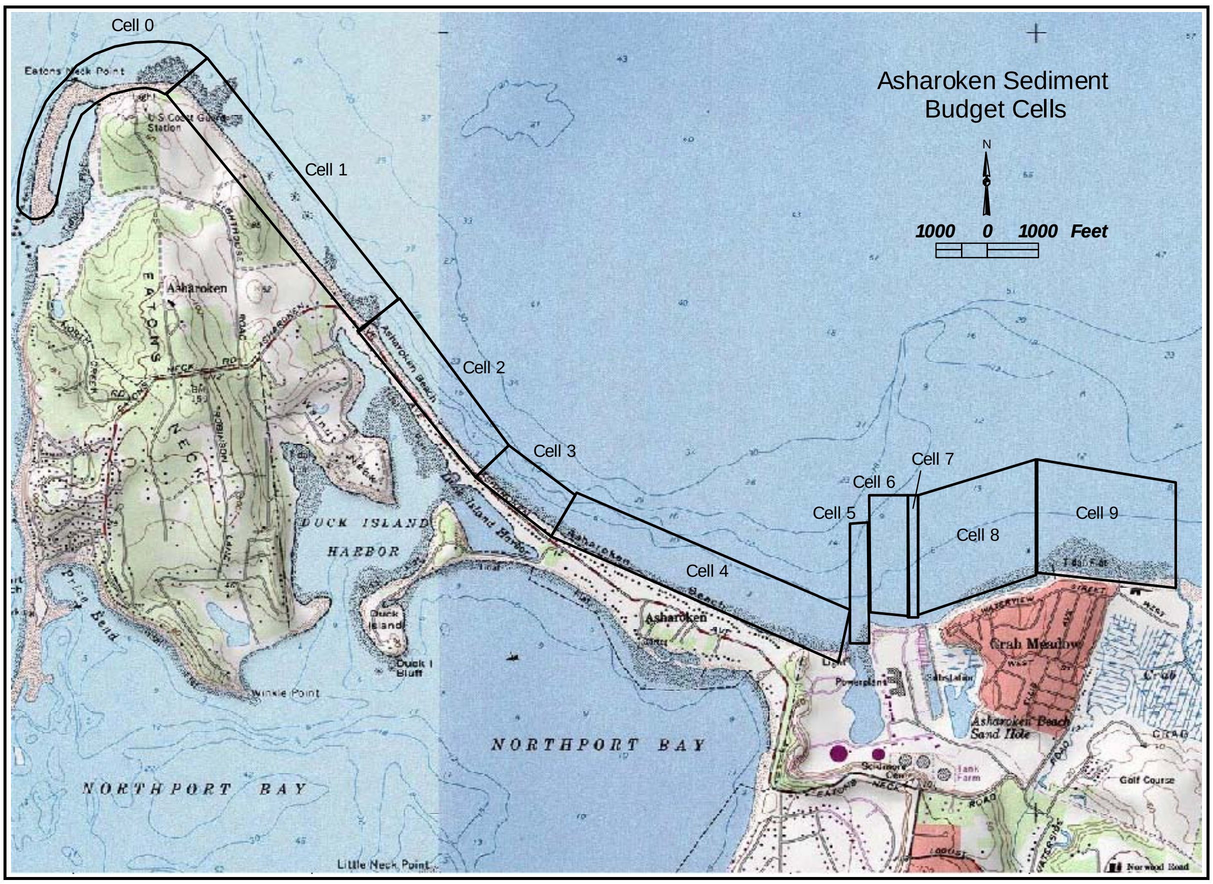
Sediment Transport Analysis
Village of Asharoken, New York

NORTH SHORE OF LONG ISLAND, NEW YORK
COMBINED EROSION CONTROL AND STORM DAMAGE PROTECTION
FEASIBILITY STUDY

FINAL REPORT
August 2004



US ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

SUMMARY AND CONCLUSION

Asharoken Beach is a narrow section of land in the Town of Huntington on the north shore of Long Island, connecting Eaton's Neck and the Village of Asharoken with the Village of Northport. In 1929 Metropolitan Sand and Gravel Co. filed with Corps of Engineers for a permit to construct two jetties into Long Island Sound at the western corner of their property located east of the Village border. The jetties were constructed between 1931 and 1932 with a lagoon (a.k.a. Northport Basin) and inlet channel dredged shortly thereafter. In 1935, Metropolitan requested and received a 3-year extension for the use and maintenance of the facility and was extended periodically until March 1968 when LILCO requested a change in the permit to construct a power plant adjacent to Northport Basin. As part of LILCO's plant construction, the existing barge jetties were rehabilitated into permanent quarrystone and concrete riprap jetties. In addition, a water-cooling pond was constructed to the east of the power plant with cooling water effluent discharged directly into the Sound via a weir structure on the beach.

Since the construction of jetties and navigation channel, the shoreline east of the basin has accreted while the shoreline west of the jetties recessed from its natural position (Figure 6). Approximately 6,000 feet shoreline west of the jetties has experienced increased beach erosion as a combined effect of disrupted upstream sediment supply and storm erosion activities. Construction of groins and seawall along the upstream Crab Meadow shoreline in the 1950's and early 1960's further reduced natural sediment source. To counter the erosion, timber bulkheads were constructed along the eroding stretch by homeowners and five interlocking groins were placed along the eroding stretch by New York State DPW in 1956. A concrete and stone groin was also constructed at the northwest portion of the shoreline in 1952. An approximately 840,000 cubic yards of sand nourishment was placed on the beach from a borrow area located approximately 1,000 feet directly offshore in the 1960's. Since the construction of the power plant facility, LILCO (now Keyspan) continued bypassing shoaling material dredged from the boat channel and basin and deposited on the beach west of the jetties. Based on Keyspan provided dredging records, the average bypassing rate in the period from 1962 to 2001 is approximately 10,000 cubic yards/year.

Despite the various beach erosion control activities, Asharoken beach shoreline continued to erode. The causes of erosion are continuously debated between experts representing Village of Asharoken and Keyspan and a court decision is pending. Understanding the sensitivity of this issue and as a neutral party, the US Army Corps of Engineers (USACE) has taken this study independently with all analyses based on existing public and established data including USGS shoreline positions, NOS bathymetric contours, rectified and geo-referenced aerial photos, historical dredging and beachfill records, shore improvement histories, and records of daily cooling water discharge, channel dredging and beachfill records. All available data were analyzed with USACE developed Coastal Engineering Design Modeling System (CEDAS) and Surface Modeling System (SMS). Models applied include SBAS for sediment budget analysis, ADCIRC, STWAVE for nearshore wave-current effect of sediment transport, and

GENESIS for shoreline responses vicinity of the jetties. Numerical model outputs were interpreted with engineering judgment. Study results were reviewed by independent local and academic specialists and consensus conclusions were made and summarized below.

Historical Shoreline Evolution. Shoreline changes prior to the completion of Northport Basin and jetties is defined with the comparison of 1885/1886 and 1931 aerial photos. During this period the net westward sediment transport on Asharoken Beach was uninterrupted and the study shoreline was stable with minor beach erosion. The post-jetty construction effect is illustrated by comparing aerial photos in the period of 1932 to 2001. A shoreline differential developed since the completion of jetties, with shoreline accretion to the east and erosion to the west. The western shoreline experienced continued beach erosion on the order of 2 ft/year even after receiving periodical bypassing at an average rate of 10,000 cy/year in the period 1962-2001 and a one-time beachfill of 840,000 cubic yards in the1960's placed in the middle portion of Asharoken Beach. The approximately 6,000 ft shoreline immediately west of the jetties experienced higher erosion rate due to combined effect of sediment supply deficit and storm activities; while the western 6,000 ft shoreline experienced less erosion due to continued but reduced supply of littoral material from the eastern Asharoken Beach shoreline.

Sediment Budget. Sediment budget analysis was performed to quantify baseline and existing transport rates. The 1976-2001 sediment budget, shown in Table 6 and Figure 13, represents recent sediment transport pattern at the project shoreline and is used for transport rate estimates. This sediment budget excludes the effect of 840,000 cy beachfill (considered to be in-compatible to native beach sand) placed in the mid-1960's, but includes the current and ongoing sand bypassing by Keyspan. This sediment budget provides several useful key erosion and transport rates summarized as follows (note that all rates are rounded to thousands to reflect the degree of confidence):

- Based on the 1976-2001 sediment budget (shown in Table 6 and Figure 13), the erosion rate on the eastern shoreline immediately west of the jetties (Cell 4) is eroding at approximately 10,000 cy/year after the 10,000 cy/year bypassed from upstream by Keyspan, a total erosion rate of 20,000 cy/year;
- The shoreline in the middle of Asharoken Beach (Cells 3 and 2) are relatively stable, experiencing minor shore erosion at approximately 4,000 cy/year;
- Beach erosion increases along the western shoreline (Cell 1) at approximately 18,000 cy/year. The 900 ft Section 14 shoreline experienced higher erosion due to interruption of sediment supply by a concrete/stone groin located just east of this section;
- The sand spit just west of Eaton's Neck Point (Cell 0) is growing at a rate of 16,000 cy/year, representing net sediment transport into this cell less sediment lost offshore;
- The sediment supply from upstream shoreline is approximately 15,000 cy/year (Cell 8 to Cell6), with 10,000 cy/year being bypassed downstream (Cell 4) and approximately 5,000 cy/year retained in Cell 6 or lost offshore;

Future Renourishment. Periodic nourishment is necessary to stabilize the Asharoken Beach within design life. The nourishment (deficit) volume is estimated at 20,000 cubic yards per year based on the existing condition beach erosion rate on the eastern half of the Asharoken Beach shoreline. The estimated volume includes 10,000 cy/year being bypassed by Keyspan periodically plus the 10,000 cy/year annual erosion rate. Beach nourishment will be performed in a 5-year interval and can be synchronized with ongoing Keyspan operation. The nourishment volume should be placed evenly on the eastern half shoreline and is expected to transport naturally downstream, feeding and stabilizing the downstream shoreline. Note that the available upstream source is approximately 15,000 cy/year, therefore, the balance of nourishment volume will be supplemented from a borrow source. Of the 15,000 cy/year upstream source, 10,000 cy/year is being bypassed and 5,000 cy/year can be tapped from the sediment fillet accumulated at east of east jetty (Cell 6) or from borrow source.

Effect of Cooling Water Effluent Flow. The sediment transport pattern vicinity of the cooling water outfall was simulated with the application of an advanced circulation model (ADCIRC) combined with a fine-scale nearshore wave model (STWAVE). Long-term depth changes were calculated to determine the direction and distance of sediment movement. Results of model analysis indicates that sediment in surf zone near the outfall would be carried offshore to a maximum 600 ft distance during normal operating condition and approximately a maximum 1,800 ft during storm condition, which might be lost permanently. The material carried up to 600 ft offshore within active surf zone would continue its alongshore transport pattern and be deposited in the boat channel or carried inside the boat basin, eventually bypassed onto Asharoken Beach via dredge/disposal operation. Littoral material naturally bypassing the jetties and returned to the Asharoken Beach is minimal as evidenced by a lack of offshore bar formation across the jetties (Figure 9). As a result, installation of a cooling water diffusion pipe (not thermal diffusion pipe) to divert effluent flow offshore would be ineffective to enhance natural bypassing or to significantly reduce sediment loss offshore.

Effect of Jetties. The shoreline response model GENESIS was applied to investigate the extent of jetties influence on the study shoreline. The GENESIS model was validated for the time period 1995-2001 based on wave records in this period and measured shoreline positions. A hypothetical jetty removal was configured using the 2001 shoreline as a base and predict the future without jetties shoreline for a 10-year period. Model results indicate a restored shoreline similar to the pre-1932 condition. The downdrift shoreline affected by the jetties show an approximately 5,000 ft distance. However, it requires a complete removal of jetties and closing of Northport Basin for restoration to a straight shoreline.

Sediment Transport Analysis
Asharoken, New York

FIGURES

TABLES

INTRODUCTION

This report presents a description of sediment transport patterns and processes for the shoreline of Asharoken, located on the north shore of Long Island, New York.

The project area is located on Long Island, New York (Figure 1) and faces Long Island Sound. The Asharoken shorefront is approximately 23,000 feet in length. A sediment budget was developed for the Asharoken coast between Crab Meadow (east) and Eatons Neck (west) for the periods 1962 to 2001 and 1976 to 2001. Ten sediment budget cells were established at coastal structure boundaries and where shoreline orientation changes are significant (Figure 2; similar locations as illustrated in U.S. Army Corps of Engineers, 1995).

Historical shoreline positions were established with U.S. Coast and Geodetic Survey topographic maps (1885/86, 1917, 1931) and rectified aerial photography (1961, 1962, 1972, 1976, 1983, 1988, 1994, 2001). Bathymetry data for the periods 1967 (acquired from the National Ocean Service) and 2001 (collected by the New York District through Gahagan and Bryant) were used to quantify sand volume changes from the high-water line offshore to the 20-ft (NGVD) depth contour. Sand volume change at Eatons Neck spit (south of Eatons Neck Point) was determined using bathymetry data for the periods 1931 and 1990. Sand volume change in the offshore region north of Eatons Neck Point was determined using bathymetry data from 1967 and 1990. Information from a 10-yr wave hindcast simulation was used to estimate potential longshore sand transport rates throughout the study area. Permanent offshore sand losses resulting from high-energy events were determined by quantifying sand accumulation seaward of the 20-ft (NGVD) depth contour from the bathymetric change surface.

An investigation of sediment transport processes local to the Keyspan plant outfall, a nearshore finite element hydrodynamic model and sedimentation analysis was employed. This analysis was performed to indicate any fine scale processes that impact the sediment budget sources and sinks, including the effects of cooling water discharge, the stone jetties and the lagoon.

A shoreline change model, GENESIS, validated for the time period 1994-2001, was used to simulate a hypothetical future condition with the Keyspan plant jetties removed.

Figure 1. Project Site Map

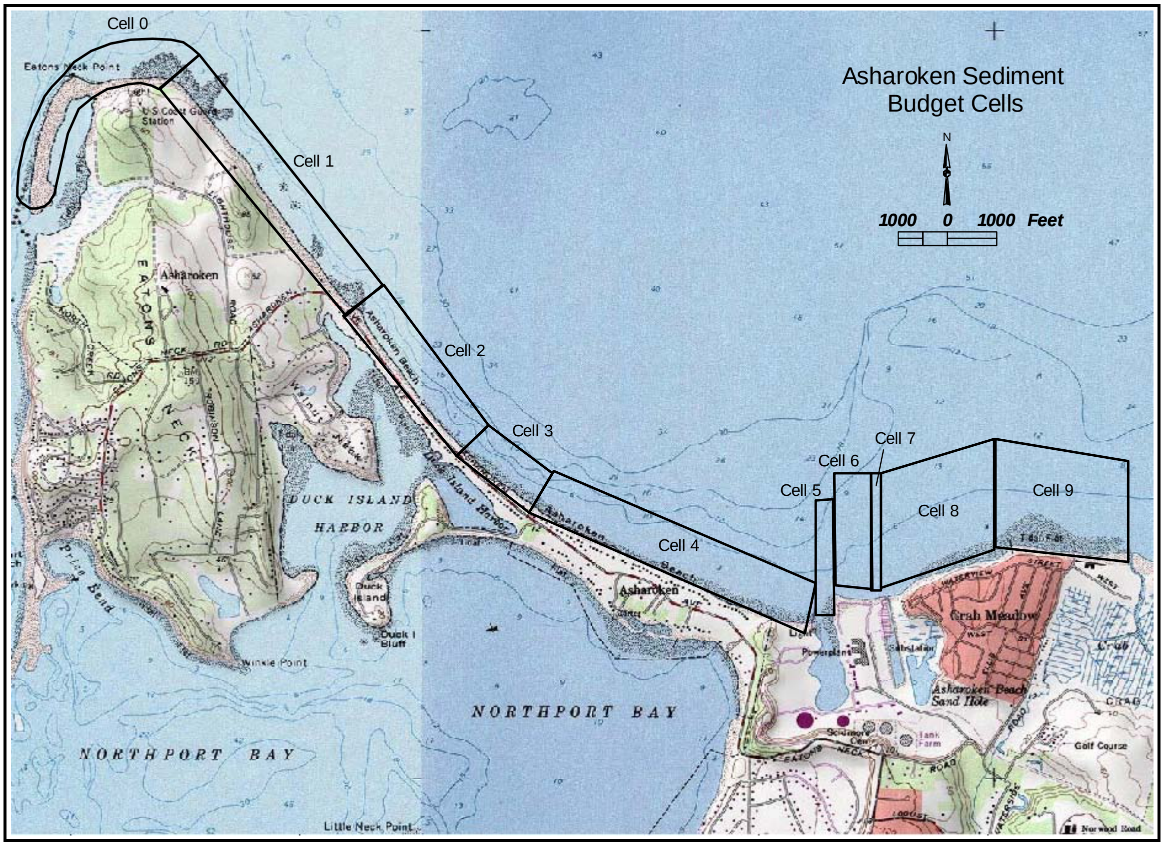


Figure 2. Asharoken study area and sediment budget cells.

HISTORIC SHORELINE CHANGE AND SEDIMENT BUDGET ANALYSIS

Historic Shoreline Change

Shoreline positions derived from high-resolution scans of aerial photographs for August 1961, March 1962, October 1972, April 1976, October 1983, March 1988, April 1994, and April 2001 were determined by registering all photographs to a common datum and coordinate system using control points extracted from 2001 orthophotography provided by the U.S. Army Corps of Engineers (USACE). Photographic registration error ranged from ±3 to ±9 ft. Interpretation of the high-water shoreline position, recognized as a feature on the beach marking the boundary between wind-driven transport and that associated with waves and currents (e.g., the berm crest or a dark line marking contrast between the backshore and the foreshore), was quite difficult for the 1961 and 1988 photos because the beach was overexposed in many places. As such, shorelines derived for those years were excluded from the change analysis. The 1994 aerial photos, while better than those for 1961 and 1988, were still somewhat overexposed, and interpretation of the 1994 high-water line is less certain than that of other years used in the analysis.

In addition to these concerns, the shoreline developed from the March 1962 aerial photography was impacted by the Ash Wednesday storm of March 6-8. Although this representation of high-water shoreline position for the 1960s reflects post-storm conditions, visible delineation of the shoreline was much better than that for the 1961 photos; thus, it was considered a better source for documenting shoreline position during this time period. Furthermore, a comparison between the 1961 and 1962 high-water shorelines (where visible for 1961) illustrated only minor variations in shoreline position. Information obtained from the U.S. Army Corps of Engineers [1995] indicates that the shoreline was retreating significantly during the time period between 1960 and 1964. As such, the delineation for 1962 was believed to be an adequate representation of the shoreline position for the early 1960s. The inclusion of a 1960s shoreline was important for evaluating shoreline position prior to beach fill activities, which commenced with the placement of 840,000 cy of material on the beach in the mid-1960s. The high-water shorelines on the 1962, 1972, 1976, 1983, and 2001 photos were clearly defined, and beach profiles at five locations along Asharoken Beach were used to verify the interpretation of the 2001 shoreline. Uncertainty with shoreline position determination was estimated as ±10 ft.

Historical shorelines from 1885/86 and July 1931 were compiled to document long-term trends prior to construction of engineering structures. This was particularly useful for documenting the impact of jetties at the Keyspan intake canal on adjacent shoreline response. Recent shoreline response was evaluated at decadal intervals between 1962 and 2001 to observe cumulative and incremental change trends. Figures 3 and 4 illustrate regional trends in shoreline response between 1962 and 2001. Sediment budget cell locations are denoted on the figures for reference. The boundaries of the sediment budget (littoral) cells were selected to correspond to the location of littoral barriers and/or significant shoreline orientation changes as follows:

- Cell 0 – area west of the study area at the western end of Eatons Neck Point
- Cell 1 – Eatons Neck Point east 5980 feet to a stone groin
- Cell 2 – From Cell 1 east 3610 feet to a location of relative shoreline stability;

- Cell 3 – from Cell 2 east 1825 feet to a point of shoreline orientation change;
- Cell 4 – from Cell 3 east 6035 feet to the Keyspan west jetty;
- Cell 5 – Keyspan intake basin;
- Cell 6 – Keyspan east jetty 1025 feet east to the Keyspan discharge channel;
- Cell 7 – Keyspan discharge channel;
- Cell 8 – Cell 7 east 2710 feet to a shoreline orientation change in Crab Meadow;
- Cell 9 – Cell 8 east 2560 feet to the creek at the eastern end of Crab Meadow.

Tables 1 and 2 provide summaries of historical shoreline change results for cumulative and incremental intervals, respectively. Overall, shoreline change trends between 1962 and 2001 document a general increase in erosion rates from Asharoken Beach to Eatons Neck (cells 1 through 4). While change rates for the 1962 to 2001 comparison may have been influenced by the landward position of the 1962 shoreline, change trends from 1972 to 2001, 1976 to 2001, and 1983 to 2001 show general patterns of increasing erosion between the western Keyspan jetty and Eatons Neck Point. East of the facility, change patterns remain relatively consistent through time.

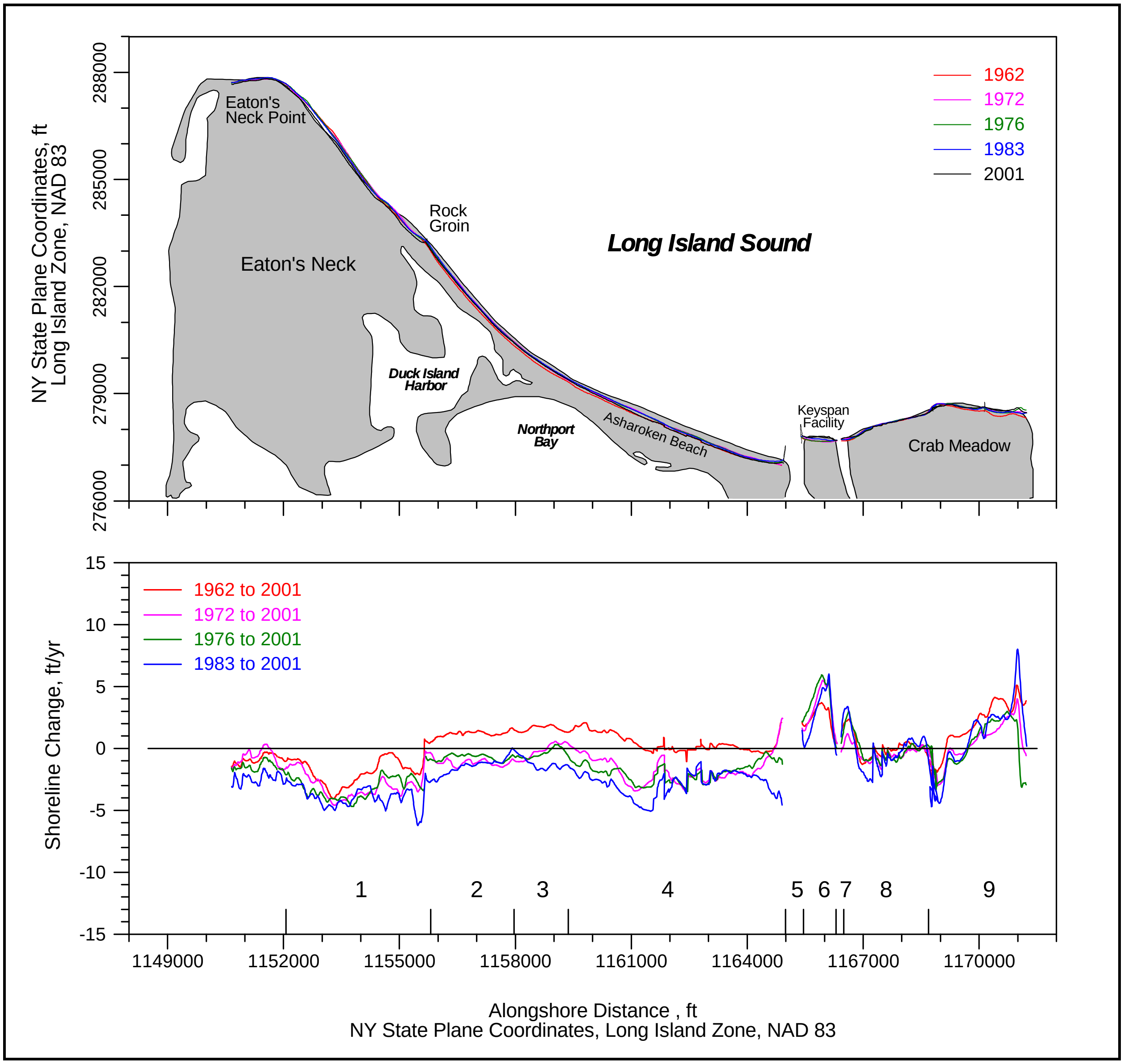


Figure 3. Comprehensive shoreline change at Asharoken Beach between 1962 and 2001. Sediment budget polygon boundaries shown for reference.

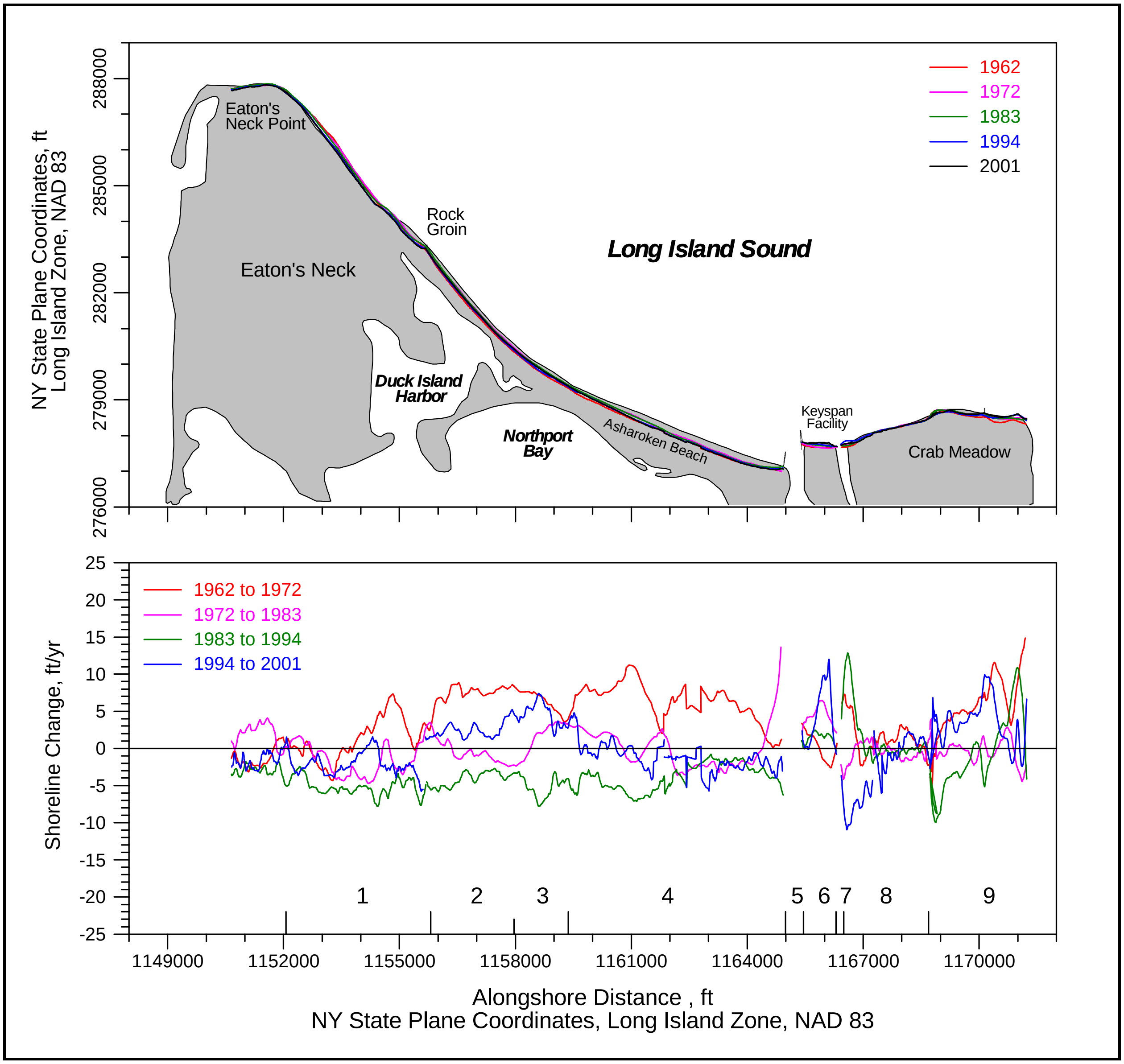


Figure 4. Decadal shoreline change at Asharoken Beach between 1962 and 2001. Sediment budget polygon boundaries shown for reference.

Sand bypassing data indicate that approximately 400,000 cy of material was placed on Asharoken Beach between 1971 and 2001 (this total excludes a 2001 beach fill placed after the April 2001 shoreline date). The cumulative sand bypassing total is about half of the total placed on the beach in the 1960s by the USACE. The reduction in beach bypassing quantity over time may perhaps explain the consistent increase in erosion rates observed between 1962 and 2001.

Shoreline response was also evaluated for the periods 1885/86 to 1931 and 1931 to 2001 to understand long-term shoreline trends prior to and after initial jetty construction in 1932 (Figure 5). Shoreline change patterns for the longer interval demonstrate that the area most affected by increasing erosion is located adjacent to the west intake jetty in cell 4. Northwest of cell 4, long-term change patterns are similar to historical levels.

Volume change calculations were developed from shoreline change data to estimate gain or loss between the high-water shoreline and the 20-ft depth contour. Volume change calculations were derived by multiplying the shoreline change rate by the cell length times the volume conversion of 0.92 for an active profile depth of 25 ft (+5 ft NGVD to -20 ft NGVD). The 20 ft NGVD depth contour was determined as the limiting depth of significant sand transport based on contour shape for the 1967 and 2001 surfaces and patterns of deposition and erosion identified on the bathymetry change surface. The elevation +5 ft NGVD was determined to be the approximate elevation of the high-water shoreline based on 2001 profile data collected along Asharoken Beach.

Table 1. Comprehensive shoreline change trends for Asharoken Beach and vicinity, 1886-2001. (Note: The shoreline change rates include 840,000 cy beach nourishment in mid-1960's and approximately 400,000 cy bypassing between 1971 and 2001.)

Sediment Budget Cell	Cell Length	1962 to 2001		1972 to 2001		1976 to 2001		1983 to 2001	
	ft	ft/yr	cy/yr	ft/yr	cy/yr	ft/yr	cy/yr	ft/yr	cy/yr
1	5980	-1.9	-10,690	-3.1	-16,956	-3.3	-17,919	-3.9	-21,440
2	3610	1.1	3,670	-1.1	-3,618	-0.7	-2,464	-1.6	-5,288
3	1825	1.6	2,686	-0.3	-427	-0.4	-714	-1.2	-2,008
4	6035	0.5	2,548	-1.7	-9,511	-1.9	-10,782	-2.8	-15,613
5									
6	1025	2.5	2,318	3.3	3,118	3.8	3,596	2.7	2,506
7									
8	2710	0.0	-77	-0.5	-1,142	-0.1	-347	-0.5	-1,247
9	2560	2.0	4,621	0.5	1,076	0.2	570	0.9	2,174

Table 2. Incremental shoreline change trends for Asharoken Beach and vicinity, 1886-2001. (Note: The shoreline change rates include 840,000 cy beach nourishment in mid-1960's and approximately 400,000 cy bypassing between 1971 and 2001.)

Sediment Budget Cell	Cell Length	1962 to 1972		1972 to 1983		1983 to 1994		1994 to 2001	
	ft	ft/yr	cy/yr	ft/yr	cy/yr	ft/yr	cy/yr	ft/yr	cy/yr
1	5980	1.1	6,178	-1.8	-9,798	-5.1	-28,234	-2.0	-11,201
2	3610	7.0	23,295	-0.3	-962	-4.2	-13,937	2.3	7,696
3	1825	7.0	11,066	1.3	2,104	-5.1	-8,487	4.6	7,713
4	6035	6.3	34,929	0.0	-6	-3.9	-21,726	-1.2	-6,457
5									
6	1025	0.2	165	4.4	4,170	1.4	1,334	4.5	4,251
7									
8	2710	1.1	2,852	-0.4	-1,032	0.7	1,773	-2.3	-5,774
9	2560	6.0	14,103	-0.3	-678	-0.7	-1,667	3.4	7,935

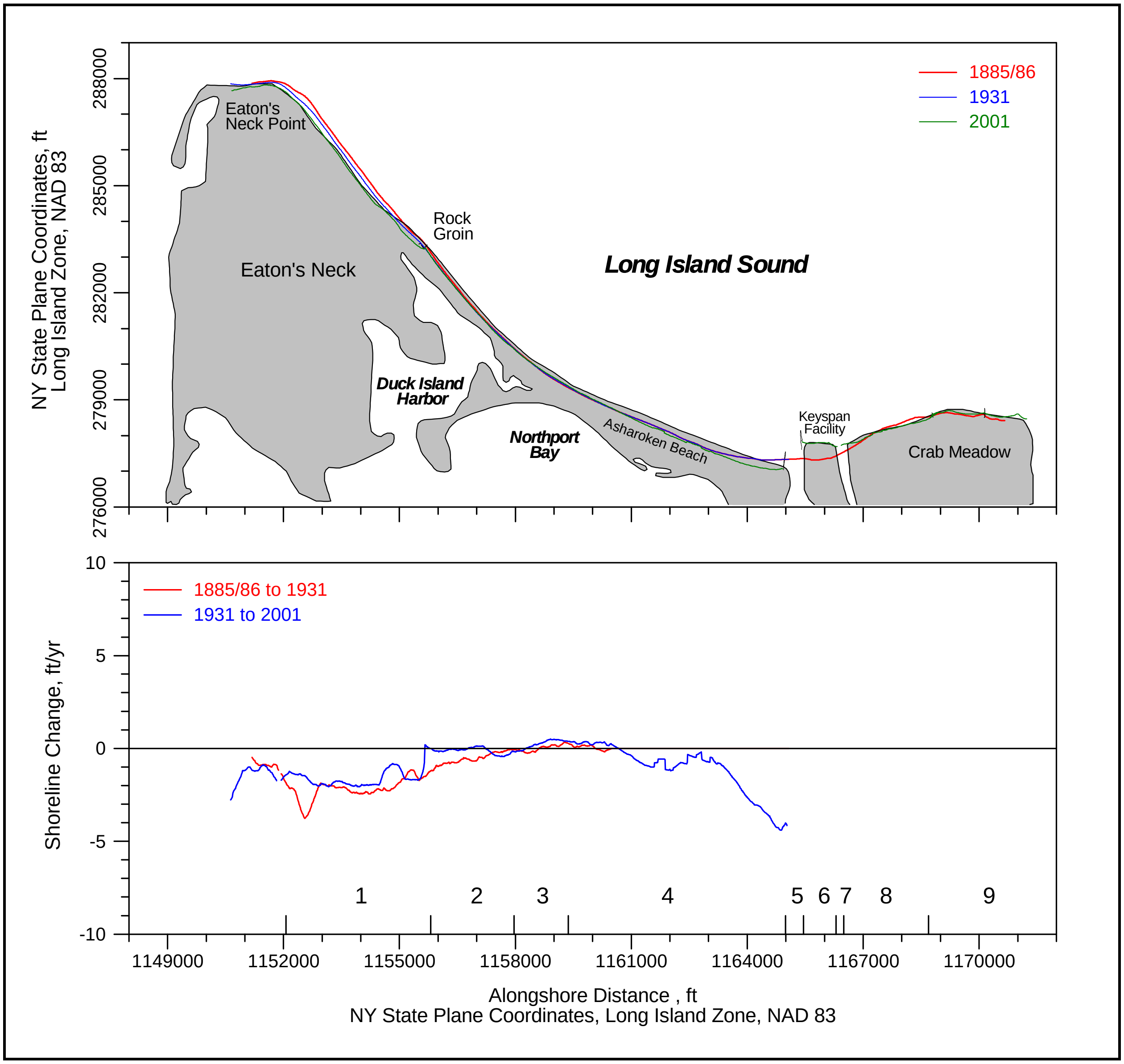


Figure 5. Long-term shoreline change at Asharoken Beach between 1885/86 and 2001. Sediment budget polygon boundaries shown for reference.

Table 2 illustrates how shoreline and volumetric changes have varied since 1972 (the 1962 shoreline probably had some influence by the Ash Wednesday storm). For example, cell 1 has exhibited consistent shoreline recession throughout the period, while cell 2 exhibits accretion since 1994 after two decades of constant recession. A groin at the western boundary of cell 2 may have a strong influence on shoreline responses updrift (cell 2) and downdrift (cell 1). Shoreline movement in Cell 3 has been more variable, while cell 4 has been consistently erosional. The rock/concrete groin on the border of cells 2 and 3 appears to exhibit accretion on the updrift side (cell 3) and erosion on the downdrift side (cell 2). It is not clear whether the presence of the groin has an impact on the shoreline beyond the offset or whether its removal would improve existing conditions. Further discussion about cells 1-4 is presented in the next paragraph. East of the power plant, cell 8 has exhibited constant recession, presumably due to its shoreline orientation and the lack of longshore sediment supply from both the east and west. Cell 9 appears to be supplied by sediment from the creek outfall, which forms a dynamic shoal feature in the shallow waters of Long Island sound. This feature, which is likely a function of creek outflow, waves and tides, likely supplies sediment to cell 9 based on the cycles of the shoal growth and bridging with the shoreline. The groins in cell 9 appear to be effective in retaining this longshore supply and in preventing the sediment from moving toward the west in significant amounts.

Volume change was calculated for cells 1 through 4 for the period 1885/86 and 1931 to compare with volumes calculated for 1931 to 2001. The comparison provided a means of determining the quantity of loss occurring at Asharoken Beach over the past 70 years that may be attributable to engineering structures associated with the Keyspan facility. Change rates for the period 1885/86 to 1931 reflect beach conditions prior to the existence of the jetties at the Keyspan intake canal and before the commencement of beach nourishment activities. Loss associated with this time period is considered to be the baseline rate at which the beaches were changing prior to jetty construction and facility operation. A comparison of net loss between these two time periods provides an estimate of the amount of additional sediment needed to maintain baseline levels.

Table 3 documents net changes in beach sand volume prior to and after jetty construction. Net volume change for cells 1 through 4 prior to jetty construction and beach fill placement was approximately 628,000 cy (14,000 cy/yr). After jetty construction, the rate of beach erosion in this area increased to about 15,000 cy/yr, even though about 1.25 million cu yd of sand had been placed on the beach between the early 1960s and 2001. A comparison of beach erosion rates prior to and after jetty construction suggests that, accounting for beach nourishment and a sand bypassing volume of 1,252,200 cy (18,000 cy/yr), the actual erosion rate would increase from the pre-construction rate of 14,000 cy/yr to a post-construction rate of 33,000 cy/yr, an increase of 19,000 cy/yr of erosion due to jetty construction.

Table 3. Shoreline change rates 1885/86 to 2001.

Sediment Budget Cell	Cell Length	1885/86 to 1931		1931 to 2001	
	ft	ft/yr	cy/yr	ft/yr	cy/yr
1	5,980	-2.2	-11,971	-1.7	-9,199
2	3,610	-0.6	-2,056	-0.1	-339
3	1,825	0.0	5	0.2	349
4	6,035	0.1	61	-1.0	-5,697
Net Volume (cy/yr)			-13,961		-14,886
Cumulative Volume(cy)			-628,245		-1,042,020
Total Beachfill (cy)					1,252,200
Total Volume Change without Beach Nourishment (cy)					-2,294,220

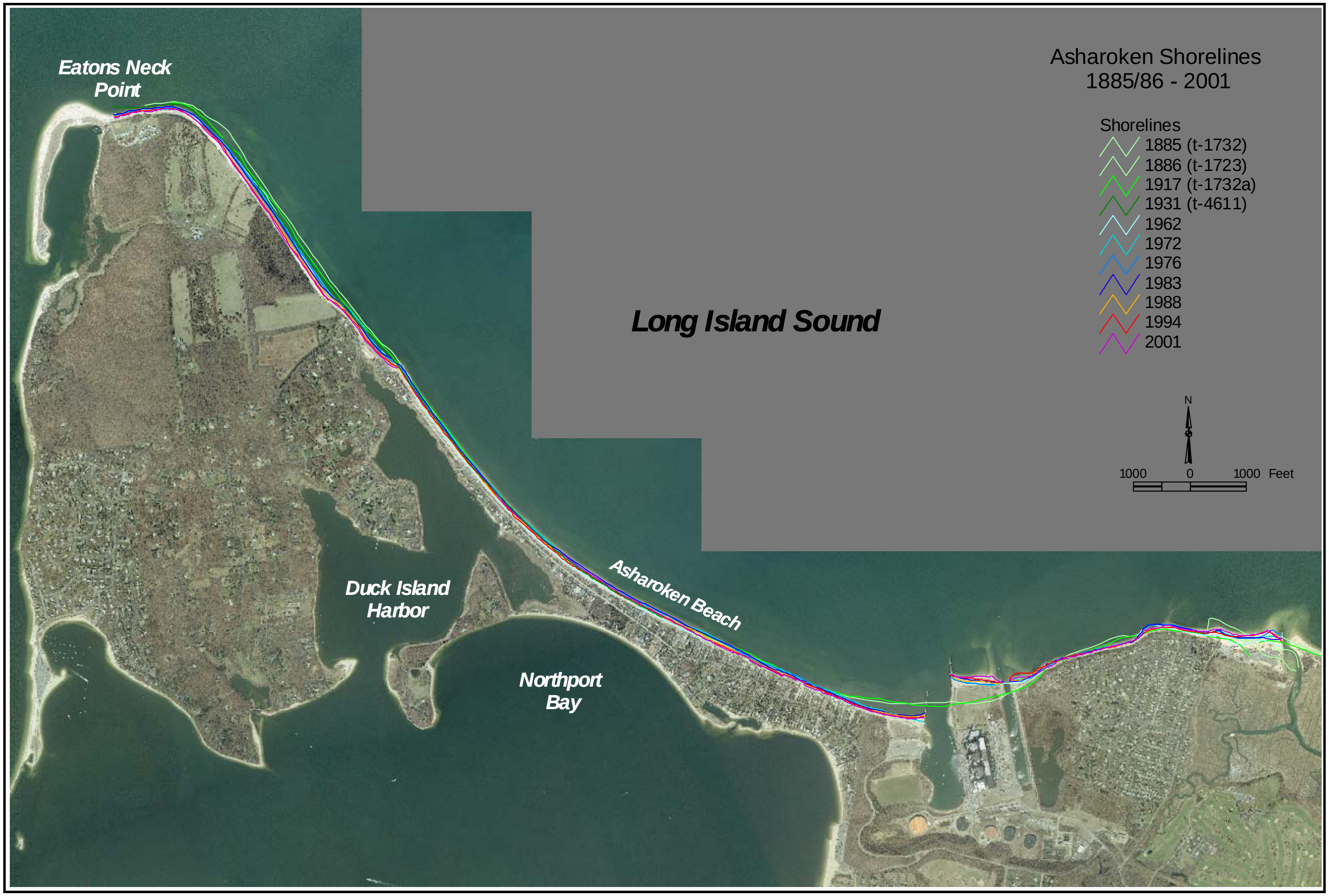


Figure 6. Historical shoreline positions for Asharoken Beach and vicinity, 1885/86 to 2001.

Bathymetric Change

Digital National Ocean Service (NOS) bathymetry data from the National Geophysical Data Center were used to compile the 1967 bathymetric surface for comparison with bathymetry data collected by Gahagan and Bryant for 2001. Both surfaces were compiled in Long Island State Plane coordinates (NAD 83) relative to the National Geodetic Vertical Datum (1929). Surface comparison reveals areas of net erosion and accretion that has occurred during the 34-yr time period. This information was used to verify the rates of sand volume loss and gain derived from shoreline change data and to quantify sand volume accumulation seaward of the 20-ft depth contour (NGVD) as permanent loss from the beach due the offshore transport during storms. Because data only exist for a portion of cell 1, the rates were used as a proxy to estimate volume loss primarily due to storms for the entire cell. Figures 7 through 10 illustrate the 1967 and 2001 bathymetric surfaces and the net change surface. Table 4 provides a summary of erosion and accretion volumes associated with sediment budget Cells 1 through 8.

Table 4. Bathymetric change offshore Asharoken Beach, 1967-2001. (Note: Volume changes shown are between the Mean High Water shoreline and the –20 ft NGVD contour.)

Sediment Budget Cell	Volume Loss (cy)	Volume Gain (cy)	Annual Volume Loss (cy/yr)	Annual Volume Gain (cy/yr)	Net Volume Change (cy)	Annual Net Volume Change (cy/yr)
1	-88,168	18,006	-2,593	530	-70,162	-2,064
2	-68,521	25,594	-2,015	753	-42,927	-1,263
3	-13,086	35,101	-385	1,032	22,015	648
4	-220,190	47,336	-6,476	1,392	-172,860	-5,084
5	0	0	0	0	0	0
6	-39,976	63,209	-1,176	1,859	23,233	683
7	0	0	0	0	0	0
8	-56,271	27,332	-1,655	804	-28,939	-851

Net volume changes in Table 4 provide the following information concerning nearshore sediment volume changes:

- The 6,000 feet of shoreline immediately west of the west jetty (Cell 4) experienced the highest offshore sediment loss;
- There is minimal loss of material in the vicinity of the Keyspan facility (Cells 6 and 8).

Digital NOS bathymetry data for the years 1931, 1967, and 1990 also were used to quantify sand accretion forming the spit south of Eatons Neck Point and depositing offshore in the shallow zone north of Eatons Neck Point (Figure 11). These areas represent the terminal point for longshore transport in the Asharoken Beach cell. As such, the volume of accumulated sand in this area between 1931 and 1990 and 1967 to 1990 must equal the net westward directed transport rate derived from the sediment budget. The volume of sand accumulated north of Eatons Neck Point between 1967 and 1990 is about 7,500 cy/yr and accumulation at the spit between 1931 and 1990 is about 16,000 cy/yr.

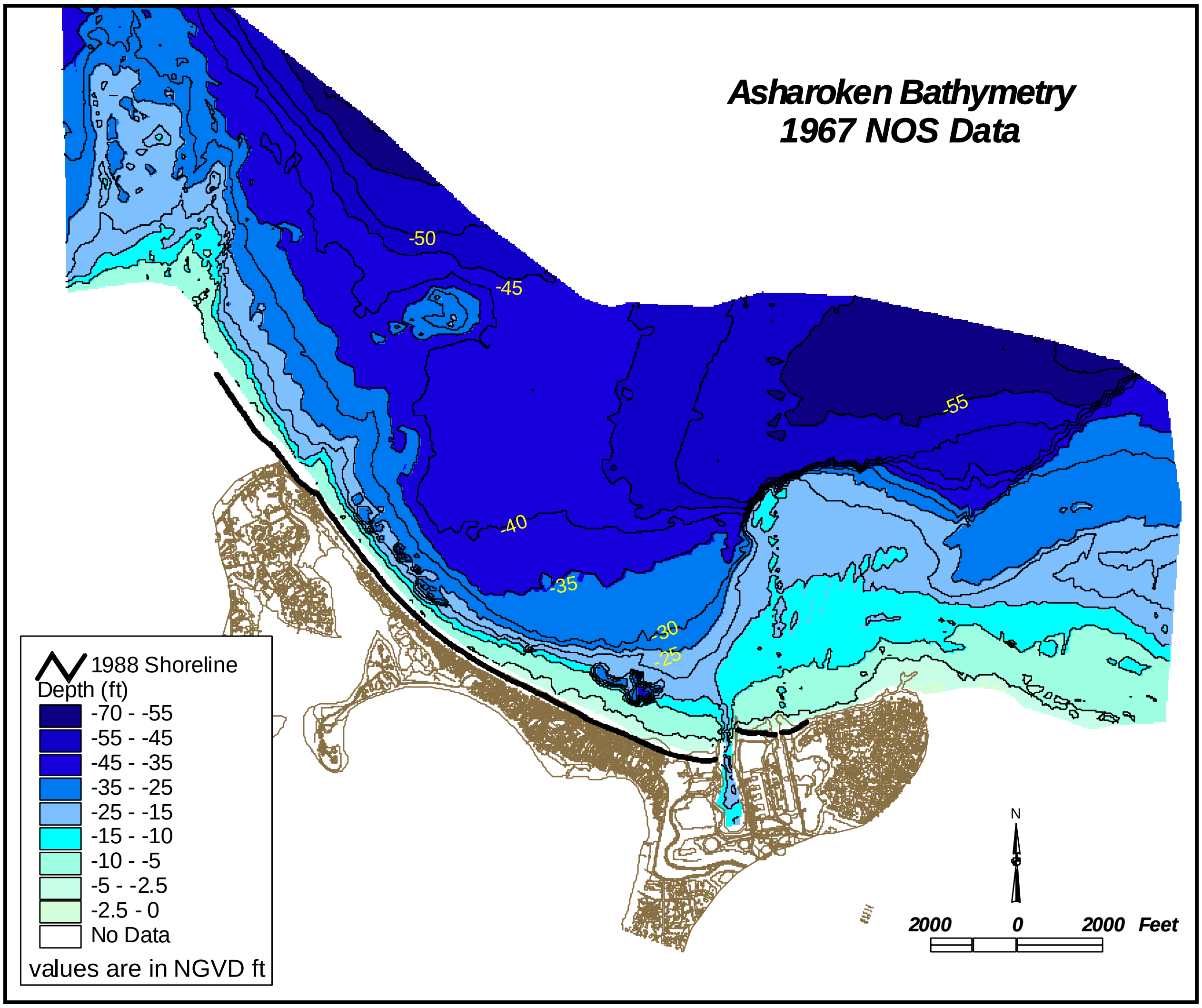


Figure 7. Bathymetry surface in 1967.

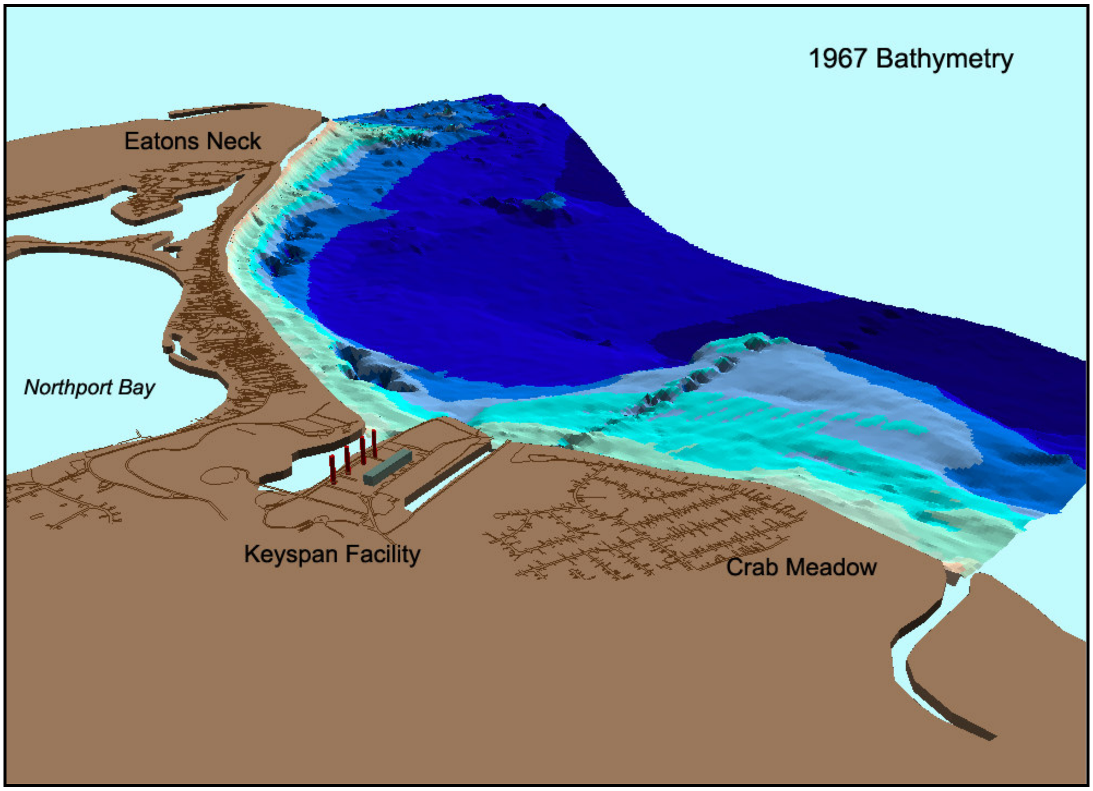


Figure 8. Three-dimensional view of the 1967 bathymetry surface.

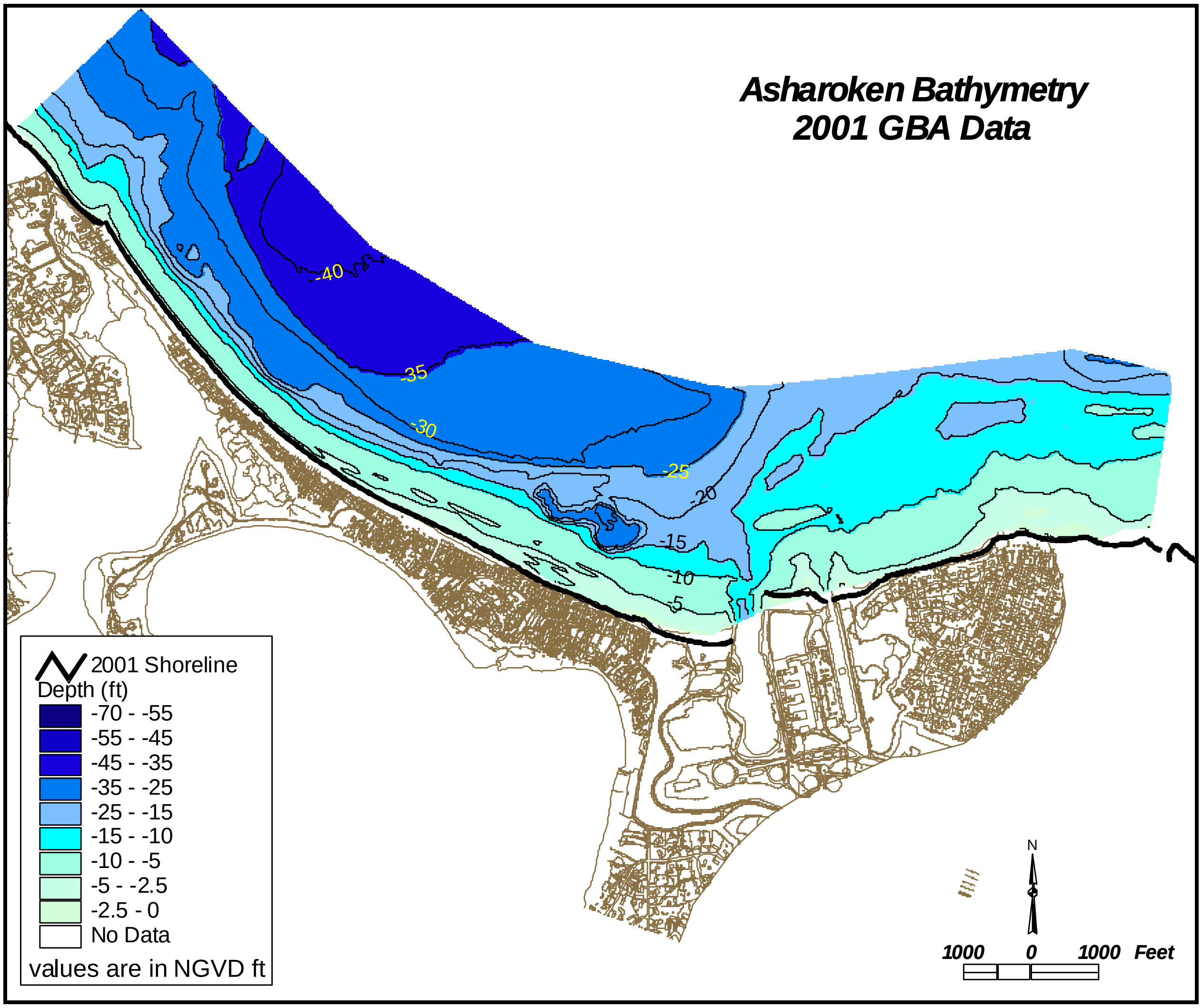


Figure 9. Bathymetry surface in 2001.

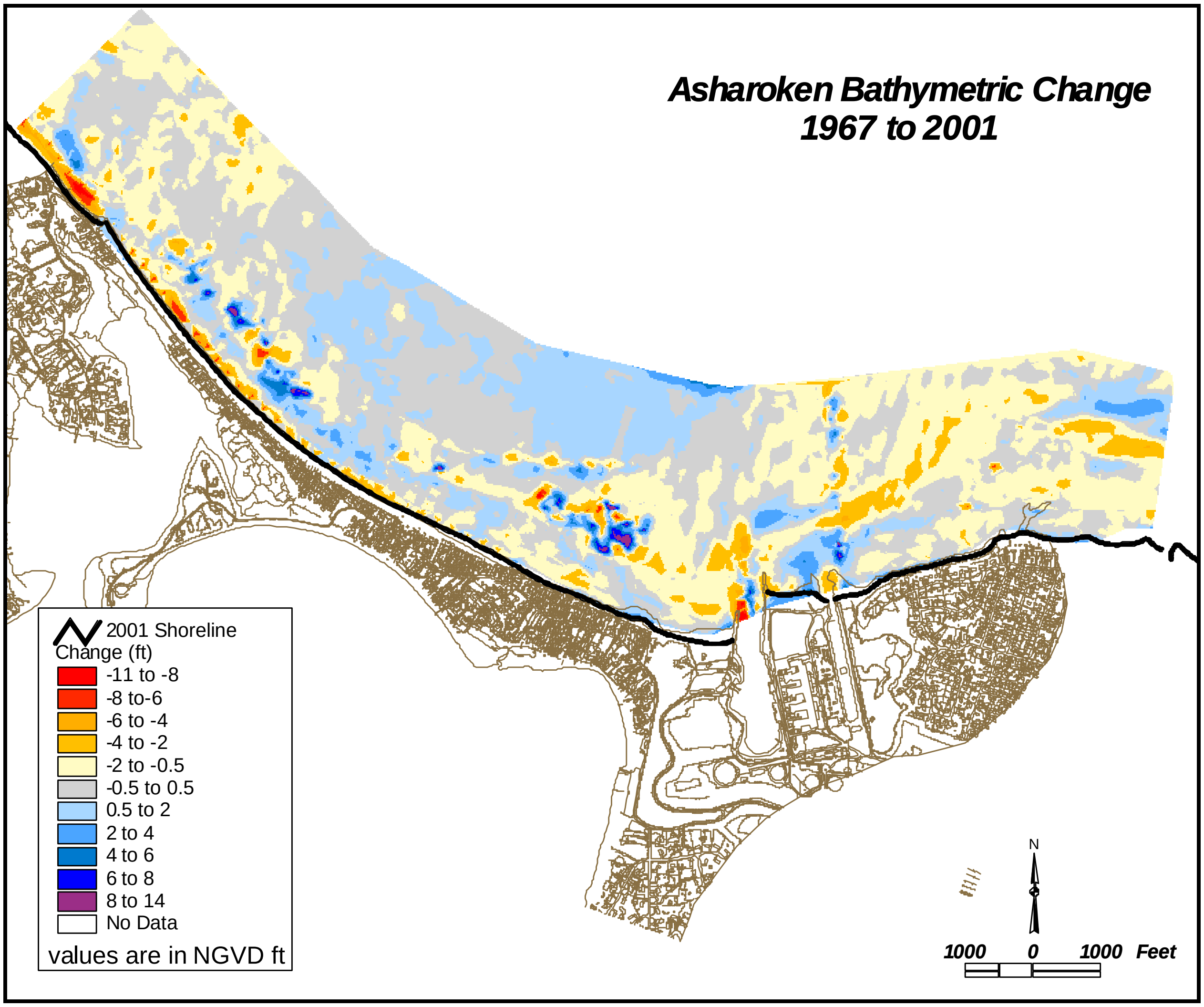


Figure 10. Bathymetric change surface, 1967 to 2001.

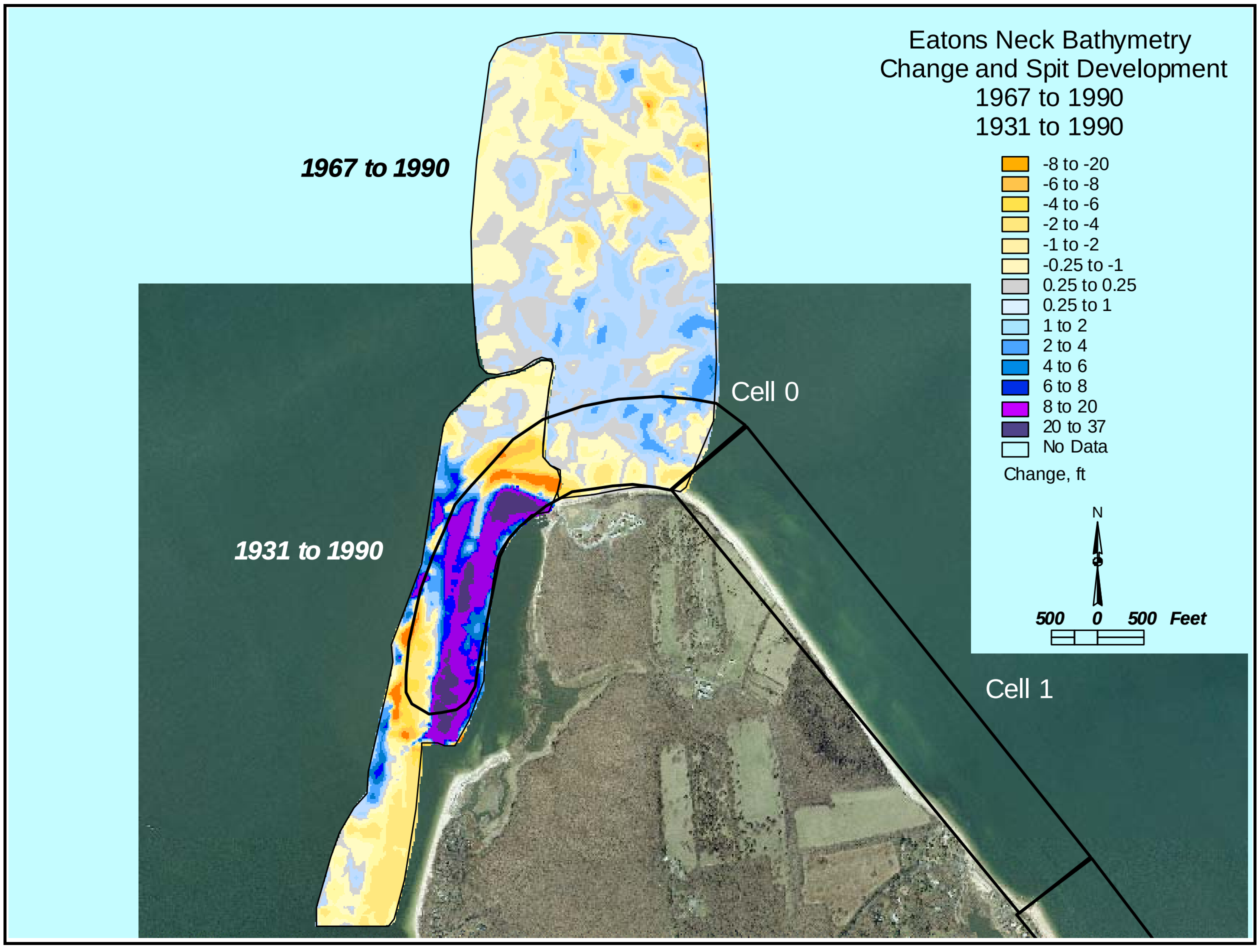


Figure 11. Bathymetric change at Eatons Neck spit, 1931 to 1990.

Sediment Budget

Shoreline and bathymetry change data formed the primary source of information for developing a sediment budget for the periods 1962 to 2001 and 1976 to 2001 using the USACE Sediment Budget Analysis System (SBAS). These two time periods were chosen to represent both long-term and recent change for the study area. These years were chosen because they provide the best representation of change trends for each interval when compared with other years. The 1983 shoreline was ruled out from analysis within the sediment budget because it is seasonally divergent from the other years and was felt to be a poor representation for that time interval, and 1994 was ruled out due to the combined effects of aerial photo overexposure along the beach, a very small time interval between it and 2001, and historical weather information indicating that the study region had been repeatedly impacted by severe storms in the early 1990s. Hindcast wave information was used to calculate east- and west-directed potential longshore sand transport rates at the boundary of each sediment budget cell.

East-directed transport rates were fairly stable throughout the study area, so these were used directly in the sediment budget formulation. West-directed transport quantities were determined by balancing volume change estimates derived from shoreline change results, offshore losses due to storms, and east-directed longshore transport calculations. Keyspan has been bypassing sediment east of the intake canal into Cell 4 since 1971. Annual bypassing data from Keyspan were used to derive average annual bypassing rates of 10,200 cy/yr for 1962 to 2001 and 11,100 cy/yr for 1976 to 2001. These bypassing rates are reflected in the sediment budget as inputs into Cell 4 from the east. The 1960s USACE placement of 22,500 cy/yr was also added to the 1962 to 2001 sediment budget in the form of placements into cells three and four. In addition, sand contributed to the beach during bluff erosion in Cell 1 was estimated using an average bluff retreat rate of 1.5 ft/yr (Davies, 1973) and a bluff height of 75 ft over a distance of 2,990 ft (12,500 cy/yr).

Figures 12 and 13 illustrate sediment budget quantities for the project area in cy/yr. Transport rates for both time periods are in general agreement with each other, with magnitudes increasing for the recent interval. The largest difference in transport rates between the two intervals was located at the north end of Eatons Neck to the west of Cell 1, where erosion rates have consistently been high. Overall, east-directed transport rates varied from about 20,000 to 25,000 cy/yr, and west-directed rates ranged from about 34,000 to 41,000 cy/yr. Offshore losses due to storm events were greatest in Cell 1 (5,000 cy/yr), which is the area of the coastline most directly exposed to west-directed waves. Offshore losses at Cells 6 through 9 were effectively zero, owing to the shallow shoreface offshore this area. Net transport to the west into Cell 0 is about 16,000 cy/yr, the sand volume required to form Eatons Neck Spit between 1931 and 1990. Beach volume losses and gains range from about -18,000 cy/yr in Cell 1(1976 to 2001) to 4,600 cy/yr in Cell 9 (1962 to 2001). Net volume change rates are lower than those reported in U.S. Army Corps of Engineers (1995). However, a comparison of the 1976 and 1994 shorelines used in this study produced similar rates to their observations for that time interval. It appears that the 1994 shoreline may have been affected by severe northeast storms in the early 1990s, which would have contributed greatly to the discrepancy.

The 1976 to 2001 change analysis produces smaller magnitudes which are in agreement with comparisons from 1962 and 1972 to 2001. Additionally, the magnitude of volume change rates derived from bathymetric surface comparisons were very similar to the ones determined from shoreline change results. Tables 5 and 6 summarize the sediment budgets as illustrated in Figures 12 and 13.

Table 5. Asharoken sediment budget, 1962-2001. (Note: All sediment budget values are shown in cy/yr.)

Cell Number	1	2	3	4	5	6	7	8	9
Input (W-E) (+)	3,000	21,000	21,000	22,000	2000	0	21,800	21,800	24,800
Output (W-E) (-)	-21,000	-21,000	-22,000	-2,000	0	-21,800	-21,800	-24,800	-23,800
Input (E-W) (+)	36,700	41,400	39,900	12,200	10,200	34,300	34,300	37,200	40,800
Output (E-W) (-)	-36,900	-36,700	-41,400	-39,900	-12,200	-10,200	-34,300	-34,300	-37,200
Offshore	-5,000	-1,000	-1,300	-4,800	0	0	0	0	
Onshore	12,500	0	0	0	0	0	0	0	
Placement*			6,500	15,000					
Residual	**-10,700**	**3,700**	**2,700**	**2,500**	**0**	**2,300**	**0**	**-100**	**4,600**
Placements into Cells 3 and 4 derived from 1960's USACE beach nourishment of 840,000 cy									

Table 6. Asharoken sediment budget, 1976-2001.

Cell Number	1	2	3	4	5	6	7	8	9
Input (W-E) (+)	3,000	21,000	21,000	22,000	2000	0	20,000	20,000	23,100
Output (W-E)(-)	-21,000	-21,000	-22,000	-2,000	0	-20,000	-20,000	-23,100	-23,800
Input (E-W) (+)	39,000	37,500	39,100	13,100	11,100	34,700	34,700	37,500	38,800
Output (E-W)(-)	-46,400	-39,000	-37,500	-39,100	-13,100	-11,100	-34,700	-34,700	-37,500
Offshore	-5,000	-1,000	-1,300	-4,800	0	0	0	0	
Onshore	12,500	0	0	0	0	0	0	0	
Placement									
Residual	**-17,900**	**-2,500**	**-700**	**-10,800**	**0**	**3,600**	**0**	**-300**	**600**

The 1976-2001 sediment budget, shown in Table 6 and Figure 13, better represents recent sediment transport conditions at the project shoreline. The sediment budget excludes the effect of 840,000 cy of beachfill placed in the mid-1960's but includes the current and ongoing sand bypassing volume of 11,000 cy/yr. This sediment budget indicates that beach erosion has continued in the project shoreline at rates ranging from 700 cy/yr in Cell 3 to 17,900 cy/yr in Cell 1. The shoreline immediately west of the west jetty (Cell 4) is eroding at a rate of approximately 10,800 cy/yr. The shoreline east of the east jetty (Cell 6) is accreting at a rate of 3,600 cy/yr, which, for example, could be bypassed to the downdrift beach. Further east at Crab Meadow the shoreline is stable and is bypassing a net quantity of 14,000 cy/yr of littoral material downstream as indicated in Figure 13. The net longshore transport rate (Table 6 and Figure 13) entering the discharge channel (Cell 7) is 14,700 cy/yr, which is also approximately equal to the net rate along the entire Crab Meadow shoreline (Cells 8 and 9). This quantity exceeds the average rate of 11,100 cy/yr currently bypassed by Keyspan, with the difference being the accretion rate of 3,600 cy/yr east of the east jetty (Cell 6, indicated above).

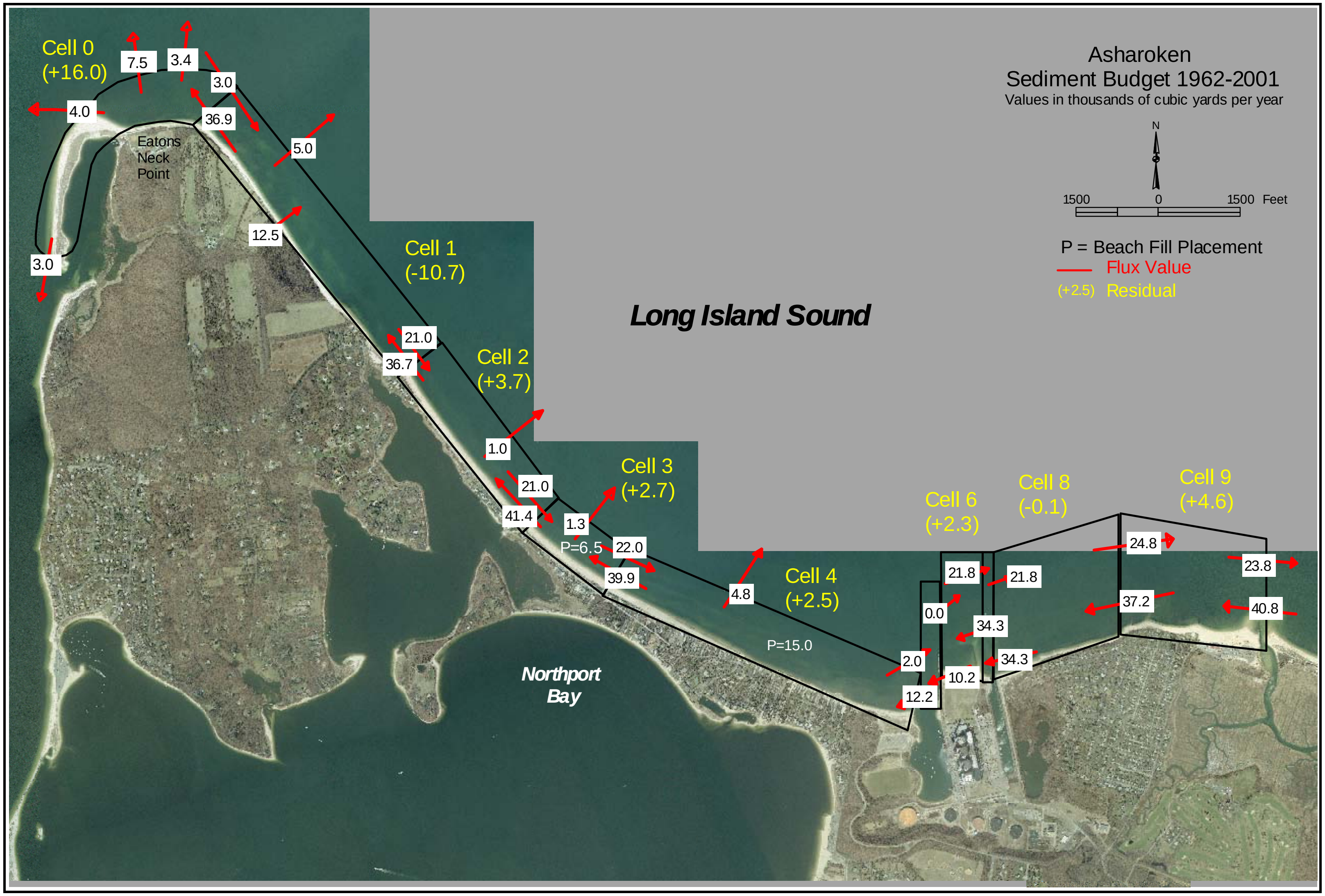


Figure 12. Sediment budget for the Asharoken littoral cell (Crab Meadow to Eatons Neck Spit), 1962 to 2001.

Figure 13. Sediment budget for the Asharoken littoral cell (Crab Meadow to Eatons Neck Spit), 1976 to 2001.

SEDIMENTATION MODELING AT THE PLANT OUTFALL AREA

Modeling Approach

In order to examine the details of circulation in the vicinity of the Keyspan plan intake and outfall, two types of modeling were required. A circulation model (ADCIRC) was used to produce time-varying water level and current fields throughout the immediate study area for mean and spring tide conditions. A fine-scale wave model (STWAVE) was applied to produce wave fields and the associated radiation stress-driven circulation patterns for mean and storm waves from the northwest, north, and northeast. The results from both models were used as input to a sediment transport model (analytical, implemented in a finite-difference scheme), which computed the change in depth over the study area. Long term (multi-year) depth changes were then calculated based on the distribution of conditions and transport model results.

Circulation modeling was conducted with the circulation model ADCIRC (Luettich, et al., 1992). The finite-element mesh was developed, calibrated, and verified for the Long Island Sound as part of the storm hindcasting phase of this project. The model finite element mesh includes the northern Atlantic Ocean (Figure 14) and has increasing resolution in the Long Island Sound and Asharoken regions (Figures 15 and 16). The resolution in the Asharoken area was enhanced using bathymetry from the New York District collected in 2001. All modeling was conducted in geographic coordinates (NAD 83, meters) with the vertical datum of Mean Sea Level. The ADCIRC computational mesh consisted of 33,721 nodes and 64,971 elements. Bathymetry in the vicinity of the study area is shown in Figure 17.

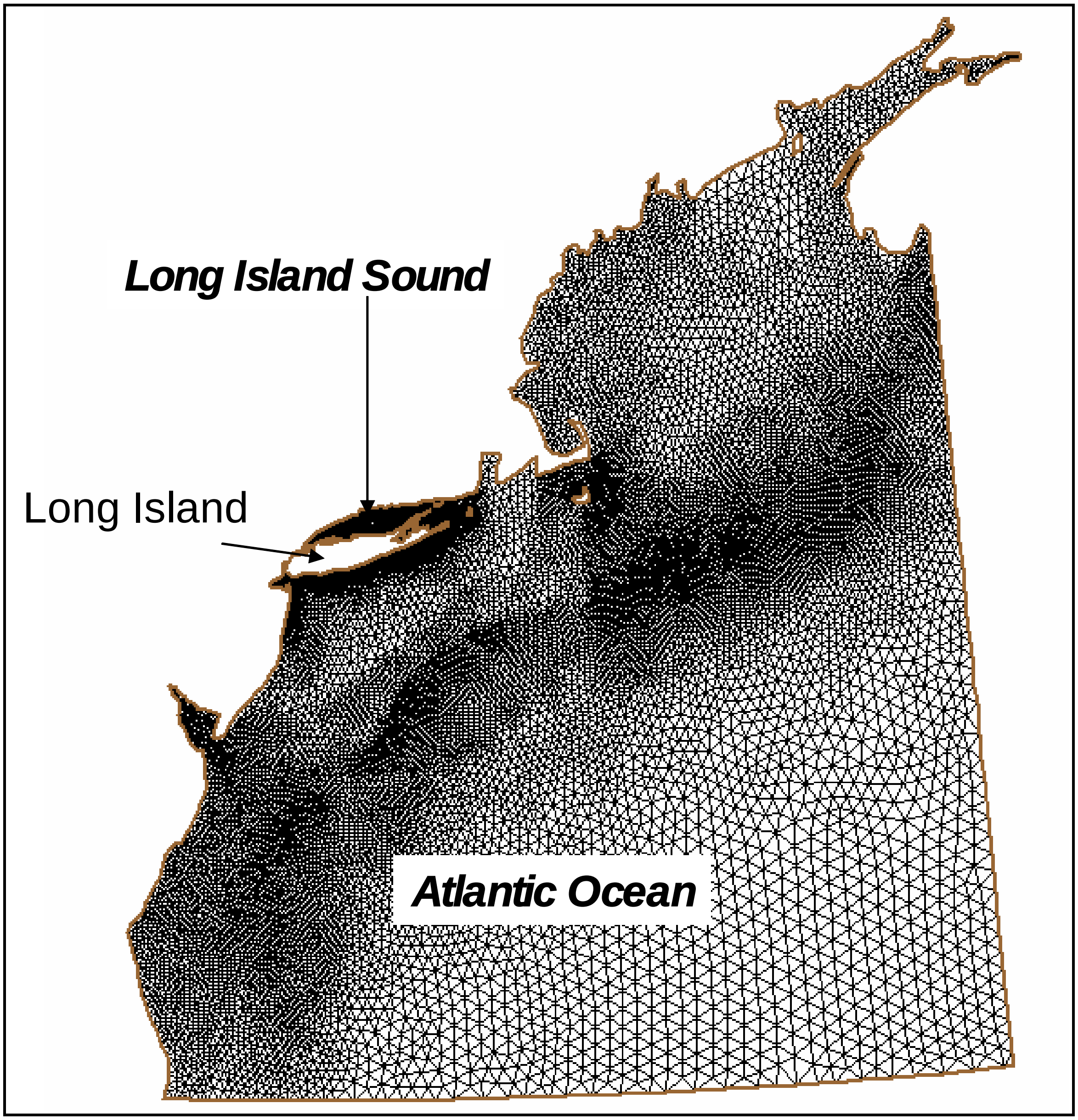


Figure 14. Finite-element mesh used for ADCIRC modeling

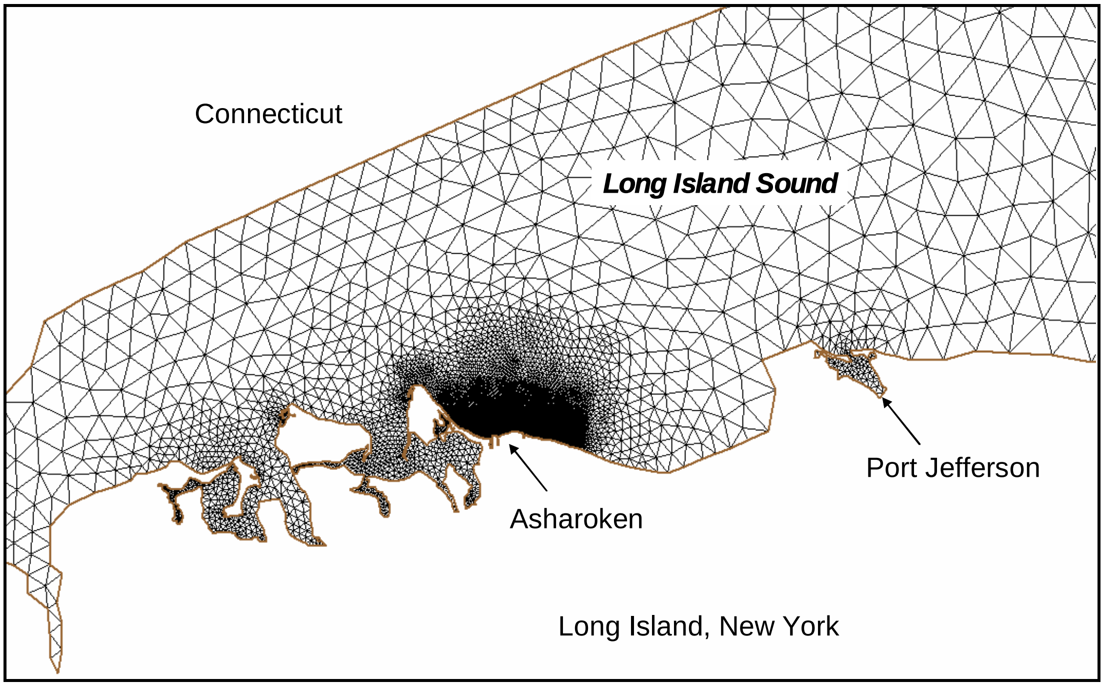


Figure 15. Detail of ADCIRC mesh in central Long Island Sound.

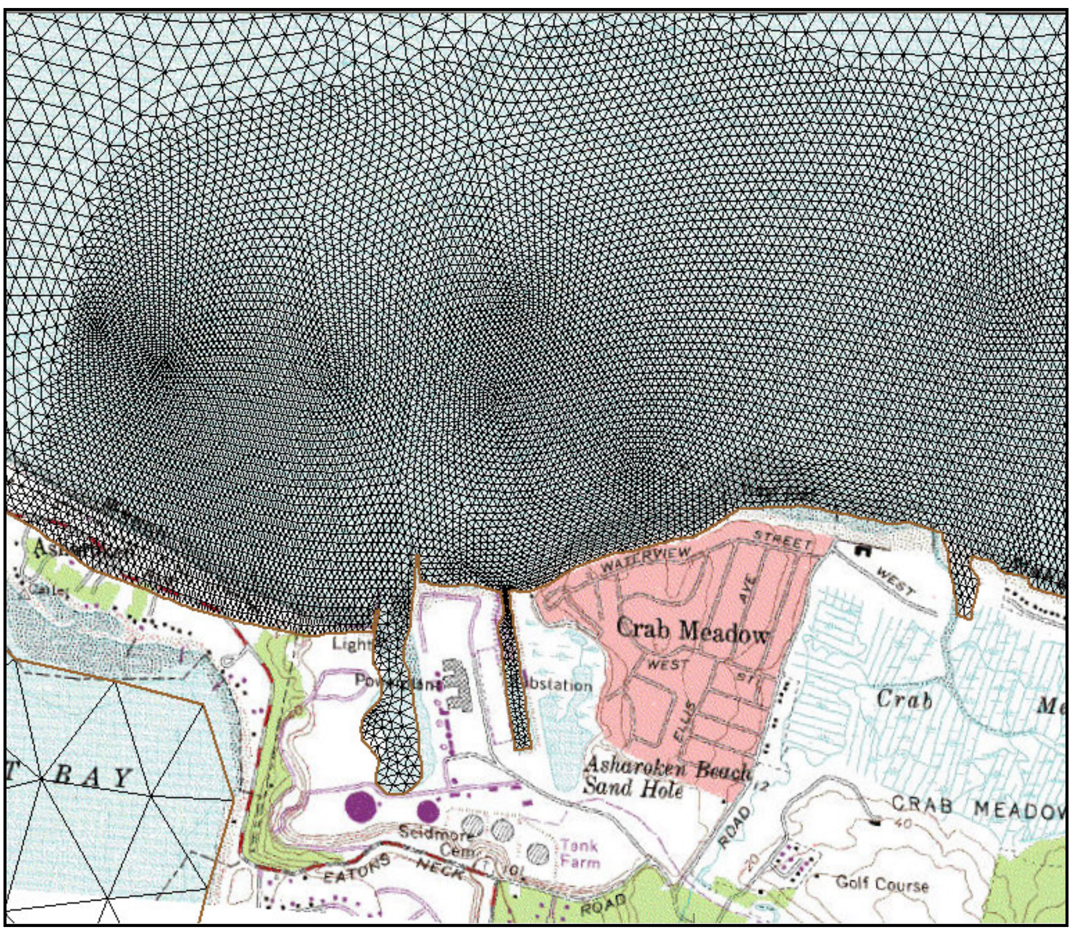


Figure 16. Detail of ADCIRC mesh in Asharoken area.

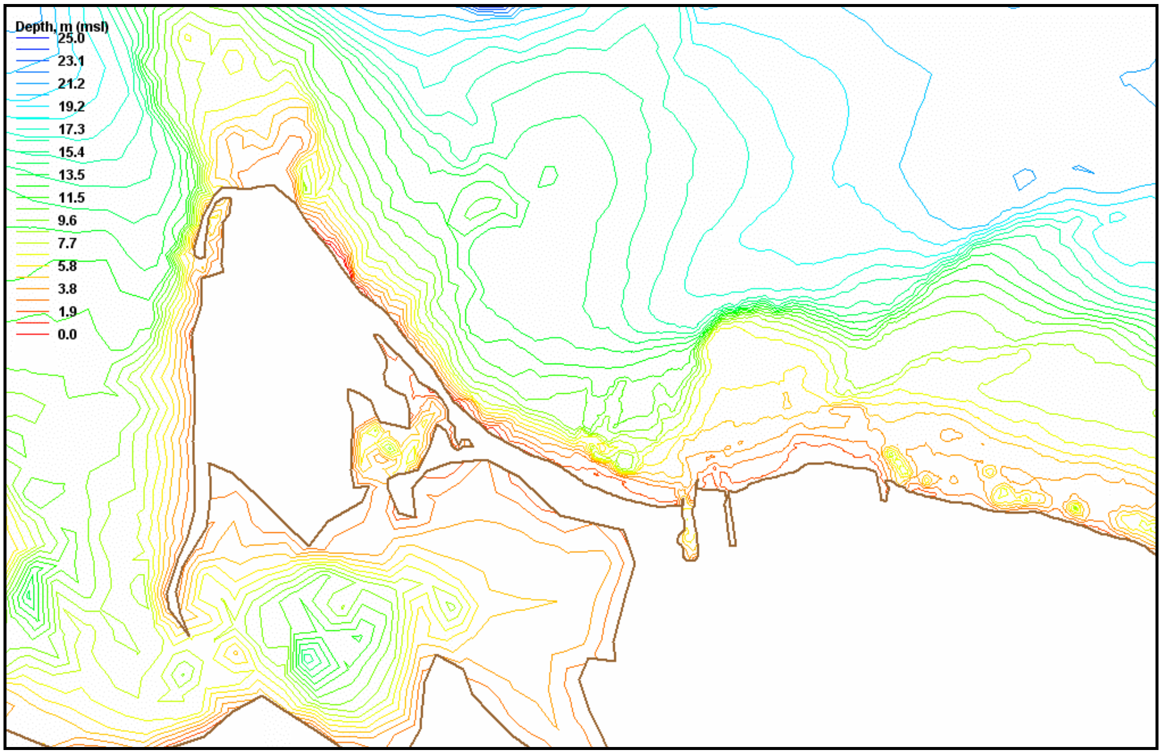


Figure 17. Contoured bathymetry in Asharoken area.

Circulation Model Validation and Interpretation

In order to validate the circulation model, simulations were compared with ADCP current measurements collected at the Asharoken study site on May 23, 2002. Forcing for the model consisted of tidal constituents, wind, and power plant discharge. Hourly marine wind data from NOAA Bouy 44025 (20 miles south of Fire Island Inlet in the Atlantic Ocean) was applied as spatially constant forcing. Winds were generally between 4 to 6 m/s from the southwest. Because the winds were blowing from the shore, waves were not observed to be important during the validation time period, so wave forcing was not included in the validation simulation. The plant discharge for this and all other simulation in which it was included was 34.4 m^3/s (approximately 549,000 gallons/minute), the average flow rate based on data provided by Keyspan (2002), listed in Appendix A. The mean discharge was represented in the model as stream flow.

Calculated currents were compared with measurements at 14 points on each survey (Survey 0824 had 16 points). Points were selected so that they were approximately on the same transect location for each survey. Examples of the locations for the three transects are shown in Figures 18-23. The comparisons of the model to measured values at each point are shown in Appendix B. Because of the variability in the ADCP measurements, an average of the 5 measurement points closest to the comparison point was taken as the measured current value. Calculations indicate that the model underpredicted the measured currents by an average of 0.06 m/s. The greatest error occurred during the change in tidal current direction, with measurements showing a faster reversal than the calculations. During intervals of stronger current flow, the calculated and measured currents compared more favorably. The rms-error was calculated to be 0.08 m/s.

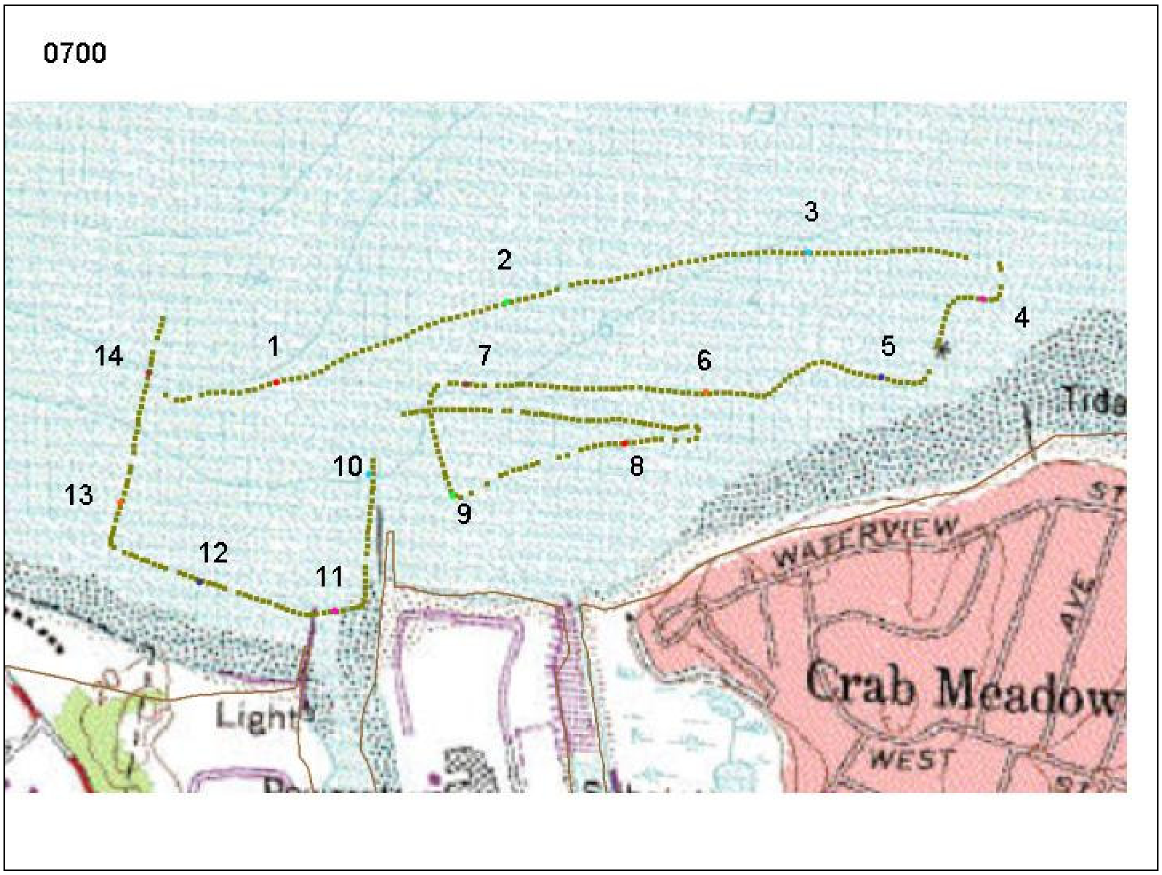


Figure 18. Locations of model comparisons (red dots) and field current measurements at 0700

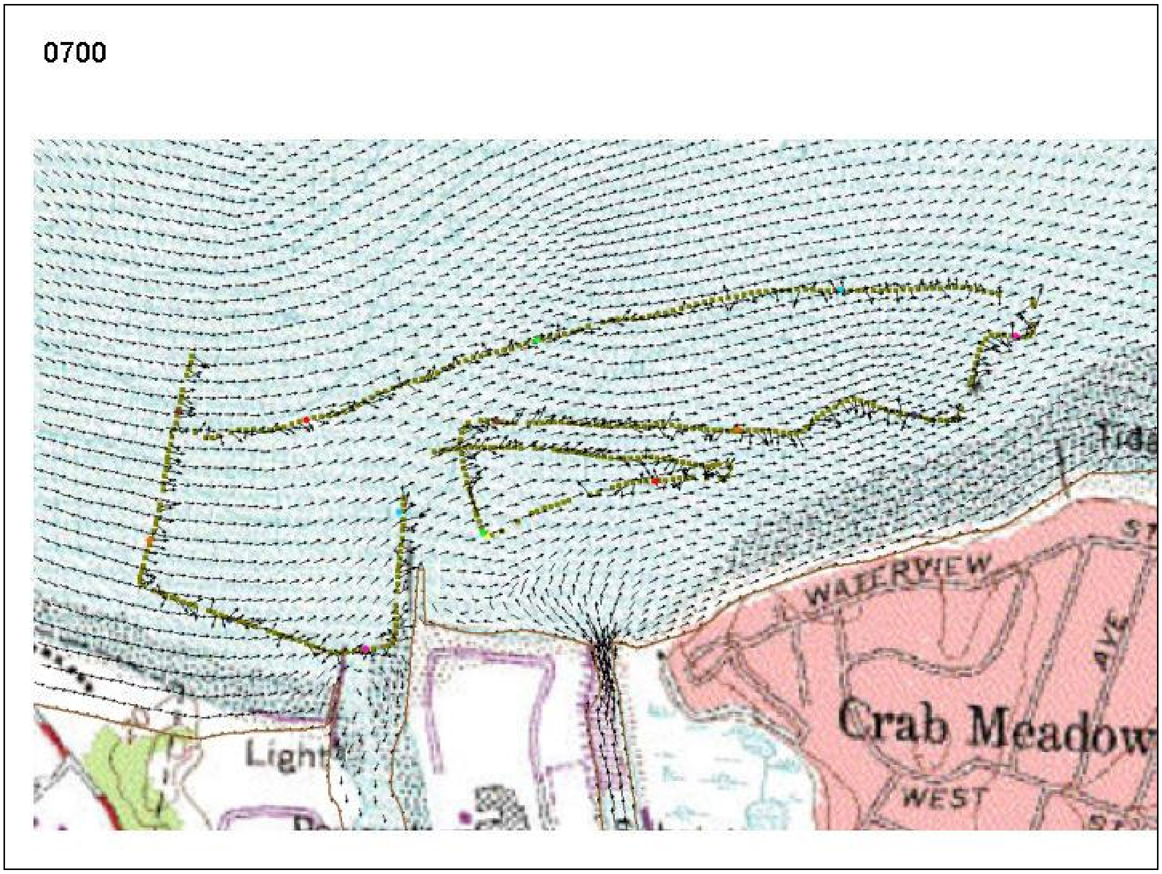


Figure 19. Modeled current vector field compared to measurements (shown at green dots) at 0700.

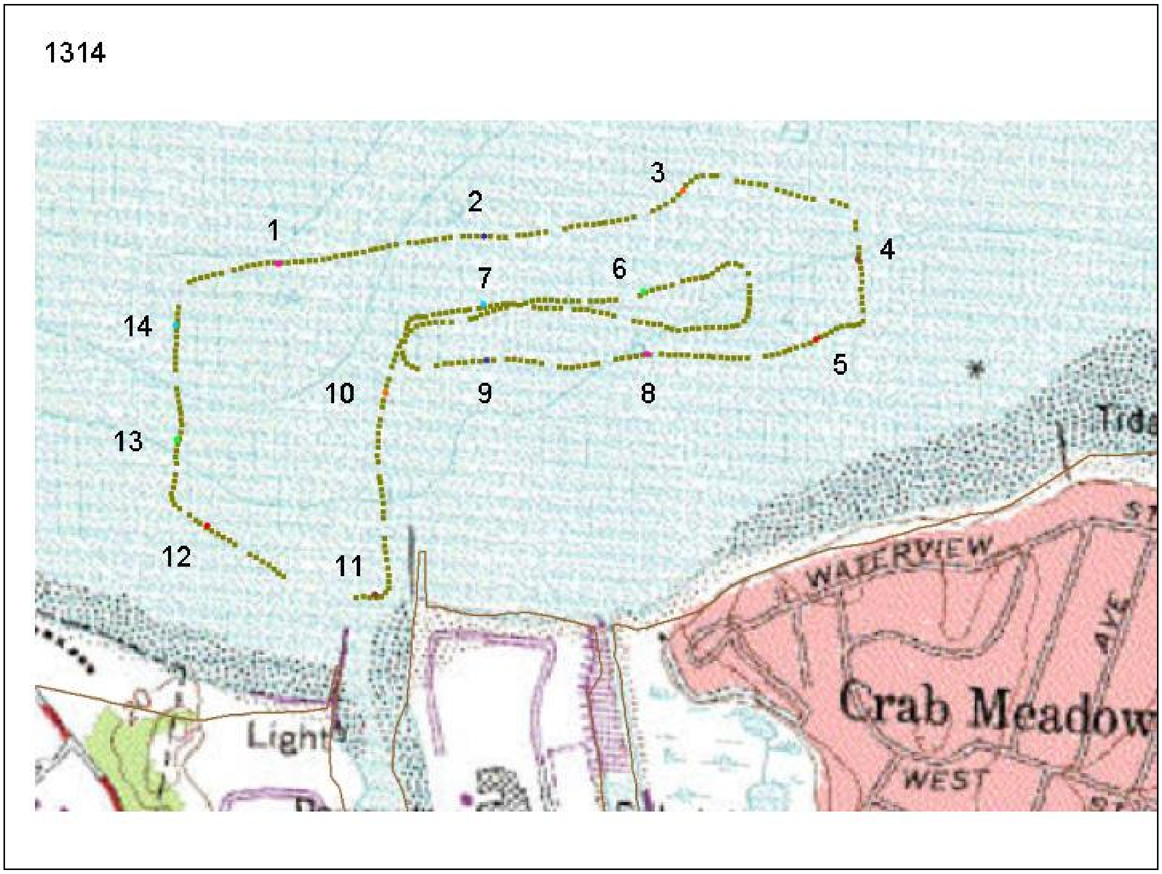


Figure 20. Locations of model comparisons (red dots) along field current measurement transects at 1314.

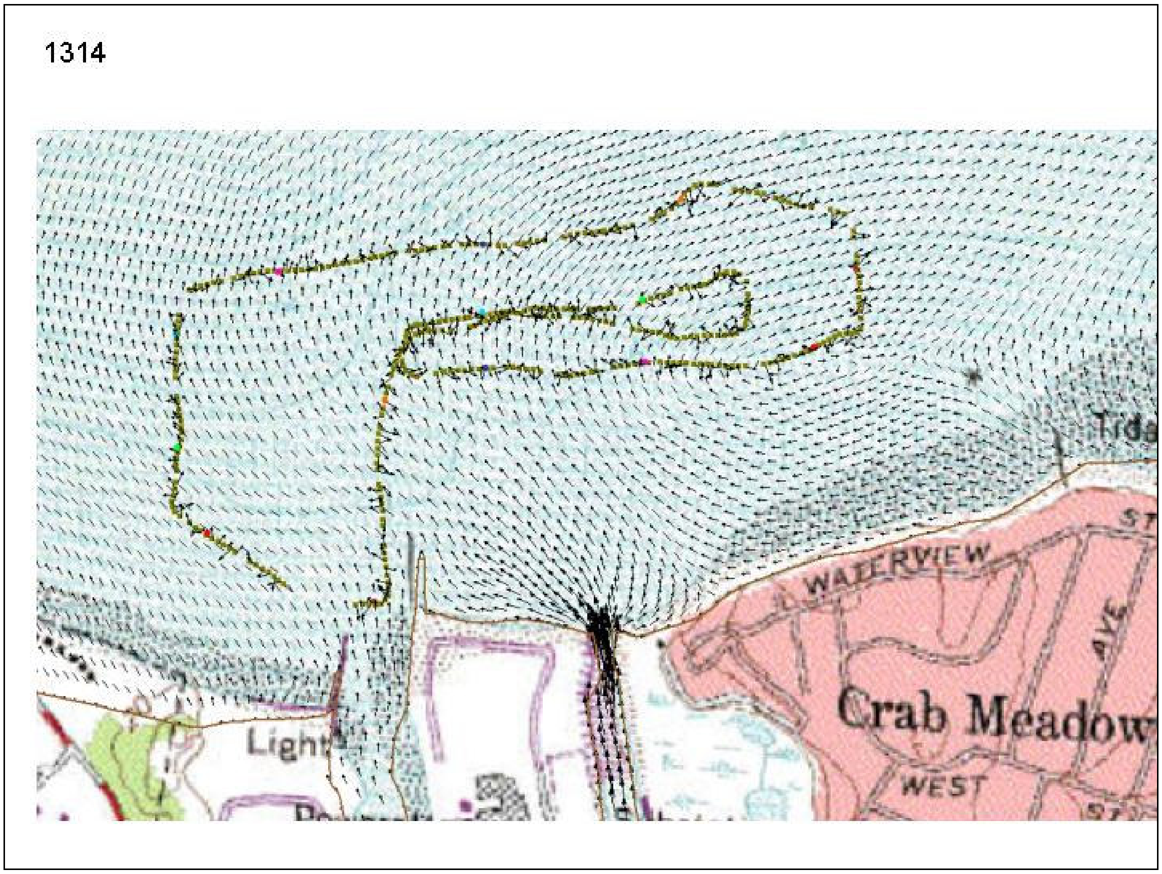


Figure 21. Comparison of model vector field and current measurements (green dots) at 1314.

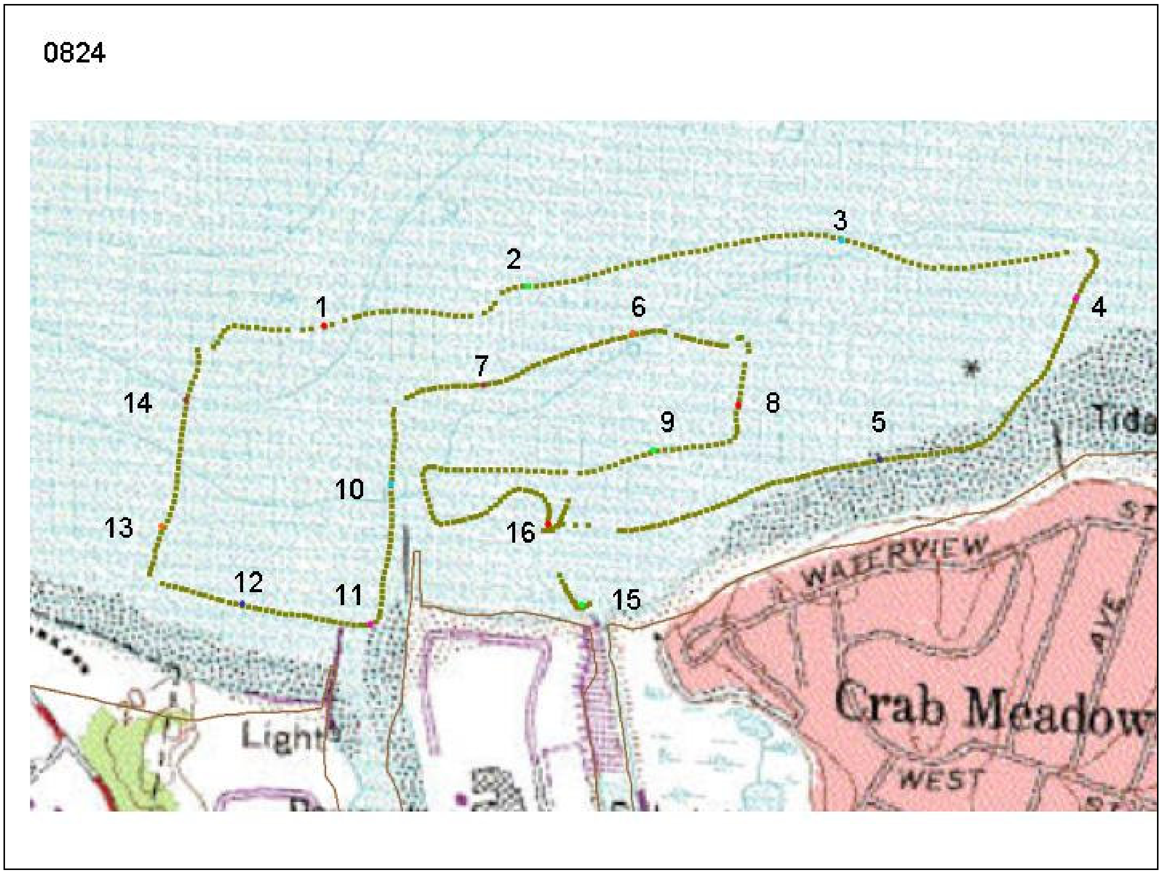


Figure 22. Model comparison locations (red dots) along field current measuement transects at 0824. Note that one transect was able to be traversed into the intake channel because of sufficient high tide.

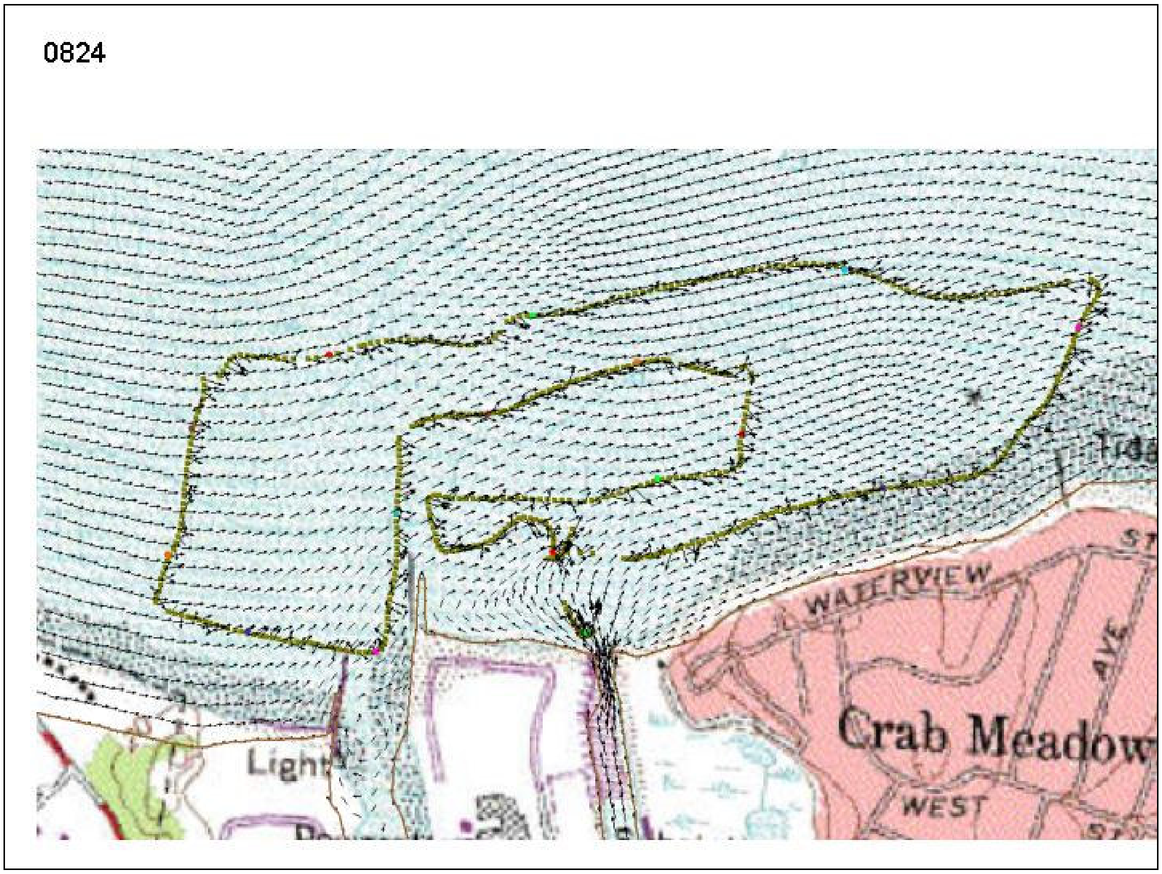


Figure 23. Comparison of model current vector field versus measurements at time 0824.

The best agreement between the calculated and measured currents was found to be at locations of Points 1 through 10, where the current was typically in the range of 0.10 to 0.25 m/s. Points 11 and 12 were consistently underpredicted by the model. At time 0824 measured current near the discharge point of the pond containing the plant pumps (Point 15). The measured current at Point 15 (very close to the weir) was 0.43 m/s and calculated was 0.14 m/s; however, the total discharge was correct. The model depth adjacent to the weir had to be maintained at approximately 2 meters for model stability, making the velocity at that location lower than measured. As the flow enters the water at the beach and the depths in the field decrease, the modeled currents more closely match the measurements.

Figures 19, 21 and 23 provide sample comparison of the measured flow field with calculated depth-averaged current vectors. In general, the calculated directions agree with the measurements. The agreement is best during times of stronger flow. During the interval of tidal current reversal, the agreement is again found to be less favorable.

Circulation Modeling Simulations

To examine the range of hydrodynamic conditions experienced at the study site, the following simulations were conducted:

1. Mean tide, no waves
2. Spring tide, no waves
3. Mean tide, mean waves from the northwest
4. Spring tide, mean waves from the northwest
5. Mean tide, mean waves from the north
6. Spring tide, mean waves from the north
7. Mean tide, mean waves from the northeast
8. Spring tide, mean waves from the northeast
9. Mean tide, storm waves from the northwest
10. Spring tide, storm waves from the northwest
11. Mean tide, storm waves from the north
12. Spring tide, storm waves from the north
13. Mean tide, storm waves from the northeast
14. Spring tide, storm waves from the northeast
15. Storm tide, storm waves from the northwest
16. Storm tide, storm waves from the north
17. Storm tide, storm waves from the northeast.

Wave properties were obtained from the 1990 to 1999 wave hindcast conducted for this study. Waves from the north (0 deg), northeast (45 deg), and northwest (315 deg) were selected as representative of the directional distribution. Properties of the mean and storm waves applied in the STWAVE modeling are given in Table 7.

For simulations that included wave forcing, the steady spectral wave model STWAVE was applied to calculate radiation stress gradients that were input into the ADCIRC model. The STWAVE grid (Figure 24) contains 50,576 cells with dimensions of 30 m on each side. All wave simulations were conducted with spectral parameter settings such that the wave frequency spectrum narrow, a characteristic of fetches that are limited in length and width like those on Long Island Sound.

Table 7. Mean and storm wave properties

Condition	Height, m	Period, s	Direction, deg	Probability
Mean	0.46	2.5	0	0.0040
Mean	0.76	3.5	45	0.0066
Mean	0.76	3.5	315	0.0082
Storm	1.68	4.5	0	0.0003
Storm	1.98	6.5	45	0.0004
Storm	1.37	4.5	315	0.0001

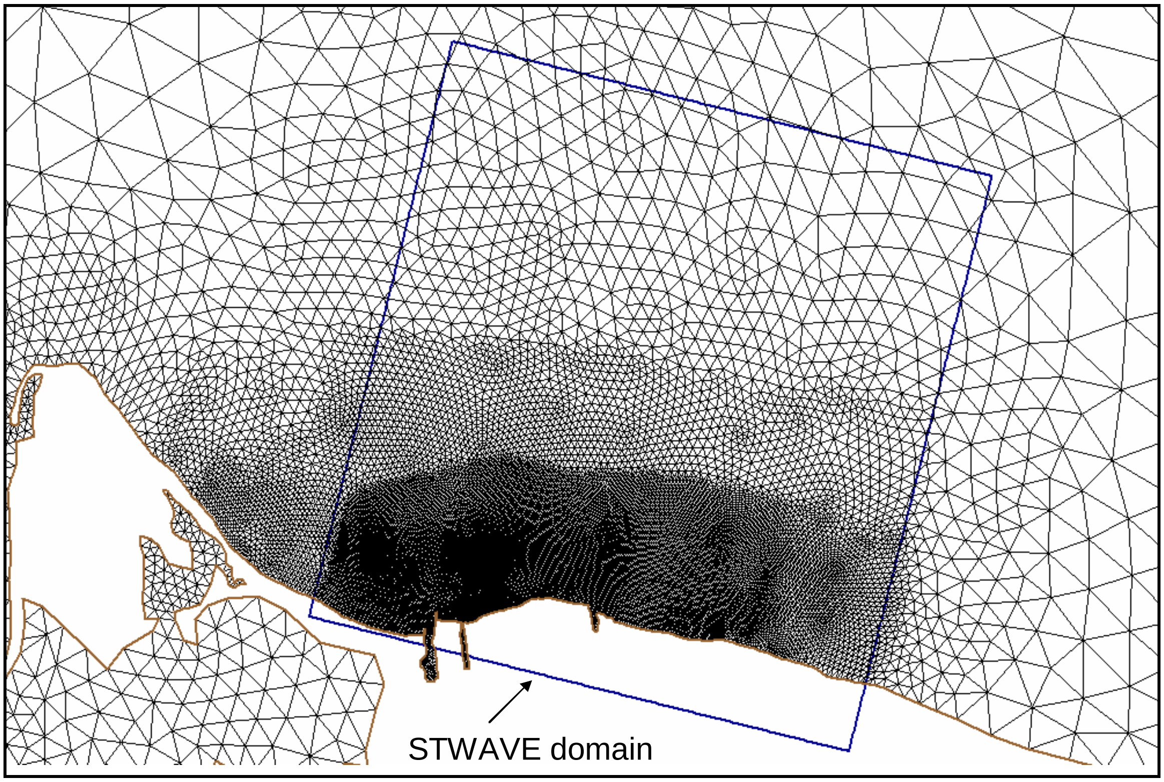


Figure 24. STWAVE domain overlain on ADCIRC mesh to evaluate processes due to the presence of the power plant.

Mean and spring tide simulations, with and without waves, were run for prototype lengths of 48 hours. The first 24-hour period was a ramp interval. The storm tide simulations were conducted for the August 28, 1954 storm, selected as a moderate storm condition, with a realization time of 72 hr and a 24-hr ramp interval. Wind fields for the 1954 storm were developed for the storm surge phase of this study, and applied again for this phase.

The water level and velocity fields calculated by ADCIRC for each simulation were mapped onto a variably-spaced, rectilinear grid for calculation of sediment transport and change in depth (Figure 25). Grid spacing ranged from 50 m to 25 m, with greatest resolution in the vicinity of the plant discharge.

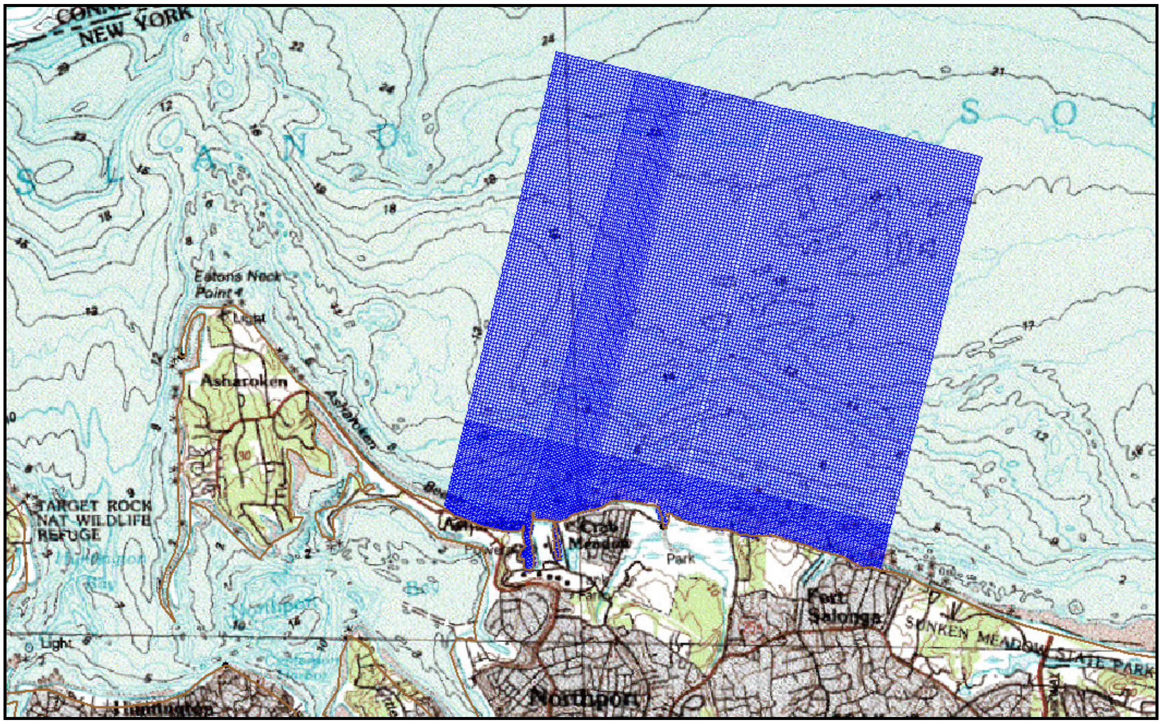


Figure 25. Rectilinear grid for sediment transport calculations.

Sediment Transport Model Methodology

Sediment transport calculations were calculated with the Watanabe (1987) total-load formulation on the rectilinear grid. The change in bottom elevation over time is given by

$$\frac{\partial z_b}{\partial t} = -\frac{\partial}{\partial x}\left(q_x - \varepsilon\left|q_x\right|\frac{\partial z_b}{\partial x}\right) - \frac{\partial}{\partial y}\left(q_y - \varepsilon\left|q_y\right|\frac{\partial z_b}{\partial y}\right) \qquad (1)$$

where z_b is the bottom elevation, t is time, q_x is the x-directed sediment transport rate, ε is an empirically-derived coefficient, and q_y is the y-directed sediment transport rate. The transport rates q_x and q_y are given by

$$q_x = A_0 \frac{(\tau - \tau_{cr})u}{\rho_w g} \qquad (2)$$

and

$$q_y = A_0 \frac{(\tau - \tau_{cr})v}{\rho_w g} \qquad (3)$$

where A_0 is a nondimensional coefficient, τ is the maximum bottom shear stress, τ_{cr} is the critical shear stress, u and v are the components of velocity parallel to the x and y

axes, respectively, and ρ_w is the density of water. The maximum bottom shear stress τ is

$$\tau = C_{b\_\max} \rho_w U^2 \qquad (4)$$

where $C_{b\_\max}$ is the maximum bottom-friction coefficient, and U is the total current speed. Calibration of the sediment transport formulation for the present study gave values of A_0 = 0.05 and τ_{cr} = 0.26.

Sediment transport calculations were conducted in a post-processing mode by calculating the change in depth over a 24-hr time interval for each hydrodynamic simulation. Thus, changes in depth were not fed back into the circulation model calculations. However, a continuity adjustment was implemented into the sediment transport model by modifying the current speed through a cell based on a discharge calculation. The discharge was calculated with the original grid depth and velocity. Then, an adjusted velocity was calculated based on the discharge and the updated depth. For all sediment transport simulations, water level and velocity fields were input at 6-min intervals. Sediment transport and depth change were calculated at this 6-min interval.

Calculations were conducted for two time intervals. The first was the interval from 1967 to 2001, in which the calculated results were compared to measured changes in bottom elevation. The second was a 50-year prediction (extrapolation) of change at 10-year time intervals. These long-term calculations were conducted by computing the annual change in depth based on the distribution of wave and tide conditions. The probability of each wave condition (Table 7) was computed from the Asharoken wave analysis and then the number of days over a 1-yr interval in which each condition is expected to occur was also computed. Those expectancies were then distributed between spring and mean tide, with each tide condition taken as occurring 50% of the time. Tide-only conditions were also represented as 50% mean and 50% spring.

Physical limitations were imposed on the depth change to reduce the lack of hydrodynamic feedback and unrealistic results. For areas in which the annual change in depth was greater than 0.025 m, based upon observed long term changes in the study area, a decrease in annual depth change was applied. This decrease was specified as the annual depth change multiplied by a factor F given by

$$F = \left(1 - \tanh\left(4.5t/50\right)\right)/10 \qquad (5)$$

where t is the time in years, and t/50 decreases the annual depth change over a 50-year interval.

Relative Effects of Tide and Wave Forcing

To investigate the processes that exert the largest influence on the sediment transport, selected results of a 24-hr depth change calculations are compared. Figures 26-

33 show calculated change in depth over a 24-hr time interval under a range of forcing conditions. Each figure shows results from a single set of forcing conditions (i.e. mean tide and no waves, spring tide and mean waves from the north, etc.).

Figures 26 and 27 show the change in depth with mean and spring tide (no waves), respectively. Only the area near the beach discharge shows any change in depth. This result is typical of when tidal currents are typically weak, unless forced through a constriction such as a tidal inlet.

Figures 28-30 show the change in depth at spring tide with mean waves propagating from the north, northeast, and northwest, respectively. The wave forcing induces sand movement in the nearshore area, primarily transporting sand alongshore. Note that the depth change north of Crab Meadow is opposite in sign for waves propagating from the northeast versus the northwest. Thus, areas that are depositional (erosional) under northeast waves become erosional (depositional) under northwest waves.

Figures 31-33 show the change in depth for storm tide with storm waves propagating from the north, northeast, and northwest, respectively. The circulation model was driven by the last 24 hours of the 1954 northeaster when the storm impact actually hit the northern shore of Long Island. The storm conditions induce significantly more transport and depth change than the situations of tide only and mean waves. Depths are modified at greater distances from the shoreline, owing to wave breaking further in deeper water. Longshore sediment transport is greater than with the mean waves, causing larger changes in the depth.

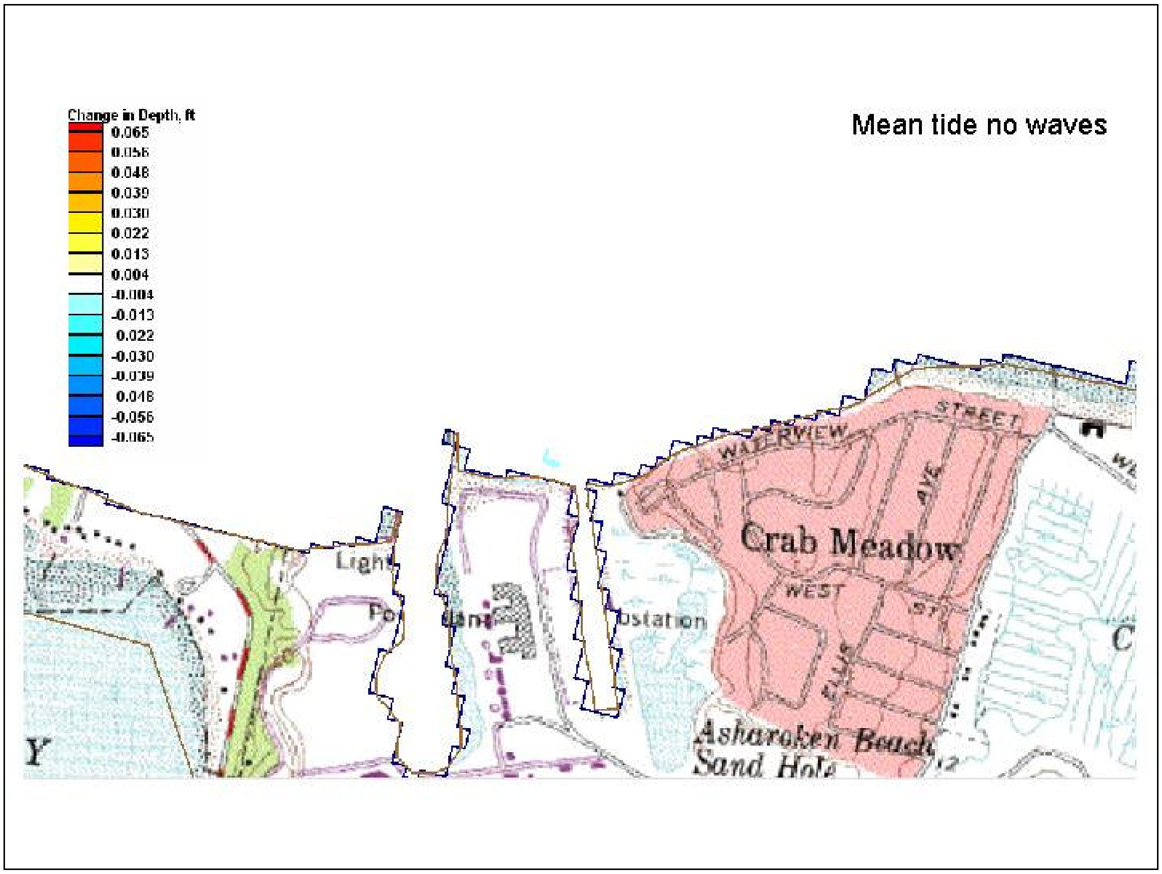


Figure 26. Depth change due to 24 hours of mean tidal current at Asharoken

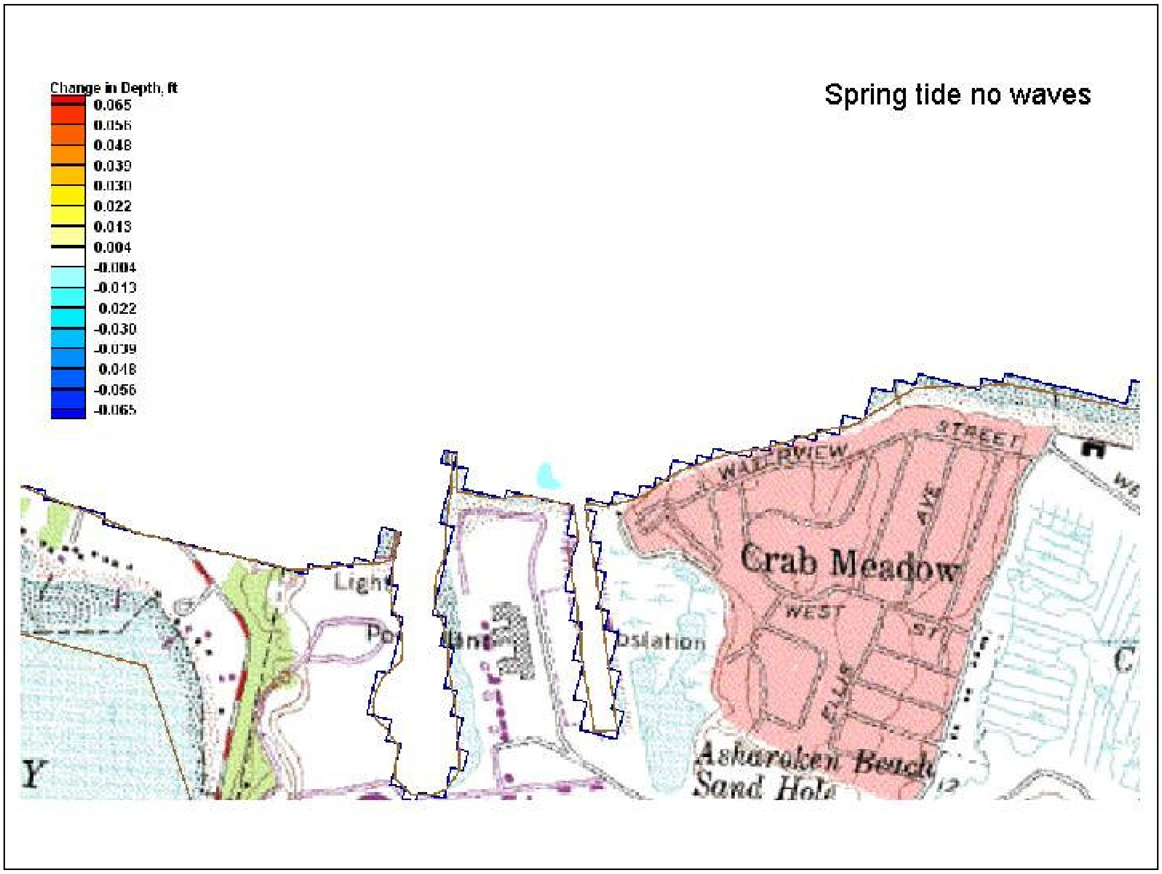


Figure 27. Depth change due to 24 hours of spring tidal current at Asharoken.

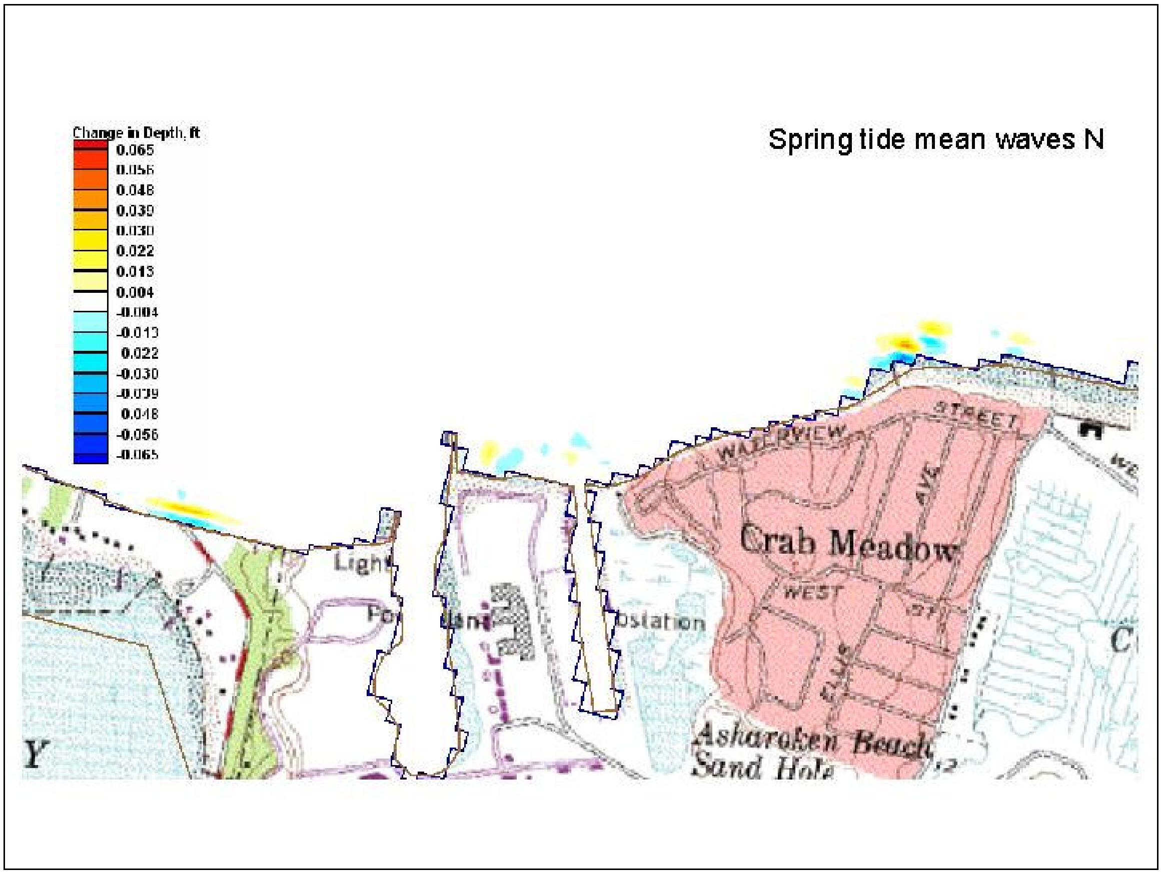


Figure 28. Depth change due to 24 hours of spring tidal current with mean daily waves from the north.

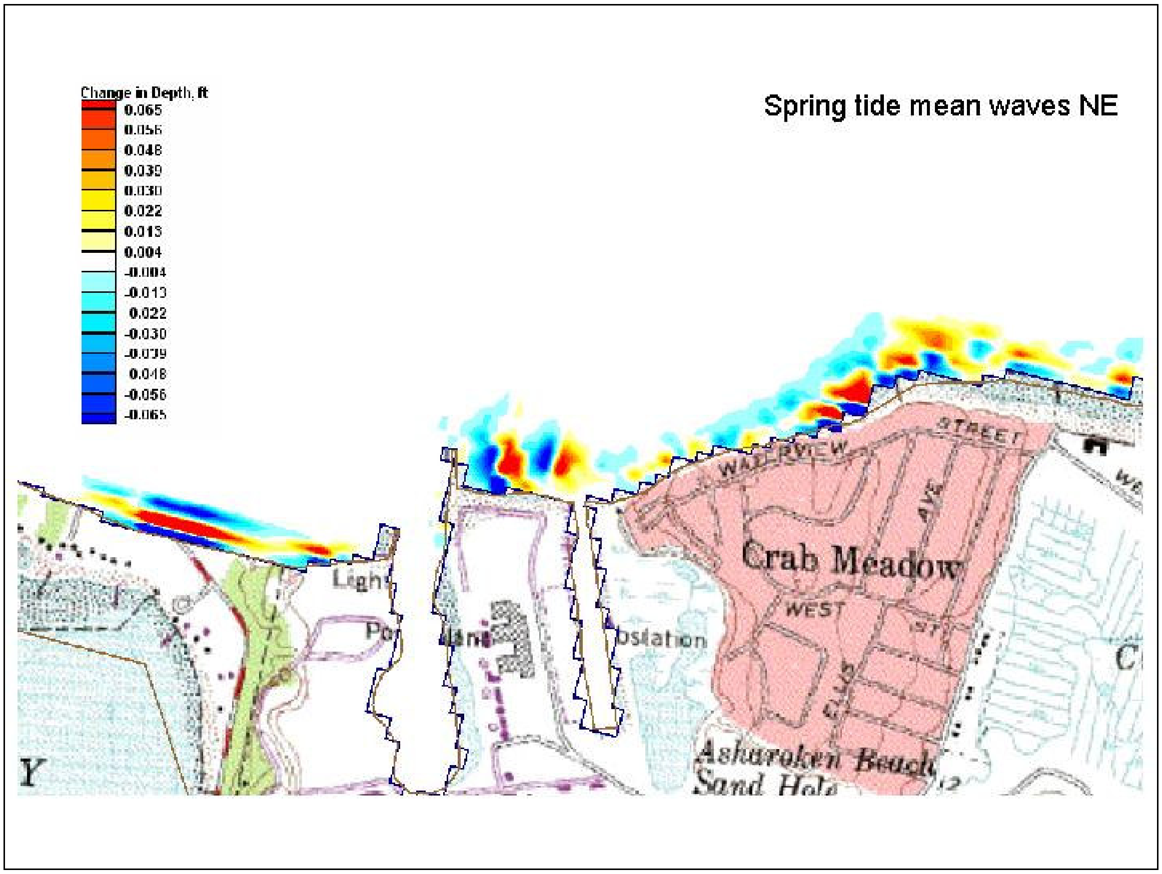


Figure 29. Depth change due to 24 hours of spring tidal current and mean daily waves from northeast.

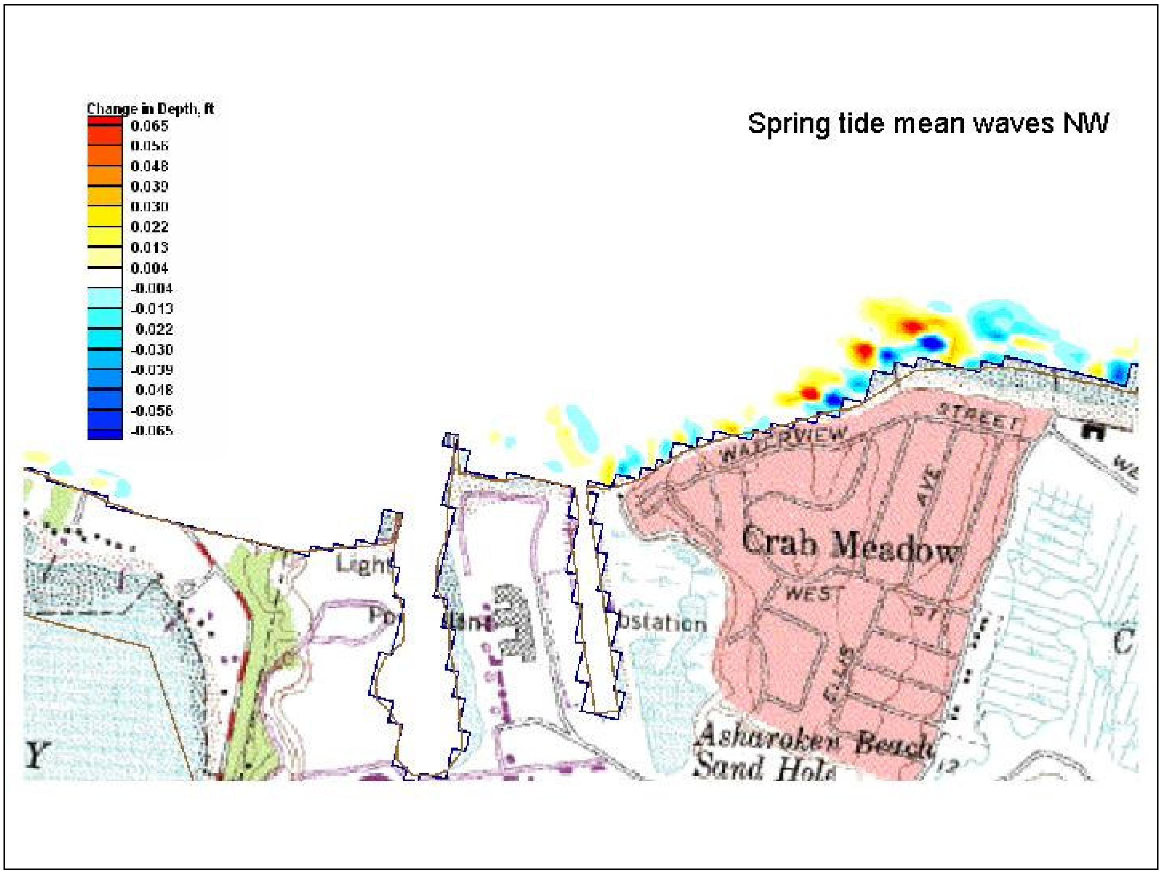


Figure 30. Depth change due to 24 hours of spring tidal current with mean daily waves from northwest.

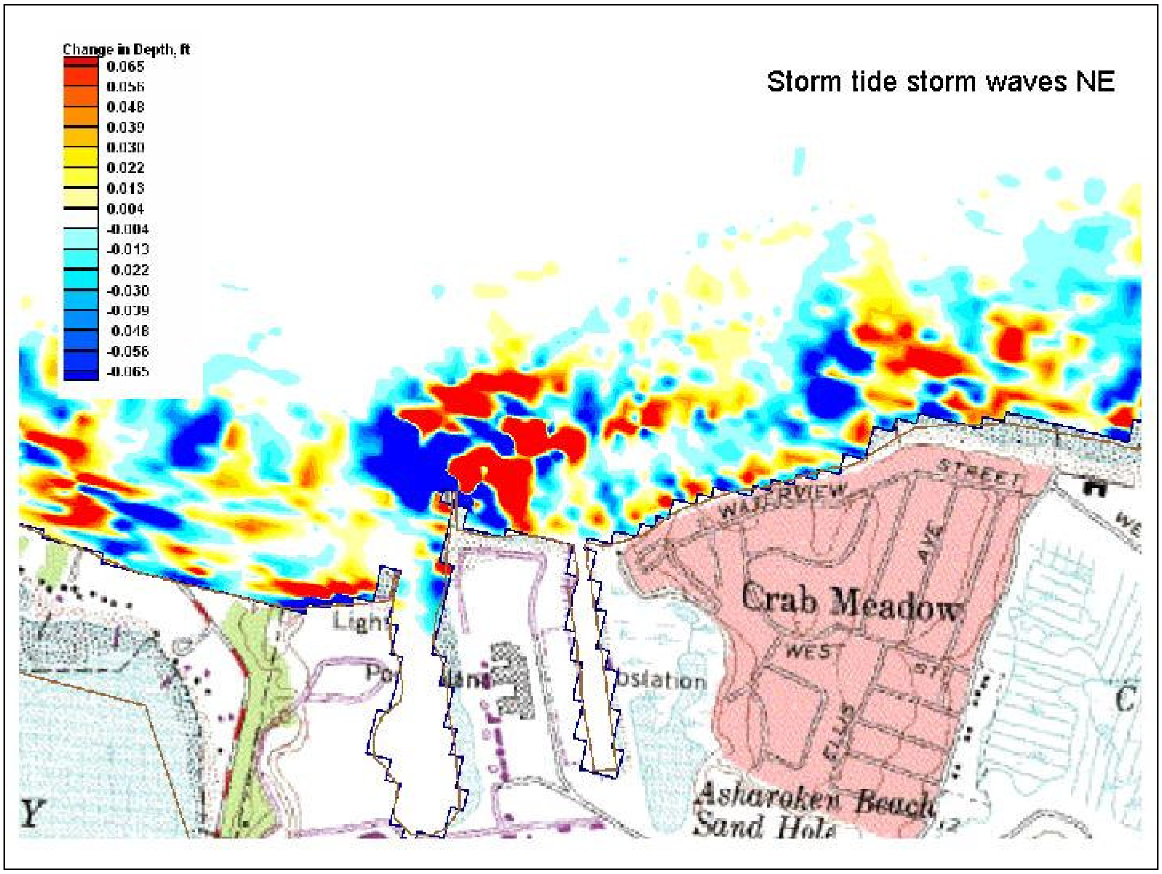


Figure 31. Depth changes from 24 hours of storm tidal currents and storm waves from the northeast.

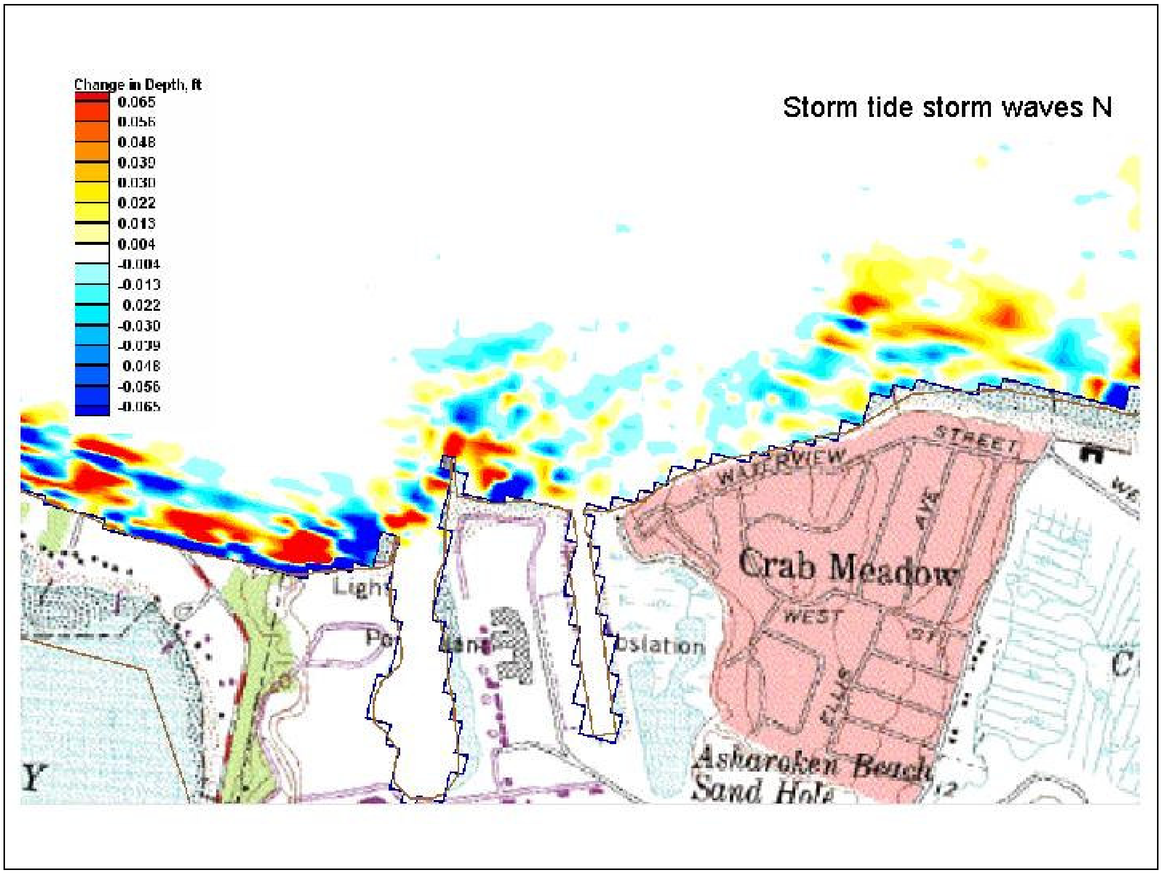


Figure 32. Depth change due to 24 hours of storm tide and storm waves from the north.

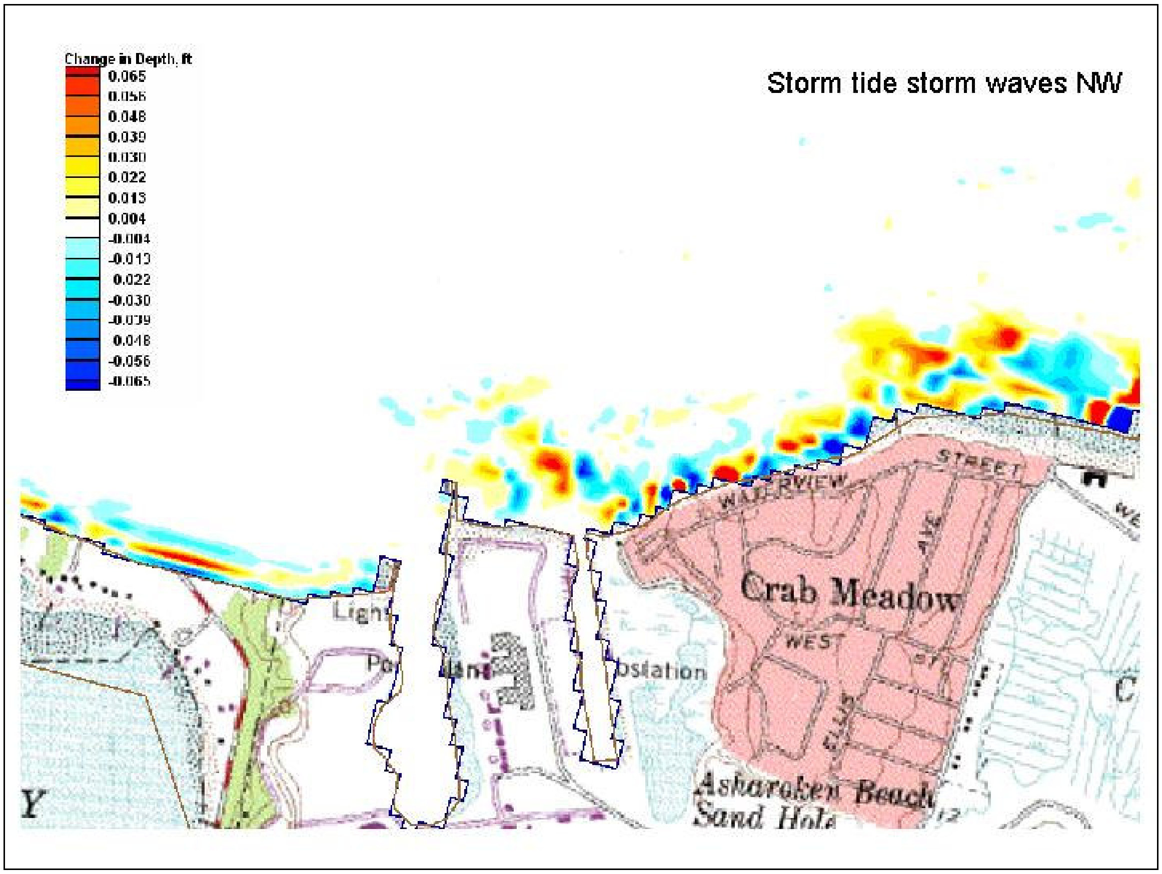


Figure 33. Depth change due to 24 hours of storm tidal current with storm waves from the northwest.

Based on the sediment transport calculations for these conditions, transport of sand offshore of the mean daily surf zone is controlled by storm waves. Changes in depth for storm waves were calculated to extend about 600 m from the shore. Mean waves induced changes in depth to a distance of approximately 200 m from the shore. Thus, sand lost by offshore transport can occur during storms, but is not expected to take place during fair weather conditions.

The sand shoal located at the plant discharge area provides a partial blockage of sand transported alongshore. During mean wave conditions, waves from the northeast may drive small volumes of sand past the shoal, but the transport during these conditions is limited. However, during storms, sand can be moved more readily around the shoal, particularly when the waves are from the northeast.

Offshore Extent of Discharge Effect

In order to evaluate the offshore extent of the discharge plume on sedimentation, a spring tide (with no waves) was applied to the model domain for a tidal cycle with the plant discharge turned on and compared to the same simulation with the plant discharge turned off.

Figures 34-36 illustrate the difference in the flow fields between the two cases at four snapshots during the tidal cycle. The figures show that the maximum longshore extent of the effect of the plume is the western end of Crab Meadow to about the middle of the intake canal (between the jetties).

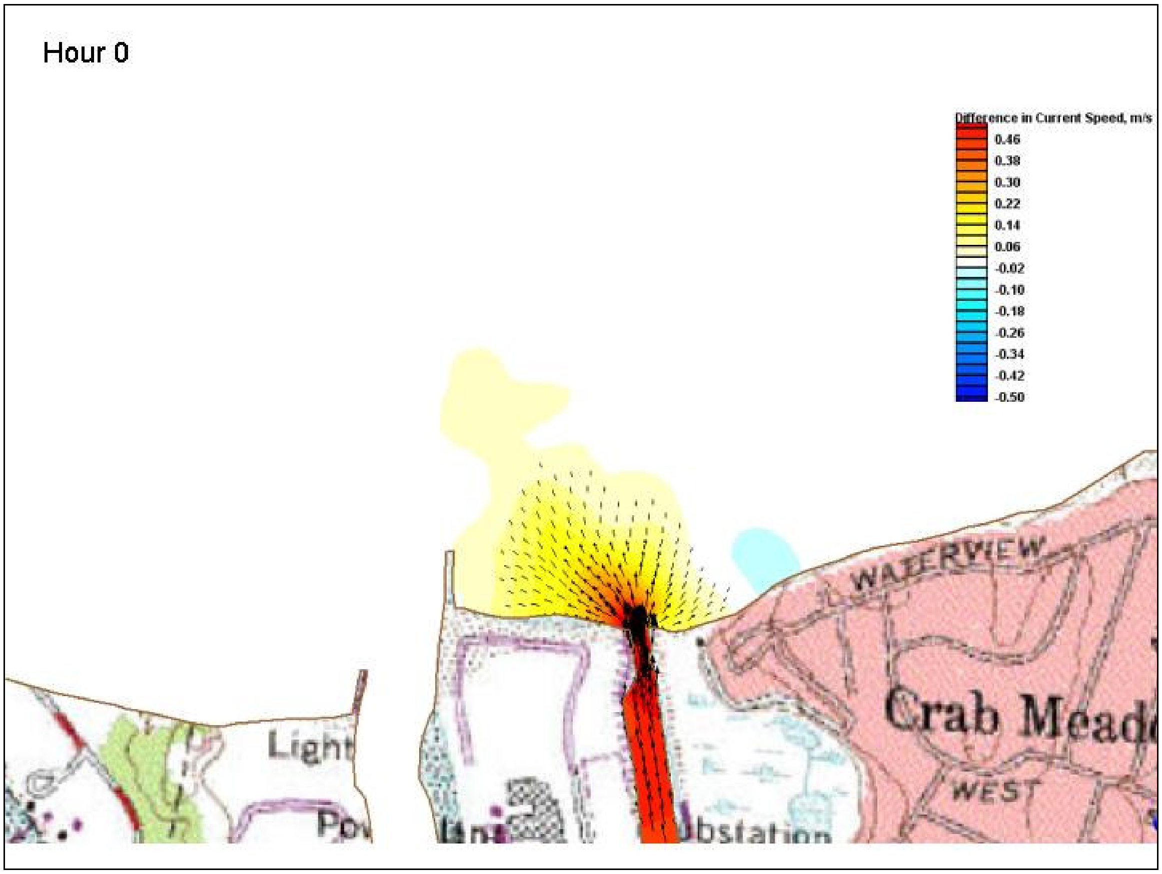


Figure 34. Differences at Hour 0 in flow velocity at spring tide between the discharge on and the discharge off (intermediate tide).

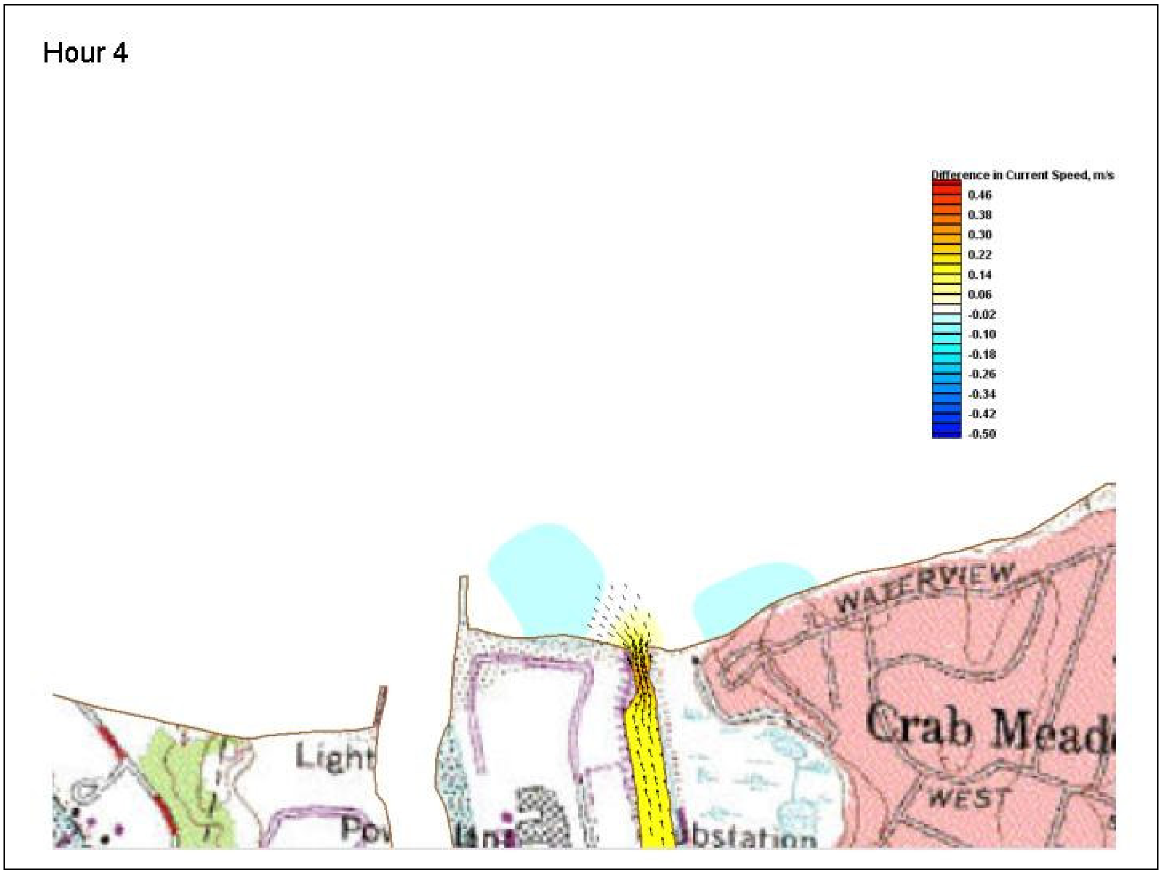


Figure 35. Difference at Hour 4 between spring tide flow field with discharge on minus discharge off (maximum flood tide).

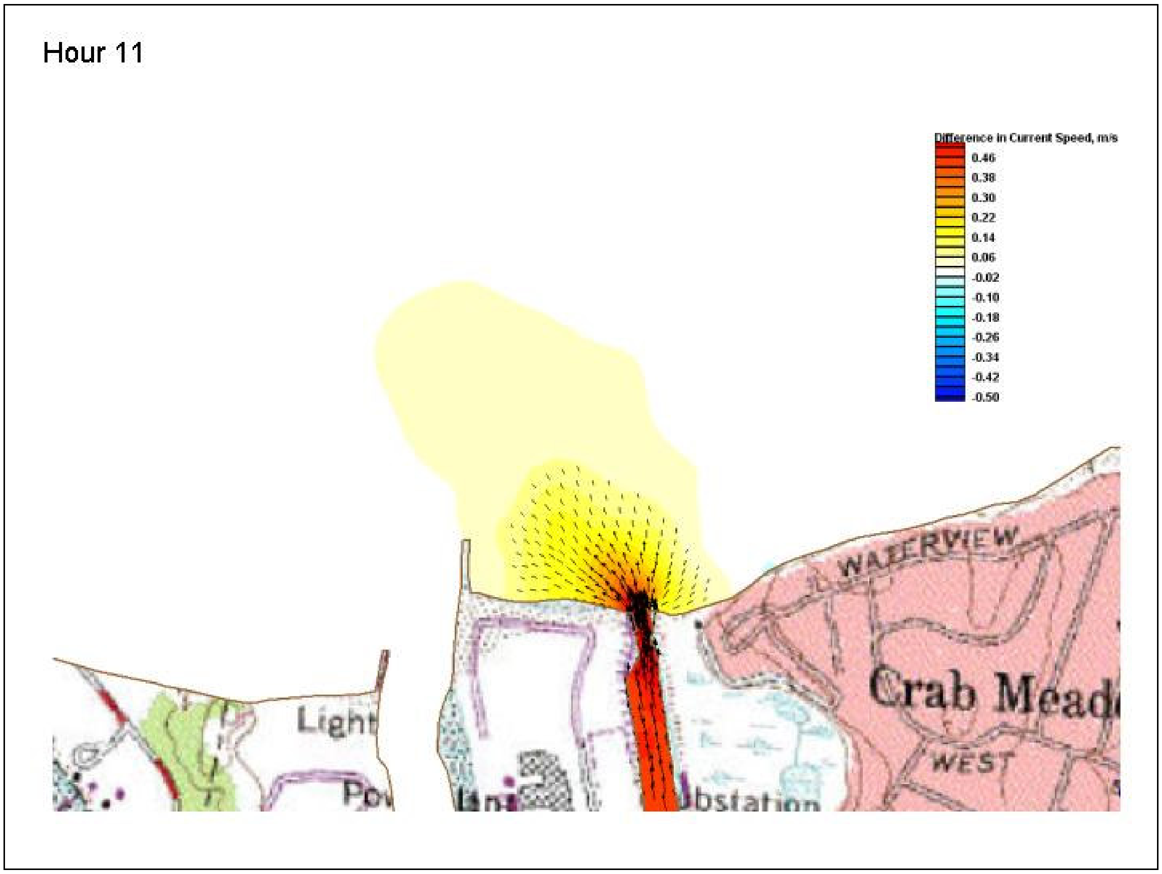


Figure 36. Difference in spring tide flow field with discharge on minus discharge off (maximum ebb tide).

To define the offshore extent of the plume effect, Figure 37 presents nine locations through the flow field where currents are compared between the spring tide conditions of the discharge on minus the discharge off. Figure 38-42 plot the currents at selected locations. These figures indicate that the discharge plume, at spring tide, alters tidal currents by extending the duration of the peak current out to approximately 370 meters from shore. The peak currents are only affected out to approximately 220 meters from shore. These values can be compared to that reported by Taylor Engineering (2001), which indicates that the largest extent of the plume is approximately 200 meters from the weir.

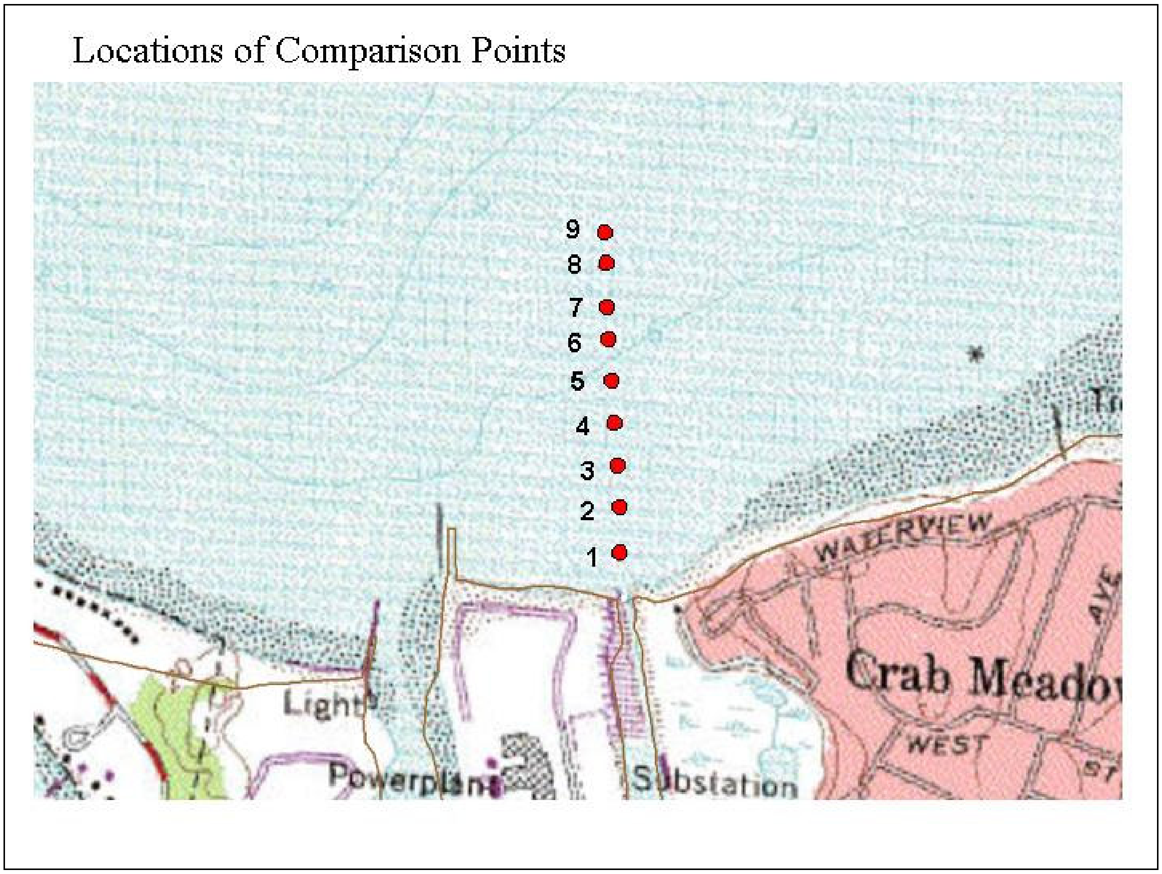


Figure 37. Locations to compare conditions with plant discharge versus no plant discharge.

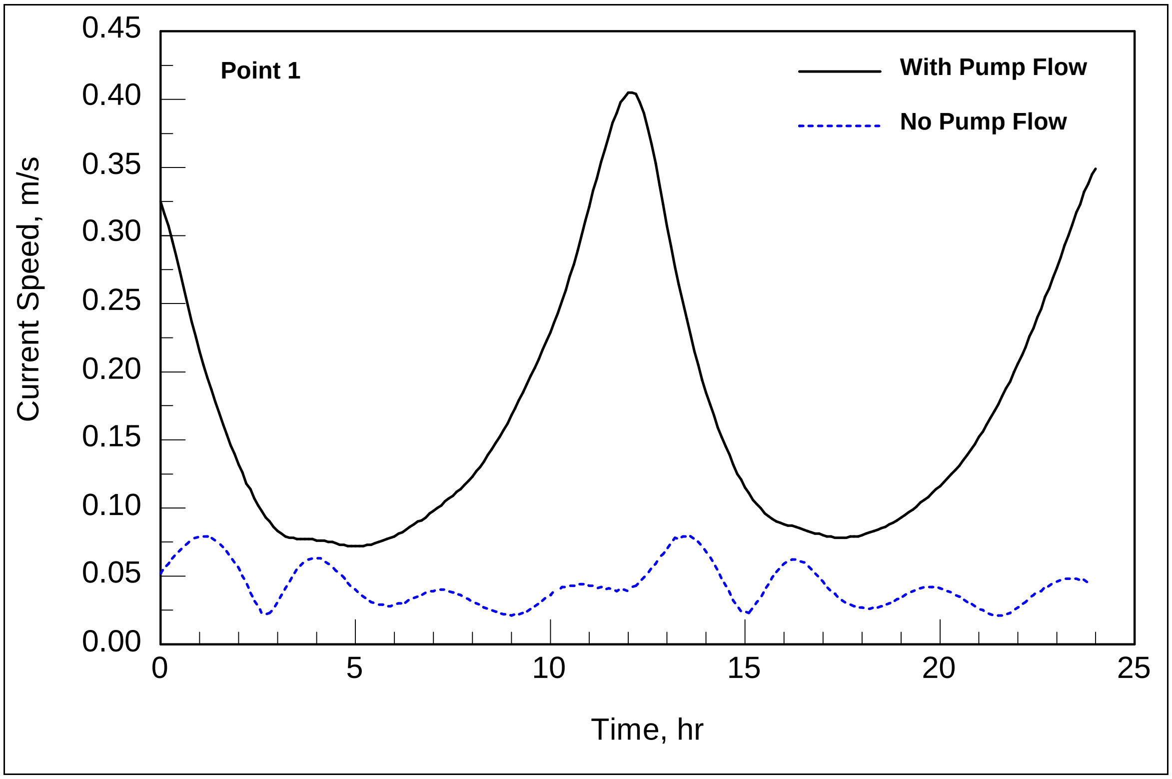


Figure 38. Comparison of current speed at Point 1 (70m from shore) for conditions with plant discharge on versus plant discharge off.

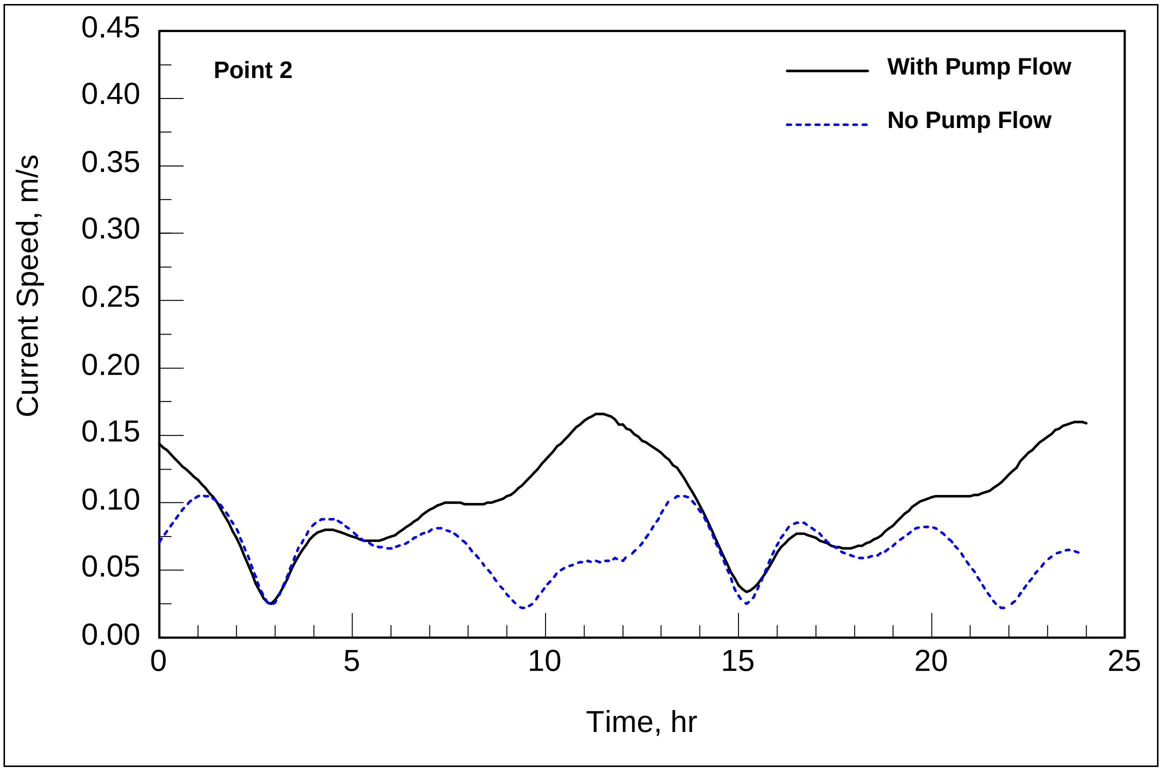


Figure 39. Comparison of current speed at Point 2 (150m from shore) with plant discharge on versus discharge off.

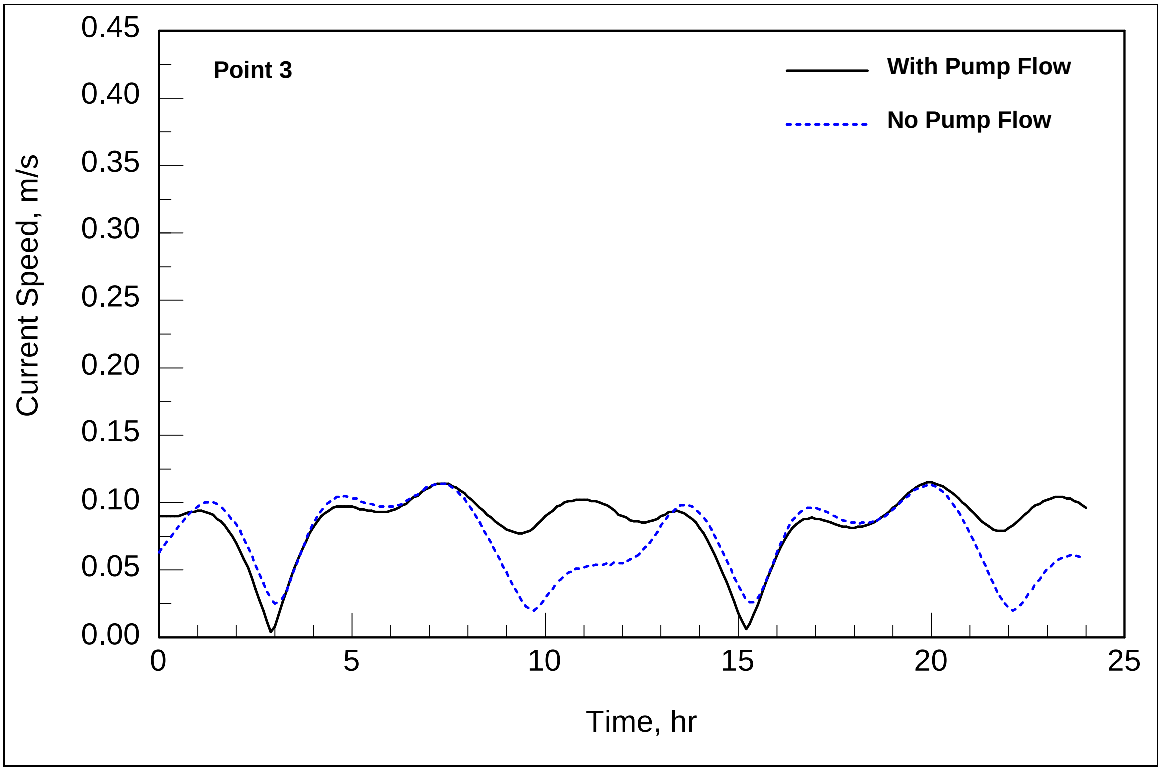


Figure 40. Comparison of current speed at Point 3 (220m from shore) with plant discharge on versus discharge off.

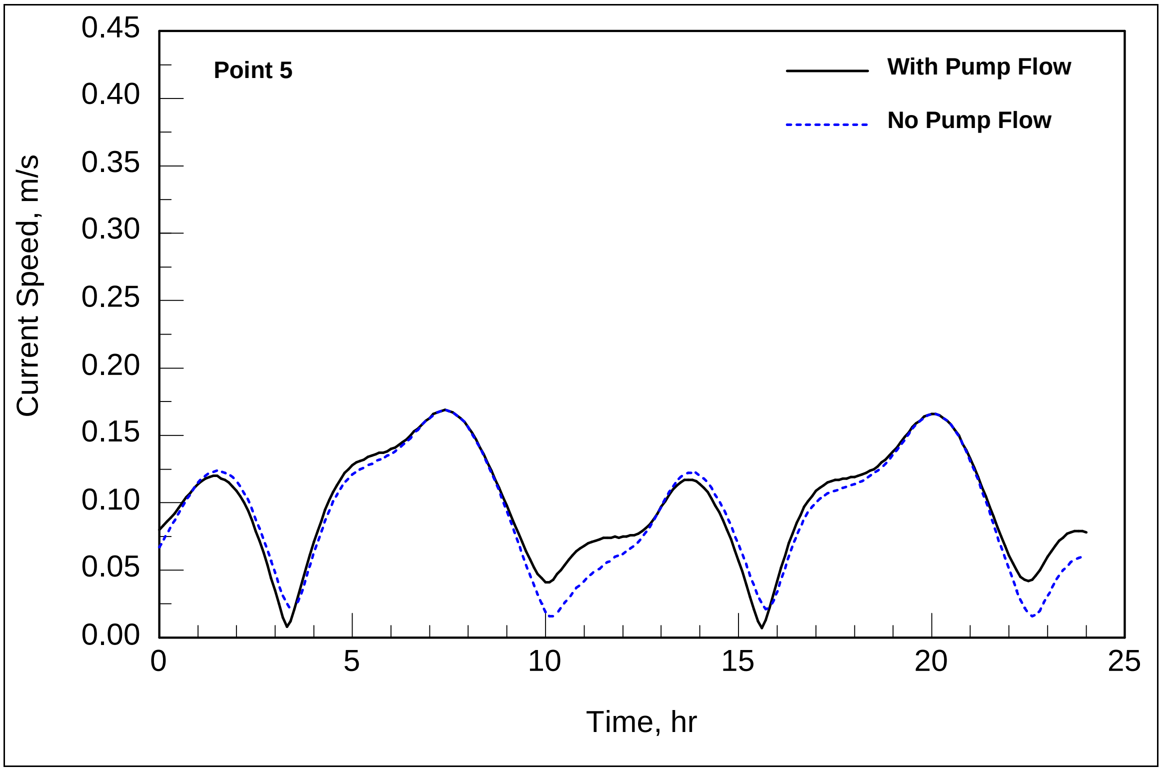


Figure 41. Comparison of current speed at Point 5 (370m from shore) with plant discharge on versus discharge off.

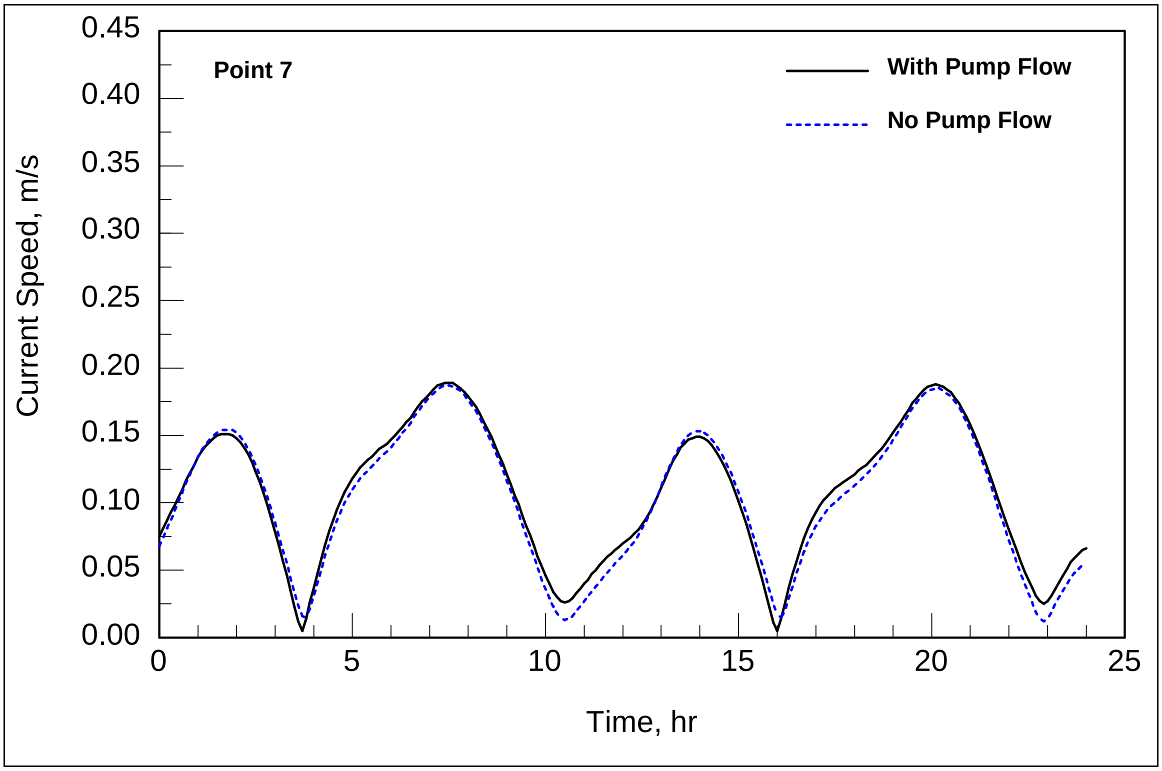


Figure 42. Comparison of current speed at Point 7 (500m from shore) with plant discharge on versus discharge off.

Long-Term Bathymetric Change: 1967-2001

Bathymetric change was calculated for the time interval 1967 to 2001. For this calculation, the 1967 bathymetry was input into the circulation, wave, and sediment transport model grids. Simulations were conducted for mean tide, as well as each combination of mean tide with mean and storm waves from the north, northeast, and northwest. The wave conditions were those given in Table 7. The annual change was calculated based on the distribution of the tide and wave conditions.

Figure 43 compares the calculated and measured change in depth for the 34-year interval from 1967 to 2001. Calculations reproduce gross features shown by the measurements, such as the major erosional and depositional areas. Patterns of calculated erosion extend further seaward on the eastern portion of the figure as compared to the western portion. These patterns also agree with measurements. There are also smaller areas where the calculated changes in depth do not agree with the measurements. In particular, results for the beach and nearshore region located between the beach discharge point (weir location) and the jetty to its west do not agree with measurements. This depositional feature is likely affected by longshore sediment influx, propeller wash from fishing boats that often go into the warm outfall waters, and other contributors that are not accounted for in a circulation model.

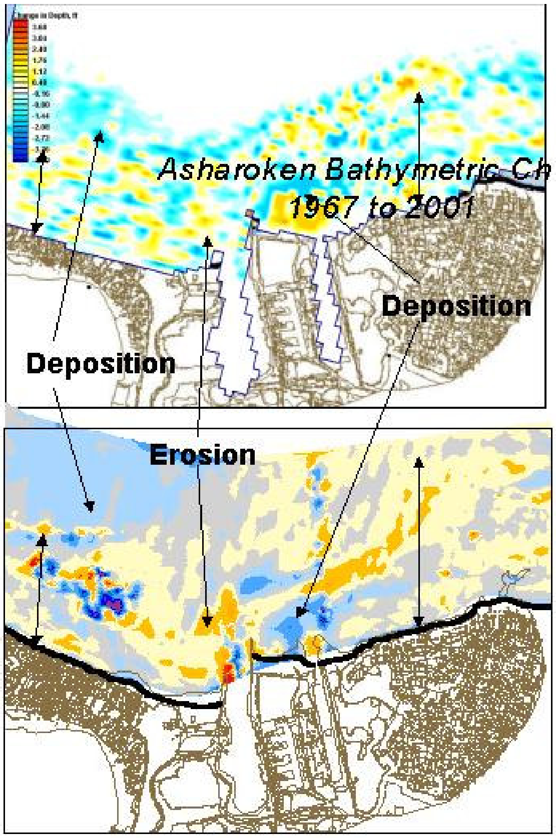


Figure 43. Comparison of bathymetric change from 1967 to 2001 between the model (top figure) and surveys (bottom figure).

Long-Term Bathymetric Change Extrapolation Over 50 years

Bathymetric change was calculated at 10-year intervals over a period of 50 years. Plots of the changes are shown in Figures 44-48. These plots describe the change in depth based on 2001 bathymetry. As with the 1967-2001 results, it is expected that the gross features of depth changes are reasonably represented. Variation from these results will take place in nature because of contributing effects not accounted for in a circulation model application of this type. The figures illustrate that a deposition of 1-2 feet of additional material is expected in the shoals bounding the outflow channel during the next 50 years.

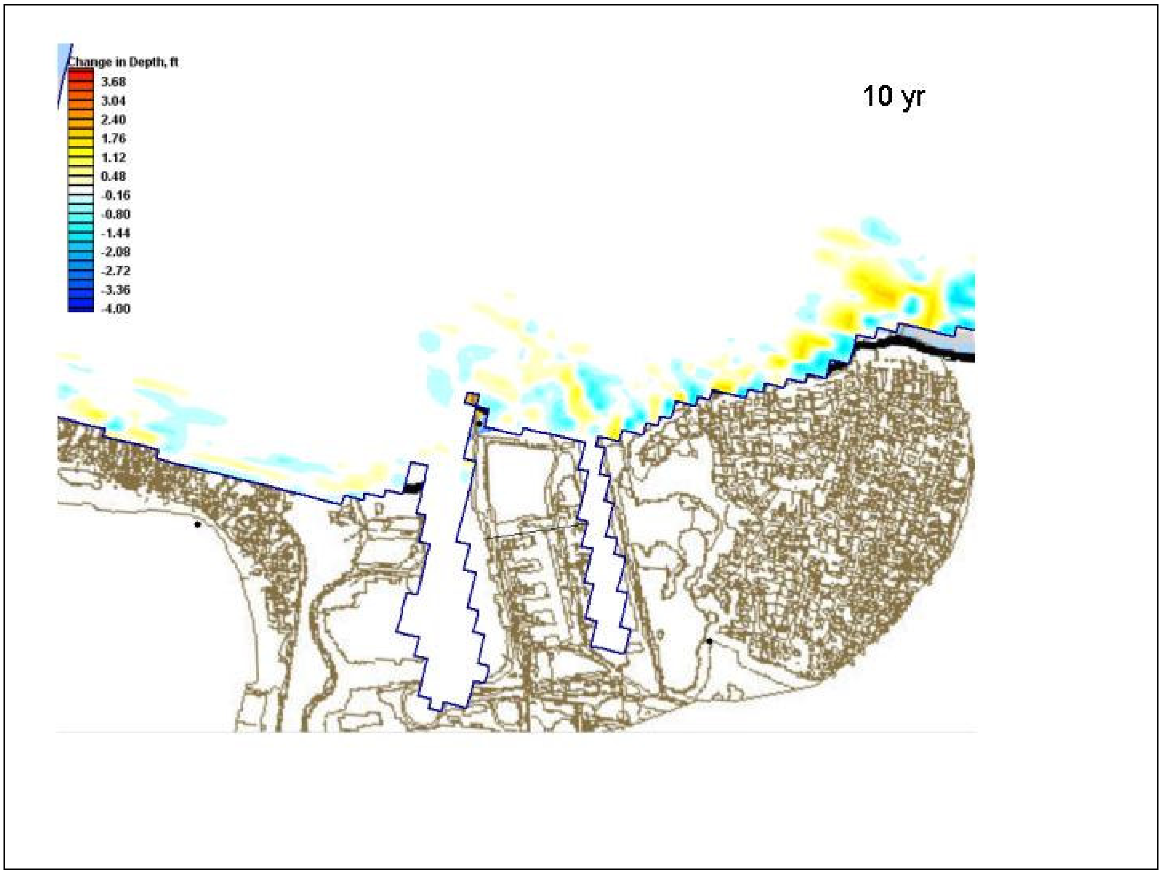


Figure 44. Expected depth changes 10 years into the future.

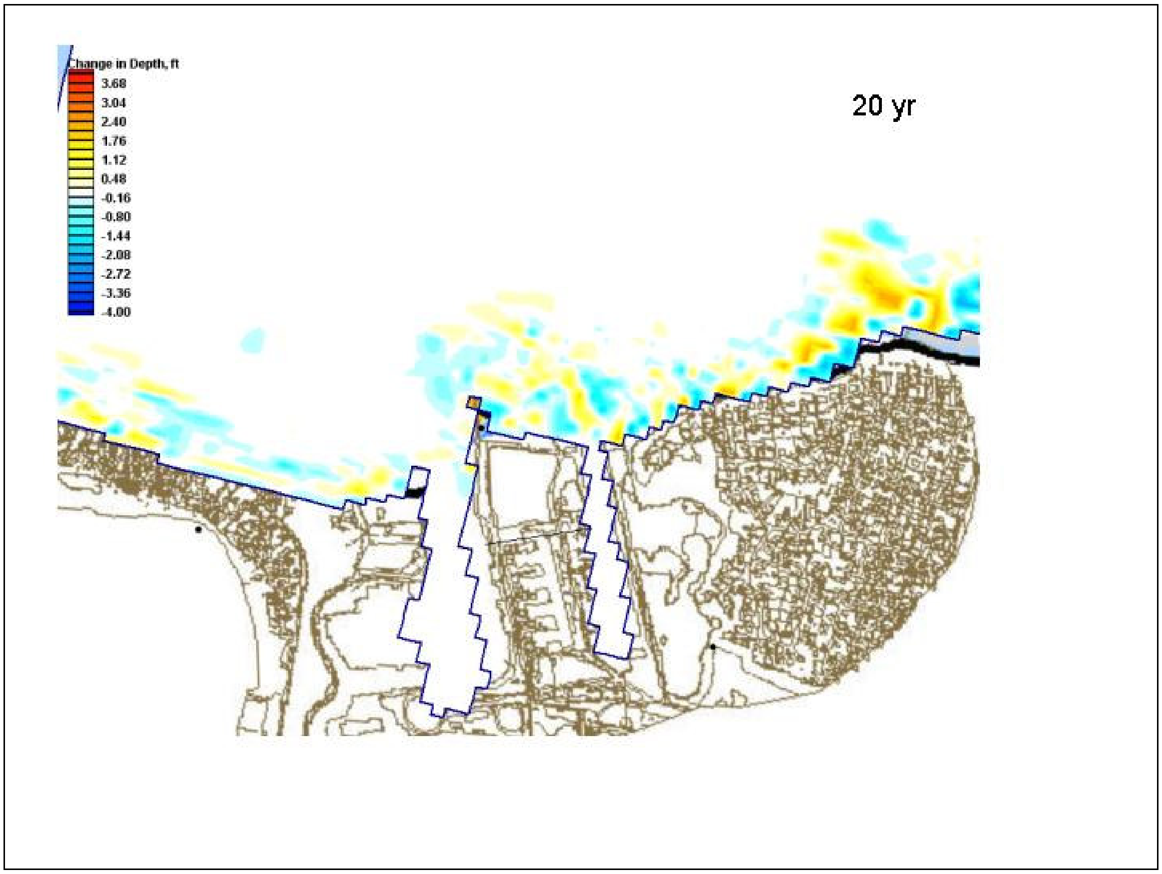


Figure 45. Expected depth changes 20 years into the future.

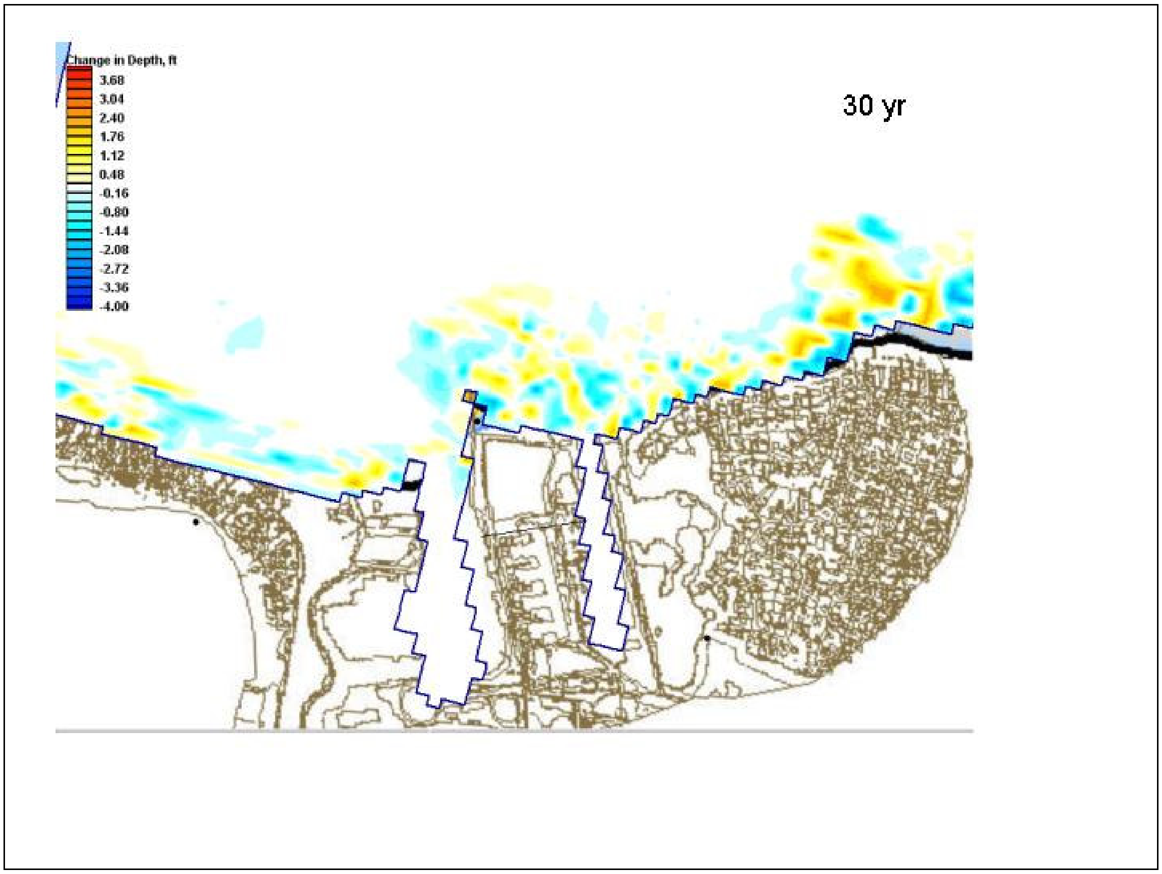


Figure 46. Expected depth changes 30 years into the future.

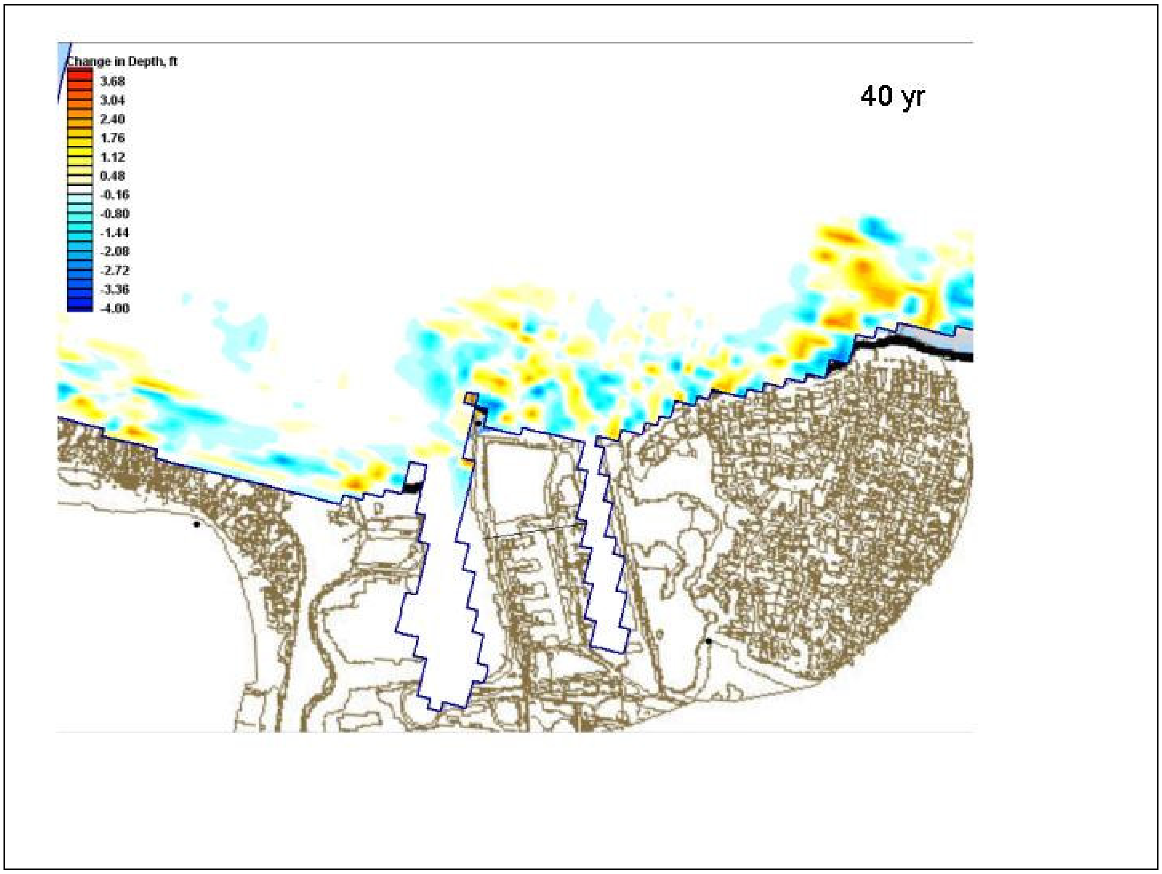


Figure 47. Expected depth changes 50 years into the future.

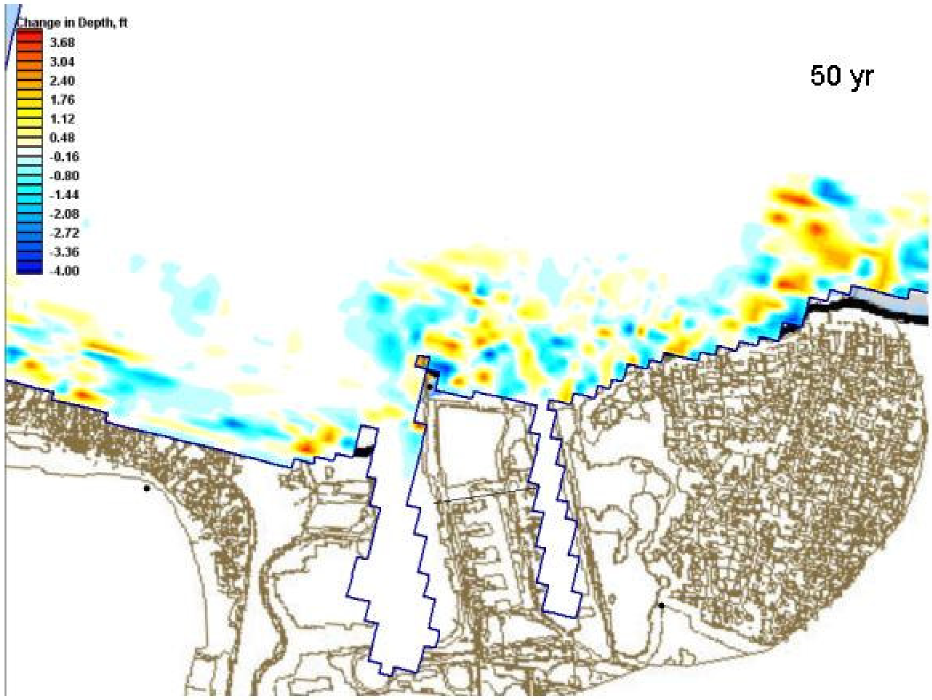


Figure 48. Expected depth change 50 years into the future.

Conclusions: Impact of Power Plant on Sedimentation

The sedimentation modeling approach used for this study has clarified the coastal processes that take place with the power plant in place. The model reproduces the gross features that have evolved over the past 34 years, including the deposition areas offshore of the plant.

A breakdown of the components that make up the comprehensive model, namely tidal currents and waves indicates that the nearshore depositional shoal to the north and west of the outfall, and other small erosion/deposition features, are primarily driven by storm waves from the northeast. Northwesterly storm waves cause an inverse pattern to the east of the outfall but the northeasterly wave-driven patterns dominate the historic bathymetric change signature.

A comparison of currents with and without the discharge in operation indicates that the effect of the discharge itself extends approximately 200-300 meters offshore and is confined to between the intake canal jetties and the western boundary of Crab Meadow. This effect is within the mean daily breaking wave (surf) zone, indicating that littoral transport in the vicinity of the discharge is confined to the active sediment transport zone with a minimal portion lost permanently offshore. The model result is consistent with the conclusions of the sediment budget analysis shown in Tables 5 and 6.

It is expected that littoral material from the upstream (Crab Meadow) shoreline will continue to be deposited in the shoals bounding the discharge channel on the order of 1-2 feet in 50 years. The extent of the effect of the discharge is not expected to change significantly over that period of time. A portion of the littoral material in the shoal would continue moving in a net westerly direction and be deposited either in the cooling water intake channel or farther west toward Asharoken beach.

FUTURE SHORELINE RESPONSE

Shoreline Change Model

The shoreline change model GENESIS was used to examine the hypothetical removal of the jetties at the Keyspan power plant.

The GENESIS model was configured with the following characteristics:

Baseline orientation:	116.9 degrees clockwise from North
Number of cells:	226
Cell size:	100 feet
Time step:	0.5 hours
Transport parameters:	K1=0.77, K2=.385
Offshore hindcast waves:	40 deg 59 min N, 73 deg 21 min W (-35 ft MLLW)
Wave input DT:	3 hours
D50:	0.95mm
Avg. berm height:	+10 feet NGVD29
Closure depth:	-20 feet NGVD29
Fill placement:	11,100 cy/yr into budget Cell 4
Groin Tip Depths:	-3’ NGVD29

The locations of important features within the GENESIS model are included in Table 8. The cell locations are given for reference in reviewing model output figures, which are in GENESIS coordinates (feet along and from the baseline). Existing condition GENESIS input and output files are included in Appendix C for a 10-yr simulation.

Because of the uncertainty in the location of the 1988 shoreline (because of the lack of quality of the photography upon which the shoreline was based), a model validation time period of 1995-2001 was used. The waves from the 1990-1999 hindcast, performed for this project, were used as input to the model, specified at the location given above. The waves for 1990 and 1991 waves were used for the 2002-2001 time period.

In order to simulate the area in a continuous model, the intake channel and the discharge channel were represented by a straight-lined shoreline, and the jetties were represented as diffracting impermeable groin structures. As shown in Figure 49, this led to what is probably an unrealistic shoreline response in the local plant area (for example, Sediment Budget Cells 6 and 8 which are GENESIS cells 177 and greater), but probably a reasonable estimate of response in Sediment Budget Cells 1-4 (GENESIS cells 176 and lower) because the Keyspan sand bypassing rate is maintained uniformly into Cell 4.

Table 8. Locations of important features within GENESIS model.

Description (Approximate)	Easting (NAD83, feet)	Northing (NAD83, feet)	GENESIS Cell
Genesis Origin	1150600	287660	0
Sediment Budget Cell 1 West Boundary	1151844	287757	11
Groin 118' long (also Sediment Budget Cell 2 West Boundary)	1155636	283248	65
Sediment Budget Cell 3 West Boundary	1157936	280458	98
Sediment Budget Cell 4 West Boundary	1159390	279377	116
West Jetty 517' long (also Sediment Budget Cell 5 West Boundary)	1164936	277032	176
East Jetty 539' long (also Sediment Budget Cell 6 West Boundary)	1165413	277602	177
Outfall (also Sediment Budget Cell 8 West Boundary)	1166370	277720	186
Groin 113' long	1167258	278018	192
Groin Pair 75' long	1167495	278112	194
Groin Pair 64' long	1167789	278185	196
Groin 37' long	1168072	278265	199
Groin 57' long	1168375	278325	201
Groin 142' long (also Sediment Budget Cell 9 West Boundary)	1168807	278505	204
Creek (also Sediment Budget Cell 9 East Boundary)	1171263	278290	226

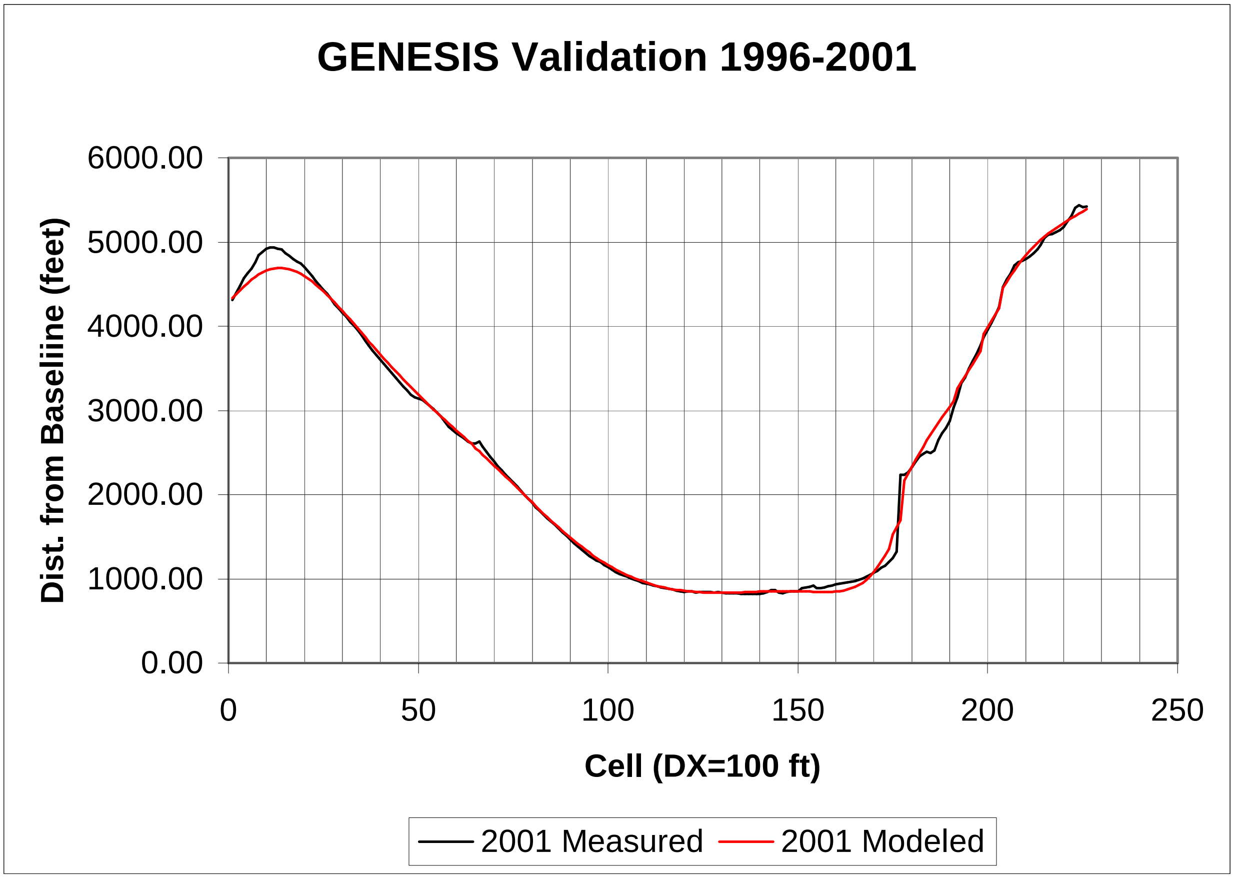


Figure 49. GENESIS validation 1996-2001.

Hypothetical Jetty Removal

The GENESIS model was configured for the entire shoreline described in the sediment budget analysis, from Cell 1 to Cell 9, for the cases of with and without the jetties at the Keyspan power plant. An assumption was made that the power plant was not operating and therefore the channels were "closed off", resulting in a straight-line shoreline across the existing openings. No plant bypassing was included. The GENESIS model, which was validated as described earlier for the entire area, was used to simulate a 10-year period with the jetties in place, followed by the same 10-year simulation with the jetties removed. The relative change between the cases is shown in Figures 50 and 51.

The results of the modeling indicate the difference in shoreline response west of the plant, which provides some estimate of the influence of the jetties on the downdrift shoreline. The influence reaches GENESIS cell 130, which is the "pinch point" where the pre-plant shorelines converge with the post-plant shorelines on Asharoken Beach. The differences, based on GENESIS model results, indicate that approximately 5,000 ft of downdrift shoreline are affected by the jetties.

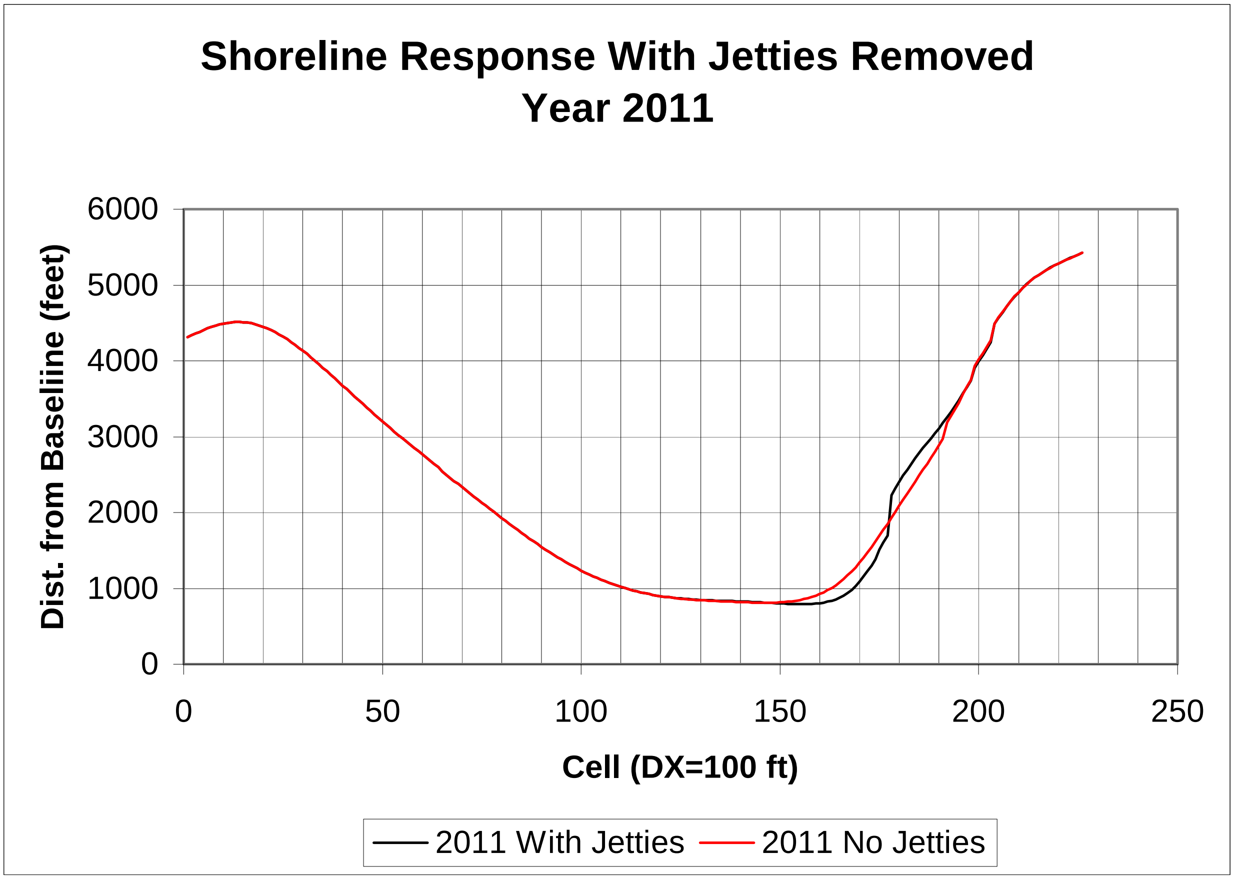


Figure 50. Effect of removal of jetties at the power plant.

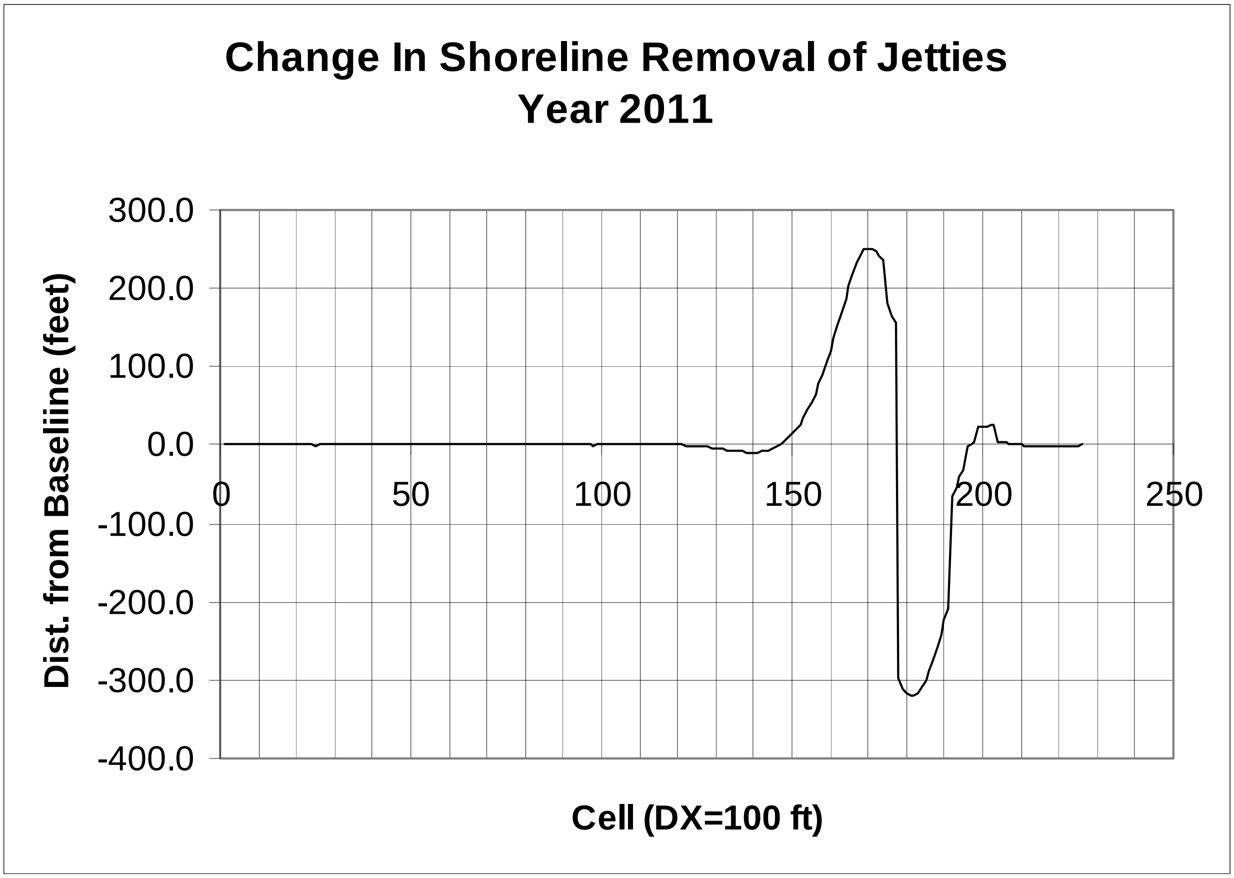


Figure 51. Effect of the removal of the jetties at power plant.

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APPENDIX A. Sample Keyspan Plant Discharge Data (Keyspan, 2002). Files submitted with this report to the New York District.

ENVIRONMENTAL DATA - NORTHPORT
CIRCULATING WATER FLOW
MONTH: FEBRUARY 2000
PREPARED I PAUL BOCCUZZA

	DAY	Min. Flow MGD	Max. Flow MGD	Daily Ave. MGD
	---	------------------	------------------	------------------
1	1	712.8	712.8	712.8
1	2	712.8	712.8	712.8
1	3	712.8	712.8	712.8
1	4	712.8	712.8	712.8
1	5	587.88	712.8	671.16
1	6	587.88	587.88	546.24
1	7	587.88	587.88	546.24
1	8	587.88	712.8	671.16
1	9	712.8	712.8	712.8
1	10	712.8	712.8	712.8
1	11	712.8	712.8	712.8
1	12	587.88	712.8	671.16
1	13	712.8	712.8	712.8
1	14	712.8	712.8	712.8
1	15	712.8	712.8	712.8
1	16	712.8	712.8	712.8
1	17	712.8	712.8	712.8
1	18	712.8	712.8	712.8
1	19	712.8	712.8	712.8
1	20	606.24	712.8	677.28
1	21	606.24	712.8	677.28
1	22	712.8	712.8	712.8
1	23	712.8	712.8	712.8
1	24	712.8	712.8	712.8
1	25	462.96	712.8	629.52
1	26	462.96	462.96	462.96
1	27	462.96	462.96	462.96
1	28	462.96	462.96	462.96
1	29	462.96	462.96	462.96

ENVIRONMENTAL DATA - NORTHPORT
CIRCULATING WATER FLOW
MONTH: MARCH 2000
PREPARED BY: PAUL BOCCUZZA

	DAY	Min. Flow MGD	Max. Flow MGD	Daily Ave. MGD
	---	------------------	------------------	------------------
1	1	462.96	462.96	462.96
1	2	462.96	462.96	462.96
1	3	462.96	462.96	462.96
1	4	462.96	462.96	462.96
1	5	462.96	462.96	462.96
1	6	462.96	462.96	462.96
1	7	462.96	462.96	462.96
1	8	462.96	462.96	462.96
1	9	462.96	462.96	462.96
1	10	462.96	462.96	462.96
1	11	587.88	712.8	671.16
1	12	712.8	712.8	712.8
1	13	712.8	712.8	712.8
1	14	712.8	712.8	712.8
1	15	712.8	712.8	712.8
1	16	712.8	712.8	712.8
1	17	712.8	712.8	712.8
1	18	712.8	712.8	712.8
1	19	712.8	712.8	712.8
1	20	606.24	606.24	606.24
1	21	499.68	499.68	499.68
1	22	499.68	499.68	499.68
1	23	499.68	499.68	499.68
1	24	499.68	499.68	499.68
1	25	499.68	499.68	499.68
1	26	499.68	499.68	499.68
1	27	499.68	499.68	499.68
1	28	499.68	499.68	499.68
1	29	499.68	499.68	499.68
1	30	499.68	499.68	499.68
1	31	499.68	499.68	499.68

ENVIRONMENTAL DATA - NORTHPORT
CIRCULATING WATER FLOW
MONTH: APRIL 2000
PREPARED BY PAUL BOCCUZZA

	DAY	Min. Flow MGD	Max. Flow MGD	Daily Ave. MGD
	---	------------------	------------------	------------------
1	1	499.68	499.68	499.68
1	2	499.68	499.68	499.68
1	3	499.68	499.68	499.68
1	4	499.68	499.68	499.68
1	5	499.68	606.24	570.72
1	6	606.24	712.8	677.28
1	7	587.88	712.8	671.16
1	8	587.88	587.88	587.88
1	9	587.88	587.88	587.88
1	10	587.88	587.88	587.88
1	11	462.96	587.88	587.88
1	12	462.96	462.96	462.96
1	13	462.96	462.96	462.96
1	14	462.96	462.96	462.96
1	15	462.96	462.96	462.96
1	16	462.96	462.96	462.96
1	17	462.96	462.96	462.96
1	18	462.96	462.96	462.96
1	19	462.96	462.96	462.96
1	20	462.96	462.96	462.96
1	21	462.96	587.88	546.24
1	22	587.88	587.88	587.88
1	23	587.88	587.88	587.88
1	24	587.88	587.88	587.88
1	25	587.88	587.88	587.88
1	26	587.88	587.88	587.88
1	27	587.88	587.88	587.88
1	28	587.88	712.8	671.16
1	29	712.8	712.8	712.8
1	30	712.8	712.8	712.8

ENVIRONMENTAL DATA - NORTHPORT
CIRCULATING WATER FLOW
MONTH: MAY 2000
PREPARED I PAUL BOCCUZZA

	DAY	Min. Flow MGD	Max. Flow MGD	Daily Ave. MGD
	---	------------------	------------------	------------------
1	1	587.88	712.8	671.16
1	2	712.8	712.8	712.8
1	3	712.8	712.8	712.8
1	4	712.8	712.8	712.8
1	5	712.8	712.8	712.8
1	6	712.8	712.8	712.8
1	7	712.8	712.8	712.8
1	8	712.8	712.8	712.8
1	9	712.8	712.8	712.8
1	10	712.8	712.8	712.8
1	11	712.8	712.8	712.8
1	12	712.8	712.8	712.8
1	13	712.8	712.8	712.8
1	14	712.8	712.8	712.8
1	15	712.8	712.8	712.8
1	16	712.8	712.8	712.8
1	17	712.8	712.8	712.8
1	18	712.8	712.8	712.8
1	19	712.8	819.36	783.84
1	20	819.36	819.36	819.36
1	21	819.36	819.36	819.36
1	22	819.36	819.36	819.36
1	23	819.36	819.36	819.36
1	24	819.36	819.36	819.36
1	25	925.92	925.92	925.92
1	26	925.92	925.92	925.92
1	27	819.36	819.36	819.36
1	28	819.36	819.36	819.36
1	29	925.92	925.92	925.92
1	30	925.92	925.92	925.92
1	31	925.92	925.92	925.92

ENVIRONMENTAL DATA - NORTHPORT
CIRCULATING WATER FLOW
MONTH: JUNE 2000
PREPARED [PAUL BOCCUZZA

	DAY	Min. Flow MGD	Max. Flow MGD	Daily Ave. MGD
	---	------------------	------------------	------------------
1	1	925.92	925.92	925.92
1	2	925.92	925.92	925.92
1	3	925.92	925.92	925.92
1	4	925.92	925.92	925.92
1	5	925.92	925.92	925.92
1	6	819.36	819.36	819.36
1	7	819.36	925.92	890.4
1	8	925.92	925.92	925.92
1	9	925.92	925.92	925.92
1	10	925.92	925.92	925.92
1	11	925.92	925.92	925.92
1	12	925.92	925.92	925.92
1	13	925.92	925.92	925.92
1	14	925.92	925.92	925.92
1	15	819.36	925.92	890.4
1	16	925.92	925.92	925.92
1	17	925.92	1638.72	1282.32
1	18	925.92	925.92	925.92
1	19	925.92	925.92	925.92
1	20	925.92	1282.32	1044.72
1	21	925.92	1638.72	1163.52
1	22	925.92	1638.72	1163.52
1	23	925.92	1638.72	1282.32
1	24	925.92	1638.72	1282.32
1	25	925.92	1638.72	1282.32
1	26	925.92	1638.72	1163.52
1	27	925.92	1638.72	1282.32
1	28	925.92	1638.72	1401.12
1	29	925.92	1638.72	1163.52
1	30	925.92	1638.72	1282.32

APPENDIX B. Current Model Comparisons With Field Data

Time: EDT 0700		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.13	0.09
2	0.12	0.11
3	0.10	0.10
4	0.19	0.17
5	0.24	0.14
6	0.11	0.13
7	0.17	0.15
8	0.11	0.12
9	0.25	0.11
10	0.22	0.14
11	0.07	0.03
12	0.14	0.07
13	0.12	0.08
14	0.17	0.07

Time: EDT 0735		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.20	0.10
2	0.21	0.13
3	0.09	0.12
4	0.17	0.18
5	0.16	0.13
6	0.20	0.14
7	0.17	0.15
8	0.14	0.14
9	0.17	0.12
10	0.23	0.14
11	0.08	0.02
12	0.16	0.06
13	0.13	0.07
14	0.06	0.08

Time: EDT 0824		
Point	Measured Speed, m/s	Calculated Speed, m/s
1	0.16	0.11
2	0.19	0.14
3	0.30	0.15
4	0.25	0.20
5	0.14	0.11
6	0.17	0.15
7	0.19	0.15
8	0.20	0.13
9	0.18	0.12
10	0.16	0.12
11	0.15	0.03
12	0.13	0.06
13	0.13	0.07
14	0.15	0.08
15	0.43	0.14
16	0.20	0.06

Time: EDT 0917		
Point	Measured Speed, m/s	Calculated Speed, m/s
1	0.14	0.12
2	0.19	0.16
3	0.16	0.18
4	0.18	0.22
5	0.14	0.13
6	0.19	0.17
7	0.17	0.16
8	0.18	0.15
9	0.21	0.12
10	0.13	0.14
11	0.08	0.04
12	0.09	0.06
13	0.11	0.07
14	0.15	0.08

Time: EDT 1003		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.13	0.14
2	0.15	0.19
3	0.17	0.21
4	0.29	0.26
5	0.16	0.15
6	0.19	0.19
7	0.17	0.18
8	0.20	0.18
9	0.18	0.17
10	0.19	0.16
11	0.17	0.05
12	0.10	0.06
13	0.10	0.07
14	0.10	0.09

Time: EDT 1040		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.15	0.13
2	0.24	0.18
3	0.26	0.21
4	0.30	0.27
5	0.13	0.17
6	0.22	0.18
7	0.22	0.18
8	0.22	0.16
9	0.25	0.15
10	0.18	0.15
11	0.09	0.05
12	0.17	0.06
13	0.14	0.07
14	0.10	0.08

Time: EDT 1236		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.09	0.04
2	0.12	0.07
3	0.17	0.09
4	0.15	0.08
5	0.14	0.06
6	0.16	0.09
7	0.18	0.07
8	0.14	0.06
9	0.12	0.07
10	0.16	0.05
11	0.14	0.03
12	0.11	0.01
13	0.11	0.02
14	0.06	0.03

Time: EDT 1314		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.07	0.02
2	0.12	0.04
3	0.19	0.05
4	0.13	0.03
5	0.08	0.01
6	0.12	0.04
7	0.09	0.04
8	0.09	0.02
9	0.09	0.05
10	0.13	0.04
11	0.15	0.03
12	0.08	0.02
13	0.09	0.02
14	0.12	0.01

Time: EDT 1351		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.11	0.02
2	0.12	0.03
3	0.14	0.01
4	0.14	0.02
5	0.25	0.03
6	0.19	0.02
7	0.14	0.04
8	0.11	0.05
9	0.14	0.07
10	0.17	0.06
11	0.12	0.02
12	0.16	0.02
13	0.09	0.02
14	0.09	0.02

Time: EDT 1445		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.21	0.05
2	0.22	0.06
3	0.19	0.06
4	0.27	0.08
5	0.17	0.07
6	0.19	0.06
7	0.22	0.08
8	0.12	0.07
9	0.15	0.09
10	0.15	0.08
11	0.15	0.02
12	0.13	0.02
13	0.11	0.02
14	0.16	0.03

Time: EDT 1547		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.16	0.08
2	0.28	0.11
3	0.22	0.13
4	0.18	0.15
5	0.18	0.12
6	0.16	0.12
7	0.18	0.11
8	0.12	0.09
9	0.14	0.10
10	0.15	0.10
11	0.10	0.02
12	0.11	0.03
13	0.11	0.04
14	0.13	0.06

Time: EDT 1645		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.13	0.10
2	0.22	0.15
3	0.24	0.18
4	0.24	0.19
5	0.09	0.15
6	0.20	0.17
7	0.13	0.15
8	0.17	0.12
9	0.16	0.12
10	0.12	0.12
11	0.14	0.01
12	0.19	0.03
13	0.12	0.04
14	0.11	0.07

Time: EDT 1719		
Point	**Measured Speed, m/s**	**Calculated Speed, m/s**
1	0.12	0.10
2	0.25	0.15
3	0.26	0.19
4	0.26	0.19
5	0.11	0.13
6	0.29	0.17
7	0.17	0.14
8	0.18	0.10
9	0.21	0.11
10	0.13	0.09
11	0.12	0.02
12	0.17	0.04
13	0.14	0.03
14	0.08	0.06

APPENDIX C. Sample GENESIS Input and Output Files

```
 *********************************************************************
 * INPUT FILE START.DAT TO GENESIS
 *********************************************************************
A------------------------------  MODEL SETUP  ------------------------------A
A.1  RUN TITLE
     Calibration RLN:6
A.2  INPUT UNITS (METERS=1, FEET=2): ICONV
     2
A.3  TOTAL NUMBER OF CALCULATION CELLS AND CELL LENGTH: NN, DX
     226 100
A.4  GRID CELL NUMBER WHERE SIMULATION STARTS AND NUMBER OF CALCULATION
     CELLS (N = -1 MEANS N = NN): ISSTART, N
     1 -1
A.5  VALUE OF TIME STEP IN HOURS: DT
     0.1
A.6  DATE WHEN SHORELINE SIMULATION STARTS
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501): SIMDATS
     900101
A.7  DATE WHEN SHORELINE SIMULATION ENDS OR TOTAL NUMBER OF TIME STEPS
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501): SIMDATE
     991231
A.8  NUMBER OF INTERMEDIATE PRINT-OUTS WANTED: NOUT
     9
A.9  DATES OR TIME STEPS OF INTERMEDIATE PRINT-OUTS
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501, NOUT VALUES): TOUT(I)
     910101 920101 930101 940101 950101 960101 970101 980101 990101
A.10 INCLUDE REGIONAL BATHYMETRIC FEATURES? (YES=1; NO=0): IREG
     0
A.11 IF REGIONAL FEATURES ARE NOT INCLUDED, CONTINUE TO A.13
A.12 NOT USED
A.13 NUMBER OF CALCULATION CELLS IN OFFSHORE CONTOUR SMOOTHING WINDOW
     (ISMOOTH = 0 MEANS NO SMOOTHING, ISMOOTH = N MEANS STRAIGHT LINE.
     RECOMMENDED DEFAULT VALUE = 11): ISMOOTH
     11
A.14 REPEATED WARNING MESSAGES (YES=1, NO=0): IRWM
     1
A.15 LONGSHORE SAND TRANSPORT CALIBRATION COEFFICIENTS: K1, K2
     0.77 0.385
A.16 PRINT-OUT OF TIME STEP NUMBERS? (YES=1, NO=0): IPRINT
     1
A.17 NESTING WITH CASCADE IN I=1 (YES=1, NO=0): INEST1
     0
A.18 NESTING WITH CASCADE IN I=N+1 (YES=1, NO=0): INESTN
     0
A.19 IF NESTING NOT USED CONTINUE TO B.1
A.20 VALUE OF TIME STEP IN CASCADE IN HOURS (MUST BE AN EVEN MULTIPLE
     OF, OR EQUAL TO DT): DTC
     24
B-----------------------------  WAVES  -------------------------------------B
B.1  WAVE HEIGHT CHANGE FACTOR. WAVE ANGLE CHANGE FACTOR AND AMOUNT (DEG)
     (NO CHANGE: HCNGF=1, ZCNGF=1, ZCNGA=0): HCNGF, ZCNGF, ZCNGA
     1 1 -10
B.2  DEPTH OF OFFSHORE WAVE INPUT: DZ
     35
B.3  IS AN EXTERNAL WAVE MODEL BEING USED (YES=1, NO=0): NWD
     0
B.4  COMMENT: IF AN EXTERNAL WAVE MODEL IS NOT BEING USED, CONTINUE TO B.9
B.5  NUMBER OF SHORELINE CALCULATION CELLS PER WAVE MODEL ELEMENT: ISPW

B.6  NUMBER OF HEIGHT BANDS USED IN THE EXTERNAL WAVE MODEL TRANSFORMATIONS
     (MINIMUM IS 1, MAXIMUM IS 9):  NHBANDS

B.7  COMMENT:  IF ONLY ONE HEIGHT BAND WAS USED CONTINUE TO B.9
B.8  MINIMUM WAVE HEIGHT AND BAND WIDTH OF HEIGHT BANDS:  HBMIN, HBWIDTH

B.9  VALUE OF TIME STEP IN WAVE DATA FILE IN HOURS (MUST BE AN EVEN MULTIPLE
     OF, OR EQUAL TO DT): DTW
     24
B.10 NUMBER OF WAVE COMPONENTS PER TIME STEP: NWAVES
     1
B.11 DATE WHEN WAVE FILE STARTS (FORMAT YYMMDD: 1 MAY 1992 = 920501): WDATS
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     900101
B.12 ARE WATER LEVELS BEING USED (YES=1, NO=0): IWL
     0
B.13 COMMENT: IF WATER LEVELS NOT USED CONTINUE TO C.1
B.14 WATER LEVEL FILE TIMESTEP (MUST BE AN EVEN MULTIPLE OF OR EQUAL TO DT): DTWL

C------------------------------  BEACH  -----------------------------------C
C.1  EFFECTIVE GRAIN SIZE DIAMETER IN MILLIMETERS: D50
     0.95
C.2  AVERAGE BERM HEIGHT FROM MEAN WATER LEVEL: ABH
     10
C.3  CLOSURE DEPTH: DCLOS
     20
C.4  ANY OPEN BOUNDARY? (NO=0, YES=1): IOB
     1
C.5  COMMENT: IF NO OPEN BOUNDARY, CONTINUE TO D.
C.6  TIME BASE IN BOUNDARY MOVEMENT SPECIFICATION(S)?
     (SIMULATION PERIOD = 1, DAY = 2, TIME STEP = 3): ITB
     1
C.7  OPEN BOUNDARY ON LEFT-HAND SIDE? (NO=0, YES=1): IOB1
     1
C.8  COMMENT: IF A GROIN ON LEFT-HAND BOUNDARY, CONTINUE TO C.10.
C.9  BOUNDARY MOVEMENT PER TIME BASE ON LEFT-HAND BOUNDARY, IN SYSTEM OF
     UNITS SPECIFIED IN A.2 (PINNED BEACH => YC1 = 0): YC1
     0
C.10 OPEN BOUNDARY ON RIGHT-HAND SIDE? (NO=0, YES=1): IOBN
     1
C.11 COMMENT: IF A GROIN ON RIGHT-HAND BOUNDARY, CONTINUE TO D.
C.12 BOUNDARY MOVEMENT PER TIME BASE ON RIGHT-HAND BOUNDARY, IN SYSTEM OF
     UNITS SPECIFIED IN A.2 (PINNED BEACH => YCN = 0): YCN
     0
D---------------------  NON-DIFFRACTING GROINS  --------------------------D
D.1  ANY NON-DIFFRACTING GROINS? (NO=0, YES=1): INDG
     0
D.2  COMMENT: IF NO NON-DIFFRACTING GROINS, CONTINUE TO E.
D.3  NUMBER OF NON-DIFFRACTING GROINS: NNDG

D.4  GRID CELL NUMBERS OF NON-DIFFRACTING GROINS (NNDG VALUES): IXNDG(I)

D.5  LENGTHS OF NON-DIFFRACTING GROINS FROM X-AXIS (NNDG VALUES): YNDG(I)

E-------------   DIFFRACTING (LONG) GROINS AND JETTIES --------------------E
E.1  ANY DIFFRACTING GROINS OR JETTIES? (NO=0, YES=1): IDG
     1
E.2  COMMENT: IF NO DIFFRACTING GROINS, CONTINUE TO F.
E.3  NUMBER OF DIFFRACTING GROINS/JETTIES: NDG
     7
E.4  GRID CELL NUMBERS OF DIFFRACTING GROINS/JETTIES (NDG VALUES): IXDG(I)
     65 175 178 192 196 199 204
E.5  LENGTHS OF DIFFRACTING GROINS/JETTIES FROM X-AXIS (NDG VALUES): YDG(I)
     2724 1840 2775 3272 3555 3920 4604
E.6  DEPTHS AT SEAWARD END OF DIFFRACTING GROINS/JETTIES(NDG VALUES): DDG(I)
     3. 3. 3. 3. 3. 3. 3.
F------------------------ ALL GROINS/JETTIES ------------------------------F
F.1  COMMENT: IF NO GROINS OR JETTIES, CONTINUE TO G.
F.2  PERMEABILITIES OF ALL GROINS AND JETTIES (NNDG+NDG VALUES): PERM(I)
     0.4    0.4     0.4    0.4   0.4   0.4   0.4
F.3  IF GROIN/JETTY ON LH BOUNDARY, DIST. FROM SHORELINE OUTSIDE GRID TO SEAWARD
     END OF STRUCTURE (YG1) & SHORELINE ORIENTATION ACROSS JETTY (ZG1 IN DEG).
     YG1 IS CONTROLLING Q-IN AND ZG1 IS CONTROLLING Q-OUT: YG1, ZG1
     1000 35
F.4  IF GROIN/JETTY ON RH BOUNDARY, DIST. FROM SHORELINE OUTSIDE GRID TO SEAWARD
     END OF STRUCTURE (YGN) & SHORELINE ORIENTATION ACROSS JETTY (ZGN IN DEG).
     YGN IS CONTROLLING Q-IN AND ZGN IS CONTROLLING Q-OUT: YGN, ZGN
     1000 16 25 7 -15 25
G----------------------  DETACHED BREAKWATERS  ----------------------------G
G.1  ANY DETACHED BREAKWATERS? (NO=0, YES=1): IDB
     0
G.2  COMMENT: IF NO DETACHED BREAKWATERS, CONTINUE TO H.
G.3  NUMBER OF DETACHED BREAKWATERS: NDB
     4
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G.4  ANY DETACHED BREAKWATER ACROSS LEFT-HAND CALCULATION BOUNDARY
     (NO=0, YES=1): IDB1
     0
G.5  ANY DETACHED BREAKWATER ACROSS RIGHT-HAND CALCULATION BOUNDARY
     (NO=0, YES=1): IDBN
     0
G.6  GRID CELL NUMBERS OF TIPS OF DETACHED BREAKWATERS:
     (2 * NDB - (IDB1+IDBN) VALUES): IXDB(I)
     50  60    95  100 100 105   140 150
G.7  DISTANCES FROM X-AXIS TO TIPS OF DETACHED BREAKWATERS
     (1 VALUE FOR EACH TIP SPECIFIED IN G.6): YDB(I)
     530 530   530 530 530 530   530 530
G.8  DEPTHS AT DETACHED BREAKWATER TIPS (1 VALUE FOR EACH TIP
     SPECIFIED IN G.6): DDB(I)
     3   3     3   3   3   3     3   3
G.9  CONSTANT OR VARIABLE KT? (CONSTANT=0, VARIABLE=1): IKTDB
     0
G.10 COMMENT: IF VARIABLE, CONTINUE TO G.12
     --CONSTANT KT SPECIFICATION--
G.11 TRANSMISSION COEFFICIENTS FOR DETACHED BREAKWATERS (NDB VALUES): TRANDB(I)
     0   0     0   0     0   0   0   0     0   0     0    0
     --VARIABLE KT SPECIFICATIONS--
G.12 COMMENT: IF VARIABLE, A WATER LEVEL FILE MUST BE USED (SEE B.12)
G.13 SPECIFICATION OF TRANSMISSION ALGORITHM (NDB VALUES)(AHRENS=0,SEABROOK&HALL=1,
     DANGREMOND=2): KTMETHOD(I)

G.14 HEIGHT AND CREST WIDTH FOR DETACHED BREAKWATERS (2 X NDB VALUES): DIMDB(I)

G.15 SEAWARD FACING SLOPE AND LANDWARD FACING SLOPE FOR DETACHED BREAKWATERS
     (2 X NDB VALUES): SLOPESDB(I)

G.16 MEDIAN ROCK SIZE FOR DETACHED BREAKWATERS (NDB VALUES)(CAN ENTER 0 FOR DANGREMOND
     FORMULATION): D50TR(I)

G.17 IS THE BREAKWATER PERMEABLE? (0=NO, 1=YES)(NDB VALUES)(ENTER
     1 FOR AHRENS AND SEABRO0K & HALL FORMULATIONS): PTR(I)


H----------------------------  SEAWALLS  ---------------------------------H
H.1  ANY SEAWALL ALONG THE SIMULATED SHORELINE? (YES=1, NO=0): ISW
     0
H.2  COMMENT: IF NO SEAWALL, CONTINUE TO I.
H.3  GRID CELL NUMBERS OF START AND END OF SEAWALL (ISWEND = -1 MEANS
     ISWEND = N): ISWBEG, ISWEND

I----------------------------  BEACH FILLS  -------------------------------I
I.1  ANY BEACH FILLS DURING SIMULATION PERIOD? (NO=0, YES=1): IBF
     1
I.2  COMMENT: IF NO BEACH FILLS, CONTINUE TO J.
I.3  NUMBER OF BEACH FILLS DURING SIMULATION PERIOD: NBF
     10
I.4  DATES OR TIME STEPS WHEN THE RESPECTIVE FILLS START
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501, NBF VALUES): BFDATS(I)
     900102 910102 920102 930102 940102 950102 960102 970102 980102 990102
I.5  DATES OR TIME STEPS WHEN THE RESPECTIVE FILLS END
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501, NBF VALUES): BFDATE(I)
     900103 910103 920103 930103 940103 950103 960103 970103 980103 990103
I.6  GRID CELL NUMBERS OF START OF RESPECTIVE FILLS (NBF VALUES): IBFS(I)
     177 177 177 177 177 177 177 177 177 177
I.7  GRID CELL NUMBERS OF END OF RESPECTIVE FILLS (NBF VALUES): IBFE(I)
     186     186     186      186     186   186     186     186      186     186
I.8  ADDED BERM WIDTHS AFTER ADJUSTMENT TO EQUILIBRIUM CONDITIONS
     (NBF VALUES): YADD(I)
     11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1
K--------------------------  TIDAL CURRENTS  ------------------------------K
K.1  INCLUDE TIDAL CURRENTS? (NO=0, YES=1): ITD
     0
K.2  COMMENT: IF NO TIDAL CURRENTS, CONTINUE TO L.
K.3  TIDAL COMPONENT CALIBRATION COEFFICIENT: KTIDE
     1
K.4  VALUE OF TIME STEP IN TIDAL DATA FILE IN HOURS (MUST BE AN EVEN MULTIPLE
```

```
     OF, OR EQUAL TO DT): DTTI
     1
J-----------------------------  BYPASSING  -------------------------------J
J.1  ANY BYPASSING OPERATIONS DURING SIMULATION PERIOD? (NO=0, YES=1): IBP
     0
J.2  COMMENT: IF NO BYPASSING OPERATIONS, CONTINUE TO K.
J.3  READ BYPASSING RATES FROM A FILE OR SPECIFY BELOW?
     (FILE=1, BELOW=2): IBPF

J.4  COMMENT: IF BYPASSING OPERATIONS ARE SPECIFIED BELOW, CONTINUE TO J.8
     -- BYPASSING OPERATIONS SPECIFIED IN SEPARATE DATA FILE --
J.5  DATE OR TIME STEP WHEN BYPASS DATA FILE STARTS AND ENDS, RESPECTIVELY
     (FORMAT YYMMDD: 1 MAY 1992 = 920501): QQDATS QQDATE

J.6  CELL NOS. WHERE BYPASS FILE STARTS AND ENDS, RESPECTIVELY: IQQS, IQQE

J.7  COMMENT: END OF BYPASS DATA FILE SECTION. CONTINUE TO K.
     -- BYPASSING OPERATIONS SPECIFIED IN THIS FILE --
J.8  NUMBER OF BYPASSING OPERATIONS DURING SIMULATION PERIOD: NBP

J.9  DATES OR TIME STEPS WHEN THE RESPECTIVE OPERATIONS START
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501, NBP VALUES): BPDATS(I)

J.10 DATES OR TIME STEPS WHEN THE RESPECTIVE OPERATIONS END
     (DATE FORMAT YYMMDD: 1 MAY 1992 = 920501, NBP VALUES): BPDATE(I)

J.11 GRID CELL NUMBERS OF START OF RESPECTIVE OPERATIONS (NBP VALUES): IBPS(I)

J.12 GRID CELL NUMBERS OF END OF RESPECTIVE OPERATIONS (NBP VALUES): IBPE(I)

J.13 BYPASSING RATES AS TOTAL AVERAGE VOLUME PER HOUR (CY/HR OR M3/HR,
     ACCORDING TO UNITS GIVEN IN A.2) FOR RESPECTIVE OPERATIONS
     (NBP VALUES): QBP(I)

L------------------------------  COMMENTS  -------------------------------L
     * ALL COORDINATES MUST BE GIVEN IN THE "TOTAL" GRID SYSTEM
     * ONE VALUE FOR EACH STRUCTURE, TIP ETC. ESPECIALLY IMPORTANT FOR
       COMBINED STRUCTURES, E.G., TWO DBW'S WHERE THE LOCATION WHERE THEY
       MEET HAS TO BE TREATED AS TWO TIPS.
     * ANY GROIN CONNECTED TO A DETACHED BREAKWATER MUST BE REGARDED AS
       DIFFRACTING
     * CONNECTED STRUCTURES MUST BE GIVEN THE SAME Y AND D VALUES WHERE THEY
       CONNECT
     * IF DOING REAL CASES, THE WAVE.DAT FILE MUST CONTAIN FULL YEARS DATA
     * DATA FOR START OF BEACH FILL IN SPACE AND TIME SHOULD BE GIVEN IN
       INCREASING/CHRONOLOGICAL ORDER. DATA FOR END OF BEACH FILL MUST
       CORRESPOND TO THESE VALUES, AND NOT NECESSARILY BE IN INCREASING ORDER.
     * DON'T CHANGE THE LABELS OF THE LINES SINCE THEY ARE USED TO IDENTIFY
       THE LINES BY GENESIS.
     * GENESIS95 GRAPHICAL USER INTERFACE FOR WINDOWS 95 CREATED BY PERON
       AT PERON SOFTWARE & HARDWARE (peron@pobox.org.sg). COPYRIGHT 1996
----------------------------------- END -----------------------------------
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  INITIAL SHORELINE POSITION (FT)
   4314.47   4394.78   4480.63   4567.40   4634.52   4682.93   4760.87   4841.94
4883.26   4919.69
   4935.10   4934.22   4923.57   4911.29   4869.80   4834.30   4800.11   4770.94
4741.64   4698.82
   4642.66   4593.24   4543.33   4483.93   4432.66   4384.66   4323.80   4261.74
4210.94   4161.65
   4111.99   4055.42   4005.11   3952.54   3890.16   3827.54   3771.73   3709.37
3659.68   3602.93
   3553.06   3498.55   3443.60   3392.57   3340.90   3287.00   3235.82   3187.01
3153.90   3140.98
   3122.09   3091.26   3056.74   3016.60   2973.09   2925.32   2864.72   2804.84
2767.57   2730.47
   2701.03   2666.71   2634.30   2611.91   2606.05   2631.30   2573.21   2510.27
2448.78   2393.19
   2337.85   2286.64   2236.12   2188.71   2142.06   2095.83   2046.45   1991.90
1945.42   1900.24
   1851.35   1807.17   1762.83   1717.81   1679.57   1639.36   1597.61   1554.35
1510.09   1465.54
   1425.30   1383.48   1345.11   1311.76   1273.01   1249.38   1220.29   1198.50
1166.24   1137.08
   1110.22   1082.44   1060.76   1041.04   1024.65   1006.35    986.36    969.85
953.34    942.48
    933.60    923.78    910.63    900.93    891.79    882.76    871.15    863.06
851.98    847.50
    852.73    849.01    839.06    840.31    842.10    840.39    840.93    834.46
842.14    836.06
    830.84    827.22    825.28    826.71    824.17    819.73    818.68    818.65
820.00    822.49
    830.93    847.19    864.10    869.25    833.97    832.23    843.85    848.09
850.99    852.22
    892.23    897.46    902.70    919.01    891.12    889.54    896.01    915.29
918.73    938.10
    946.28    953.39    959.10    967.49    975.86    987.90   1004.17   1025.62
1047.19   1074.06
   1095.63   1131.36   1158.34   1197.89   1245.66   1323.19   2235.07   2233.86
2266.87   2324.40
   2393.48   2454.19   2484.31   2506.95   2494.75   2522.51   2645.44   2729.41
2791.58   2873.28
   3033.57   3158.42   3322.20   3394.66   3498.18   3590.97   3674.17   3772.81
3872.20   3957.66
   4034.84   4131.42   4229.77   4462.45   4554.00   4620.92   4720.97   4757.07
4772.53   4795.64
   4827.35   4867.87   4915.47   4966.63   5047.66   5084.95   5094.22   5114.80
5139.00   5181.80
   5244.79   5311.22   5408.49   5435.66   5410.78   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3) FROM   900101 TO   910101
  46724  46724  46284  44953  42770  41246  42516  44677  45072  46139
  46834  47305  47665  48891  50077  49244  47854  46392  45482  45109
  44954  44264  43722  43488  42688  42183  42404  42215  41482  41189
  41166  41351  41122  41263  41761  41877  41723  41911  41580  41829
  41751  42023  42418  42907  43640  44492  45094  45454  45356  46307
  46437  46009  45684  45788  45842  46239  46930  46904  45938  45867
  45746  45708  44886  41136  21089  41766  44428  45881  45590  44746
  44058  43387  43024  42756  42637  42732  43080  43468  43391  43548
  43908  44000  44206  44376  44286  44505  44786  45086  45385  45656
  45810  46155  46325  46465  46867  46855  47181  47583  48043  48295
  48440  48658  48787  48936  49137  49365  49538  49644  49688  49830
  49941  49960  49911  49886  49827  49782  49747  49804  49809  49911
  50054  50038  50014  50099  50052  49989  49933  49760  49758  49507
  49401  49336  49323  49383  49430  49546  49729  49883  50003  50057
  50065  50256  50049  49958  51068  49988  50033  50030  50095  50119
  51057  50245  50097  50163  50756  49897  49687  49555  49209  49010
  48532  47985  47258  46483  45429  44004  42276  40320  38322  36645
  35446  32756  29285  23315  10950  38170  70597  10070  10348  15345
  21118  25236  30377  33675  34215  29104  27843  27089  26058  25798
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26551	14328	25940	24362	23912	17201	22128	21518	11709	21166
22551	23595	22797	15113	23793	26428	28999	30247	33678	34988
35550	36395	38112	40112	41835	41541	42051	42705	42910	44038
45436	46587	46477	43301	45430	45097	45097			

NET TRANSPORT VOLUME (YARDS3) FROM 900101 TO 910101

-43969	-43969	-43523	-41914	-38851	-36311	-35755	-32697	-25648	-18097
-9620	-1528	5368	10921	15839	17724	18015	17548	17500	18409
19235	18865	18363	17929	16693	15703	15424	14498	12842	11744
11396	11778	12132	13163	14623	15411	15482	15559	14856	14709
14236	14084	13600	12579	11292	9500	6790	3309	-821	-3977
-4020	-1696	1592	5379	8992	12013	13921	13235	9960	6518
2820	-384	-3662	-6590	-7819	-5874	3353	10495	14953	17057
17719	17212	16196	14897	13753	12901	12402	11891	10757	9845
9233	8431	7878	7471	7049	7276	7844	8488	8945	8999
8505	7822	6649	5245	4029	2244	1414	776	1001	773
272	-399	-1497	-2491	-3309	-3728	-4105	-4768	-5450	-6280
-6767	-6801	-6593	-6615	-6593	-6565	-6616	-7123	-7781	-9005
-10139	-10170	-10163	-10863	-11077	-10787	-10418	-9752	-9597	-8403
-7726	-7495	-7558	-7757	-7751	-8015	-8799	-9772	-10860	-11957
-12984	-13322	-12149	-9437	-6536	-7984	-10088	-11393	-12750	-14333
-16343	-14480	-12610	-10727	-7585	-8077	-9249	-10176	-9409	-8696
-6257	-3348	-134	3131	6576	9914	13174	16292	19107	20788
21081	18525	13747	4759	-8169	-38139	-70587	-9951	747	7104
12308	17902	23386	25645	24041	14780	2285	-5460	-10551	-15821
-19728	-14328	-21616	-19975	-19452	-16621	-15327	-14155	-11505	-13266
-14781	-16707	-16823	-15113	-13695	-10545	-7620	-590	3975	4236
1440	-3111	-8130	-12554	-15733	-14151	-12573	-14066	-17332	-21941
-25786	-26567	-23830	-14120	-5225	-2922	-2922			

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM 900101 TO 910101

-45347	-45347	-44904	-43434	-40810	-38779	-39136	-38686	-35360	-32118
-28228	-24416	-21148	-18985	-17119	-15760	-14920	-14423	-13990	-13351
-12859	-12700	-12679	-12780	-12997	-13238	-13490	-13856	-14319	-14722
-14885	-14788	-14496	-14051	-13569	-13233	-13119	-13176	-13362	-13558
-13757	-13969	-14408	-15165	-16174	-17496	-19151	-21073	-23089	-25142
-25229	-23851	-22046	-20203	-18424	-17113	-16504	-16835	-17988	-19673
-21462	-23045	-24275	-23863	-14455	-23821	-20539	-17691	-15320	-13845
-13168	-13088	-13413	-13929	-14442	-14916	-15338	-15787	-16318	-16850
-17337	-17785	-18164	-18453	-18618	-18615	-18471	-18298	-18222	-18327
-18651	-19166	-19837	-20609	-21418	-22305	-22884	-23402	-23517	-23761
-24084	-24527	-25141	-25714	-26223	-26546	-26823	-27207	-27568	-28056
-28352	-28384	-28251	-28252	-28210	-28175	-28181	-28462	-28794	-29458
-30097	-30104	-30087	-30480	-30564	-30389	-30178	-29757	-29679	-28955
-28564	-28418	-28441	-28569	-28590	-28778	-29264	-29827	-30430	-31006
-31524	-31792	-31097	-29699	-28803	-28987	-30062	-30712	-31422	-32227
-33703	-32361	-31354	-30445	-29170	-28987	-29469	-29867	-29306	-28853
-27396	-25666	-23696	-21676	-19426	-17045	-14551	-12014	-9607	-7928
-7182	-7116	-7768	-9278	-9560	-38155	-70592	-10011	-4800	-4120
-4403	-3666	-3495	-4015	-5087	-7162	-12778	-16275	-18305	-20810
-23140	-14328	-23778	-22168	-21682	-16911	-18727	-17837	-11607	-17216
-18666	-20151	-19810	-15113	-18744	-18487	-18309	-15418	-14852	-15376
-17054	-19753	-23121	-26334	-28784	-27845	-27312	-28387	-30122	-32989
-35610	-36576	-35154	-28712	-25328	-24010	-24010			

TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM 900101 TO 910101

1376	1376	1379	1519	1958	2468	3382	5989	9711	14019
18607	22887	26516	29906	32959	33483	32936	31970	31490	31761
32092	31565	31042	30709	29691	28942	28914	28356	27163	26464
26281	26567	26627	27215	28191	28645	28603	28734	28217	28268
27993	28057	28010	27745	27468	26997	25942	24382	22267	21163
21208	22155	23639	25584	27417	29125	30426	30070	27949	26190
24282	22662	20613	17272	6634	17946	23892	28185	30272	30902
30887	30301	29610	28827	28195	27819	27741	27678	27076	26696
26571	26217	26042	25925	25668	25891	26316	26789	27167	27326
27157	26988	26487	25856	25447	24550	24300	24180	24520	24534
24357	24128	23644	23223	22913	22816	22717	22438	22118	21775
21584	21580	21656	21637	21616	21608	21563	21339	21012	20454
19957	19932	19924	19618	19487	19601	19759	20006	20082	20553
20838	20921	20883	20811	20839	20764	20465	20056	19570	19047
18540	18468	18949	20261	22265	21002	19974	19318	18671	17894

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  17358  17882  18743  19717  21586  20909  20219  19690  19897  20156
  21137  22318  23561  24807  26004  26959  27726  28306  28713  28716
  28264  25641  21516  14038   1390     15      4     59   5548  11225
  16712  21569  26882  29660  29128  21942  15064  10814   7753   4988
   3412      0   2162   2193   2229    289   3401   3681    101   3950
   3885   3443   2986      0   5049   7941  10688  14828  18827  19613
  18495  16641  14990  13778  13050  13694  14739  14320  12788  11048
   9823  10009  11323  14591  20102  21086  21086

  SHORELINE POSITION (FT) AFTER  87601 TIME STEPS. DATE IS   910101
   4314.47   4390.77   4466.16   4539.89   4611.69   4677.90   4733.38   4778.60
4815.40   4843.49
   4862.37   4872.23   4873.66   4867.08   4852.86   4831.68   4804.31   4771.38
4733.47   4691.40
   4645.97   4597.75   4547.24   4495.03   4441.56   4387.17   4332.12   4276.63
4220.81   4164.77
   4108.56   4052.24   3995.84   3939.42   3883.07   3826.90   3771.05   3715.68
3661.00   3607.18
   3554.42   3502.91   3452.78   3404.14   3357.01   3311.36   3267.11   3224.14
3182.28   3141.35
   3101.21   3061.69   3022.70   2984.13   2945.94   2908.16   2870.89   2834.28
2798.51   2763.71
   2729.83   2696.18   2660.62   2622.97   2588.56   2548.36   2509.02   2470.20
2429.86   2387.24
   2342.41   2295.77   2247.80   2198.98   2149.72   2100.32   2051.05   2002.09
1953.61   1905.74
   1858.57   1812.14   1766.48   1721.61   1677.53   1634.25   1591.81   1550.25
1509.61   1469.97
   1431.44   1394.03   1357.73   1322.69   1289.05   1256.85   1226.02   1196.47
1168.30   1141.58
   1116.26   1092.31   1069.70   1048.40   1028.40   1009.75    992.32    975.98
960.81    946.84
    933.92    921.91    910.83    900.73    891.54    883.22    875.70    868.97
862.98    857.68
    853.02    848.94    845.36    842.23    839.49    837.08    834.95    833.07
831.41    829.97
    828.76    827.79    827.07    826.65    826.54    826.79    827.41    828.43
829.86    831.71
    833.98    836.65    839.72    843.17    846.99    851.13    855.58    860.29
865.22    870.30
    875.47    880.65    885.78    890.76    895.55    900.08    904.34    908.39
912.32    916.19
    920.13    924.50    929.74    936.53    945.86    958.60    976.14   1000.32
1032.08   1071.43
   1118.61   1174.30   1239.13   1314.10   1515.03   1614.83   1712.33   2159.94
2231.98   2299.86
   2365.44   2427.17   2486.25   2543.62   2600.23   2657.07   2715.07   2775.17
2838.95   2908.39
   2985.03   3223.93   3307.45   3389.96   3472.73   3579.34   3663.64   3748.98
3888.03   3971.27
   4052.16   4132.46   4214.41   4449.69   4525.69   4594.63   4657.78   4716.03
4770.17   4820.78
   4868.26   4912.98   4955.23   4995.21   5033.44   5070.76   5107.64   5144.17
5180.42   5216.37
   5251.79   5286.64   5321.21   5355.70   5390.10   5424.42


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 GROSS TRANSPORT VOLUME (YARDS3) FROM   910101 TO   920101
  72577  72577  71817  70349  68441  66835  66310  66296  67148  67837
  68957  69445  69079  67838  66877  65503  63462  61088  59054  57370
  55890  54498  53274  52297  51490  50836  50415  50132  49919  49766
  49670  49625  49624  49671  49803  50007  50288  50632  51026  51484
  52027  52650  53308  53963  54604  55232  55840  56405  56951  57454
  57958  58427  58842  59203  59499  59788  60067  60324  60535  60620
  60412  59709  58103  52662  24617  52291  57093  57822  57507  56847
  56127  55474  54902  54463  54168  54008  53922  53933  54059  54256
  54525  54847  55213  55603  56003  56422  56862  57325  57789  58306
  58875  59435  60006  60645  61308  62002  62706  63386  64019  64606
  65183  65767  66324  66831  67304  67756  68201  68623  69024  69411
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69725	70034	70355	70731	71076	71408	71679	71968	72233	72459
72635	72749	72823	72891	72947	73004	73031	73047	73050	73034
73039	73044	73042	73047	73075	73107	73163	73224	73302	73378
73478	73584	73701	73822	73931	74022	74083	74112	74110	74048
73934	73747	73508	73191	72783	72295	71698	71028	70259	69382
68425	67355	66157	64817	63184	61035	58140	54287	49611	44482
40082	35043	29933	25013	15842	20450	21229	12846	12042	15390
20072	23090	25307	27427	29496	31271	32639	33177	32924	31604
29261	20219	27074	27228	25735	18933	24179	23553	16067	23991
25685	26775	26697	20275	30372	34310	37944	41226	44124	46681
49112	51487	53803	56006	57937	59449	60671	61747	62683	63446
64063	64542	64840	64989	65080	65117	65117			

NET TRANSPORT VOLUME (YARDS3) FROM 910101 TO 920101

-68118	-68118	-67190	-65356	-62641	-59026	-54562	-49471	-43944	-38109
-32063	-25936	-19873	-14000	-8447	-3329	1267	5293	8717	11519
13711	15333	16436	17087	17367	17365	17166	16847	16471	16080
15702	15357	15042	14737	14416	14043	13579	12990	12253	11358
10306	9114	7807	6425	5011	3613	2270	1017	-123	-1133
-2012	-2773	-3432	-4016	-4549	-5042	-5496	-5885	-6156	-6233
-6033	-5523	-4833	-4415	-4506	-2269	-658	555	1806	3202
4667	6067	7284	8235	8884	9228	9287	9098	8702	8143
7463	6703	5893	5057	4213	3368	2520	1658	773	-145
-1105	-2109	-3160	-4267	-5430	-6631	-7849	-9074	-10308	-11545
-12764	-13956	-15119	-16244	-17337	-18388	-19384	-20322	-21210	-22050
-22833	-23563	-24257	-24913	-25536	-26121	-26666	-27166	-27620	-28022
-28367	-28653	-28881	-29043	-29154	-29214	-29234	-29227	-29201	-29175
-29163	-29171	-29216	-29301	-29432	-29616	-29851	-30132	-30454	-30815
-31206	-31609	-32025	-32429	-32808	-33147	-33419	-33600	-33666	-33584
-33322	-32851	-32146	-31171	-29920	-28379	-26552	-24452	-22115	-19577
-16907	-14203	-11565	-9113	-6966	-5243	-4048	-3456	-3496	-4201
-5605	-7671	-10257	-13163	-15842	-17263	-17021	-12846	-8187	-4615
-1880	196	1524	2086	1921	1131	-143	-4219	-8454	-12674
-16729	-20219	-20643	-20402	-19745	-18524	-18205	-17397	-16065	-17718
-18861	-19706	-20254	-20275	-20271	-19887	-19590	-19512	-19767	-20399
-21389	-22692	-24247	-25970	-27775	-29590	-31327	-32920	-34316	-35478
-36393	-37081	-37583	-37921	-38130	-38223	-38223			

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM 910101 TO 920101

-70347	-70347	-69505	-67852	-65541	-62932	-60436	-57883	-55545	-52972
-50512	-47693	-44476	-40921	-37662	-34418	-31098	-27898	-25167	-22925
-21089	-19578	-18417	-17605	-17061	-16735	-16626	-16641	-16723	-16843
-16984	-17133	-17290	-17465	-17693	-17982	-18353	-18820	-19387	-20062
-20859	-21769	-22749	-23768	-24796	-25810	-26783	-27695	-28537	-29293
-29985	-30600	-31138	-31610	-32023	-32415	-32780	-33106	-33345	-33426
-33224	-32616	-31469	-28539	-14562	-27279	-28876	-28633	-27852	-26823
-25729	-24701	-23811	-23113	-22644	-22389	-22318	-22419	-22676	-23061
-23530	-24072	-24660	-25271	-25892	-26524	-27175	-27831	-28509	-29226
-29989	-30771	-31580	-32451	-33369	-34318	-35279	-36227	-37161	-38077
-38974	-39864	-40723	-41541	-42322	-43076	-43793	-44473	-45116	-45728
-46278	-46803	-47308	-47821	-48311	-48765	-49173	-49570	-49923	-50241
-50498	-50700	-50851	-50967	-51052	-51107	-51132	-51140	-51124	-51110
-51098	-51103	-51126	-51175	-51251	-51368	-51507	-51677	-51876	-52099
-52340	-52601	-52864	-53125	-53366	-53581	-53751	-53859	-53886	-53816
-53627	-53301	-52823	-52178	-51352	-50333	-49123	-47740	-46183	-44479
-42669	-40783	-38862	-36967	-35074	-33138	-31094	-28871	-26556	-24341
-22843	-21357	-20096	-19088	-15842	-18857	-19125	-12846	-10115	-10002
-10976	-11446	-11891	-12671	-13786	-15070	-16390	-18699	-20688	-22138
-22995	-20219	-23858	-23815	-22741	-18728	-21192	-20475	-16066	-20854
-22273	-23241	-23475	-20275	-25322	-27099	-28767	-30371	-31943	-33540
-35252	-37090	-39026	-40988	-42857	-44518	-46001	-47334	-48499	-49462
-50231	-50815	-51211	-51455	-51605	-51671	-51671			

TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM 910101 TO 920101

2228	2228	2315	2496	2900	3904	5874	8415	11601	14863
18448	21755	24603	26920	29214	31090	32365	33192	33884	34444
34803	34913	34857	34693	34430	34103	33793	33488	33195	32922
32687	32491	32332	32203	32111	32026	31937	31810	31640	31418
31167	30882	30557	30195	29808	29426	29054	28712	28413	28160
27970	27827	27704	27594	27476	27371	27286	27219	27190	27194
27191	27093	26635	24123	10055	25009	28218	29189	29657	30025

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  30398  30767  31096  31351  31528  31619  31608  31518  31381  31202
  30994  30773  30554  30328  30105  29894  29695  29492  29283  29082
  28883  28664  28422  28183  27939  27689  27429  27155  26850  26533
  26211  25907  25603  25296  24984  24686  24408  24151  23905  23676
  23446  23237  23050  22907  22771  22641  22505  22402  22305  22217
  22132  22048  21970  21921  21899  21893  21901  21911  21925  21934
  21937  21931  21910  21873  21818  21747  21656  21545  21421  21282
  21136  20988  20840  20698  20559  20434  20332  20257  20221  20232
  20303  20448  20681  21007  21431  21954  22574  23286  24071  24903
  25758  26575  27295  27856  28105  27896  27047  25415  23059  20140
  17239  13684   9838   5925      0   1593   2103      0   1927   5387
   9096  11644  13416  14757  15708  16201  16247  14479  12234   9465
   6266      0   3215   3413   2994    204   2987   3077      0   3137
   3411   3534   3221      0   5050   7212   9176  10858  12178  13141
  13862  14396  14776  15017  15080  14930  14670  14413  14185  13986
  13835  13728  13626  13535  13475  13447  13447

  SHORELINE POSITION (FT) AFTER 175201 TIME STEPS. DATE IS   920101
   4314.47   4382.44   4449.70   4515.50   4579.17   4637.77   4687.59   4728.97
4762.96   4789.12
   4807.30   4817.73   4820.88   4817.16   4806.86   4790.36   4768.12   4740.60
4708.29   4671.69
   4631.39   4587.83   4541.39   4492.52   4441.58   4388.96   4334.99   4280.02
4224.33   4168.15
   4111.66   4055.08   3998.57   3942.31   3886.43   3831.07   3776.34   3722.31
3669.05   3616.63
   3565.14   3514.65   3465.20   3416.84   3369.58   3323.42   3278.38   3234.39
3191.36   3149.26
   3108.04   3067.63   3027.95   2988.91   2950.38   2912.24   2874.38   2836.72
2799.20   2761.92
   2725.25   2689.98   2656.86   2623.78   2568.46   2533.87   2498.11   2458.96
2417.30   2374.08
   2329.82   2284.84   2239.26   2193.15   2146.62   2099.79   2052.75   2005.65
1958.64   1911.85
   1865.40   1819.42   1773.99   1729.20   1685.12   1641.88   1599.56   1558.20
1517.87   1478.61
   1440.46   1403.47   1367.68   1333.14   1299.85   1267.80   1237.03   1207.57
1179.40   1152.53
   1126.98   1102.75   1079.83   1058.21   1037.85   1018.69   1000.74    983.97
968.36    953.88
    940.48    928.12    916.75    906.32    896.79    888.11    880.21    873.05
866.59    860.79
    855.59    850.96    846.85    843.22    840.03    837.26    834.87    832.85
831.18    829.85
    828.85    828.18    827.84    827.84    828.19    828.89    829.94    831.35
833.11    835.21
    837.63    840.36    843.35    846.59    850.02    853.58    857.23    860.88
864.48    867.95
    871.24    874.28    877.04    879.51    881.69    883.65    885.49    887.37
889.51    892.20
    895.81    900.80    907.69    917.23    930.36    947.87    970.81   1000.68
1038.42   1084.04
   1137.19   1197.53   1265.25   1338.18   1527.80   1612.66   1697.03   2140.31
2222.12   2297.53
   2369.02   2437.48   2503.45   2567.35   2629.58   2690.76   2751.70   2813.23
2876.87   2944.84
   3016.40   3227.75   3305.29   3384.06   3461.74   3576.47   3656.39   3737.00
3902.89   3981.57
   4059.75   4137.38   4214.61   4449.64   4522.24   4591.96   4657.08   4718.33
4775.86   4829.67
   4879.98   4926.96   4970.71   5011.44   5049.73   5086.39   5121.96   5156.70
5190.85   5224.61
   5258.00   5291.12   5324.26   5357.55   5390.96   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3/1000) FROM   920101 TO   921231
    102    102    101    101    100    101    104    108    112    116
    120    123    124    124    122    120    117    113    109    106
    103    100     98     96     94     92     91     90     89     89
```

88	88	88	89	89	90	90	91	92	93
94	96	97	98	99	100	101	102	103	104
105	105	106	107	107	108	108	108	108	108
108	106	101	91	58	90	100	103	104	103
102	102	101	100	100	99	99	99	99	99
99	100	100	101	102	102	103	104	105	106
107	108	109	111	112	114	115	116	118	119
120	122	123	124	125	126	127	128	128	129
130	130	131	131	132	132	133	133	133	133
133	133	133	133	133	133	133	133	133	133
133	133	133	133	133	133	133	133	133	133
133	133	133	133	133	133	133	133	133	133
132	132	131	130	130	128	127	126	124	122
120	117	114	110	106	100	92	83	73	63
53	45	37	32	19	25	25	17	19	22
27	30	33	35	38	41	42	44	44	42
38	24	36	37	35	24	32	31	21	32
34	35	34	23	37	43	48	53	59	64
70	75	80	85	90	93	96	99	101	103
104	106	107	107	107	107	107			

NET TRANSPORT VOLUME (YARDS3/1000) FROM 920101 TO 921231

-95	-95	-95	-93	-91	-89	-87	-84	-81	-77
-73	-69	-64	-60	-55	-50	-45	-41	-36	-32
-29	-25	-22	-20	-18	-16	-15	-14	-13	-13
-13	-14	-14	-15	-16	-17	-18	-20	-21	-23
-24	-26	-28	-30	-32	-33	-35	-37	-38	-40
-41	-43	-44	-44	-45	-46	-46	-46	-45	-44
-43	-42	-40	-38	-36	-36	-36	-36	-35	-34
-33	-33	-32	-31	-31	-30	-30	-30	-30	-30
-30	-31	-32	-33	-34	-35	-36	-38	-39	-41
-42	-44	-46	-47	-49	-51	-53	-54	-56	-58
-59	-61	-62	-64	-65	-67	-68	-69	-70	-71
-72	-73	-74	-75	-76	-76	-77	-77	-77	-78
-78	-78	-78	-78	-78	-78	-78	-78	-78	-78
-79	-79	-79	-79	-79	-79	-80	-80	-80	-81
-81	-81	-82	-82	-82	-82	-82	-82	-81	-81
-80	-78	-77	-75	-73	-71	-68	-65	-61	-58
-54	-50	-46	-42	-38	-34	-31	-27	-24	-21
-19	-18	-18	-19	-19	-20	-20	-17	-15	-13
-11	-9	-7	-6	-6	-6	-6	-10	-14	-17
-21	-24	-25	-25	-24	-23	-23	-22	-21	-23
-24	-24	-24	-23	-25	-26	-27	-29	-31	-34
-37	-40	-43	-47	-50	-54	-57	-60	-62	-65
-67	-68	-70	-71	-71	-72	-72			

TRANSPORT VOLUME TO THE LEFT (YARDS3/1000) FROM 920101 TO 921231

-99	-99	-98	-97	-96	-95	-95	-96	-96	-97
-96	-96	-94	-92	-89	-85	-81	-77	-73	-69
-66	-63	-60	-58	-56	-54	-53	-52	-51	-51
-51	-51	-51	-52	-53	-53	-54	-56	-57	-58
-59	-61	-62	-64	-65	-67	-68	-69	-71	-72
-73	-74	-75	-76	-76	-77	-77	-77	-77	-76
-76	-74	-71	-65	-47	-63	-68	-69	-69	-69
-68	-67	-66	-66	-65	-65	-64	-64	-64	-64
-65	-65	-66	-67	-68	-69	-70	-71	-72	-73
-75	-76	-78	-79	-81	-82	-84	-85	-87	-88
-90	-91	-93	-94	-95	-96	-97	-98	-99	-100
-101	-102	-103	-103	-104	-104	-105	-105	-105	-105
-106	-106	-106	-106	-106	-106	-106	-106	-106	-106
-106	-106	-106	-106	-106	-106	-106	-107	-107	-107
-107	-107	-107	-108	-108	-108	-108	-107	-107	-107
-106	-105	-104	-103	-101	-100	-98	-95	-93	-90
-87	-84	-80	-76	-72	-67	-61	-55	-48	-42
-36	-31	-28	-25	-19	-22	-23	-17	-17	-18
-19	-19	-20	-21	-22	-23	-24	-27	-29	-30
-30	-24	-30	-31	-30	-24	-28	-27	-21	-27
-29	-30	-29	-23	-31	-34	-38	-41	-45	-49
-53	-58	-62	-66	-70	-73	-76	-79	-82	-84
-86	-87	-88	-89	-89	-90	-90			

TRANSPORT VOLUME TO THE RIGHT (YARDS3/1000) FROM 920101 TO 921231

3	3	3	3	4	5	8	12	15	19
23	26	29	32	33	35	35	36	36	36
37	37	37	38	38	38	38	38	37	37
37	37	37	36	36	36	36	35	35	35
35	34	34	34	33	33	32	32	32	31
31	31	31	31	31	31	31	31	31	31
32	31	30	26	11	27	31	33	34	34
34	34	34	34	34	34	34	34	34	34
34	34	34	34	33	33	33	33	32	32
32	32	31	31	31	31	31	31	30	30
30	30	30	30	29	29	29	29	29	28
28	28	28	28	28	28	28	27	27	27
27	27	27	27	27	27	27	27	27	27
27	27	27	27	26	26	26	26	26	26
26	26	25	25	25	25	25	25	25	26
26	26	27	27	28	28	29	30	31	32
32	33	33	34	33	32	30	28	24	21
17	13	9	6	0	2	2	0	1	4
8	10	12	14	16	17	17	17	15	12
8	0	5	5	5	0	4	4	0	4
5	5	4	0	6	8	10	12	13	15
16	17	18	19	19	19	19	19	19	19
18	18	18	18	17	17	17			

SHORELINE POSITION (FT) AFTER 263041 TIME STEPS. DATE IS 930101

4314.47	4375.88	4437.36	4498.64	4558.88	4614.56	4661.62	4700.02	4730.67	4753.65
4769.18	4777.38	4778.80	4774.19	4763.72	4747.70	4726.80	4701.39	4671.82	4638.40
4601.54	4561.68	4519.05	4473.96	4426.70	4377.62	4327.05	4275.22	4222.39	4168.81
4114.66	4060.16	4005.54	3950.94	3896.54	3842.47	3788.84	3735.78	3683.37	3631.69
3580.78	3530.68	3481.45	3433.13	3385.72	3339.18	3293.53	3248.77	3204.82	3161.62
3119.08	3077.12	3035.68	2994.68	2954.04	2913.64	2873.38	2833.18	2793.02	2753.02
2713.43	2674.70	2637.44	2602.45	2569.53	2533.35	2494.49	2453.36	2410.64	2366.89
2322.52	2277.81	2232.86	2187.71	2142.41	2097.00	2051.56	2006.18	1960.90	1915.81
1870.97	1826.48	1782.42	1738.87	1695.94	1653.71	1612.22	1571.58	1531.87	1493.12
1455.39	1418.74	1383.13	1348.61	1315.26	1283.13	1252.23	1222.56	1194.14	1166.99
1141.12	1116.51	1093.11	1070.96	1050.04	1030.33	1011.80	994.44	978.19	962.95
948.74	935.60	923.47	912.30	902.03	892.62	884.04	876.25	869.19	862.83
857.12	852.05	847.58	843.68	840.32	837.47	835.09	833.15	831.63	830.50
829.75	829.36	829.34	829.70	830.40	831.38	832.67	834.28	836.16	838.28
840.57	843.00	845.50	848.01	850.46	852.78	854.90	856.77	858.32	859.51
860.32	860.73	860.75	860.43	859.84	859.08	858.34	857.86	857.89	858.73
860.93	865.03	871.52	881.09	894.66	913.23	938.31	971.79	1014.73	1067.69
1129.71	1197.10	1266.80	1340.79	1538.20	1613.80	1688.74	2145.73	2226.63	2301.25
2373.82	2445.44	2515.93	2584.90	2652.30	2718.29	2783.20	2847.42	2910.96	2974.64
3043.96	3235.58	3308.17	3378.53	3453.13	3573.64	3650.05	3726.58	3916.93	3992.12
4063.64	4134.45	4208.57	4461.05	4534.17	4603.34	4671.81	4738.06	4800.07	4857.07
4909.39	4957.45	5001.52	5041.91	5079.18	5114.30	5147.95	5180.42	5212.01	5242.99
5273.40	5303.34	5333.30	5363.52	5393.92	5424.42				

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GROSS TRANSPORT VOLUME (YARDS3) FROM 921231 TO 931231

89868	89868	89318	88185	86672	86025	87070	88196	89361	90090
92314	93635	94353	94838	94168	92627	90265	87370	84778	82677
80601	78697	77162	75960	74793	73911	73376	72963	72594	72292
72083	71935	71833	71762	71700	71678	71724	71816	71952	72171
72417	72864	73372	73898	74384	74837	75307	75808	76402	76973
77516	78001	78450	78864	79213	79527	79817	80050	80221	80270
80054	79381	77626	70824	34248	70944	77204	78134	77991	77569
77171	76772	76385	76049	75829	75682	75607	75583	75630	75737
75913	76134	76423	76830	77323	77865	78457	79088	79767	80450
81084	81738	82443	83184	83923	84645	85346	86098	86851	87785
88696	89602	90479	91283	92036	92737	93401	94035	94643	95246
95781	96198	96530	96817	97091	97323	97494	97633	97769	97884
97967	98017	98028	98047	98060	98098	98095	98062	98035	98009
97970	97885	97843	97797	97756	97734	97723	97704	97698	97705
97715	97722	97750	97764	97773	97764	97734	97663	97545	97409
97227	96987	96674	96297	95852	95354	94786	94130	93350	92431
91380	90063	88315	86160	83668	80471	75704	69163	63022	57036
50809	44759	39573	35165	21109	28125	28948	17929	19859	24787
30118	32646	34603	36924	39480	41912	43779	45963	46832	46088
42642	25240	39454	40448	38411	25185	36800	36144	23944	35897
37627	38007	36801	25397	39819	44824	49007	53022	56896	60344
63288	66071	68973	71867	74368	76319	77888	79232	80430	81506
82542	83415	83919	84135	84261	84321	84321			

NET TRANSPORT VOLUME (YARDS3) FROM 921231 TO 931231

-79642	-79642	-78709	-76785	-73768	-69624	-64447	-58533	-52184	-45624
-39042	-32591	-26410	-20600	-15202	-10262	-5813	-1846	1660	4734
7399	9691	11658	13325	14692	15768	16582	17163	17532	17706
17701	17531	17207	16742	16152	15447	14644	13755	12797	11783
10729	9644	8542	7436	6343	5279	4256	3290	2401	1601
899	301	-193	-595	-908	-1144	-1321	-1473	-1640	-1872
-2214	-2697	-3350	-4225	-5421	-2980	-933	827	2329	3576
4577	5356	5949	6386	6690	6873	6944	6912	6788	6575
6274	5884	5406	4842	4190	3454	2638	1741	764	-278
-1362	-2477	-3620	-4794	-6001	-7234	-8483	-9739	-11000	-12256
-13502	-14729	-15933	-17115	-18268	-19385	-20469	-21509	-22507	-23457
-24365	-25230	-26050	-26814	-27528	-28191	-28799	-29357	-29871	-30338
-30768	-31161	-31523	-31853	-32157	-32442	-32713	-32964	-33217	-33466
-33723	-33983	-34261	-34555	-34857	-35163	-35473	-35780	-36065	-36312
-36506	-36628	-36660	-36582	-36374	-36016	-35497	-34807	-33920	-32851
-31579	-30120	-28478	-26678	-24736	-22698	-20607	-18514	-16490	-14605
-12945	-11589	-10605	-10063	-10023	-10522	-11553	-13033	-14799	-16642
-18270	-19450	-20261	-20937	-21109	-20759	-20508	-17929	-15764	-13684
-12145	-11098	-10475	-10186	-10167	-10371	-10751	-13715	-16711	-19744
-22802	-25176	-25428	-25033	-24677	-24210	-24072	-24020	-23944	-23728
-23626	-24037	-24865	-25397	-26620	-27299	-27911	-28339	-28531	-28580
-28617	-28745	-29026	-29501	-30175	-31044	-32076	-33225	-34427	-35635
-36786	-37839	-38735	-39444	-39934	-40183	-40183			

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM 921231 TO 931231

-84753	-84753	-84014	-82488	-80222	-77825	-75756	-73365	-70774	-67851
-65677	-63112	-60381	-57716	-54690	-51445	-48040	-44608	-41555	-38974
-36603	-34499	-32752	-31317	-30047	-29068	-28400	-27902	-27527	-27293
-27190	-27204	-27313	-27508	-27776	-28115	-28540	-29028	-29578	-30194
-30841	-31608	-32420	-33231	-34025	-34782	-35523	-36258	-36998	-37684
-38308	-38846	-39324	-39728	-40062	-40337	-40566	-40761	-40928	-41074
-41134	-41041	-40488	-37525	-19835	-36963	-39068	-38651	-37833	-36995
-36297	-35707	-35218	-34834	-34568	-34403	-34329	-34335	-34420	-34582
-34818	-35124	-35506	-35992	-36562	-37202	-37907	-38677	-39501	-40363
-41230	-42110	-43031	-43986	-44964	-45942	-46922	-47920	-48926	-50022
-51103	-52170	-53202	-54199	-55154	-56061	-56935	-57773	-58574	-59351
-60072	-60711	-61292	-61816	-62313	-62756	-63145	-63502	-63823	-64106
-64363	-64583	-64774	-64954	-65111	-65272	-65403	-65512	-65625	-65737
-65844	-65940	-66048	-66175	-66302	-66445	-66594	-66743	-66882	-67012
-67108	-67180	-67204	-67169	-67071	-66891	-66610	-66232	-65736	-65127
-64404	-63552	-62582	-61487	-60296	-59021	-57691	-56325	-54919	-53513

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 -52162 -50826 -49464 -48108 -46844 -45497 -43630 -41100 -38911 -36838
 -34539 -32104 -29918 -28051 -21109 -24442 -24728 -17929 -17811 -19235
 -21131 -21872 -22542 -23556 -24824 -26140 -27267 -29839 -31771 -32917
 -32724 -25208 -32441 -32742 -31543 -24697 -30437 -30082 -23944 -29814
 -30628 -31024 -30833 -25397 -33219 -36061 -38460 -40680 -42713 -44460
 -45951 -47408 -49004 -50683 -52273 -53684 -54981 -56229 -57426 -58575
 -59666 -60623 -61324 -61790 -62100 -62253 -62253

 TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM   921231 TO   931231
   5112   5112   5306   5704   6450   8200  11311  14831  18588  22231
  26635  30522  33969  37115  39487  41184  42229  42759  43214  43708
  44003  44191  44409  44645  44740  44833  44983  45064  45057  45002
  44892  44735  44522  44250  43927  43563  43186  42784  42374  41981
  41574  41250  40965  40667  40368  40060  39777  39550  39395  39288
  39205  39153  39128  39135  39155  39192  39244  39290  39290  39201
  38918  38340  37135  33299  14414  33983  38134  39479  40161  40575
  40873  41064  41168  41223  41260  41281  41272  41249  41208  41158
  41092  41009  40911  40830  40754  40658  40545  40421  40264  40084
  39866  39630  39411  39194  38963  38705  38438  38177  37923  37763
  37597  37436  37268  37086  36883  36678  36468  36260  36070  35896
  35705  35480  35243  34999  34781  34563  34343  34137  33947  33771
  33599  33423  33254  33095  32956  32832  32690  32549  32410  32270
  32119  31954  31789  31616  31447  31282  31114  30961  30818  30696
  30603  30551  30543  30590  30696  30871  31110  31422  31812  32278
  32821  33433  34102  34814  35556  36325  37089  37807  38428  38913
  39213  39238  38854  38048  36827  34974  32076  28067  24111  20198
  16270  12654   9657   7114      0   3683   4220      0   2047   5551
   8986  10774  12065  13371  14655  15769  16514  16124  15059  13173
   9920     31   7013   7707   6866    487   6364   6062      0   6085
   7001   6985   5968      0   6599   8762  10547  12342  14182  15882
  17336  18661  19976  21181  22100  22640  22904  23002  22997  22937
  22875  22790  22589  22344  22160  22067  22067

  SHORELINE POSITION (FT) AFTER 350641 TIME STEPS. DATE IS   940101
   4314.47   4367.48   4420.03   4471.61   4521.59   4568.00   4608.52   4642.96
4671.69   4694.49
   4711.20   4721.83   4726.58   4725.68   4719.31   4707.72   4691.14   4669.87
4644.20   4614.45
   4580.94   4543.99   4504.07   4461.68   4417.03   4370.30   4321.83   4271.91
4220.83   4168.84
   4116.19   4063.08   4009.71   3956.26   3902.87   3849.69   3796.82   3744.39
3692.48   3641.17
   3590.53   3540.59   3491.40   3442.96   3395.29   3348.37   3302.21   3256.76
3212.01   3167.92
   3124.46   3081.58   3039.28   2997.49   2956.16   2915.24   2874.75   2834.69
2795.11   2756.09
   2717.78   2680.56   2645.31   2613.18   2547.60   2514.95   2478.66   2439.85
2399.43   2357.89
   2315.52   2272.49   2228.93   2184.98   2140.76   2096.36   2051.85   2007.30
1962.82   1918.52
   1874.47   1830.77   1787.50   1744.73   1702.55   1661.04   1620.28   1580.37
1541.24   1502.86
   1465.41   1429.01   1393.69   1359.46   1326.34   1294.36   1263.54   1233.89
1205.43   1178.18
   1152.15   1127.33   1103.72   1081.32   1060.10   1040.06   1021.17   1003.40
986.72    971.11
    956.53    942.96    930.36    918.71    907.97    898.10    889.07    880.85
873.40    866.67
    860.65    855.29    850.56    846.43    842.88    839.87    837.39    835.40
833.87    832.79
    832.13    831.86    831.97    832.41    833.16    834.17    835.41    836.84
838.39    840.02
    841.67    843.28    844.79    846.14    847.27    848.12    848.66    848.85
848.67    848.11
    847.20    845.98    844.54    843.00    841.51    840.28    839.56    839.66
840.94    843.82
    848.74    856.19    866.65    880.72    899.15    922.50    951.60    987.67
1031.29   1082.32
   1140.32   1204.38   1272.88   1342.34   1535.06   1611.53   1687.79   2148.52
2230.18   2309.67
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   2386.66   2462.08   2535.57   2606.98   2676.38   2743.95   2809.84   2874.35
2938.22   3002.13
   3065.28   3237.85   3304.63   3375.31   3448.93   3572.39   3649.59   3725.87
3914.99   3991.21
   4067.34   4141.89   4213.37   4472.05   4540.24   4608.85   4675.65   4739.79
4800.50   4857.42
   4910.55   4959.98   5005.77   5047.96   5086.99   5123.59   5158.25   5191.24
5222.86   5253.36
   5282.82   5311.43   5339.68   5367.92   5396.16   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3/1000) FROM   931231 TO   941231
    104     104     104     103     102     102     103     104     105     106
    107     107     106     105     103     101      98      95      91      88
     84      81      79      77      75      74      73      72      71      71
     70      70      70      70      70      70      70      70      70      71
     71      71      72      72      73      73      73      74      74      75
     75      75      76      76      77      78      78      79      79      79
     79      78      76      69      36      69      76      77      77      77
     76      76      75      75      75      75      75      75      75      75
     75      75      76      76      76      77      78      78      79      80
     81      82      83      85      86      87      88      90      91      92
     93      94      95      96      97      98      99     100     101     102
    102     103     104     104     105     105     106     106     106     107
    107     107     107     108     108     108     108     108     109     109
    109     109     109     109     109     109     109     110     110     110
    110     110     109     109     109     109     109     108     108     107
    107     107     106     105     105     104     104     103     103     102
    101     100      98      96      93      89      83      76      69      61
     52      45      38      32      18      23      24      15      16      20
     25      29      32      35      39      42      45      47      48      47
     44      24      40      40      38      22      33      32      21      32
     33      34      34      23      39      45      50      55      60      64
     69      73      77      81      85      88      90      92      93      95
     96      97      97      98      98      98      98

 NET TRANSPORT VOLUME (YARDS3/1000) FROM   931231 TO   941231
    -90     -90     -90     -88     -86     -83     -79     -75     -71     -66
    -61     -56     -50     -45     -40     -34     -29     -25     -20     -16
    -12      -8      -5      -2       0       1       3       4       5       6
      6       6       6       6       5       5       4       3       2       1
      0       0      -1      -2      -3      -4      -5      -6      -7      -8
     -9     -10     -11     -11     -12     -13     -13     -13     -14     -14
    -14     -14     -13     -12     -12     -11     -11     -11     -10     -10
     -9      -8      -7      -7      -6      -6      -6      -6      -6      -6
     -6      -7      -7      -8      -8      -9     -10     -11     -12     -13
    -15     -16     -17     -19     -20     -22     -23     -24     -26     -27
    -29     -30     -32     -33     -35     -36     -37     -39     -40     -41
    -42     -43     -44     -45     -46     -47     -48     -48     -49     -50
    -50     -51     -51     -52     -52     -53     -53     -53     -54     -54
    -55     -55     -55     -56     -56     -56     -56     -57     -57     -57
    -57     -56     -56     -56     -55     -55     -54     -53     -52     -51
    -50     -48     -47     -46     -44     -43     -42     -40     -39     -38
    -36     -35     -34     -32     -31     -30     -28     -27     -25     -23
    -22     -20     -19     -18     -18     -17     -17     -15     -14     -14
    -13     -13     -13     -14     -14     -14     -14     -16     -18     -20
    -21     -23     -23     -22     -22     -21     -21     -21     -21     -21
    -21     -21     -22     -23     -25     -27     -29     -31     -34     -36
    -38     -40     -43     -45     -46     -48     -50     -51     -52     -53
    -54     -55     -56     -56     -56     -57     -57

 TRANSPORT VOLUME TO THE LEFT (YARDS3/1000) FROM   931231 TO   941231
    -97     -97     -97     -96     -94     -92     -91     -90     -88     -86
    -84     -81     -78     -75     -71     -68     -64     -60     -56     -52
    -48     -45     -42     -40     -38     -36     -35     -34     -33     -32
    -32     -31     -31     -31     -32     -32     -32     -33     -33     -34
    -35     -36     -36     -37     -38     -39     -39     -40     -41     -41
    -42     -43     -43     -44     -44     -45     -46     -46     -46     -46
    -46     -46     -45     -41     -24     -40     -43     -44     -44     -43
```

-42	-42	-41	-41	-41	-40	-40	-40	-40	-40
-41	-41	-41	-42	-42	-43	-44	-45	-46	-47
-48	-49	-50	-52	-53	-54	-56	-57	-58	-60
-61	-62	-64	-65	-66	-67	-68	-69	-70	-71
-72	-73	-74	-75	-75	-76	-77	-77	-78	-78
-79	-79	-79	-80	-80	-80	-81	-81	-81	-81
-82	-82	-82	-82	-83	-83	-83	-83	-83	-83
-83	-83	-83	-83	-82	-82	-81	-81	-80	-79
-78	-78	-77	-76	-75	-74	-73	-72	-71	-70
-69	-67	-66	-64	-62	-59	-56	-51	-47	-42
-37	-33	-29	-25	-18	-20	-21	-15	-15	-17
-19	-21	-23	-24	-26	-28	-29	-32	-33	-34
-33	-23	-31	-31	-30	-22	-27	-27	-21	-26
-27	-28	-28	-23	-32	-36	-39	-43	-47	-50
-54	-57	-60	-63	-66	-68	-70	-71	-73	-74
-75	-76	-77	-77	-77	-77	-77			

TRANSPORT VOLUME TO THE RIGHT (YARDS3/1000) FROM 931231 TO 941231

6	6	6	7	8	9	11	14	17	19
22	25	27	29	31	33	34	35	35	36
36	36	36	37	37	37	38	38	38	38
38	38	38	38	38	37	37	37	36	36
36	35	35	34	34	34	33	33	33	33
32	32	32	32	32	32	32	32	32	32
32	32	31	28	12	28	32	32	33	33
33	33	34	34	34	34	34	34	34	34
34	34	34	34	34	33	33	33	33	33
33	33	33	32	32	32	32	32	32	32
32	31	31	31	31	31	30	30	30	30
30	29	29	29	29	29	28	28	28	28
28	28	28	27	27	27	27	27	27	27
27	27	26	26	26	26	26	26	26	26
26	26	26	26	26	27	27	27	27	28
28	29	29	29	30	30	31	31	31	32
32	32	32	31	30	29	27	24	21	18
15	12	9	7	0	3	3	0	0	3
5	7	9	10	12	14	15	15	15	13
11	0	8	9	7	0	6	5	0	5
6	6	5	0	7	8	10	11	13	14
15	16	17	18	19	19	20	20	20	20
20	20	20	20	20	20	20			

SHORELINE POSITION (FT) AFTER 438241 TIME STEPS. DATE IS 950101

4314.47	4360.48	4406.20	4451.29	4495.21	4536.18	4572.07	4602.66
4628.29	4648.78						
4663.96	4673.74	4678.29	4677.84	4672.46	4662.32	4647.73	4628.90
4606.03	4579.39						
4549.22	4515.81	4479.45	4440.33	4398.82	4355.34	4310.00	4263.00
4214.63	4165.15						
4114.77	4063.69	4012.13	3960.26	3908.26	3856.26	3804.41	3752.81
3701.56	3650.75						
3600.44	3550.70	3501.55	3453.04	3405.18	3357.97	3311.42	3265.51
3220.25	3175.61						
3131.57	3088.11	3045.20	3002.83	2960.93	2919.46	2878.35	2837.54
2796.94	2756.46						
2716.10	2676.10	2637.76	2604.79	2547.47	2514.01	2474.98	2434.01
2392.44	2350.59						
2308.51	2266.18	2223.60	2180.76	2137.70	2094.48	2051.14	2007.77
1964.45	1921.27						
1878.30	1835.63	1793.33	1751.49	1710.18	1669.52	1629.51	1590.10
1551.47	1513.73						
1476.89	1440.99	1406.07	1372.17	1339.32	1307.55	1276.88	1247.34
1218.92	1191.65						
1165.52	1140.55	1116.72	1093.99	1072.39	1051.92	1032.55	1014.28
997.10	980.99						
965.89	951.79	938.66	926.49	915.25	904.94	895.48	886.82
878.95	871.86						
865.51	859.86	854.89	850.55	846.82	843.66	841.06	838.96
837.34	836.16						
835.38	834.97	834.87	835.06	835.48	836.08	836.83	837.67
838.54	839.39						

840.17	840.83	841.33	841.60	841.63	841.39	840.84	840.00	838.86	837.46
835.84	834.06	832.22	830.44	828.88	827.77	827.27	827.58	829.09	832.21
837.30	844.77	855.04	868.71	886.54	909.15	937.49	972.99	1016.48	1068.03
1127.28	1193.19	1264.31	1340.79	1526.70	1609.99	1693.36	2164.62	2247.33	2328.77
2408.38	2484.97	2559.00	2630.36	2699.06	2765.45	2829.94	2892.79	2954.58	3016.71
3082.80	3231.29	3301.48	3370.95	3444.76	3570.15	3647.72	3725.73	3913.26	3993.14
4070.91	4147.91	4226.25	4483.90	4558.11	4628.45	4696.40	4761.20	4821.99	4878.46
4930.77	4979.09	5023.53	5064.30	5101.92	5137.18	5170.59	5202.37	5232.75	5261.96
5290.06	5317.22	5344.01	5370.79	5397.60	5424.42				

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GROSS TRANSPORT VOLUME (YARDS3) FROM 941231 TO 951231

82434	82434	82091	81414	80491	79784	79543	79792	80021	79944
80111	80326	80083	79289	78432	77356	76276	75078	73553	72088
70521	68974	67898	67182	66699	66179	65740	65323	64938	64601
64306	64049	63855	63707	63595	63517	63484	63493	63528	63588
63668	63782	63903	64020	64151	64262	64352	64453	64583	64726
64889	65060	65248	65424	65569	65690	65773	65811	65757	65552
65197	64642	62930	56949	27274	57483	63202	64591	65061	65448
65656	65722	65701	65660	65619	65570	65497	65456	65441	65462
65506	65578	65673	65764	65870	66002	66144	66284	66439	66725
67072	67465	67931	68424	68938	69465	70019	70555	71098	71647
72272	72905	73515	74085	74605	75086	75525	75921	76259	76572
76864	77146	77428	77712	77999	78216	78415	78614	78803	78971
79135	79293	79446	79580	79739	79886	80023	80134	80229	80319
80413	80542	80637	80721	80787	80838	80870	80889	80881	80855
80813	80751	80653	80526	80393	80236	80085	79924	79751	79559
79342	79111	78905	78718	78509	78257	77982	77681	77344	76913
76321	75527	74547	73213	71335	68813	65332	61002	56088	50749
45258	39989	34897	30805	18883	23259	24140	15654	16587	20640
25221	27931	30158	33005	36137	39161	41678	43351	44065	43566
41083	21622	38127	38329	35700	21798	32833	32276	21652	31948
33371	33807	33116	23545	36320	40872	44719	48167	51511	54510
56893	59155	61708	64339	66674	68372	69689	70783	71704	72495
73205	73776	74052	74127	74163	74177	74177			

NET TRANSPORT VOLUME (YARDS3) FROM 941231 TO 951231

-64544	-64544	-63776	-62237	-59916	-56860	-53143	-48921	-44337	-39503
-34530	-29496	-24496	-19618	-14926	-10465	-6271	-2358	1261	4569
7552	10214	12564	14612	16360	17827	19049	20041	20807	21363
21720	21899	21916	21791	21544	21191	20741	20210	19612	18959
18266	17548	16818	16079	15340	14603	13874	13157	12453	11769
11110	10478	9879	9316	8794	8330	7935	7609	7336	7085
6805	6430	5873	5058	4096	5584	6910	7946	8755	9412
9972	10474	10941	11376	11773	12114	12381	12567	12666	12676
12594	12417	12144	11781	11335	10815	10230	9585	8872	8094
7265	6387	5468	4513	3531	2524	1502	467	-574	-1615
-2655	-3686	-4706	-5715	-6707	-7687	-8651	-9594	-10514	-11399
-12249	-13071	-13859	-14617	-15341	-16028	-16679	-17297	-17893	-18466
-19016	-19546	-20057	-20552	-21026	-21488	-21927	-22349	-22749	-23126
-23472	-23789	-24075	-24317	-24517	-24666	-24760	-24790	-24756	-24648
-24465	-24195	-23845	-23411	-22890	-22288	-21604	-20846	-20018	-19130
-18193	-17215	-16216	-15210	-14214	-13242	-12316	-11456	-10706	-10085
-9583	-9220	-9030	-9036	-9258	-9700	-10356	-11206	-12222	-13353
-14523	-15644	-16674	-17685	-18883	-18384	-18116	-15654	-14656	-13921
-13279	-12747	-12286	-11840	-11384	-10915	-10429	-12401	-14362	-16361
-18481	-20823	-20610	-20636	-20837	-21217	-21084	-21209	-21652	-21697
-21960	-22318	-22799	-23545	-23677	-24055	-24503	-24909	-25247	-25538
-25815	-26110	-26437	-26802	-27214	-27657	-28114	-28567	-29003	-29411
-29784	-30114	-30390	-30607	-30755	-30830	-30830			

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 TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM   941231 TO   951231
 -73487 -73487 -72933 -71822 -70206 -68321 -66340 -64359 -62176 -59721
 -57319 -54907 -52284 -49453 -46678 -43912 -41276 -38718 -36146 -33761
 -31485 -29379 -27664 -26286 -25167 -24177 -23343 -22639 -22064 -21619
 -21293 -21075 -20967 -20959 -21024 -21160 -21369 -21639 -21958 -22313
 -22703 -23116 -23541 -23972 -24404 -24826 -25239 -25651 -26064 -26480
 -26890 -27291 -27681 -28053 -28389 -28680 -28921 -29102 -29209 -29232
 -29194 -29104 -28528 -25945 -11589 -25950 -28146 -28325 -28152 -28019
 -27842 -27624 -27383 -27142 -26921 -26724 -26561 -26445 -26389 -26392
 -26455 -26581 -26762 -26989 -27268 -27593 -27956 -28351 -28783 -29312
 -29906 -30537 -31231 -31953 -32700 -33471 -34256 -35047 -35837 -36630
 -37462 -38298 -39109 -39898 -40659 -41384 -42088 -42758 -43390 -43984
 -44555 -45108 -45645 -46162 -46665 -47122 -47545 -47955 -48348 -48718
 -49076 -49420 -49747 -50069 -50384 -50683 -50979 -51240 -51490 -51726
 -51948 -52165 -52356 -52516 -52651 -52755 -52811 -52838 -52818 -52752
 -52637 -52469 -52249 -51971 -51640 -51262 -50847 -50385 -49886 -49345
 -48765 -48162 -47560 -46963 -46359 -45749 -45145 -44569 -44027 -43500
 -42954 -42374 -41786 -41123 -40293 -39258 -37842 -36104 -34155 -32050
 -29889 -27817 -25786 -24246 -18883 -20822 -21128 -15654 -15622 -17281
 -19250 -20339 -21220 -22422 -23762 -25038 -26053 -27876 -29215 -29965
 -29783 -21222 -29369 -29483 -28269 -21508 -26958 -26743 -21652 -26822
 -27665 -28062 -27957 -23545 -29998 -32464 -34611 -36537 -38379 -40026
 -41355 -42633 -44073 -45572 -46943 -48016 -48905 -49677 -50354 -50953
 -51494 -51945 -52219 -52365 -52455 -52502 -52502

 TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM   941231 TO   951231
   8942   8942   9158   9590  10286  11463  13197  15436  17841  20219
  22790  25409  27789  29835  31751  33449  35004  36359  37407  38333
  39038  39598  40228  40897  41529  42004  42391  42678  42873  42984
  43017  42974  42885  42752  42572  42351  42113  41850  41569  41272
  40970  40666  40358  40051  39742  39433  39111  38806  38521  38248
  38000  37769  37562  37371  37180  37008  36855  36710  36546  36318
  36000  35535  34401  31003  15685  31535  35057  36272  36908  37431
  37814  38097  38322  38520  38695  38843  38943  39011  39057  39071
  39050  38998  38909  38770  38603  38405  38186  37934  37655  37408
  37168  36927  36698  36467  36232  35993  35760  35512  35262  35016
  34807  34615  34403  34185  33950  33697  33437  33163  32877  32588
  32306  32037  31783  31546  31322  31095  30866  30661  30452  30253
  30062  29874  29693  29517  29356  29200  29047  28891  28740  28598
  28473  28376  28281  28200  28136  28086  28054  28045  28061  28103
  28173  28275  28403  28557  28748  28972  29241  29539  29867  30214
  30572  30947  31343  31753  32146  32506  32831  33112  33322  33414
  33372  33153  32755  32086  31038  29556  27487  24897  21933  18697
  15367  12173   9111   6560      0   2437   3011      0    965   3360
   5970   7591   8934  10580  12377  14123  15623  15476  14852  13604
  11301    399   8758   8846   7431    290   5874   5532      0   5125
   5705   5744   5158      0   6320   8406  10108  11628  13132  14487
  15539  16524  17636  18768  19729  20359  20788  21112  21351  21540
  21710  21831  21830  21761  21704  21676  21676

  SHORELINE POSITION (FT) AFTER 525841 TIME STEPS. DATE IS   960101
   4314.47   4353.55   4392.33   4430.49   4467.71   4502.79   4534.10   4561.41
4584.85   4604.07
   4618.75   4628.82   4634.49   4635.71   4632.40   4624.67   4612.61   4596.40
4576.36   4552.62
   4525.34   4494.72   4461.07   4424.64   4385.65   4344.36   4301.09   4256.10
4209.65   4161.93
   4113.16   4063.54   4013.25   3962.48   3911.44   3860.30   3809.18   3758.18
3707.42   3656.97
   3606.89   3557.26   3508.18   3459.69   3411.79   3364.52   3317.86   3271.83
3226.39   3181.54
   3137.24   3093.48   3050.27   3007.52   2965.10   2923.00   2881.28   2839.99
2799.20   2758.98
   2719.47   2681.08   2644.97   2613.81   2533.69   2502.24   2465.71   2426.74
2386.54   2345.56
   2304.00   2262.00   2219.69   2177.19   2134.64   2092.08   2049.48   2006.87
1964.36   1922.01
   1879.89   1838.08   1796.61   1755.49   1714.85   1674.77   1635.30   1596.51
1558.45   1521.18
   1484.77   1449.25   1414.64   1381.00   1348.35   1316.74   1286.17   1256.68
1228.28   1200.97
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   1174.78   1149.70   1125.74   1102.89   1081.18   1060.57   1041.01   1022.53
1005.06    988.64
    973.26    958.88    945.46    932.97    921.42    910.79    901.04    892.15
884.08    876.80
    870.27    864.46    859.32    854.83    850.94    847.62    844.84    842.55
840.71    839.29
    838.24    837.51    837.06    836.85    836.82    836.93    837.12    837.35
837.56    837.72
    837.78    837.69    837.42    836.93    836.22    835.25    834.03    832.56
830.88    829.03
    827.07    825.08    823.17    821.48    820.17    819.44    819.54    820.83
823.49    827.69
    834.03    843.06    855.09    870.70    890.53    915.06    945.15    982.14
1026.68   1078.66
   1137.56   1202.63   1273.55   1351.70   1522.10   1607.63   1693.60   2177.71
2262.95   2345.25
   2425.82   2503.03   2577.16   2648.43   2717.01   2783.27   2847.58   2910.38
2972.60   3035.85
   3104.13   3229.21   3301.73   3372.83   3448.35   3568.90   3648.88   3729.77
3913.62   3995.47
   4074.10   4152.24   4233.05   4484.86   4561.42   4632.31   4699.91   4764.14
4824.56   4880.94
   4933.39   4981.99   5026.81   5067.96   5105.89   5141.30   5174.67   5206.28
5236.41   5265.31
   5293.03   5319.70   5345.94   5372.13   5398.28   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3/1000) FROM   951231 TO   961230
    112    112    112    112    111    111    112    113    114    114
    115    114    114    112    111    109    108    106    103    100
     98     95     94     93     91     90     89     88     87     87
     86     85     85     84     84     84     84     84     84     84
     84     84     85     85     85     85     86     86     87     87
     87     88     88     88     88     89     89     89     89     89
     88     87     84     75     37     76     85     88     88     89
     89     89     89     89     89     89     89     89     89     89
     89     89     89     89     90     90     90     91     91     91
     92     92     93     93     94     95     96     97     98     98
     99    100    101    102    103    104    105    105    106    107
    108    108    109    109    109    110    110    111    111    111
    112    112    112    112    113    113    113    113    113    113
    113    113    114    114    114    114    114    114    114    113
    113    113    113    113    113    112    112    112    112    111
    111    111    110    110    110    109    109    108    108    107
    106    105    103    100     97     93     88     80     71     63
     55     48     42     36     20     28     29     17     20     26
     31     34     37     41     45     48     51     54     56     55
     51     27     48     48     45     27     40     39     27     38
     40     40     38     26     42     48     53     58     63     67
     72     76     81     86     89     93     95     97     99    100
    101    102    103    103    103    103    103

 NET TRANSPORT VOLUME (YARDS3/1000) FROM   951231 TO   961230
    -83    -83    -83    -81    -80    -77    -75    -71    -68    -64
    -60    -56    -51    -47    -42    -38    -33    -29    -24    -20
    -16    -13     -9     -6     -3     -1      0      2      4      5
      6      7      7      7      7      7      7      6      5      5
      4      3      2      1      0      0     -1     -2     -3     -4
     -5     -5     -6     -7     -8     -8     -9     -9     -9     -9
     -9     -8     -7     -5     -2     -4     -6     -7     -7     -7
     -7     -7     -7     -6     -6     -5     -5     -5     -5     -5
     -5     -5     -5     -6     -6     -7     -8     -8     -9    -10
    -11    -12    -14    -15    -16    -17    -19    -20    -21    -22
    -24    -25    -26    -27    -29    -30    -31    -32    -33    -35
    -36    -37    -38    -39    -39    -40    -41    -42    -43    -43
    -44    -45    -45    -46    -46    -47    -47    -48    -48    -48
    -49    -49    -49    -49    -49    -49    -49    -49    -49    -49
    -48    -48    -48    -47    -47    -46    -45    -44    -44    -43
    -42    -41    -40    -39    -38    -37    -36    -35    -34    -33
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    -32    -30    -29    -27    -26    -24    -22    -21    -19    -18
    -17    -17    -18    -19    -20    -19    -19    -17    -16    -15
    -15    -14    -14    -13    -13    -13    -12    -15    -17    -20
    -22    -25    -25    -25    -26    -26    -26    -26    -27    -26
    -26    -25    -25    -26    -26    -26    -27    -28    -30    -31
    -33    -35    -37    -39    -41    -43    -45    -46    -47    -48
    -49    -50    -50    -51    -51    -51    -51

 TRANSPORT VOLUME TO THE LEFT (YARDS3/1000) FROM   951231 TO   961230
    -98    -98    -97    -97    -95    -94    -93    -92    -91    -89
    -87    -85    -83    -80    -77    -74    -70    -67    -64    -60
    -57    -54    -52    -49    -47    -46    -44    -43    -41    -40
    -40    -39    -38    -38    -38    -38    -38    -38    -39    -39
    -40    -40    -41    -41    -42    -43    -43    -44    -45    -45
    -46    -47    -47    -48    -48    -48    -49    -49    -49    -49
    -49    -48    -45    -40    -19    -40    -45    -47    -48    -48
    -48    -48    -48    -48    -47    -47    -47    -47    -47    -47
    -47    -47    -47    -48    -48    -48    -49    -50    -50    -51
    -52    -52    -53    -54    -55    -56    -57    -58    -59    -60
    -62    -63    -64    -65    -66    -67    -68    -69    -70    -71
    -72    -72    -73    -74    -74    -75    -76    -76    -77    -77
    -78    -78    -79    -79    -79    -80    -80    -80    -81    -81
    -81    -81    -81    -81    -81    -81    -81    -81    -81    -81
    -81    -81    -80    -80    -80    -79    -79    -78    -78    -77
    -77    -76    -75    -75    -74    -73    -73    -72    -71    -70
    -69    -67    -66    -64    -61    -59    -55    -50    -45    -40
    -36    -33    -30    -27    -20    -24    -24    -17    -18    -20
    -23    -24    -26    -27    -29    -30    -32    -34    -36    -37
    -37    -26    -36    -37    -35    -27    -33    -33    -27    -32
    -33    -33    -32    -26    -34    -37    -40    -43    -46    -49
    -52    -56    -59    -62    -65    -68    -70    -71    -73    -74
    -75    -76    -77    -77    -77    -77    -77

 TRANSPORT VOLUME TO THE RIGHT (YARDS3/1000) FROM   951231 TO   961230
     14     14     14     15     15     16     18     20     22     25
     27     29     31     32     34     35     37     38     39     40
     40     41     42     43     44     44     45     45     46     46
     46     46     46     46     46     45     45     45     45     44
     44     44     43     43     43     42     42     42     41     41
     41     41     40     40     40     40     39     39     39     39
     39     39     38     35     17     35     39     40     40     40
     40     40     41     41     41     41     41     42     42     42
     42     42     42     41     41     41     41     41     40     40
     40     39     39     39     38     38     38     38     38     38
     37     37     37     37     37     36     36     36     36     36
     36     35     35     35     34     34     34     34     34     33
     33     33     33     33     33     32     32     32     32     32
     32     32     32     32     32     32     32     32     32     32
     32     32     32     32     33     33     33     33     33     34
     34     34     35     35     35     35     36     36     36     37
     37     37     36     36     35     34     32     29     25     22
     19     15     12      8      0      4      4      0      2      5
      8     10     11     13     15     17     19     19     19     17
     14      0     11     11      9      0      7      6      0      6
      7      7      6      0      8     11     13     14     16     17
     19     20     21     23     24     24     25     25     25     25
     26     26     26     26     26     26     26

  SHORELINE POSITION (FT) AFTER 613681 TIME STEPS. DATE IS   970101
   4314.47   4347.87   4381.19   4414.29   4447.12   4478.37   4506.01   4530.03
4550.80   4567.71
   4580.59   4589.53   4594.34   4594.95   4591.44   4583.89   4572.54   4557.65
4539.24   4517.34
   4492.19   4463.99   4432.91   4399.20   4363.12   4324.77   4284.37   4242.26
4198.58   4153.48
   4107.15   4059.79   4011.59   3962.73   3913.36   3863.64   3813.73   3763.75
3713.83   3664.08
   3614.59   3565.44   3516.70   3468.43   3420.66   3373.43   3326.75   3280.62
3235.03   3189.95
   3145.33   3101.11   3057.22   3013.63   2970.34   2927.28   2884.38   2841.51
2798.56   2755.40
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   2712.08   2669.13   2627.81   2586.43   2557.35   2515.72   2474.11   2430.90
2387.40   2344.15
   2301.24   2258.58   2216.10   2173.74   2131.47   2089.31   2047.33   2005.56
1964.00   1922.67
   1881.58   1840.80   1800.38   1760.32   1720.60   1681.35   1642.69   1604.66
1567.30   1530.65
   1494.77   1459.68   1425.50   1392.22   1359.74   1328.20   1297.74   1268.31
1239.91   1212.55
   1186.25   1161.04   1136.94   1113.92   1092.00   1071.17   1051.40   1032.67
1014.95    998.21
    982.44    967.71    953.98    941.11    929.14    918.13    908.05    898.83
890.41    882.76
    875.87    869.71    864.23    859.39    855.16    851.50    848.39    845.77
843.60    841.82
    840.40    839.26    838.37    837.68    837.13    836.68    836.28    835.89
835.47    834.98
    834.38    833.64    832.74    831.66    830.39    828.92    827.26    825.41
823.41    821.30
    819.11    816.91    814.79    812.85    811.24    810.13    809.71    810.29
812.24    815.85
    821.33    829.34    840.48    855.29    874.54    898.86    929.40    968.79
1016.91   1073.62
   1137.42   1207.68   1283.74   1364.37   1515.20   1604.12   1692.76   2191.90
2280.43   2364.03
   2444.10   2521.20   2595.50   2667.15   2736.36   2803.37   2868.35   2931.62
2994.36   3058.69
   3126.34   3231.96   3304.22   3377.58   3453.26   3569.96   3650.69   3732.56
3907.89   3990.55
   4071.94   4153.06   4235.15   4485.66   4564.26   4639.16   4710.10   4777.06
4839.65   4897.82
   4951.48   5000.68   5045.36   5085.58   5122.05   5155.76   5187.38   5217.32
5245.83   5273.16
   5299.31   5324.37   5349.16   5374.14   5399.25   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3) FROM   961230 TO   971230
  84225  84225  84101  83890  83617  83447  83543  83913  84606  85266
  85633  85621  85249  84630  83650  82578  81440  80142  78773  77152
  75385  73487  71618  69831  68099  66543  65085  63730  62483  61477
  60613  59870  59295  58840  58496  58254  58107  58025  58013  58063
  58161  58308  58487  58713  58980  59271  59573  59947  60345  60737
  61121  61494  61867  62223  62514  62774  63034  63302  63552  63777
  63814  63324  61387  54670  25449  55223  61928  63661  64018  63931
  63772  63641  63564  63509  63512  63532  63530  63553  63641  63780
  63967  64190  64458  64752  65087  65455  65854  66272  66764  67309
  67867  68457  69087  69726  70365  70995  71620  72255  72886  73529
  74153  74766  75397  76001  76600  77166  77708  78217  78692  79116
  79554  79974  80395  80774  81178  81528  81841  82088  82305  82508
  82741  82963  83188  83387  83558  83710  83855  83991  84110  84219
  84292  84350  84413  84464  84492  84511  84510  84496  84468  84426
  84362  84281  84189  84070  83940  83788  83636  83466  83286  83130
  82959  82831  82698  82601  82547  82507  82489  82487  82461  82332
  82038  81435  80435  78970  76803  73827  69550  64598  59858  54305
  47466  40288  33719  29187  15971  21886  22772  13922  14811  18776
  23915  26974  29652  33098  37163  40977  44452  47044  48358  47397
  43352  19078  39531  40079  36839  21402  32396  31591  20206  31013
  32945  33152  31529  20941  34055  39546  44295  48860  53307  57173
  60264  62923  65400  67761  69941  71724  73091  74430  75580  76557
  77428  78141  78495  78593  78602  78601  78601

 NET TRANSPORT VOLUME (YARDS3) FROM   961230 TO   971230
 -49030 -49030 -48617 -47787 -46544 -44884 -42831 -40416 -37694 -34730
 -31577 -28290 -24913 -21504 -18116 -14790 -11562  -8462  -5492  -2672
    -22   2447   4731   6809   8684  10350  11798  13033  14079  14951
  15651  16192  16577  16818  16922  16905  16773  16542  16223  15822
  15355  14837  14276  13684  13081  12470  11872  11292  10738  10217
   9736   9295   8893   8516   8164   7839   7536   7245   6944   6594
   6145   5553   4835   4186   4087   4397   5261   6177   6929   7491
   7908   8220   8461   8647   8785   8870   8905   8889   8831   8729
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   8589   8405   8179   7918   7617   7252   6823   6340   5808   5228
   4602   3937   3232   2490   1714    909     80   -767  -1629  -2501
  -3386  -4276  -5157  -6022  -6870  -7695  -8493  -9263 -10006 -10726
 -11426 -12117 -12795 -13460 -14105 -14738 -15354 -15944 -16509 -17054
 -17581 -18083 -18561 -19014 -19438 -19834 -20198 -20529 -20824 -21075
 -21289 -21459 -21586 -21673 -21717 -21721 -21681 -21600 -21473 -21299
 -21079 -20806 -20480 -20094 -19650 -19139 -18561 -17912 -17192 -16402
 -15550 -14640 -13687 -12706 -11723 -10762  -9862  -9055  -8369  -7820
  -7432  -7252  -7305  -7582  -8079  -8776  -9633 -10585 -11575 -12569
 -13531 -14449 -15334 -16051 -15966 -16669 -16865 -13922 -12386 -10795
  -9542  -8589  -7920  -7490  -7239  -7081  -6921  -9167 -11285 -13180
 -14600 -14983 -17640 -19217 -20190 -20425 -21191 -21187 -20206 -21381
 -21769 -21956 -21899 -20941 -21917 -21953 -21697 -21372 -21042 -20732
 -20463 -20263 -20157 -20151 -20247 -20445 -20739 -21120 -21571 -22065
 -22566 -23034 -23432 -23741 -23952 -24061 -24061

 TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM   961230 TO   971230
 -66625 -66625 -66356 -65838 -65078 -64166 -63187 -62169 -61152 -59995
 -58603 -56953 -55082 -53063 -50882 -48685 -46503 -44301 -42133 -39915
 -37702 -35517 -33444 -31514 -29707 -28095 -26640 -25349 -24203 -23264
 -22481 -21840 -21357 -21013 -20784 -20673 -20666 -20742 -20894 -21118
 -21403 -21735 -22105 -22512 -22949 -23399 -23851 -24330 -24804 -25259
 -25691 -26098 -26487 -26851 -27174 -27468 -27750 -28026 -28304 -28591
 -28834 -28885 -28277 -25243 -10681 -25412 -28333 -28742 -28545 -28219
 -27931 -27710 -27547 -27432 -27362 -27328 -27311 -27332 -27404 -27524
 -27687 -27891 -28138 -28416 -28734 -29102 -29514 -29964 -30476 -31037
 -31631 -32260 -32924 -33618 -34327 -35043 -35772 -36510 -37258 -38014
 -38772 -39523 -40277 -41018 -41732 -42428 -43103 -43742 -44343 -44921
 -45489 -46043 -46593 -47118 -47637 -48136 -48596 -49013 -49407 -49785
 -50167 -50528 -50874 -51195 -51495 -51772 -52027 -52260 -52466 -52642
 -52787 -52910 -53003 -53067 -53103 -53114 -53096 -53050 -52971 -52862
 -52722 -52547 -52335 -52085 -51794 -51467 -51098 -50689 -50238 -49760
 -49257 -48730 -48190 -47656 -47135 -46639 -46177 -45774 -45412 -45077
 -44735 -44344 -43870 -43277 -42440 -41300 -39591 -37591 -35717 -33437
 -30499 -27367 -24528 -22620 -15969 -19277 -19819 -13922 -13598 -14785
 -16729 -17781 -18786 -20294 -22201 -24029 -25687 -28105 -29822 -30289
 -28976 -17031 -28586 -29647 -28516 -20913 -26794 -26389 -20206 -26197
 -27357 -27554 -26714 -20941 -27986 -30748 -32997 -35115 -37175 -38953
 -40364 -41594 -42776 -43955 -45095 -46086 -46913 -47776 -48573 -49311
 -49996 -50588 -50968 -51165 -51280 -51330 -51330

 TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM   961230 TO   971230
  17597  17597  17743  18049  18536  19283  20355  21752  23457  25266
  27028  28665  30164  31558  32769  33897  34938  35840  36637  37242
  37679  37967  38174  38325  38393  38444  38439  38384  38283  38216
  38131  38031  37933  37831  37706  37582  37438  37283  37117  36940
  36759  36571  36379  36196  36032  35871  35727  35622  35538  35474
  35427  35393  35378  35367  35341  35307  35285  35268  35246  35185
  34980  34441  33110  29430  14767  29808  33595  34921  35476  35711
  35838  35931  36011  36078  36148  36201  36216  36224  36234  36254
  36279  36300  36321  36335  36350  36353  36338  36308  36287  36264
  36234  36195  36155  36110  36040  35954  35852  35744  35625  35507
  35385  35247  35121  34991  34860  34732  34609  34476  34339  34195
  34060  33927  33796  33659  33527  33400  33245  33073  32896  32730
  32586  32447  32308  32183  32058  31937  31831  31730  31640  31564
  31495  31450  31418  31394  31386  31392  31413  31448  31501  31564
  31643  31741  31855  31988  32143  32329  32537  32774  33046  33355
  33710  34088  34507  34949  35412  35871  36311  36719  37042  37260
  37307  37091  36567  35693  34360  32524  29956  27008  24143  20866
  16966  12918   9193   6568      2   2607   2953      0   1212   3990
   7186   9192  10865  12804  14961  16946  18766  18939  18536  17110
  14375   2046  10947  10430   8324    488   5602   5201      0   4815
   5588   5598   4815      0   6068   8796  11299  13744  16132  18220
  19900  21330  22620  23804  24849  25639  26172  26657  27007  27244
  27429  27554  27532  27420  27322  27268  27268

  SHORELINE POSITION (FT) AFTER 701281 TIME STEPS. DATE IS   980101
   4314.47   4344.14   4373.70   4403.01   4431.86   4459.22   4483.69   4505.09
4523.58   4538.85
   4550.63   4558.77   4563.25   4564.08   4561.28   4554.80   4544.64   4530.98
4513.96   4493.68
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   4470.22   4443.78   4414.59   4382.71   4348.37   4311.92   4273.44   4233.03
4190.95   4147.36
   4102.47   4056.47   4009.55   3961.86   3913.57   3864.79   3815.72   3766.58
3717.40   3668.23
   3619.25   3570.50   3521.97   3473.78   3426.03   3378.73   3331.88   3285.51
3239.62   3194.19
   3149.23   3104.69   3060.56   3016.76   2973.26   2930.02   2887.05   2844.32
2801.85   2759.58
   2717.36   2674.97   2632.84   2595.45   2546.41   2508.78   2466.53   2424.18
2382.17   2340.25
   2298.31   2256.33   2214.36   2172.46   2130.66   2088.98   2047.44   2006.07
1964.89   1923.91
   1883.20   1842.78   1802.71   1763.04   1723.83   1685.12   1646.96   1609.38
1572.43   1536.18
   1500.73   1466.05   1432.06   1398.93   1366.77   1335.54   1305.26   1275.96
1247.67   1220.40
   1194.15   1168.87   1144.64   1121.47   1099.36   1078.31   1058.31   1039.36
1021.44   1004.54
    988.65    973.76    959.85    946.88    934.83    923.67    913.39    903.96
895.35    887.52
    880.43    874.05    868.33    863.25    858.76    854.82    851.39    848.43
845.91    843.77
    842.01    840.53    839.22    838.10    837.16    836.33    835.54    834.75
833.91    832.98
    831.92    830.69    829.27    827.63    825.73    823.60    821.36    818.98
816.42    813.69
    810.95    808.37    806.04    804.10    802.75    802.19    802.64    804.32
807.53    812.65
    820.10    830.28    843.58    860.58    881.82    907.66    939.33    978.59
1026.23   1082.06
   1145.42   1215.12   1289.65   1369.28   1517.96   1605.78   1693.14   2198.71
2286.84   2373.16
   2457.08   2537.24   2613.86   2687.14   2757.18   2824.22   2888.57   2950.55
3011.00   3071.44
   3135.65   3249.90   3318.45   3386.86   3460.33   3571.62   3650.36   3729.66
3912.73   3994.25
   4073.55   4152.28   4232.56   4488.73   4565.03   4637.48   4707.53   4774.33
4837.03   4895.35
   4949.37   4999.12   5044.54   5085.75   5123.28   5158.00   5190.48   5221.04
5249.84   5277.17
   5303.13   5327.80   5351.91   5376.04   5400.22   5424.42


 ********************
 GROSS TRANSPORT VOLUME (YARDS3) FROM   971230 TO   981230
  86173  86173  86095  85903  85662  85702  86112  86614  87001  87251
  87283  87354  87228  86859  86184  85079  83648  82047  80269  78277
  76160  74021  71890  69808  67910  66152  64494  62961  61588  60346
  59290  58364  57623  57030  56572  56220  55993  55884  55857  55927
  56059  56251  56495  56796  57137  57509  57896  58289  58683  59089
  59463  59807  60143  60416  60648  60843  60982  61065  61074  61021
  60840  60521  59840  56090  26881  56739  60407  60936  61142  61356
  61546  61724  61875  62018  62150  62289  62428  62573  62747  62951
  63184  63437  63700  63992  64349  64772  65236  65724  66268  66832
  67444  68088  68737  69411  70138  70945  71741  72532  73357  74188
  74980  75761  76546  77302  78038  78789  79530  80235  80930  81552
  82130  82660  83143  83571  84011  84411  84786  85131  85461  85801
  86130  86398  86586  86718  86862  86994  87105  87195  87253  87325
  87393  87437  87457  87470  87473  87475  87460  87414  87370  87311
  87222  87122  87014  86871  86729  86559  86398  86203  86006  85797
  85573  85364  85129  84908  84654  84397  84056  83652  83110  82370
  81363  80002  78267  76064  73209  69914  65411  59297  52837  46325
  39617  33282  27684  24186  14168  17302  18054  11362  12308  16403
  21030  23556  25397  28063  31252  34479  37568  39908  41174  40456
  37365  18903  33866  33890  31263  18687  27055  26306  18541  25760
  26933  27035  26028  19074  28736  33209  37514  41799  46044  49940
  53551  57141  60772  64237  67264  69649  71590  73258  74675  75888
  76969  77851  78287  78420  78491  78525  78525

 NET TRANSPORT VOLUME (YARDS3) FROM   971230 TO   981230
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-59967	-59967	-59644	-58978	-57996	-56675	-55070	-53181	-51051	-48721
-46234	-43629	-40924	-38138	-35301	-32433	-29579	-26759	-24001	-21317
-18710	-16200	-13809	-11551	-9441	-7499	-5735	-4152	-2751	-1529
-497	351	1025	1537	1887	2083	2139	2067	1882	1597
1226	784	283	-261	-840	-1438	-2043	-2642	-3217	-3759
-4246	-4665	-5013	-5272	-5442	-5522	-5509	-5414	-5250	-5045
-4847	-4750	-4912	-5567	-6397	-5491	-4759	-4522	-4574	-4760
-5004	-5256	-5501	-5729	-5935	-6126	-6305	-6481	-6654	-6840
-7047	-7291	-7573	-7891	-8253	-8663	-9121	-9634	-10202	-10823
-11494	-12217	-12978	-13787	-14629	-15502	-16394	-17307	-18232	-19170
-20096	-21020	-21943	-22866	-23779	-24675	-25552	-26410	-27245	-28060
-28849	-29610	-30350	-31055	-31744	-32401	-33025	-33616	-34181	-34710
-35211	-35679	-36128	-36534	-36918	-37277	-37598	-37894	-38155	-38390
-38578	-38749	-38866	-38956	-38990	-38981	-38922	-38817	-38651	-38440
-38163	-37847	-37475	-37058	-36589	-36082	-35545	-34970	-34371	-33753
-33122	-32483	-31844	-31182	-30502	-29815	-29091	-28340	-27531	-26666
-25755	-24788	-23763	-22687	-21578	-20474	-19404	-18415	-17541	-16790
-16129	-15478	-14769	-14131	-14168	-13472	-13348	-11362	-11347	-11653
-11810	-11787	-11545	-11070	-10349	-9390	-8241	-9453	-10686	-12130
-14097	-16950	-15948	-15930	-16604	-17893	-17431	-17557	-18541	-17447
-17121	-17169	-17658	-19074	-19253	-20288	-21603	-22962	-24303	-25634
-26959	-28266	-29510	-30686	-31795	-32844	-33820	-34710	-35495	-36163
-36722	-37184	-37553	-37833	-38027	-38128	-38128			

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM 971230 TO 981230

-73072	-73072	-72867	-72443	-71828	-71186	-70589	-69890	-69027	-67994
-66759	-65487	-64080	-62503	-60742	-58761	-56613	-54404	-52134	-49803
-47444	-45112	-42849	-40679	-38676	-36824	-35114	-33556	-32168	-30942
-29892	-29004	-28294	-27744	-27336	-27070	-26927	-26905	-26989	-27165
-27417	-27731	-28107	-28528	-28992	-29474	-29968	-30465	-30953	-31421
-31854	-32235	-32574	-32847	-33045	-33179	-33247	-33237	-33165	-33031
-32842	-32636	-32378	-30827	-16641	-31114	-32584	-32727	-32860	-33057
-33278	-33492	-33690	-33870	-34043	-34208	-34365	-34524	-34699	-34895
-35117	-35364	-35634	-35942	-36301	-36715	-37180	-37683	-38233	-38826
-39473	-40153	-40862	-41599	-42383	-43224	-44067	-44924	-45797	-46679
-47540	-48388	-49237	-50080	-50915	-51735	-52549	-53327	-54083	-54809
-55489	-56131	-56740	-57318	-57878	-58407	-58905	-59372	-59825	-60255
-60672	-61035	-61355	-61632	-61886	-62137	-62353	-62540	-62703	-62854
-62986	-63094	-63167	-63215	-63234	-63226	-63186	-63118	-63013	-62873
-62692	-62486	-62241	-61967	-61653	-61319	-60967	-60591	-60192	-59771
-59349	-58921	-58489	-58040	-57578	-57100	-56573	-55997	-55318	-54523
-53559	-52399	-51014	-49374	-47395	-45193	-42409	-38857	-35190	-31556
-27872	-24381	-21226	-19158	-14168	-15387	-15701	-11362	-11827	-14028
-16420	-17672	-18470	-19566	-20800	-21935	-22905	-24679	-25929	-26291
-25730	-17925	-24907	-24911	-23934	-18289	-22243	-21932	-18541	-21603
-22027	-22102	-21843	-19074	-23995	-26749	-29559	-32379	-35174	-37786
-40255	-42705	-45138	-47461	-49532	-51246	-52707	-53984	-55086	-56025
-56843	-57517	-57923	-58129	-58256	-58322	-58322			

TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM 971230 TO 981230

13103	13103	13221	13458	13831	14507	15528	16711	17975	19269
20522	21858	23154	24367	25443	26324	27034	27647	28132	28480
28730	28911	29040	29128	29234	29324	29381	29404	29420	29411
29394	29354	29322	29281	29225	29155	29066	28975	28875	28759
28642	28514	28390	28268	28148	28036	27925	27822	27734	27662
27605	27567	27564	27575	27603	27657	27736	27825	27912	27985
27994	27884	27465	25259	10243	25622	27825	28203	28287	28300
28274	28233	28186	28141	28107	28083	28061	28042	28045	28056
28067	28073	28061	28050	28046	28054	28056	28046	28030	28003
27973	27936	27881	27811	27753	27718	27668	27613	27562	27509
27442	27372	27298	27217	27131	27057	26990	26918	26839	26751
26641	26518	26389	26258	26130	26002	25877	25753	25642	25546
25462	25359	25230	25093	24968	24860	24751	24642	24545	24469
24404	24347	24295	24259	24243	24247	24266	24303	24357	24435
24530	24641	24770	24911	25069	25240	25429	25622	25821	26023
26229	26438	26650	26860	27079	27287	27484	27658	27787	27852
27803	27605	27249	26691	25816	24720	23002	20440	17649	14765
11744	8902	6457	5027	0	1915	2353	0	480	2374
4610	5883	6924	8496	10452	12545	14663	15227	15243	14161
11634	977	8959	8980	7329	397	4811	4372	0	4155
4906	4932	4185	0	4741	6461	7955	9418	10872	12156

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  13293  14438  15630  16773  17731  18402  18887  19272  19589  19861
  20121  20334  20367  20290  20227  20193  20193

  SHORELINE POSITION (FT) AFTER 788881 TIME STEPS. DATE IS   990101
   4314.47   4341.21   4367.82   4394.18   4420.18   4444.87   4466.90   4486.16
4502.84   4516.65
   4527.25   4534.46   4538.27   4538.67   4535.60   4529.04   4519.12   4505.98
4489.60   4469.99
   4447.38   4422.01   4394.05   4363.62   4330.87   4295.96   4259.02   4220.22
4179.80   4137.92
   4094.70   4050.28   4004.85   3958.62   3911.73   3864.29   3816.43   3768.28
3719.96   3671.57
   3623.20   3574.94   3526.86   3479.02   3431.46   3384.22   3337.31   3290.74
3244.51   3198.62
   3153.06   3107.83   3062.93   3018.33   2974.00   2929.96   2886.24   2842.91
2800.10   2757.96
   2716.74   2676.76   2638.23   2599.97   2541.20   2502.70   2464.11   2424.39
2383.72   2342.36
   2300.56   2258.53   2216.41   2174.33   2132.38   2090.62   2049.04   2007.68
1966.59   1925.82
   1885.41   1845.34   1805.64   1766.38   1727.58   1689.31   1651.62   1614.53
1578.07   1542.27
   1507.19   1472.85   1439.30   1406.57   1374.68   1343.67   1313.56   1284.38
1256.14   1228.85
   1202.55   1177.27   1153.04   1129.80   1107.52   1086.27   1066.08   1046.93
1028.80   1011.69
    995.57    980.43    966.26    953.07    940.82    929.39    918.77    909.02
900.14    892.04
    884.68    878.03    872.05    866.71    861.94    857.72    854.02    850.79
847.98    845.54
    843.41    841.55    839.91    838.43    837.08    835.81    834.56    833.30
831.98    830.57
    829.03    827.34    825.49    823.45    821.23    818.83    816.27    813.58
810.80    807.98
    805.20    802.53    800.10    798.04    796.52    795.71    795.81    797.04
799.77    804.39
    811.35    821.01    833.75    850.28    871.38    897.57    929.93    970.12
1018.81   1075.82
   1140.14   1210.15   1285.43   1365.79   1513.71   1605.50   1694.14   2220.79
2313.29   2398.69
   2479.38   2556.80   2631.14   2702.22   2770.28   2835.80   2899.49   2962.04
3024.64   3089.50
   3157.73   3245.10   3318.32   3392.73   3468.79   3571.47   3652.04   3734.25
3907.33   3991.05
   4074.04   4156.98   4240.58   4493.99   4573.12   4648.10   4719.17   4786.46
4849.41   4907.71
   4961.46   5010.64   5055.39   5096.01   5132.94   5166.94   5198.59   5228.17
5256.04   5282.50
   5307.50   5331.21   5354.46   5377.76   5401.08   5424.42


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 GROSS TRANSPORT VOLUME (YARDS3) FROM   981230 TO   991230
  81962  81962  81906  81800  81674  81704  81919  82157  82245  82296
  82444  82614  82554  82306  81900  81340  80453  79361  77991  76518
  75134  73691  72191  70678  69133  67604  66172  64868  63890  62970
  62134  61391  60754  60241  59793  59396  59062  58813  58625  58511
  58457  58447  58484  58565  58680  58828  58993  59184  59397  59639
  59899  60190  60517  60836  61122  61365  61610  61863  62066  62230
  62213  61697  59957  53911  25059  54437  60534  62289  62837  62934
  62882  62847  62793  62751  62746  62760  62750  62753  62806  62920
  63069  63277  63596  63952  64322  64712  65130  65562  66022  66524
  67048  67568  68084  68617  69163  69721  70305  70895  71472  72027
  72614  73209  73780  74305  74827  75329  75803  76301  76859  77369
  77848  78328  78759  79161  79535  79861  80160  80439  80690  80908
  81099  81263  81413  81542  81651  81753  81818  81872  81936  81996
  82055  82091  82115  82129  82130  82127  82120  82110  82094  82074
  82057  82018  81995  81952  81915  81860  81814  81755  81706  81658
  81638  81624  81592  81568  81560  81542  81474  81334  81063  80667
  80088  79239  78081  76509  74261  71496  67792  62891  57034  50755
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44218	37814	31811	27703	15220	18665	20305	12580	12425	16926
22552	26058	28845	32546	36668	40648	44164	46471	47561	46666
42903	19462	39567	40028	36950	20213	31985	31031	19938	29956
31495	31650	30340	20592	33011	37800	42100	46254	50333	54046
57256	60210	62991	65862	68408	70345	71865	73153	74187	75019
75747	76319	76570	76623	76644	76657	76657			

NET TRANSPORT VOLUME (YARDS3) FROM 981230 TO 991230

-39002	-39002	-38593	-37789	-36590	-35025	-33115	-30908	-28434	-25750
-22891	-19913	-16867	-13787	-10713	-7689	-4748	-1914	791	3347
5738	7945	9969	11817	13497	15011	16366	17554	18580	19460
20205	20813	21281	21619	21840	21958	21981	21914	21779	21579
21328	21035	20716	20374	20021	19661	19302	18944	18585	18222
17852	17460	17038	16580	16073	15513	14898	14230	13498	12690
11805	10879	10072	9727	9731	9785	10172	11010	11947	12818
13569	14206	14737	15168	15503	15739	15879	15920	15876	15767
15601	15386	15125	14821	14479	14106	13702	13271	12816	12331
11819	11281	10708	10108	9487	8849	8187	7508	6809	6097
5366	4615	3851	3081	2308	1529	750	-23	-783	-1531
-2267	-2983	-3679	-4360	-5019	-5659	-6285	-6895	-7488	-8062
-8610	-9131	-9624	-10087	-10514	-10908	-11271	-11596	-11882	-12129
-12333	-12495	-12611	-12682	-12702	-12678	-12602	-12475	-12295	-12063
-11777	-11442	-11057	-10623	-10144	-9618	-9050	-8448	-7815	-7161
-6489	-5804	-5111	-4428	-3770	-3153	-2596	-2124	-1773	-1562
-1496	-1585	-1852	-2311	-2934	-3675	-4491	-5355	-6293	-7389
-8674	-10116	-11715	-13480	-15220	-14909	-15077	-12580	-10894	-9536
-8201	-6850	-5576	-4454	-3524	-2818	-2344	-4514	-6779	-9065
-11312	-13704	-14620	-15700	-16847	-18080	-18608	-19223	-19938	-19818
-19736	-19862	-20202	-20592	-19746	-19076	-18582	-18228	-17953	-17716
-17524	-17365	-17212	-17076	-16958	-16862	-16794	-16746	-16723	-16715
-16730	-16758	-16786	-16804	-16816	-16822	-16822			

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM 981230 TO 991230

-60481	-60481	-60250	-59797	-59131	-58366	-57515	-56533	-55340	-54025
-52666	-51261	-49712	-48048	-46305	-44512	-42604	-40636	-38600	-36581
-34697	-32869	-31114	-29429	-27819	-26298	-24902	-23657	-22656	-21756
-20964	-20287	-19739	-19312	-18975	-18717	-18542	-18448	-18426	-18466
-18560	-18704	-18884	-19095	-19331	-19583	-19847	-20121	-20408	-20707
-21023	-21364	-21737	-22128	-22523	-22925	-23357	-23817	-24283	-24769
-25204	-25410	-24940	-22091	-7663	-22326	-25179	-25642	-25444	-25058
-24656	-24320	-24028	-23791	-23623	-23509	-23435	-23416	-23464	-23572
-23736	-23947	-24237	-24565	-24923	-25303	-25713	-26146	-26604	-27093
-27614	-28144	-28685	-29255	-29841	-30438	-31058	-31693	-32330	-32967
-33623	-34300	-34965	-35612	-36259	-36900	-37523	-38161	-38820	-39447
-40055	-40656	-41219	-41758	-42276	-42759	-43219	-43670	-44090	-44486
-44856	-45200	-45521	-45818	-46082	-46324	-46543	-46736	-46904	-47064
-47193	-47290	-47361	-47403	-47418	-47402	-47363	-47292	-47196	-47066
-46916	-46734	-46524	-46287	-46027	-45739	-45428	-45103	-44759	-44406
-44066	-43713	-43351	-42998	-42665	-42345	-42038	-41731	-41420	-41108
-40791	-40412	-39966	-39410	-38596	-37585	-36143	-34121	-31666	-29073
-26444	-23964	-21764	-20591	-15220	-16787	-17691	-12580	-11659	-13231
-15375	-16455	-17210	-18502	-20096	-21732	-23252	-25493	-27170	-27866
-27106	-16583	-27093	-27863	-26900	-19147	-25296	-25128	-19938	-24887
-25616	-25755	-25270	-20592	-26378	-28439	-30343	-32244	-34144	-35883
-37392	-38784	-40105	-41469	-42684	-43604	-44329	-44950	-45457	-45867
-46239	-46537	-46678	-46715	-46731	-46740	-46740			

TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM 981230 TO 991230

21477	21477	21654	22006	22544	23340	24396	25626	26905	28277
29775	31346	32845	34258	35593	36823	37855	38723	39391	39931
40435	40815	41083	41247	41315	41307	41266	41212	41237	41216
41169	41103	41021	40933	40817	40678	40518	40364	40206	40045
39889	39741	39595	39469	39352	39247	39147	39066	38991	38931
38872	38823	38779	38707	38599	38438	38255	38045	37779	37457
37007	36290	35014	31820	17396	32109	35351	36650	37393	37875
38224	38528	38765	38956	39125	39248	39314	39337	39341	39343
39339	39332	39361	39387	39402	39409	39415	39415	39419	39424
39431	39422	39398	39362	39325	39284	39245	39201	39135	39063
38990	38915	38818	38694	38568	38429	38273	38142	38034	37916
37791	37671	37537	37399	37254	37095	36937	36776	36601	36421
36247	36069	35897	35731	35569	35419	35273	35136	35026	34933

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 34856  34795  34749  34720  34711  34722  34760  34820  34899  35008
 35143  35293  35466  35665  35884  36125  36380  36653  36940  37247
 37577  37910  38235  38569  38897  39190  39441  39605  39646  39549
 39297  38825  38114  37101  35660  33910  31650  28765  25371  21683
 17769  13848  10049   7111      0   1877   2614      0    765   3695
  7175   9604  11634  14046  16572  18913  20909  20976  20390  18801
 15794   2879  12474  12163  10052   1066   6687   5903      0   5069
  5880   5894   5069      0   6632   9362  11758  14013  16191  18164
 19865  21421  22890  24395  25724  26740  27537  28205  28732  29153
 29508  29780  29892  29912  29918  29918  29918


********************
GROSS TRANSPORT VOLUME (YARDS3) FROM   991230 TO   991231
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0

NET TRANSPORT VOLUME (YARDS3) FROM   991230 TO   991231
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0

TRANSPORT VOLUME TO THE LEFT (YARDS3) FROM   991230 TO   991231
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
     0      0      0      0      0      0      0      0      0      0
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0			

TRANSPORT VOLUME TO THE RIGHT (YARDS3) FROM 991230 TO 991231

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0			

MEAN NET ANNUAL TRANSPORT (YARDS3/1000)

-67	-67	-66	-65	-63	-60	-58	-54	-50	-45
-41	-36	-31	-26	-22	-18	-14	-11	-8	-5
-2	0	2	4	5	6	7	8	9	9
10	10	10	10	10	10	9	9	8	7
7	6	5	4	3	2	1	0	-1	-2
-2	-3	-3	-3	-3	-3	-3	-4	-4	-4
-5	-5	-5	-5	-5	-5	-3	-2	-1	0
0	0	1	1	1	1	1	1	1	1
1	0	0	0	0	-1	-2	-2	-3	-4
-5	-6	-7	-8	-9	-10	-11	-12	-13	-14
-16	-17	-18	-19	-20	-21	-22	-23	-24	-25
-26	-26	-27	-28	-28	-29	-30	-30	-31	-31
-32	-32	-33	-33	-33	-34	-34	-34	-34	-34
-34	-35	-35	-35	-35	-35	-35	-36	-36	-36
-36	-36	-36	-35	-35	-34	-34	-34	-33	-33
-32	-31	-30	-29	-27	-26	-25	-24	-23	-21
-20	-18	-17	-16	-14	-13	-12	-12	-11	-11
-11	-12	-13	-14	-16	-19	-22	-14	-11	-10
-8	-7	-5	-5	-5	-5	-7	-10	-12	-15
-18	-19	-21	-21	-21	-20	-20	-20	-20	-20
-20	-21	-21	-21	-22	-22	-22	-22	-22	-23
-24	-26	-27	-29	-30	-31	-32	-33	-35	-36
-37	-38	-38	-37	-37	-37	-37			

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OUTPUT OF UNDIFFRACTED BREAKING WAVE STATISTICS

N.B. THESE VALUES ARE NOT SMOOTHED!

AVERAGE UNDIFFRACTED BREAKING WAVE HEIGHTS (FT).

0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.71	0.72	0.72
0.72	0.73	0.73	0.73	0.73	0.73	0.72	0.72	0.71	0.71
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.70	0.70	0.70	0.70	0.70	0.71	0.71	0.71	0.71	0.71
0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
0.73	0.73	0.73	0.73	0.72	0.72	0.72	0.71	0.70	0.68
0.66	0.65	0.64	0.63	0.62	0.62	0.62	0.62	0.62	0.62
0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65
0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.62
0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.65	0.66
0.67	0.67	0.68	0.69	0.70	0.70	0.70	0.71	0.71	0.71
0.71	0.71	0.72	0.72	0.72	0.72				

AVERAGE UNDIFFRACTED BREAKING WAVE ANGLE TO SHORELINE (DEG)

-4.89	-4.89	-4.89	-4.82	-4.66	-4.41	-3.54	-3.55	-2.59	-1.87
-1.13	-0.38	0.25	0.91	1.48	1.99	2.41	2.76	3.05	3.31
3.57	3.83	4.03	4.20	4.35	4.48	4.58	4.67	4.72	4.74
4.77	4.80	4.82	4.83	4.84	4.85	4.84	4.81	4.78	4.73
4.68	4.62	4.57	4.51	4.42	4.35	4.26	4.17	4.06	3.93
3.81	3.77	3.75	3.76	3.78	3.81	3.82	3.82	3.79	3.72
3.65	3.57	3.49	3.34	2.90	3.13	3.09	3.64	3.87	4.01
4.08	4.14	4.17	4.19	4.21	4.21	4.21	4.21	4.21	4.19
4.16	4.14	4.10	4.06	4.02	3.97	3.92	3.87	3.83	3.77
3.69	3.61	3.52	3.44	3.34	3.24	3.13	3.02	2.92	2.83
2.74	2.65	2.54	2.44	2.33	2.27	2.18	2.10	2.02	1.94
1.85	1.77	1.70	1.64	1.57	1.50	1.44	1.38	1.31	1.24
1.17	1.10	1.05	1.01	0.96	0.92	0.89	0.86	0.84	0.81
0.80	0.78	0.77	0.74	0.72	0.70	0.68	0.65	0.63	0.60
0.58	0.57	0.57	0.60	0.66	0.73	0.73	0.73	0.76	0.78
0.81	0.84	0.94	1.04	1.15	1.28	1.34	1.40	1.45	1.51
1.56	1.62	1.68	1.71	1.64	1.58	1.40	0.97	0.88	0.50
0.16	-0.07	-0.15	-0.24	-0.08	-4.58	-1.49	-1.96	-7.86	0.29
0.67	0.73	0.84	0.91	0.88	0.78	0.54	0.22	-0.26	-0.71
-0.88	-1.09	-5.58	-1.61	-1.42	-1.23	-3.84	-1.22	-1.06	-5.53
-1.15	-1.29	-1.40	-1.54	-7.78	-1.40	-1.61	-1.70	-1.60	-1.47
-1.41	-1.29	-1.23	-1.17	-1.11	-1.15	-1.00	-0.95	-0.95	-0.99
-1.07	-1.06	-1.23	-1.08	-0.94	-0.81				

AVERAGE LONGSHORE TRANSPORT RATE BASED ON UNDIFFRACTED WAVES (FT3/SEC)

-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04
-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
-0.01	-0.01	-0.01	-0.01	0.00	-0.03	-0.01	-0.01	-0.05	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
-0.01	-0.01	-0.04	-0.02	-0.01	-0.01	-0.03	-0.01	-0.01	-0.04

```
  -0.01  -0.01  -0.01  -0.01  -0.05  -0.01  -0.02  -0.02  -0.02  -0.02
  -0.02  -0.02  -0.02  -0.02  -0.03  -0.03  -0.03  -0.03  -0.03  -0.03
  -0.03  -0.03  -0.03  -0.03  -0.03  -0.03
 ********* END OF UNDIFFRACTED WAVE SECTION *********


 LONGSHORE TRANSPORT (FT3/SEC)
   0.08   0.08   0.08   0.09   0.09   0.09   0.08   0.08   0.08   0.07
   0.07   0.07   0.06   0.06   0.05   0.04   0.04   0.03   0.02   0.02
   0.01   0.01   0.00   0.00   0.00   0.00   0.01   0.01   0.01   0.02
   0.02   0.02   0.02   0.02   0.03   0.03   0.03   0.03   0.03   0.03
   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
   0.03   0.03   0.03   0.02   0.02   0.02   0.02   0.02   0.02   0.02
   0.02   0.02   0.02   0.02   0.01   0.02   0.02   0.02   0.02   0.02
   0.02   0.02   0.02   0.02   0.02   0.02   0.02   0.02   0.02   0.02
   0.02   0.02   0.02   0.01   0.01   0.01   0.01   0.01   0.01   0.01
   0.01   0.01   0.01   0.00   0.00   0.00   0.00   0.00   0.00   0.00
   0.00   0.00   0.01   0.01   0.01   0.01   0.01   0.01   0.02   0.02
   0.02   0.02   0.02   0.03   0.03   0.03   0.03   0.03   0.03   0.03
   0.04   0.04   0.04   0.04   0.04   0.04   0.05   0.05   0.05   0.05
   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05
   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05   0.05
   0.05   0.06   0.06   0.06   0.06   0.07   0.07   0.07   0.08   0.08
   0.09   0.10   0.11   0.11   0.12   0.13   0.14   0.15   0.15   0.12
   0.07   0.03  -0.02  -0.05  -0.05  -0.03  -0.06  -0.06  -0.02  -0.02
  -0.03  -0.04  -0.02   0.00   0.02   0.05   0.07   0.09   0.09   0.09
   0.07   0.02   0.03   0.03   0.01  -0.01  -0.03  -0.04  -0.04  -0.05
  -0.05  -0.05  -0.05  -0.04  -0.02   0.01   0.04   0.07   0.10   0.13
   0.14   0.15   0.14   0.14   0.13   0.13   0.12   0.12   0.12   0.11
   0.11   0.11   0.11   0.10   0.10   0.10   0.10

  CALCULATED FINAL SHORELINE POSITION (FT)
   4314.47   4337.58   4360.62   4383.51   4406.23   4427.91   4447.23   4464.12
4478.84   4491.13
   4500.66   4507.21   4510.68   4511.11   4508.49   4502.71   4493.75   4481.75
4466.68   4448.55
   4427.57   4403.84   4377.42   4348.51   4317.23   4283.76   4248.34   4211.03
4171.89   4131.21
   4089.22   4046.06   4001.80   3956.63   3910.67   3864.07   3816.98   3769.50
3721.74   3673.81
   3625.80   3577.80   3529.91   3482.17   3434.66   3387.43   3340.52   3293.95
3247.76   3201.96
   3156.57   3111.60   3067.05   3022.90   2979.05   2935.47   2892.23   2849.45
2807.28   2765.79
   2724.86   2683.72   2641.27   2600.04   2540.70   2499.26   2456.86   2416.15
2376.03   2335.68
   2294.90   2253.78   2212.54   2171.33   2130.25   2089.36   2048.65   2008.06
1967.57   1927.31
   1887.35   1847.69   1808.36   1769.40   1730.91   1692.94   1655.50   1618.64
1582.42   1546.87
   1512.04   1478.00   1444.71   1412.15   1380.42   1349.60   1319.68   1290.66
1262.54   1235.41
   1209.29   1184.13   1159.94   1136.72   1114.50   1093.27   1073.03   1053.77
1035.53   1018.29
   1002.00    986.69    972.36    958.99    946.54    934.93    924.19    914.35
905.30   896.97
    889.36    882.46    876.21    870.56    865.49    860.97    856.95    853.37
850.20   847.38
    844.86    842.60    840.54    838.65    836.86    835.13    833.42    831.69
829.90   828.03
    826.04    823.91    821.62    819.16    816.54    813.77    810.89    807.94
804.97   802.01
    799.10    796.39    794.05    792.23    791.10    790.84    791.73    794.05
798.02   803.96
    812.26    823.46    837.95    855.98    878.08    904.87    937.54    978.35
1028.49   1086.94
   1152.06   1223.09   1299.76   1380.88   1511.20   1606.09   1694.43   2229.30
2323.08   2408.70
   2490.01   2568.43   2644.20   2716.97   2786.91   2854.26   2919.13   2982.16
3044.76   3108.89
```

3177.72   3253.72   3327.96   3402.38   3479.28   3575.67   3657.20   3740.47
3906.00   3990.66
4075.20   4159.70   4244.32   4487.30   4568.29   4644.65   4716.66   4784.19
4847.27   4905.97
4960.04   5009.37   5054.27   5095.01   5132.06   5166.28   5198.16   5227.94
5255.94   5282.52
5307.69   5331.42   5354.61   5377.86   5401.14   5424.42

CALCULATED SEAWARDMOST SHORELINE POSITION (FT)

4314.47   4396.58   4480.66   4567.40   4634.52   4705.86   4770.13   4841.94
4883.50   4919.69
4935.19   4934.56   4924.15   4911.33   4877.27   4849.34   4816.49   4778.97
4741.64   4698.82
4647.09   4599.58   4549.54   4497.90   4444.77   4390.73   4335.73   4280.07
4225.01   4170.14
4116.19   4064.09   4013.26   3963.65   3914.29   3864.99   3817.18   3769.59
3721.77   3673.82
3625.80   3577.80   3529.91   3482.17   3434.66   3387.43   3340.52   3293.95
3247.76   3201.96
3156.57   3111.60   3067.06   3022.90   2979.05   2935.47   2892.23   2849.55
2807.46   2766.52
2731.68   2697.95   2666.17   2638.95   2625.90   2631.30   2573.21   2510.73
2452.64   2399.51
2348.34   2297.99   2248.30   2199.00   2149.90   2101.26   2052.96   2008.51
1967.84   1927.49
1887.42   1847.75   1808.40   1769.44   1730.97   1693.00   1655.57   1618.72
1582.51   1546.96
1512.13   1478.04   1444.76   1412.22   1380.55   1349.74   1319.82   1290.81
1262.73   1235.62
1209.51   1184.39   1160.17   1136.95   1114.74   1093.49   1073.23   1053.97
1035.71   1018.45
1002.18   986.89   972.55   959.15   946.67   935.08   924.35   914.45
905.36   897.07
889.54   882.67   876.37   870.68   865.60   861.08   857.05   853.47
850.29   847.46
844.93   842.66   840.60   838.71   837.39   837.17   837.17   837.67
838.67   840.08
841.71   847.20   864.10   869.25   850.74   853.76   857.23   861.14
865.53   870.32
892.23   897.46   903.95   919.01   900.08   904.74   910.22   916.11
922.66   938.10
946.28   953.39   959.30   967.49   975.86   987.90   1004.17   1025.62
1047.19   1096.36
1160.59   1231.10   1306.79   1391.51   1546.76   1622.05   2248.98   2253.59
2334.47   2420.17
2501.22   2578.90   2654.09   2726.80   2795.68   2860.73   2922.12   2982.69
3044.76   3108.89
3178.43   3272.45   3330.55   3402.42   3498.18   3592.40   3677.66   3772.81
3924.85   3998.61
4075.27   4160.69   4248.60   4516.15   4586.85   4658.62   4727.33   4792.74
4854.40   4912.22
4965.74   5014.54   5058.80   5098.92   5135.17   5168.73   5200.19   5229.71
5257.52   5283.88
5308.65   5331.96   5408.49   5435.66   5419.15   5424.42

CALCULATED LANDWARDMOST SHORELINE POSITION (FT)

4314.47   4337.58   4360.62   4383.51   4406.23   4427.91   4447.23   4464.12
4478.84   4491.13
4500.66   4507.21   4510.68   4511.11   4508.49   4502.71   4493.75   4481.75
4466.68   4448.55
4427.57   4403.84   4377.42   4348.51   4317.23   4283.76   4248.34   4211.03
4171.89   4131.21
4089.22   4046.06   4001.80   3956.63   3910.67   3864.07   3816.98   3769.50
3721.74   3673.81
3625.80   3577.80   3529.91   3482.17   3434.66   3387.43   3340.52   3293.95
3247.76   3201.96
3156.57   3111.60   3067.05   3022.90   2979.05   2935.47   2892.23   2849.45
2807.28   2765.79
2724.86   2683.72   2641.27   2600.04   2540.70   2499.26   2456.86   2416.15
2376.03   2335.68

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   2294.90   2253.78   2212.54   2171.33   2130.25   2089.36   2048.65   2008.06
1967.57   1927.31
   1887.35   1847.69   1808.36   1769.40   1730.91   1692.94   1655.50   1618.64
1582.42   1546.87
   1512.04   1478.00   1444.71   1412.15   1380.42   1349.60   1319.68   1290.66
1262.54   1235.41
   1209.29   1184.13   1159.94   1136.72   1114.50   1093.27   1073.03   1053.77
1035.53   1018.29
   1002.00    986.69    972.36    958.99    946.54    934.93    924.19    914.35
905.30    896.97
    889.36    882.46    876.21    870.56    865.49    860.97    856.95    853.37
850.20    847.38
    844.86    842.60    840.54    838.65    836.86    835.13    833.42    831.69
829.90    828.03
    826.04    823.91    821.62    819.16    816.54    813.77    810.89    807.94
804.97    802.01
    799.10    796.39    794.05    792.23    791.10    790.84    791.73    794.05
798.02    803.96
    812.26    823.46    837.95    855.98    878.08    904.87    937.54    978.35
1028.49   1086.94
   1152.06   1223.09   1299.76   1380.88   1511.20   1606.09   1694.43   2229.30
2323.08   2408.70
   2490.01   2568.43   2644.20   2716.97   2786.91   2854.26   2919.13   2982.16
3044.76   3108.89
   3177.72   3253.72   3327.96   3402.38   3479.28   3575.67   3657.20   3740.47
3906.00   3990.66
   4075.20   4159.70   4244.32   4487.30   4568.29   4644.65   4716.66   4784.19
4847.27   4905.97
   4960.04   5009.37   5054.27   5095.01   5132.06   5166.28   5198.16   5227.94
5255.94   5282.52
   5307.69   5331.42   5354.61   5377.86   5401.14   5424.42

  CALCULATED REPRESENTATIVE OFFSHORE CONTOUR POSITION (FT)
   5298.72   5318.03   5337.33   5356.63   5375.94   5395.24   5411.42   5425.97
5438.63   5449.14
   5457.22   5462.59   5465.30   5465.24   5462.32   5456.52   5447.82   5436.24
5421.82   5404.60
   5384.66   5362.09   5337.00   5309.50   5279.73   5247.82   5213.90   5178.13
5140.65   5101.62
   5061.18   5019.48   4976.67   4932.89   4888.28   4842.95   4797.05   4750.68
4703.96   4656.98
   4609.85   4562.64   4515.44   4468.32   4421.33   4374.53   4327.96   4281.66
4235.66   4189.99
   4144.67   4099.72   4055.13   4010.90   3966.88   3923.05   3879.39   3835.89
3792.54   3749.30
   3706.17   3663.08   3620.00   3576.93   3533.83   3490.99   3448.39   3406.04
3363.91   3321.99
   3280.26   3238.73   3197.41   3156.32   3115.47   3074.89   3034.46   2994.20
2954.12   2914.28
   2874.72   2835.48   2796.60   2758.13   2720.11   2682.57   2645.57   2609.13
2573.31   2538.14
   2503.65   2469.88   2436.87   2404.65   2373.24   2342.67   2312.96   2284.15
2256.24   2229.25
   2203.21   2178.11   2153.97   2130.81   2108.61   2087.39   2067.15   2047.88
2029.58   2012.25
   1995.86   1980.42   1965.91   1952.30   1939.59   1927.74   1916.72   1906.52
1897.10   1888.43
   1880.47   1873.20   1866.56   1860.53   1855.05   1850.10   1845.64   1841.60
1837.96   1834.66
   1831.67   1828.93   1826.41   1824.06   1821.83   1819.69   1817.61   1815.54
1813.46   1811.34
   1809.16   1806.92   1804.60   1802.22   1799.78   1797.31   1794.84   1792.44
1790.17   1788.11
   1786.36   1785.06   1784.34   1784.39   1785.38   1787.55   1791.14   1796.46
1803.85   1813.71
   1826.46   1842.52   1862.31   1886.25   1915.09   1949.23   1988.97   2038.16
2096.93   2165.17
   2242.61   2328.88   2423.50   2525.90   2635.43   2750.65   2870.70   2994.87
3115.10   3230.71
   3341.27   3446.55   3546.40   3640.77   3729.73   3813.58   3892.98   3968.30
4040.63   4114.03
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   4188.92   4265.57   4344.10   4425.93   4511.13   4599.66   4691.10   4785.22
4881.70   4978.81
   5076.11   5173.15   5269.46   5364.62   5455.53   5541.74   5622.90   5698.85
5769.38   5834.37
   5894.41   5949.51   5999.74   6045.26   6086.27   6124.37   6159.75   6192.76
6223.77   6253.09
   6281.04   6306.56   6332.09   6357.62   6383.14   6408.67

 CALCULATED VOLUMETRIC CHANGE = -5.56E+04 (YARDS3)
  SIGN CONVENTION:  EROSION (-), ACCRETION (+)
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