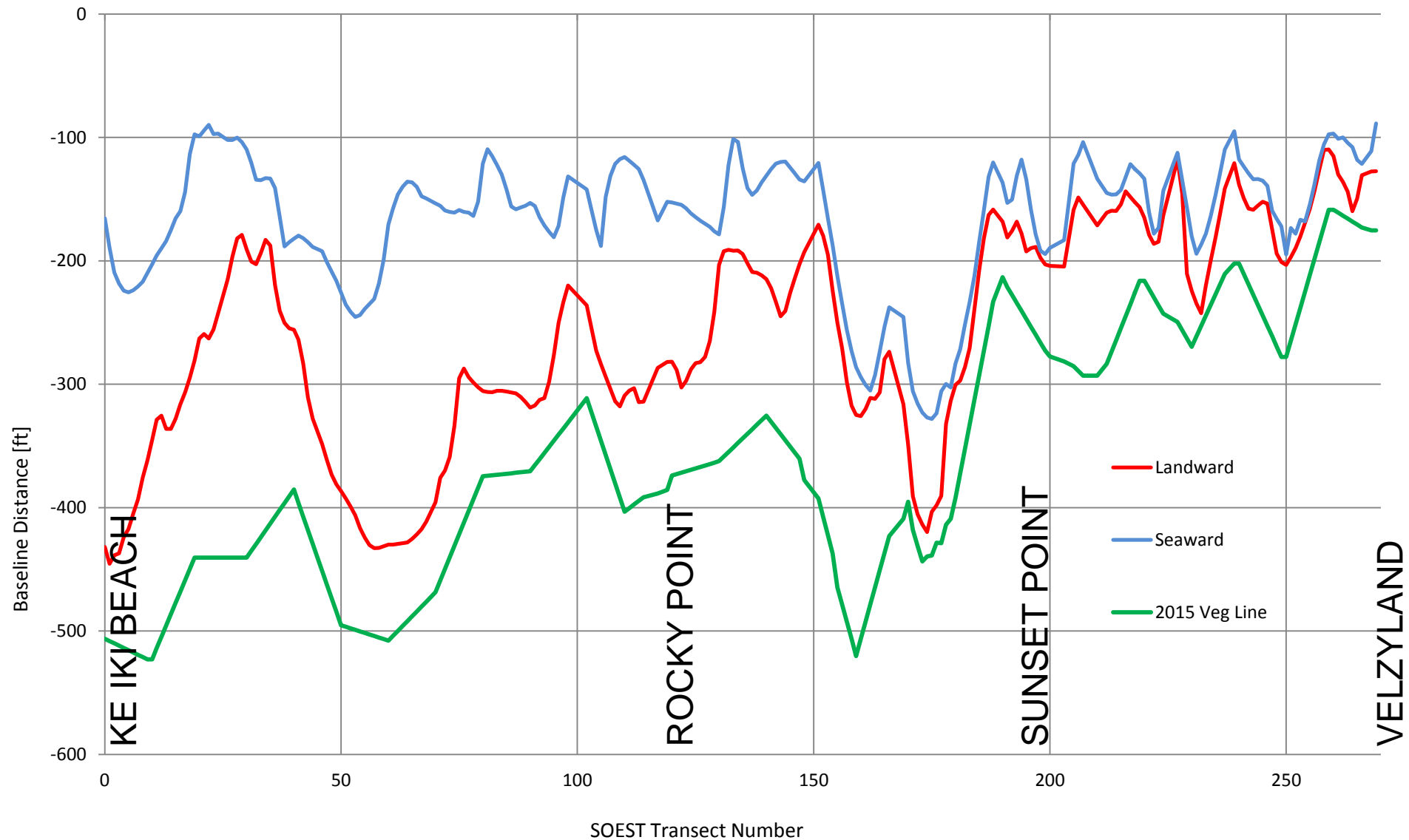
SUNSET BEACH REGION

Shoreline Toe Positions from 1975 to 2006



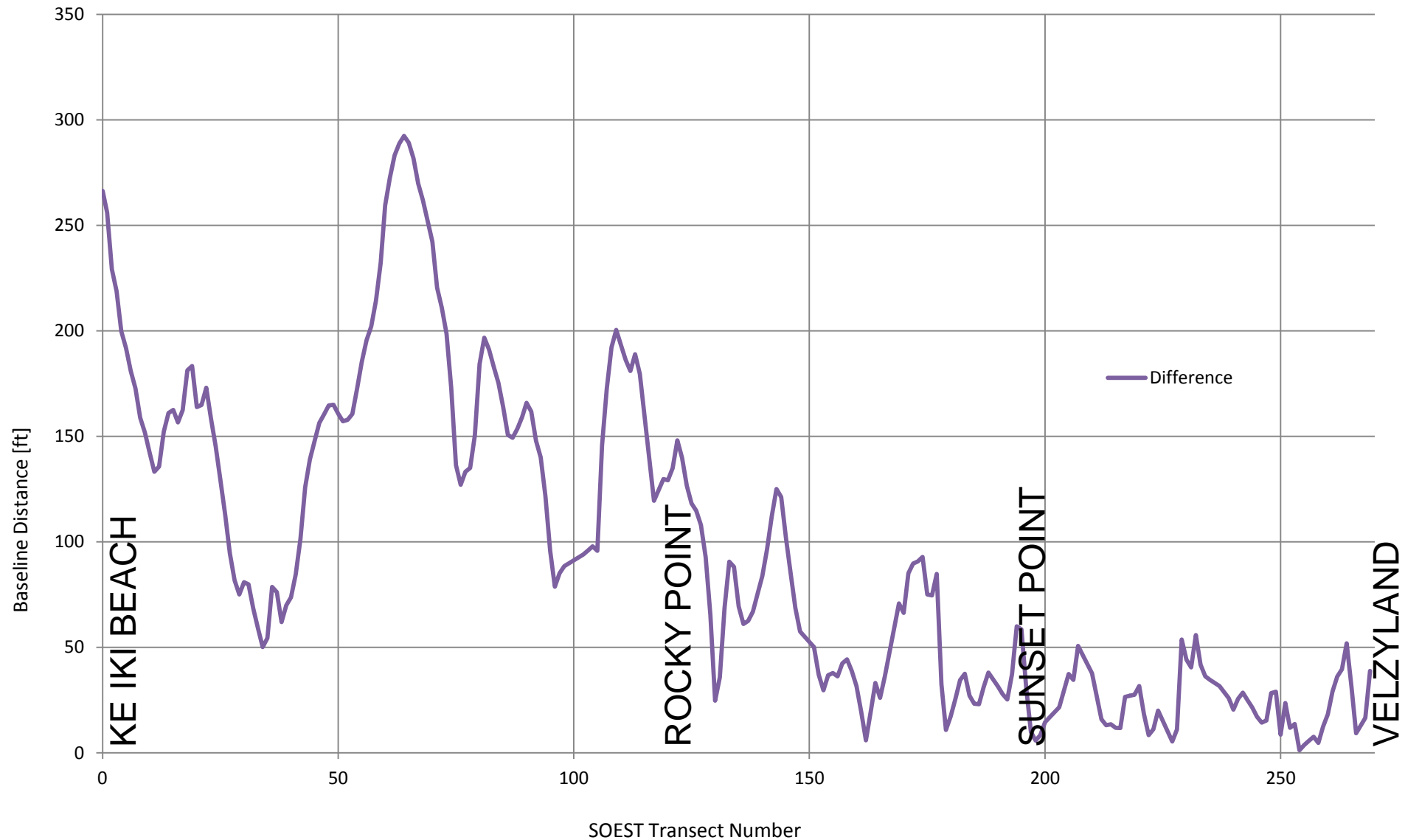
SUNSET BEACH REGION

Landward and Seaward Shoreline Toe Positions from 1975 to 2006



SUNSET BEACH REGION

Difference Between Landward and Seaward Shoreline Toe Positions from 1975 to 2006



REGIONAL SEDIMENT BUDGET

1975 – 2006

31 years



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KE IKI BEACH

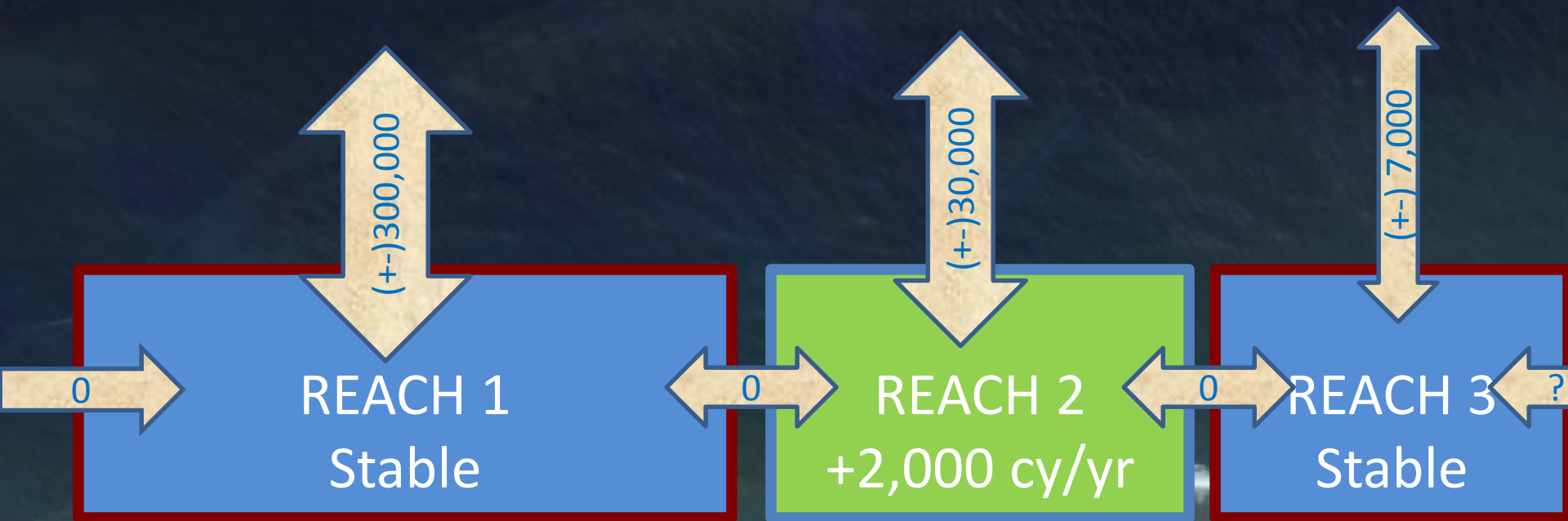
ROCKY POINT

SUNSET POINT

VELZYLAND

SUNSET BEACH RSM

REGIONAL SEDIMENT BUDGET 1975 – 2006



KE IKI BEACH

ROCKY POINT

SUNSET POINT

VELZYLAND

SUNSET BEACH RSM
REGIONAL SEDIMENT BUDGET 1975 – 2006

QUESTIONS

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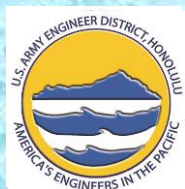


COASTAL DATA COLLECTION

Robert Walker
University of Hawaii

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US Army Corps of Engineers, Honolulu District



WEST MAUI RSM COASTAL MODELING

Jessica Podoski
Honolulu District

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