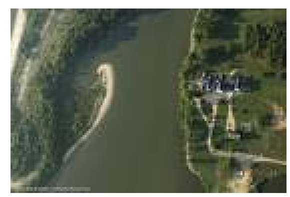
St Jerome Creek, St. Mary's County, Maryland
Section 107 Small Navigation Project

Feasibility Report And
Integrated Environmental Assessment





U.S. Army Corps of Engineers
Baltimore District

DRAFT APPENDICES

US Army Corps
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Baltimore District

APPENDIX A

ECONOMIC EVALUATION

October 2012

NAVIGATION IMPROVEMENT

St. Jerome Creek
St. Mary's County, Maryland

SECTION 107
FEASIBILITY STUDY

ECONOMIC ASSESSMENT

PREPARED BY:
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
FOR
THE BALTIMORE DISTRICT

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Introduction

The purpose of this analysis is to identify and evaluate the economic benefits of providing navigation improvements to the existing Federal Navigation Channel at St. Jerome Creek, Maryland. St. Jerome Creek is located near the towns of Ridge and Airedale, Maryland on the western shore of the Chesapeake Bay and provides outlet to the bay for a variety of commercial and recreational vessels. Navigation through the creek is currently impeded by shoaling that reduces the controlling depth in the channel from the authorized 7 Ft. to areas of only 2 Ft. MLLW within five years of dredging.

This economic analysis includes a description of the study area and a cost-benefit analysis of improvement alternatives compared to the without-project condition. The economic benefits of the project are determined by comparing the without-project condition to the with-project condition, and evaluating the difference between the two. In this case, the primary benefits include the avoided cost associated with the watermen's delays as they attempt to maneuver around shoals in the creek or wait for adequate tidal range to leave or return to the harbor. These costs include vessel damage cost, lost labor cost, increased fuel consumption cost and increased ordinary maintenance cost. Costs and benefits are converted to present value equivalents based on a 50 year project life and the FY 2012 Federal interest rate of 4.00 percent (4.00%) used for water resource projects.

In accordance with the Paperwork Reduction Act of 1995, a questionnaire approved by the Office of Management and Budget (OMB) was used to gather information on the specific problems encountered in the creek. The survey was delivered to approximately 100 local watermen whose boats are permanently based in St. Jerome Creek. Forty percent (40%) of the surveys were returned and used to form the basis of this analysis. Additional information was obtained from officials at the St. Mary's County Department of Public Works and Transportation (DPW&T).

Description of Study Area

St. Jerome Creek is located in St. Mary's County, Maryland, along the western shore of the Chesapeake Bay. The existing federal navigation project consists of a turning basin 200 Ft. wide and 300 Ft. long opposite the town of Airedale, and a 4,900 Ft. channel which enters the creek between St. Jerome Neck on the northern side and Fresh Pond Neck to the south. The channel is approximately five miles north of the mouth of the Potomac River and six miles southeast of St. Mary's City.

St. Mary's DPW&T and marina owners indicate that over 700 vessels use the creek on an annual basis, including commercial, charter, and recreational power and sail boats. There are two commercial marinas which offer approximately 300 slips and moorings; 61 of which are used permanently by commercial watermen and charter boats which harvest crabs, oysters and finfish from within the creek as well as the open Chesapeake Bay. Based on survey response, distribution of the fleet by vessel draft is shown below in Table 1. The number of vessels at each draft was derived by taking the number of survey responses for each vessel draft and applying that percentage to the known size of the commercial fleet within the harbor. For instance, 10 out of 40 vessels reported drafting 4 – 4.9 Ft. It was assumed that the survey response was a representative sample of the fleet; therefore 15 out of 61 boats would have the same draft (10/40 x 61).

Table 1 - Commercial Fleet Based on Vessel Draft

Vessel Draft (Ft.)	Number of Boats
5 - 6'	17
4 - 4.9'	15
3 - 3.9'	15
2 - 2.9'	14
Total	61

St. Jerome Creek serves a critical role as safe harbor for vessels seeking shelter from dangerous sea and wind conditions. It is the only possible point of refuge between Solomon's Island Harbor located 15.5 miles north by water, and Point Lookout located 11 miles south on the Potomac side of the point. Point Lookout can only accommodate shallow draft vessels while vessels drafting more than 4 Ft. would have to navigate around the point to Smith Creek, located 13.8 miles to the north on the St. Mary's River. This is an important consideration as it is recreational boaters with larger draft cabin cruisers or sailboats that would more likely require safe harbor from unanticipated storms on the Chesapeake.

St. Jerome Creek also harbors a fireboat for the St. Mary's County Volunteer Fire Dept. located in the town of Ridge. The 28 Ft. vessel is used for fire and rescue on water as well as for fighting fires on shorefront properties.

Economic Setting

St. Jerome Creek is a small rural area dependent upon recreational boating and commercial fishing of crabs, oysters and finfish for employment and earning opportunities. Data from the 2008 US Census Bureau County Business Patterns show latest available employment and payroll statistics for industries related to commercial fishing and recreational boating. Data is shown in Table 2 for St. Mary's County, which includes the towns of Airedale and Ridge. The data shown likely understate the true impacts of industries dependent on navigation, since most fishermen are self employed, and data from small employers are left out for confidentiality reasons.

Table 2 - Navigation Dependent Industries
St. Mary's County, Maryland 2008 County Business Patterns

NAICS Sector	Sector Name	Number of Employees	Annual Payroll	Number of Establishments
424460	Fish & Seafood Wholesalers	<19	NOT AVAILABLE	1
445220	Fish & Seafood Markets	<19	$306,000	5
441222	Boat Dealers	<19	NOT AVAILABLE	2
713930	Marinas	26	$746,000	6

Source: http://censtats.census.gov/cbpnaic/cbpnaic.shtml

Latest available data from National Marine Fisheries Service (NMFS) show overall economic impact of the fishing industry for the Maryland portion of the Chesapeake Bay was $76 Million in 2009 and $104.9M in 2010. It is estimated that St. Jerome Creek contributes approximately 2% of the overall catch; valued at approximately M $1.7M in 2009 and $2.4M in 2010. Table 3 shows the species distribution of the commercial landings in pounds and dollars for the past two years for Maryland Chesapeake Bay and St. Jerome Creek. Percentages of 'Other Finfish' and 'Miscellaneous Catch' are not included in the St. Jerome Creek estimate. These categories included species such as swordfish, sharks, snapping turtles and horseshoe crabs. While some of these species may be landed at St. Jerome Creek, especially through charter catches, taking a percentage of the overall Chesapeake catch would overstate landings at St. Jerome Creek. Data presented below does not include any landings made from commercial charter boats that operate out of the St. Jerome Creek marinas.

Table 3 - MD Chesapeake (Commercial Fish Catch)

YEAR	2009				2010			
Species	MD Chesapeake Pounds	MD Chesapeake Dollars ($)	St. Jerome Pounds	St. Jerome Dollars ($)	MD Chesapeake Pounds	MD Chesapeake Dollars ($)	St. Jerome Pounds	St. Jerome Dollars ($)
OYSTERS	497,971	$3,849,002	12,449	$96,225	430,004	4,361,465	10,750	$109,037
SCALLOPS	521,140	$3,160,118	13,029	$79,003	152,835	1,186,903	3,821	$29,673
OTHER SHELLFISH	6,423,137	$4,788,567	160,578	$119,714	7,579,957	5,910,519	189,499	$147,763
AMERICAN LOBSTER	30,988	$120,691	0	$0	30,005	134,021	0	$0
CRAB, BLUE	40,283,899	$52,019,502	1,007,097	$1,300,488	66,611,021	79,511,983	1,665,276	$1,987,800
CRAB, BLUE, SOFT	16	$72	0	$2	50,401	292,822	1,260	$7,321
CRAB, JONAH	11,657	$13,500	291	$338	18,046	24,026	451	$601
CRAB, OTHER	474,805	$196,526	11,870	$4,913	0	0	0	$0
STRIPED BASS	2,812,686	$5,181,282	5,625	$10,363	2,548,794	5,530,837	5,098	$11,062
FLOUNDER	332,057	883,025	8,301	$22,076	309,680	635,626	7,742	$15,891
PERCH, WHITE	1,301,146	$943,046	32,529	$23,576	1,704,584	1,157,794	42,615	$28,945
PERCH, YELLOW	53,605	$59,010	1,340	$1,475	63,019	71,243	1,575	$1,781
CROAKER, ATLANTIC	597,102	$444,132	14,928	$11,103	661,304	534,568	16,533	$13,364
BLUEFISH	163,329	$57,506	4,083	$1,438	125,857	61,740	3,146	$1,544
SPOT	528,625	$420,381	13,216	$10,510	598,416	399,555	14,960	$9,989
OTHER FINFISH	13,682,407	$3,493,023	0	$0	21,328,303	4,661,070	0	$0
MISC. CATCH	598,385	$427,734	0	$0	699,094	$402,640	0	$0
TOTAL LANDINGS	**68,312,955**	**$76,057,117**	**1,285,338**	**1,681,222**	**102,911,320**	**104,876,812**	**1,962,726**	**2,364,768**

Source for MD Chesapeake:
http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html
* St. Jerome Estimate based on MD DNR data

A privately owned aquaculture facility for oyster farming is also located inside the mouth of the channel. Circle C Oyster Ranch owns 10 acres of land with 65 acres of water bottom rights and currently uses 200 feet of dock and 3.2 acres of surface water in St. Jerome Creek. Circle C raises oysters from free swimming, microscopic larvae all the way to market size. The dock supports 14 upwellers for seed production as well as a lift system for boat access and oyster harvest. Oysters are supplied to local restaurants and markets as well as to Chesapeake Bay research projects aimed at measuring the oysters' effect on water quality.

Existing Conditions

The Chesapeake Bay shoreline to the north and south of St. Jerome Creek is characterized by low-lying sandy beaches. Tides in the area are semi-diurnal, with a period of approximately 12 hours, resulting in two high tides and two low tides each day.

Littoral drift along the shoreline causes rapid shoaling at the channel entrance and just inside the mouth of the channel. Shoaling in a single location in the channel restricts safe usage of the entire channel and determines the controlling depth for calculating delays. Once shoaling occurs, the channel needs to be dredged to provide safe unrestricted navigation. The most recent dredging to the authorized depth of 7 Ft. MLLW was performed at the end of May, 2006. A survey performed by the Baltimore District Corps of Engineers in December, 2008 showed depths in the channel had generally been reduced by 3 to 4 Ft. with a controlling depth of only 2 Ft. MLLW in many areas. An analysis of changes in channel depth was conducted by consultants, Andrews, Miller and Associates and is presented in the main report.

Maneuvering around the shoals severely restricts the ability of vessels to leave or enter the creek during periods of low tide. Boaters must wait until the tide has risen enough for safe passage. When the controlling depth reaches 5 feet, the wait can range from 30 minutes to 6 hours depending on vessel draft and safe underkeel clearance. With a mean diurnal tidal range of 1.5 Feet, vessels drafting greater than 5.5 feet can no longer safely use the channel as the controlling depth falls below 4 Ft. MLLW. (4 Ft. MLLW + 1.5 Ft. of rising tide does not provide safe underkeel clearance) Vessels drafting greater than 4.5 feet cannot safely use the channel when the controlling depth reaches 3 feet MLLW.

Without-project Condition

Without navigation improvements to St. Jerome Creek, shoaling will continue to impede navigation of larger boats within a year following maintenance dredging, and commercial watermen will continue to experience navigation problems and operating inefficiencies. Without dredging, tidal delays, grounding damages, and operating inefficiencies will increase as depths in the harbor decrease. For the without-project condition, it is projected that shoaling will continue to decrease the controlling depth in the harbor to -2 feet within 5 years of maintenance dredging, requiring a shortened dredge cycle of every 5 years to maintain the minimal depths required to keep the harbor viable.

With-project Condition -- Preliminary Alternatives

The Corps considered several preliminary alternatives to protect the mouth of St. Jerome Creek with stone jetties, breakwaters and channel realignment. Preliminary alternatives at the north (N) and south (S) of the entrance to the creek included the following:

- Alt 1 – 1400 FT S jetty with 200 FT breakwater; 1300 FT N jetty
- Alt 2 – 1400 FT S jetty with 200 FT breakwater; 700 FT N jetty
- Alt 3 – 1100 FT S jetty; 1300 FT N jetty
- Alt 3a – 1100 FT S jetty; 1700 FT N jetty

- Alt 4 – 985 FT S jetty; 1305 FT N jetty
- Alt 5 – 800 FT S jetty with three breakwaters of 300 FT each;1200 FT N jetty
- Alt 6 – 700 FT S jetty with three breakwaters of 200 FT each;1300 FT N jetty
- Alt 7 – 1330 FT S jetty; 1770 FT N jetty
- Alt 7 – with realigned channel – same as above; channel straightened inside creek
- Alt 8 – 800 FT S jetty with three breakwaters of 300 FT each; channel straightened inside creek
- Alt 9 – 800 FT S jetty; three breakwaters of 300 FT each to the north

The advantages and disadvantages of each of the preliminary alternatives were evaluated by the Project Delivery Team (PDT) and four alternatives were selected as Concept Plans for further evaluation. These four plans included Alternatives 4, 7, 7 with a realigned channel, and 7a. Alternative 7a is a variation of Alternative 7. The change in 7a is in the alignment of the channel and constructed jetties heading due east compared to the southeast direction in Alternative 7. The Cost Benefit analysis and BCRs for preliminary alternatives are presented in Table 4 below. Table 4 shows the concept plans updated to reflect the improved dredging cycles that would occur if each plan is constructed. A more detailed description of each alternative can be found in the main document.

Table 4 - Preliminary Alternatives chosen for Concept Design (Updated Cost Benefit Analysis)

Annualized Cost Calculation	Alt 4	Alt 7	Alt 7 w/ Realignment	Alt 7a
Scheduled Dredge Cycle	**5.6 Yrs**	**5.8 Yrs**	**10.5 Yrs**	**9 Yrs**
Project Construction Cost	$3,208,000	$3,720,000	$4,572,000	$4,442,700
Interest During Construction	$32,259	$37,407	$45,975	$44,675
Total Investment Cost	$3,240,259	$3,757,407	$4,617,975	$4,487,375
Capital Recovery Factor (CRF) =	0.0466	0.0466	0.0466	0.0466
Average Annual Cost	$150,800	$174,900	$215,000	$208,900
Operation & Maintenance Cost	$113,500	$111,600	$64,700	$76,700
Total Annual Cost of Alternatives	$264,300	$286,500	$279,700	$285,600

Calculation of NED Annual Benefits	Alt 4	Alt 7	Alt 7 w/ Realignment	Alt 7a
Scheduled Dredge Cycle	**5.6 Yrs**	**5.8 Yrs**	**10.5 Yrs**	**9 Yrs**
Annual Costs of Without-Project Condition	$763,700	$763,700	$763,700	$763,700
Less: Annual Costs Prevented with Project	($306,100)	($266,300)	($324,900)	($304,200)
Net Annual Benefits for With-Project Alternatives	$457,600	$497,400	$438,800	$459,500
Plus: Benefits for Recreational Quality Enhancement	$174,300	$174,300	$174,300	$174,300
Total Annual Benefits of Alternatives	$631,900	$671,700	$613,100	$633,800
Benefit to Cost Ratio				
Annual Benefits of Alternatives	$631,900	$671,700	$613,100	$633,800
Annual Costs	$264,300	$286,500	$279,700	$285,600
Annual Net Benefits	$367,600	$385,200	$333,400	$348,200
Benefit to Cost Ratio	**2.39**	**2.34**	**2.19**	**2.22**

With-project Condition -- Concept Design Alternatives

After a geotechnical investigation of the bottom substrate at the jetty foundation site, the number of concept design alternatives was increased to include jetties constructed of materials other than stone. . Cost estimates at the feasibility level were developed for concept plans that were technically more feasible and most efficient at reducing shoaling and the frequency of maintenance dredging.

Alternative 7 with a realigned channel was chosen as the optimal design plan for non-stone consideration. This alternative, shown in Figure 1, consists of the construction of two jetties at the entrance to Saint Jerome Creek. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit would have a length of 1,770 feet. The existing entrance channel would be realigned to eliminate the turn in the channel to the left after it passes Deep Point and continues into the existing turning basin. The channel section realignment would make the channel more hydraulically efficient for reducing shoaling potential. The realigned channel would proceed straight through the inlet and intersect the channel section in Saint Jerome Creek. Alternative 7 with realigned channel was further evaluated under two construction options for the materials used.

- Batter Pile Vinyl Sheet Pile Jetty - This option consists of driving 30 Ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 Ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 Ft. MLLW. To provide initial stabilization of the sheet pile, 50 Ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile.

- Earth-Fill Vinyl Sheet Pile Jetty - This option consists of two (2) walls of 46 ft. lengths of vinyl sheet pile separated by a distance of 8 ft. and driven into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 Ft. MLLW. The elevation of the bottom of the sheet pile would be about - 41 Ft. MLLW. To provide stabilization of the sheet pile walls, structural fill (possibly dredged material) would be placed between the walls and steel tie rods would be placed at 5 ft. intervals on each side of the walls to provide tension between the walls. A concrete cap would be placed on the top of the sheet pile walls.

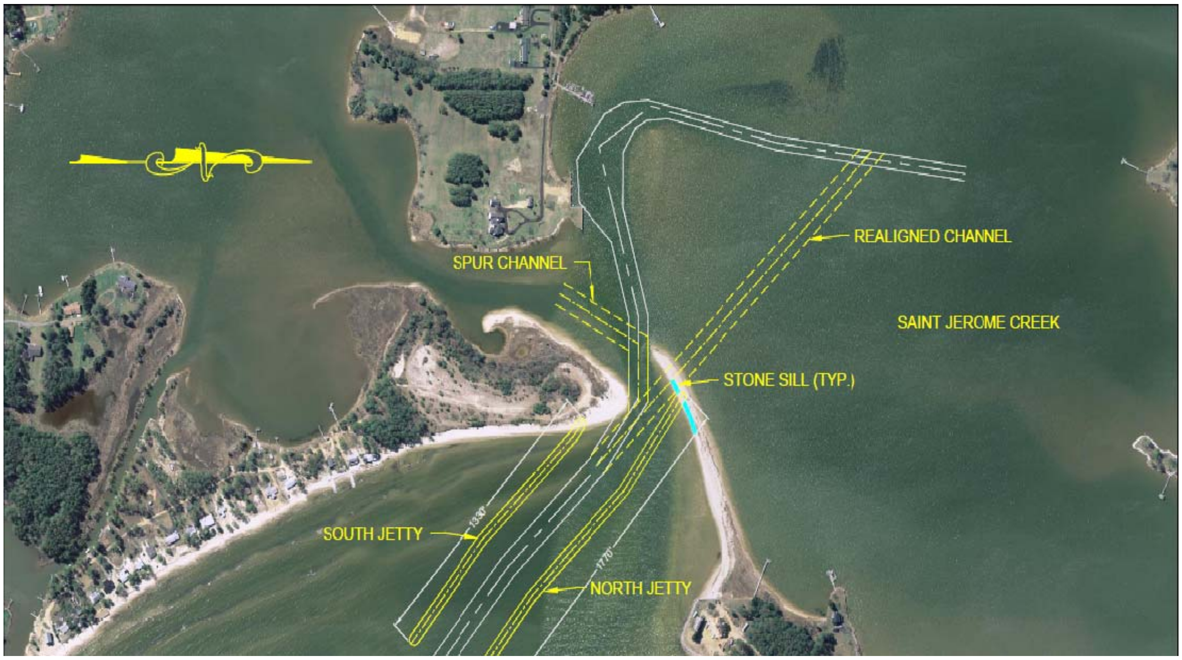


Figure 1- Twin jetties with realigned channel

Benefit Analysis

Benefits of jetty construction are calculated by comparing the projected without-project conditions to the with-project condition. Benefits to commercial fishing boats include the avoided costs of lost labor and fuel due to tidal delays, the avoided cost of increased boat maintenance and damages due to hitting the bottom in shallow depths, and the avoided costs of re-locating to a deeper harbor further away from traditional fishing grounds. Benefits are calculated based on data obtained from the watermen survey, and data obtained from the Maryland Department of Public Works and Transportation. The existing, without-project condition assumes a shoaling rate that reduces the controlling depth from 7 Ft. down to 2 Ft. every five years.

1. Lost Labor Prevented due to Tidal Delays

Tidal delays are currently experienced to some extent by all vessels, but most significantly by the larger charter vessels and workboats based in the harbor. The extent of tidal delays was calculated using a mean tide chart developed for St. Jerome Creek and the current distribution of commercial fishing vessels in the harbor, based on the current fleet list and vessel draft. An under-keel clearance of 1 Ft. was assumed. The fishing vessels make an average of 180 trips per year, have an average crew size of 3 per boat, and are all day boats. When shoaling reaches the point where the highest tides no longer provide adequate depth for safe passage in the channel, the larger boats must relocate to a new harbor with adequate depth. The 17 vessels drafting 5-6 Ft. will experience almost an hour of delay when the channel controlling depth reaches 6 Ft. When the controlling depth reaches 5 Ft. the delay increases to approximately 4 hrs and 20 minutes for these boats while vessels drafting 4 to 4.9 Ft. will start experiencing delays of approximately one hour. When the channel shoals to 4 Ft. controlling depth, the largest vessels can no longer gain sufficient depth by waiting for the tide and must move to a deeper harbor. If maintenance dredging is not performed, this pattern of delays will continue until only the smallest vessels are left in the harbor.

To calculate the overall cost of delays, the value of watermen's time is estimated using the current average wage for Farming, Fishing and Forestry workers in southern Maryland. The November 2010 average wage was $14.75 according to the Maryland Department of Labor, Licensing and Regulation; Office of Workforce Information & Performance, Occupational Employment Statistics Program is available at (http://www.dllr.state.md.us/lmi/wages/PAGE0398.HTM (accessed 4/26/2011). Calculations of lost labor at each controlling depth for vessels remaining at St Jerome Creek are presented in Table 5 below.

Table 5 - Lost Labor due to Tidal Delays

channel controlling depth	vessel draft	mid-point draft (Ft.)	# vessels	channel depth required	tidal height required	avg. delay per trip (hrs)	trips/yr	avg. hours delayed per year	cost/hr ($)	crew/ boat	annual cost of lost labor due to delays
6 FT	5-6'	5.5	17	6.5	0.5	0.90	180	162	14.75	3	$121,991
	4-4.9'	4.5	15	5.5	-0.5	0.00	180	0	14.75	3	$0
	3-3.9'	3.5	15	4.5	-1.5	0.00	180	0	14.75	3	$0
	2-2.9'	2.5	14	3.5	-2.5	0.00	180	0	14.75	3	$0
	Total		61					162			$121,991
5 FT	5-6'	5.5	17	6.5	1.5	4.29	180	773	14.75	3	$581,240
	4-4.9'	4.5	15	5.5	0.5	0.90	180	162	14.75	3	$107,640
	3-3.9'	3.5	15	4.5	-0.5	0.00	180	0	14.75	3	$0
	2-2.9'	2.5	14	3.5	-1.5	0.00	180	0	14.75	3	$0
	Total		61					170			$688,880
4 FT	5-6'	5.5	17	6.5	2.5	0.00	180	0	14.75	3	$0
	4-4.9'	4.5	15	5.5	1.5	4.29	180	773	14.75	3	$512,859
	3-3.9'	3.5	15	4.5	0.5	0.90	180	162	14.75	3	$107,640
	2-2.9'	2.5	14	3.5	-0.5	0.00	180	0	14.75	3	$0
	Total		61					935			$620,498
3 FT	5-6'	5.5	17	6.5	3.5	0.00	180	0	14.75	3	$0
	4-4.9'	4.5	15	5.5	2.5	0.00	180	0	14.75	3	$0
	3-3.9'	3.5	15	4.5	1.5	4.29	180	773	14.75	3	$512,859
	2-2.9'	2.5	14	3.5	0.5	0.90	180	162	14.75	3	$100,464
	Total		61					935			$613,322
2 FT	5-6'	5.5	17	6.5	4.5	0.00	180	0	14.75	3	$0
	4-4.9'	4.5	15	5.5	3.5	0.00	180	0	14.75	3	$0
	3-3.9'	3.5	15	4.5	2.5	0.00	180	0	14.75	3	$0
	2-2.9'	2.5	14	3.5	1.5	4.29	180	773	14.75	3	$478,668
	Total		61					773			$478,668

A summary of Lost Labor Costs, rounded to the nearest hundred, is provided in Table 6 below.

Table 6 - Lost Labor Cost Due to Tidal Delays

YEAR	CHANNEL DEPTH (Feet)	COST OF LOST LABOR DUE TO VESSEL DELAYS
1	6	$121,991
2	5	$688,880
3	4	$620,498
4	3	$613,322
5	2	$478,668

Tidal delays to commercial watermen under existing conditions are valued at $122,000 and would worsen to a projected $479,000 by year five as shoaling in the harbor continues. After maintenance dredging in year 5, tidal delays would be reduced to $122,000 and would worsen again to $479,000 by year 10. This pattern would continue through the 50 year period of analysis. With the project, these tidal delays would be prevented.

2. Vessel Damages Prevented

Twenty-six out of 40 survey respondents reported vessel damages from striking shoals or running aground. The same percentage of vessels reporting damages was applied to the entire fleet to derive the number of vessels damaged at each draft. Table 7 below shows the distribution of vessels by draft and the estimated number of vessels incurring damages as the channel shoals.

Table 7 - Number of Vessels Damaged

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
Vessel draft (Ft.)	# boats by draft that responded to survey	# boats reporting damage on survey	Damaged boats as percent of fleet	Number of Vessels in fleet	Estimated # boats damaged
			Col 3 ÷ Col 2		Col 4 x Col 5
5-6'	11	8	73%	17	12
4-4.9'	10	7	70%	15	11
3-3.9'	10	3	30%	15	5
2-2.9'	9	8	89%	14	12
Total	40	26		61	40

Survey response indicates average annual repair costs for wheel and rudder damage due to striking a shoal are $2,000. Damages are calculated based on channel depths being reduced to 2 Ft. by year 5 of the dredge cycle. It is assumed that only the largest vessels drafting over 5 feet (12 vessels from Col 6 above) are likely to incur damages in the first year. The second year assumes vessels drafting between 4 and 6 feet (12+11= 23) are likely to incur damages. In year 3, only 16 vessels drafting between 3 and 4.9 Ft. (11 + 5) will experience damages because the larger boats will relocate to deeper harbors. When the channel shoals to a controlling depth of 3 feet, 17 vessels drafting between 2 and 3.9 Ft. (12 + 5) will experience damages. When the depth is reduced to 2 feet, only the smallest vessels left in the harbor are expected to incur damages. A summary of vessel damages incurred throughout a single dredging cycle, rounded to the nearest hundred, is provided in Table 8 below. The costs of repeating this cycle over the 50-year period of analysis for the project can be seen in Table . These damages would be prevented with the project.

Table 8 - Vessel Damage Cost

YEAR	Channel Depth (Ft.)	DAMAGE COST PER VESSEL	# VESSELS DAMAGED	ANNUAL DAMAGE COST
1	6	$2,000	12	$24,000
2	5	$2,000	23	$46,000
3	4	$2,000	16	$32,000
4	3	$2,000	17	$34,000
5	2	$2,000	12	$24,000

3. Increased Ordinary Maintenance Prevented

Watermen report that maneuvering around shoals, scraping the bottom, stopping to assist other boats grounded in the channel, and waiting for adequate tidal range to re-enter the harbor have a direct impact on ordinary vessel maintenance. This is in line with other economic analyses performed in the Chesapeake Bay area. Costs are increased by sand in intake screens, filters and impellers leading to additional maintenance on the engine and electronic systems. The estimated average increase in cost per vessel for an ordinary maintenance event is $3,000 based on survey response data. The estimated cost associated with increased ordinary maintenance for 61 boats is calculated based on channel depths and a 5-year dredge cycle the same as for vessel damages. A summary of increased ordinary maintenance, rounded to the nearest hundred, is provided in Table 9. These damages would be prevented with the project.

Table 9 - Increased Ordinary Maintenance Cost

YEAR	COST PER MAINTENANCE EVENT	ADDITIONAL MAINT. EVENTS	INCREASED MAINTENANCE COST
1	$3,000	12	$36,000
2	$3,000	23	$69,000
3	$3,000	16	$48,000
4	$3,000	17	$51,000
5	$3,000	12	$36,000

4. Additional Fuel Consumption Prevented

Additional fuel cost is related to the time spent by watermen waiting for the tide to shift to avoid the shoals in the channel upon leaving or re-entering the creek. Restricted depth also causes delays when encountering other vessels in the channel as there is insufficient depth to maneuver. The rate of fuel consumption is based on the average hours of delays experienced annually, calculated from the mean tide chart developed for St. Jerome Creek. When shoaling reaches the point where the highest tides no longer provide adequate depth for safe passage in the channel, the larger boats must re-locate to a deeper harbor.

The average rate of fuel consumption at low speed used while in the harbor or waiting outside the mouth of the channel is reported to be 4.0 gallons per hour. The price per gallon is $4.27 based on the May 2011 retail prices of diesel fuel provided by the U.S. Dept. of Energy. A summary of additional fuel costs, rounded to the nearest hundred, is provided in Table 10.

Table 10 - Additional Fuel Consumption Cost

YEAR	ADDITIONAL GALLONS FUEL	COST PER GALLON	ADDITIONAL FUEL COST
1	649	$4.27	$2,800
2	3739	$4.27	$16,000
3	3739	$4.27	$16,000
4	3739	$4.27	$16,000
5	3091	$4.27	$13,200

5. Relocation Costs Prevented

If current shoaling conditions continue at St. Jerome Creek, the channel will no longer be viable for many vessels and they will have to relocate to a deeper harbor. The closest harbor with enough depth and space to accommodate commercial and charter vessels is Solomon's Island Harbor, located 41 miles to the north of St. Jerome Creek. The full expense incurred by watermen to move their vessels to a new harbor may include additional over-land travel and possibly relocating entire families. These expenses are beyond the scope of this analysis and are replaced by the estimated expense presented in Table 11 below. The additional cost of relocation was calculated by determining the number of boats that would be forced to leave the harbor due to drafts greater than the channel depth (please refer to Col 5 from Table 7 above). The number of additional miles per fishing trip was used to determine additional fuel and labor based on average speeds of 30 miles per hour and a fuel consumption rate of 4 miles per gallon. The pattern of boats leaving is repeated through the 50-year project life because it is assumed that after the channel is dredged, some vessels will return or new vessels will come in.

Table 11 - Vessel Relocation Cost

Channel Depth	Number of Boats leaving	Additional miles to fishing grounds	Average number of fishing trips per year	Total Additional miles traveled	Fuel cost per gallon	Additional Fuel Cost @ 4 MPG	Additional hours to fishing grounds @ 30 MPH	Crew per vessel not including captain	Average Labor Rate per Hour *(MD Dept. of Labor)	Additional Labor Cost @ $14.75/Hr	Total Additional Cost for vessel relocation
6	0	41	180	0	$ 4.27	$ -	0	3	$ 14.75	$ -	$ -
5	0	41	180	0	$ 4.27	$ -	0	3	$ 14.75	$ -	$ -
4	17	41	180	126,684	$ 4.27	$ 135,235	4,223	3	$ 14.75	$ 186,859	$ 322,094
3	15	41	180	111,780	$ 4.27	$ 119,325	3,726	3	$ 14.75	$ 164,876	$ 284,201
2	15	41	180	111,780	$ 4.27	$ 119,325	3,726	3	$ 14.75	$ 164,876	$ 284,201
				350,244		$ 373,885	11,675			$ 516,610	$ 890,495

6. Enhanced Recreational Quality

With the Federal dredging project, recreational users of the harbor will experience increased accessibility and improved safety. As the harbor shoals in over time, the difference between the quality of the recreational experience with and without the project will increase. The recreational quality of the harbor will be lowest by year five of the period of analysis, after which time, maintenance dredging will be performed and the recreational quality will return to existing conditions. With the project, boaters will be able to safely and easily navigate in and out of the harbor over the 50-year period of analysis.

To estimate the value of this improvement in the recreational quality with the project, the Unit Day Value method was used. The Unit Day Value method was developed by the Corps of Engineers to evaluate changes in the value of recreational quality. Recreational activities are evaluated based on five criteria that characterize the quality of the recreational experience. Point values for the existing conditions and for the with-project condition are compared. Since the depths in the harbor are currently at or near the projected without-project depths, the point values for the Existing Condition and the Future Shoaled Condition are the same. Total point values are converted to dollar values based on current Corps guidance as contained in EGM #12-03 Fiscal Year 2012 (latest available). The Unit Day Value analysis for St. Jerome Creek is shown in Table 12 below.

The figures shown in Table 12 are used to create an average annualized value for improved recreational quality that would exist due to completion of the project. For the without-project condition, recreational values are calculated based on shoaling and reduced channel depth within five years of dredging carried out over the 50-year analysis period. With 640 recreational boats in the harbor, assuming an average of 78 boating days per summer season (April – September @ 3 days/week) and an average of 3 people per boat, the value for recreational quality is calculated as follows:

(640 boats) x (78 days/year) x (3 users/boat) x ($ Value/user/day) = Value of Recreational Quality

The maximum recreational value for the future shoaled condition is $1.2 M versus an estimated value of $1.4M for the improved condition. The value of recreational experience is greatest in the year when dredging is performed and decreases as the channel shoals in. Benefits accrued to the project equal the difference between the future with-project condition and the shoaled, without-project condition. Based on historical dredging events which have occurred approximately every 10 years, the average recreational benefits in the with-project condition amount to $174,300 annually over the 50-year period of analysis. These benefits would increase if maintenance dredging occurred more frequently.

Table 12 - Unit Day Value Analysis

UDV CRITERIA	POINT RANGE	Without Project POINTS	With Project POINTS
Recreation Experience[1]	0 - 30	4	13
Availability of Opportunity	0 - 18	2	4
Carrying Capacity	0 - 14	5	14
Accessibility[2]	0 - 18	16	16
Environmental Aestetic	0 - 20	20	20
		47	67
$ Value/User/Day Hard-Keyed		$8.36	$9.60
Number of Days		78	78
Number of Users		3	3
Number of Boats		640	640
		$1,251,994	$1,437,696

Under current Corps policy, recreation must be incidental in the formulation process and may not be more than fifty percent of the total benefits required for justification of a project.

BCRs based on commercial benefits alone as well as combined commercial and recreational benefits are presented in Table 22 at the end of this document. No alternatives require more than 50% recreational benefits for project justification, therefore all recreation benefits are included in the final benefit to cost analysis.

7. Reduced Maintenance Dredging

Project benefits are calculated by comparing the with-project dredge cycle against the without-project condition. The without-project condition has a greater shoaling rate which reduces depth in the channel to 2 feet within 5 years. To maintain the channel at its proper depth, dredging is required every five years at an annualized cost of $129,800 over the 50-year project life. Project construction would slow the rate of shoaling and require maintenance dredging when the controlling depth is reduced to 4 feet. Benefits are based on extending the time period between dredging events, and comparing those costs to the cost of dredging every 5 years. Dredging costs for each alternative are presented in Table 13 below.

Table 13 Maintenance Dredging Costs

Alternative	Dredge Cycle	Cost per Dredge Event	Annualized Cost of Dredging	Annual Benefit
Without-Project Condition	5	702,800	129,800	$ -
Alternative 4	5.6	723,680	113,500	$ 16,300
Alt 7 - Stone w/o channel realignment	5.8	730,640	111,600	$ 18,200
Alt 7 - Stone Realignment Inside	10.5	876,800	64,700	$ 65,100
Alt 7 - Timber w/Realignment	10.5	876,800	64,700	$ 65,100
Alt 7 - Timberguard w/Realignment	10.5	876,800	64,700	$ 65,100
Alt 7 - Concrete w/Realignment	10.5	876,800	64,700	$ 65,100
Alt 7a - Stone Realignment Outside	9	842,000	76,700	$ 53,100

Benefit Summary

The economic benefits of the project are determined by comparing the without-project condition to the with-project condition, and evaluating the difference between the two. In this case, the primary benefits include the avoided cost associated with the watermen's delays as they attempt to maneuver around shoals in the creek or wait for adequate tidal range to leave or return to the harbor. These costs include vessel damage cost, lost labor cost, increased fuel consumption, increased ordinary maintenance cost, and the cost of relocating to a deeper harbor.

A summary of principle costs currently incurred by commercial watermen is presented below in Table14. Average annualized costs associated with the existing condition amount to $763,700. Costs incurred by watermen change based on each project alternative and the new shoaling rate caused by the project. Summaries of watermen's costs under each with-project condition are presented in Tables 15 through 18.

Table 14 - Summary of Costs Incurred by Commercial Watermen – Without Project (10 Yr Dredge Cycle)

Channel Depth	Analysis Period	Labor Lost Due to Tidal Delays	Additional Fuel Cost	Vessel Damages	Incr. Maint. Cost	Relocation Costs	Total Cost	Pres. Value Factor	PV Of Total Cost
6.0	1	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.9615	$177,684
5.0	2	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.9246	$758,025
4.0	3	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.8890	$923,305
3.0	4	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.8548	$853,542
2.0	5	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.8219	$687,188
6.0	6	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.7903	$146,043
5.0	7	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.7599	$623,041
4.0	8	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.7307	$758,889
3.0	9	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.7026	$701,549
2.0	10	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.6756	$564,818
6.0	11	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.6496	$120,037
5.0	12	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.6246	$512,094
4.0	13	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.6006	$623,752
3.0	14	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.5775	$576,622
2.0	15	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.5553	$464,239
6.0	16	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.5339	$98,662
5.0	17	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.5134	$420,904
4.0	18	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.4936	$512,678
3.0	19	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.4746	$473,941
2.0	20	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.4564	$381,571
6.0	21	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.4388	$81,093
5.0	22	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.4220	$345,953
4.0	23	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.4057	$421,384
3.0	24	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.3901	$389,545
2.0	25	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.3751	$313,624
6.0	26	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.3607	$66,652
5.0	27	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.3468	$284,348
4.0	28	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.3335	$346,347
3.0	29	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.3207	$320,178
2.0	30	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.3083	$257,776
6.0	31	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2965	$54,783
5.0	32	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.2851	$233,713
4.0	33	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.2741	$284,672
3.0	34	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.2636	$263,163
2.0	35	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.2534	$211,873
6.0	36	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2437	$45,028
5.0	37	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.2343	$192,095
4.0	38	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.2253	$233,980
3.0	39	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.2166	$216,301
2.0	40	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.2083	$174,144
6.0	41	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2003	$37,010
5.0	42	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.1926	$157,888
4.0	43	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.1852	$192,314
3.0	44	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.1780	$177,783
2.0	45	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.1712	$143,134
6.0	46	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.1646	$30,419
5.0	47	$688,880	$16,000	$46,000	$69,000	$0	$819,880	0.1583	$129,773
4.0	48	$620,498	$16,000	$32,000	$48,000	$322,094	$1,038,592	0.1522	$158,068
3.0	49	$613,322	$16,000	$34,000	$51,000	$284,201	$998,523	0.1463	$146,125
2.0	50	$478,668	$13,200	$24,000	$36,000	$284,201	$836,069	0.1407	$117,645
Present Value of Costs to Watermen									$16,405,397
Capital Recovery Factor (CRF)									0.0466
Average Annual Cost = (PV of Total Costs) x (CRF)									$763,700

Table 15 - Costs Incurred by Commercial Watermen – Alt 4 (5.6 Yr Dredge Cycle)

Channel Depth	Analysis Period	Labor Lost Due to Tidal Delays	Additional Fuel Cost	Vessel Damages	Incr. Maint. Cost	Relocation Costs	Total Cost	Pres. Value Factor	PV Of Total Cost
6.5	1	$0	$0	$0	$0	$0	$0	0.9615	$0
5.9	2	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.9246	$170,850
5.4	3	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.8890	$423,300
4.9	4	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.8548	$439,580
4.3	5	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.8219	$328,979
6.5	6	$0	$0	$0	$0	$0	$0	0.7903	$0
5.9	7	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.7599	$140,426
5.4	8	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.7307	$347,922
4.9	9	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.7026	$361,303
4.3	10	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.6756	$270,397
6.5	11	$0	$0	$0	$0	$0	$0	0.6496	$0
5.9	12	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.6246	$115,420
5.4	13	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.6006	$285,966
4.9	14	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.5775	$296,965
4.3	15	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.5553	$222,246
6.5	16	$0	$0	$0	$0	$0	$0	0.5339	$0
5.9	17	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.5134	$94,867
5.4	18	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.4936	$235,043
4.9	19	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.4746	$244,083
4.3	20	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.4564	$182,670
6.5	21	$0	$0	$0	$0	$0	$0	0.4388	$0
5.9	22	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.4220	$77,974
5.4	23	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.4057	$193,189
4.9	24	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.3901	$200,619
4.3	25	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.3751	$150,142
6.5	26	$0	$0	$0	$0	$0	$0	0.3607	$0
5.9	27	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.3468	$64,089
5.4	28	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.3335	$158,787
4.9	29	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.3207	$164,894
4.3	30	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.3083	$123,405
6.5	31	$0	$0	$0	$0	$0	$0	0.2965	$0
5.9	32	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2851	$52,676
5.4	33	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.2741	$130,511
4.9	34	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.2636	$135,531
4.3	35	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.2534	$101,430
6.5	36	$0	$0	$0	$0	$0	$0	0.2437	$0
5.9	37	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2343	$43,296
5.4	38	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.2253	$107,271
4.9	39	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.2166	$111,396
4.3	40	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.2083	$83,368
6.5	41	$0	$0	$0	$0	$0	$0	0.2003	$0
5.9	42	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.1926	$35,586
5.4	43	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.1852	$88,169
4.9	44	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.1780	$91,560
4.3	45	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.1712	$68,523
6.5	46	$0	$0	$0	$0	$0	$0	0.1646	$0
5.9	47	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.1583	$29,249
5.4	48	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.1522	$72,468
4.9	49	$133,747	$3,400	$22,000	$33,000	$322,100	$514,247	0.1463	$75,255
4.3	50	$312,253	$8,000	$32,000	$48,000	$0	$400,253	0.1407	$56,321
√									
Present Value of Costs to Watermen									$6,575,727
Capital Recovery Factor (CRF)									0.0466
Average Annual Cost = (PV of Total Costs) x (CRF)									$306,100

Table 16 Costs Incurred by Commercial Watermen – Alt 7 No Channel Realignment (5.8 Yr Dredge Cycle)

Channel Depth	Analysis Period	Labor Lost Due to Tidal Delays	Additional Fuel Cost	Vessel Damages	Incr. Maint. Cost	Relocation Costs	Total Cost	Pres. Value Factor	PV Of Total Cost
6.5	1	$0	$0	$0	$0	$0	$0	0.9615	$0
6.0	2	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.9246	$170,850
5.4	3	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.8890	$327,977
4.9	4	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.8548	$416,751
4.4	5	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.8219	$269,918
6.5	6	$0	$0	$0	$0	$0	$0	0.7903	$0
6.0	7	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.7599	$140,426
5.4	8	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.7307	$269,573
4.9	9	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.7026	$342,539
4.4	10	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.6756	$221,853
6.5	11	$0	$0	$0	$0	$0	$0	0.6496	$0
6.0	12	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.6246	$115,420
5.4	13	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.6006	$221,570
4.9	14	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.5775	$281,542
4.4	15	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.5553	$182,347
6.5	16	$0	$0	$0	$0	$0	$0	0.5339	$0
6.0	17	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.5134	$94,867
5.4	18	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.4936	$182,114
4.9	19	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.4746	$231,407
4.4	20	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.4564	$149,876
6.5	21	$0	$0	$0	$0	$0	$0	0.4388	$0
6.0	22	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.4220	$77,974
5.4	23	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.4057	$149,685
4.9	24	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.3901	$190,200
4.4	25	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.3751	$123,187
6.5	26	$0	$0	$0	$0	$0	$0	0.3607	$0
6.0	27	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.3468	$64,089
5.4	28	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.3335	$123,030
4.9	29	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.3207	$156,330
4.4	30	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.3083	$101,251
6.5	31	$0	$0	$0	$0	$0	$0	0.2965	$0
6.0	32	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2851	$52,676
5.4	33	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.2741	$101,122
4.9	34	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.2636	$128,492
4.4	35	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.2534	$83,221
6.5	36	$0	$0	$0	$0	$0	$0	0.2437	$0
6.0	37	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.2343	$43,296
5.4	38	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.2253	$83,115
4.9	39	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.2166	$105,611
4.4	40	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.2083	$68,401
6.5	41	$0	$0	$0	$0	$0	$0	0.2003	$0
6.0	42	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.1926	$35,586
5.4	43	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.1852	$68,314
4.9	44	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.1780	$86,805
4.4	45	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.1712	$56,221
6.5	46	$0	$0	$0	$0	$0	$0	0.1646	$0
6.0	47	$121,991	$2,800	$24,000	$36,000	$0	$184,791	0.1583	$29,249
5.4	48	$302,030	$6,900	$24,000	$36,000	$0	$368,930	0.1522	$56,149
4.9	49	$107,640	$2,800	$22,000	$33,000	$322,100	$487,540	0.1463	$71,347
4.4	50	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.1407	$46,210
√									
Present Value of Costs to Watermen									$5,720,592
Capital Recovery Factor (CRF)									0.0466
Average Annual Cost = (PV of Total Costs) x (CRF)									$266,300

Table 17 Costs Incurred by Watermen – Alt 7 Channel Realignment Inside (10.5 Yr Dredge Cycle)

Channel Depth	Analysis Period	Labor Lost Due to Tidal Delays	Additional Fuel Cost	Vessel Damages	Incr. Maint. Cost	Relocation Costs	Total Cost	Pres. Value Factor	PV Of Total Cost
6.7	1	$0	$0	$0	$0	$0	$0	0.9615	$0
6.4	2	$0	$0	$0	$0	$0	$0	0.9246	$0
6.1	3	$59,592	$1,350	$24,000	$36,000	$0	$120,942	0.8890	$107,517
5.9	4	$151,580	$3,400	$24,000	$36,000	$0	$214,980	0.8548	$183,766
5.6	5	$259,603	$5,900	$24,000	$36,000	$0	$325,503	0.8219	$267,540
5.3	6	$433,520	$9,900	$46,000	$69,000	$0	$558,420	0.7903	$441,328
5.0	7	$661,555	$15,300	$46,000	$69,000	$0	$791,855	0.7599	$601,745
4.7	8	$162,687	$4,200	$22,000	$33,000	$322,100	$543,987	0.7307	$397,486
4.4	9	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.7026	$230,727
4.1	10	$506,256	$13,000	$32,000	$48,000	$0	$599,256	0.6756	$404,836
6.7	11	$0	$0	$0	$0	$0	$0	0.6496	$0
6.4	12	$0	$0	$0	$0	$0	$0	0.6246	$0
6.1	13	$59,592	$1,350	$24,000	$36,000	$0	$120,942	0.6006	$72,635
5.9	14	$151,580	$3,400	$24,000	$36,000	$0	$214,980	0.5775	$124,146
5.6	15	$259,603	$5,900	$24,000	$36,000	$0	$325,503	0.5553	$180,740
5.3	16	$433,520	$9,900	$46,000	$69,000	$0	$558,420	0.5339	$298,145
5.0	17	$661,555	$15,300	$46,000	$69,000	$0	$791,855	0.5134	$406,517
4.7	18	$162,687	$4,200	$22,000	$33,000	$322,100	$543,987	0.4936	$268,527
4.4	19	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.4746	$155,871
4.1	20	$506,256	$13,000	$32,000	$48,000	$0	$599,256	0.4564	$273,493
6.7	21	$0	$0	$0	$0	$0	$0	0.4388	$0
6.4	22	$0	$0	$0	$0	$0	$0	0.4220	$0
6.1	23	$59,592	$1,350	$24,000	$36,000	$0	$120,942	0.4057	$49,069
5.9	24	$151,580	$3,400	$24,000	$36,000	$0	$214,980	0.3901	$83,868
5.6	25	$259,603	$5,900	$24,000	$36,000	$0	$325,503	0.3751	$122,102
5.3	26	$433,520	$9,900	$46,000	$69,000	$0	$558,420	0.3607	$201,416
5.0	27	$661,555	$15,300	$46,000	$69,000	$0	$791,855	0.3468	$274,629
4.7	28	$162,687	$4,200	$22,000	$33,000	$322,100	$543,987	0.3335	$181,407
4.4	29	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.3207	$105,301
4.1	30	$506,256	$13,000	$32,000	$48,000	$0	$599,256	0.3083	$184,762
6.7	31	$0	$0	$0	$0	$0	$0	0.2965	$0
6.4	32	$0	$0	$0	$0	$0	$0	0.2851	$0
6.1	33	$59,592	$1,350	$24,000	$36,000	$0	$120,942	0.2741	$33,150
5.9	34	$151,580	$3,400	$24,000	$36,000	$0	$214,980	0.2636	$56,658
5.6	35	$259,603	$5,900	$24,000	$36,000	$0	$325,503	0.2534	$82,488
5.3	36	$433,520	$9,900	$46,000	$69,000	$0	$558,420	0.2437	$136,070
5.0	37	$661,555	$15,300	$46,000	$69,000	$0	$791,855	0.2343	$185,529
4.7	38	$162,687	$4,200	$22,000	$33,000	$322,100	$543,987	0.2253	$122,552
4.4	39	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.2166	$71,138
4.1	40	$506,256	$13,000	$32,000	$48,000	$0	$599,256	0.2083	$124,818
6.7	41	$0	$0	$0	$0	$0	$0	0.2003	$0
6.4	42	$0	$0	$0	$0	$0	$0	0.1926	$0
6.1	43	$59,592	$1,350	$24,000	$36,000	$0	$120,942	0.1852	$22,395
5.9	44	$151,580	$3,400	$24,000	$36,000	$0	$214,980	0.1780	$38,276
5.6	45	$259,603	$5,900	$24,000	$36,000	$0	$325,503	0.1712	$55,726
5.3	46	$433,520	$9,900	$46,000	$69,000	$0	$558,420	0.1646	$91,924
5.0	47	$661,555	$15,300	$46,000	$69,000	$0	$791,855	0.1583	$125,337
4.7	48	$162,687	$4,200	$22,000	$33,000	$322,100	$543,987	0.1522	$82,792
4.4	49	$266,497	$6,900	$22,000	$33,000	$0	$328,397	0.1463	$48,058
4.1	50	$506,256	$13,000	$32,000	$48,000	$0	$599,256	0.1407	$84,323
√									
Present Value of Costs to Watermen									$6,978,804
Capital Recovery Factor (CRF)									0.0466
Average Annual Cost = (PV of Total Costs) x (CRF)									$324,900

Table 18 Costs Incurred by Commercial Watermen – Alt 7a Channel Realignment Outside

Channel Depth	Analysis Period	Labor Lost Due to Tidal Delays	Additional Fuel Cost	Vessel Damages	Incr. Maint. Cost	Relocation Costs	Total Cost	Pres. Value Factor	PV Of Total Cost
6.7	1	$0	$0	$0	$0	$0	$0	0.9615	$0
6.3	2	$6,220	$140	$24,000	$36,000	$0	$66,360	0.9246	$61,354
6.0	3	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.8890	$136,100
5.7	4	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.8548	$243,949
5.3	5	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.8219	$391,365
5.0	6	$581,240	$13,200	$24,000	$36,000	$0	$654,440	0.7903	$517,213
4.7	7	$194,458	$5,000	$22,000	$33,000	$322,100	$576,558	0.7599	$438,137
4.3	8	$5,488	$100	$10,000	$15,000	$0	$30,588	0.7307	$22,351
4.0	9	$593,174	$15,300	$32,000	$48,000	$0	$688,474	0.7026	$483,713
6.7	10	$0	$0	$0	$0	$0	$0	0.6756	$0
6.3	11	$6,220	$140	$24,000	$36,000	$0	$66,360	0.6496	$43,106
6.0	12	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.6246	$95,622
5.7	13	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.6006	$171,395
5.3	14	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.5775	$274,968
5.0	15	$581,240	$13,200	$24,000	$36,000	$0	$654,440	0.5553	$363,387
4.7	16	$194,458	$5,000	$22,000	$33,000	$322,100	$576,558	0.5339	$307,829
4.3	17	$5,488	$100	$10,000	$15,000	$0	$30,588	0.5134	$15,703
4.0	18	$593,174	$15,300	$32,000	$48,000	$0	$688,474	0.4936	$339,850
6.7	19	$0	$0	$0	$0	$0	$0	0.4746	$0
6.3	20	$6,220	$140	$24,000	$36,000	$0	$66,360	0.4564	$30,286
6.0	21	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.4388	$67,183
5.7	22	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.4220	$120,420
5.3	23	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.4057	$193,189
5.0	24	$581,240	$13,200	$24,000	$36,000	$0	$654,440	0.3901	$255,311
4.7	25	$194,458	$5,000	$22,000	$33,000	$322,100	$576,558	0.3751	$216,277
4.3	26	$5,488	$100	$10,000	$15,000	$0	$30,588	0.3607	$11,033
4.0	27	$593,174	$15,300	$32,000	$48,000	$0	$688,474	0.3468	$238,774
6.7	28	$0	$0	$0	$0	$0	$0	0.3335	$0
6.3	29	$6,220	$140	$24,000	$36,000	$0	$66,360	0.3207	$21,278
6.0	30	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.3083	$47,202
5.7	31	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.2965	$84,606
5.3	32	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.2851	$135,732
5.0	33	$581,240	$13,200	$24,000	$36,000	$0	$654,440	0.2741	$179,378
4.7	34	$194,458	$5,000	$22,000	$33,000	$322,100	$576,558	0.2636	$151,953
4.3	35	$5,488	$100	$10,000	$15,000	$0	$30,588	0.2534	$7,752
4.0	36	$593,174	$15,300	$32,000	$48,000	$0	$688,474	0.2437	$167,760
6.7	37	$0	$0	$0	$0	$0	$0	0.2343	$0
6.3	38	$6,220	$140	$24,000	$36,000	$0	$66,360	0.2253	$14,950
6.0	39	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.2166	$33,163
5.7	40	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.2083	$59,443
5.3	41	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.2003	$95,363
5.0	42	$581,240	$13,200	$24,000	$36,000	$0	$654,440	0.1926	$126,029
4.7	43	$194,458	$5,000	$22,000	$33,000	$322,100	$576,558	0.1852	$106,760
4.3	44	$5,488	$100	$10,000	$15,000	$0	$30,588	0.1780	$5,446
4.0	45	$593,174	$15,300	$32,000	$48,000	$0	$688,474	0.1712	$117,866
6.7	46	$0	$0	$0	$0	$0	$0	0.1646	$0
6.3	47	$6,220	$140	$24,000	$36,000	$0	$66,360	0.1583	$10,504
6.0	48	$91,024	$2,070	$24,000	$36,000	$0	$153,094	0.1522	$23,300
5.7	49	$220,386	$5,000	$24,000	$36,000	$0	$285,386	0.1463	$41,764
5.3	50	$353,155	$8,000	$46,000	$69,000	$0	$476,155	0.1407	$67,001
√									
Present Value of Costs to Watermen									$6,535,762
Capital Recovery Factor (CRF)									0.0466
Average Annual Cost = (PV of Total Costs) x (CRF)									$304,200

Regional Economic Benefits

The Circle C Oyster Farm located in St. Jerome Creek has indicated strong opposition to the proposed jetties. Construction of the project would impact the shoreline behind the jetties at the mouth of the channel by submerging the natural oyster bar where disease resistant oyster beds are re-establishing. This would have direct impact on Circle C revenues gained from resale of oysters. Additionally, increased turbidity in the creek during the period of construction and subsequent maintenance dredging affects the flavor and growth rates of oysters being cultivated. Lost revenue to the oyster farm is considered a Regional Economic Development impact and is not considered in this analysis. However, during the 7 month construction period, the additional labor costs incurred to clean oysters before they are sold to area markets and restaurants is considered an economic cost when discerning the National Economic Development (NED) plan. During normal conditions, oysters are flushed every other day compared to 3 times per day during periods of increased turbidity. The annualized cost of this additional labor, over the 50 year life of the project, is approximately $2,000 and is not considered a substantial impact for this analysis.

Project Cost Evaluation

Project alternatives include the construction of jetties and breakwaters to stabilize the mouth of St. Jerome Creek. Details of each concept design are provided in the main feasibility report. Cost estimates are rounded to the nearest $100 and presented in Table 20. Interest During Construction is calculated at the FY 2012 federal interest rate of 4.00 percent and based on a construction period of 7 months. Costs are converted to present value equivalents based on a 50 year project life and then compared to estimated annual project benefits to determine the National Economic Development (NED) plan.

Additional costs will be incurred for replacing timber piles used in alternative 7 to support the vinyl sheet piles. Timber batter-piles will require replacements approximately 30 years after initial construction at an estimated cost of $4.1M. This expense, annualized over the 50-year project life, yields additional annual cost of $58,800 as shown in Table 20, the Summary of Costs for Project Alternatives. For comparison, Table 19 below presents the pile replacement costs for each alternative. Timberguard® or concrete piles would not require replacement during the 50-year project life and are not annualized for this analysis.

Table 19 – Pile Replacement Costs

	TIMBER PILES	TIMBERGUARD ® PILES	CONCRETE PILES
CONSTRUCTION COST	$ 8,221,740	$ 8,928,696	$ 9,555,086
REPLACEMENT COST	**$ 4,099,400**	**$ 4,801,800**	**$ 5,424,200**
	REPLACEMENT IN YR 30	**NO REPLACEMENT IN 50 YRS**	**NO REPLACEMENT IN 50 YRS**

Benefit Evaluation and BCR

Economic benefits are a measurement of the difference between the continuation of the without-project conditions and the future with-project alternatives. Benefits for St. Jerome Creek accrue in four areas; reduced inefficiencies due to tidal delays, reduced maintenance dredging costs, reduced cost of vessel relocation, and increased recreational quality. Under the existing without-project conditions, average annualized costs of inefficiencies due to tidal delays are $763,700 (Table 14). The costs of inefficiencies in the with-project conditions range from $266,300 to $324,900 (Tables 15 – 18) depending on the new rate of shoaling generated by project construction. These amounts are subtracted from costs incurred in the existing without-project condition yielding total annual benefits in reduced delay costs. Annual benefits of construction projects at St. Jerome Creek range from $438,000 to $497,400 and are presented in Table 21.

Benefits gained from enhanced recreational quality ($174,300) are then added to the benefits gained by watermen yielding Total Annual Benefits ranging from $613,100 to $671,700. The Total Annual Benefits are weighed against the costs of each project alternative to determine the Total Annual Net Benefits and the Benefit-Cost Ratio (BCR). Annualized costs of each alternative are provided in Table 20. Table 21 presents the Total Annual Net Benefits and the BCRs.

A project is considered economically justified if it has positive Net Benefits and a benefit to cost ratio of 1.0 or greater. The benefit-cost ratio of each alternative is determined by dividing its total annual benefits by its total annual costs. The alternative having the greatest BCR which maximizes net annual benefits would be the National Economic Development (NED) plan. Over a 50-year analysis period, alternatives incorporating stone jetties would be recommended as NED plans based on the highest net annual benefits and benefit to cost ratios of 2.19 to 2.39. However, given the substrate conditions in Chesapeake Bay, Alternative 7 using batter pile jetties with Timberguard® has the highest BCR (1.18) for non-stone construction and is the more technically feasible alternative.

Table 20 - Summary of Costs for Project Alternatives

Annualized Cost Calculation	Without-Project Condition	Alt 4 Stone Jetties on N & S side of entrance	Alt 7 Stone w/out Channel Realign	Alt 7 Stone w/ Channel Realign inside	Alt 7 Batter Pile Timber Jetty - w/ realignment	Alt 7 Batter Pile Timberguard Jetty - w/ realignment	Alt 7 Batter Pile Concrete Jetty - w/ realignment	Alt 7a Stone w/ Channel Realign outside
Scheduled Dredge Cycle	**5 Yrs.**	**5.6 Yrs**	**5.8 Yrs.**	**10.5 Yrs**	**10.5 Yrs**	**10.5 Yrs**	**10.5 Yrs**	**9.0 Yrs.**
Construction First Cost	$0	$3,208,000	$3,720,000	$4,572,000	$8,949,370	$9,656,327	$10,282,716	$4,442,700
Interest During Construction	$0	$32,300	$37,400	$46,000	$90,000	$97,100	$103,400	$44,700
Total Investment Cost	$0	$3,240,300	$3,757,400	$4,618,000	$9,039,370	$9,753,427	$10,386,116	$4,487,400
Capital Recovery Factor at 4.0% (CRF) =	0.04655	0.04655	0.04655	0.04655	0.04655	0.04655	0.04655	0.04655
Average Annual Cost	$0	$150,800	$174,900	$215,000	$420,800	$454,000	$483,500	$208,900
Operation & Maintenance Cost								
Maintenance Dredging	$129,800	$113,500	$111,600	$64,700	$64,700	$64,700	$64,700	$76,700
Timber Pile Replacement	$0	$0	$0	$0	$58,800	$0	$0	$0
Total Annual Cost of Alternatives	$129,800	$264,300	$286,500	$279,700	$544,300	$518,700	$548,200	$285,600

Table 21 - Cost Benefit Analysis and BCR

Calculation of NED Benefits	Without-Project Condition	Alt 4 Stone Jetties on N & S side of entrance	Alt 7 Stone w/out Channel Realign	Alt 7 Stone w/ Channel Realign inside	Alt 7 Batter Pile Timber Jetty - w/ realignment	Alt 7 Batter Pile Timberguard Jetty - w/ realignment	Alt 7 Batter Pile Concrete Jetty - w/ realignment	Alt 7a Stone w/ Channel Realign outside
Scheduled Dredge Cycle	5 Yrs.	5.6 Yrs	5.8 Yrs.	10.5 Yrs	10.5 Yrs	10.5 Yrs	10.5 Yrs	9.0 Yrs.
Annual Costs of Without-Project Condition	$763,700	$763,700	$763,700	$763,700	$763,700	$763,700	$763,700	$763,700
Less: Annual Costs to watermen with Project	($763,700)	($306,100)	($266,300)	($324,900)	($324,900)	($324,900)	($324,900)	($304,200)
Net Annual Benefits for With-Project Alternatives	$0	$457,600	$497,400	$438,800	$438,800	$438,800	$438,800	$459,500
Plus: Benefits for Recreational Quality Enhancement		$174,300	$174,300	$174,300	$174,300	$174,300	$174,300	$174,300
Total Annual Benefits of Alternatives	$0	$631,900	$671,700	$613,100	$613,100	$613,100	$613,100	$633,800
Total Annual Net Benefits (Benefits minus Costs)	$0	$367,600	$385,200	$333,400	$68,800	$94,400	$64,900	$348,200
Benefit to Cost Ratio								
Annual Benefits of Alternatives	$0	$631,900	$671,700	$613,100	$613,100	$613,100	$613,100	$633,800
Annual Costs	$129,800	$264,300	$286,500	$279,700	$544,300	$518,700	$548,200	$285,600
Benefit to Cost Ratio	**0.00**	**2.39**	**2.34**	**2.19**	**1.13**	**1.18**	**1.12**	**2.22**

Table 22 - Cost Benefit Analysis with and without Recreational Benefits

	Alt 4 Stone Jetties on N & S side of entrance	Alt 7 Stone w/out Channel Realign	Alt 7 Stone w/ Channel Realign inside	Alt 7 Batter Pile Timber Jetty - w/ realignment	Alt 7 Batter Pile Timberguard Jetty - w/ realignment	Alt 7 Batter Pile Concrete Jetty - w/ realignment	Alt 7a Stone w/ Channel Realign outside
Annual Costs	$264,300	$286,500	$279,700	$544,300	$518,700	$548,200	$285,600
Annual Commercial Benefits	$457,600	$497,400	$438,800	$438,800	$438,800	$438,800	$459,500
BCR	**1.73**	**1.74**	**1.57**	**0.81**	**0.85**	**0.80**	**1.61**
Recreational Benefits	$174,300	$174,300	$174,300	$174,300	$174,300	$174,300	$174,300
Total Annual Navigation Benefits	$631,900	$671,700	$613,100	$613,100	$613,100	$613,100	$633,800
Total Annual Net Benefits	$367,600	$385,200	$333,400	$68,800	$94,400	$64,900	$348,200
BCR with Recreational Benefits	**2.39**	**2.34**	**2.19**	**1.13**	**1.18**	**1.12**	**2.22**

St Jerome Cost Update to 2015
Benefits were originally calculated in 2012

Based on:
ER 1105-2-100 Planning Guidance Notebook
Appendix D, Amendment #1 30 June 2004
D-3-NED Cost Evaluation Procedures, Section b.(4) d.(2)

Summary:
Project costs were updated by Cost Engineering to the 2015 price level. Updated costs were annualized using the FY15 Federal interest rate of 3.375% and brought back to the same year as the benefits using the Civil Works Construction Cost Index for Breakwaters and Seawalls (EGM 1110-2-1304, 30 September 2014). The 2015 economic costs of the alternatives, including interest during 7 months of construction, are presented in the Table below. Annual Cost over the 50-year project life, Net Benefits and updated BCRs are also presented in Table below.

2015 Cost Update	**Timber Pilings with Timberguard**
Construction Cost*	$ 9,636,300
IDC	$ 81,700
Project Cost	**$ 9,718,000**
Annual Cost	$ 405,000
Annual O&M	$ 65,900
Timber Pile Replacements	$ -
Total Annual Cost of Alternative	$ 470,900
Annual Benefit	$ 613,100
Annual Net Benefit	$ 142,200
BCR	**1.30**
FEATURE CODE 12 - NAVIGATION PORTS AND HARBORS	
CWCCI - 1Q12	757.76
CWCCI - 1Q15	809.25
Update factor	0.936
CONSTR. PERIOD (Months)	7
2015 UPDATED CONSTR. COST	$ 10,291,077
RATE	0.03375
CRF=	0.04168
IDC	$ 87,239
FV	$ 10,378,316

Prepared:12/18/2014

APPENDIX B

REAL ESTATE PLAN

ST. JEROME CREEK CAP SECTION 107
SMALL NAVIGATION PROJECT
REAL ESTATE PLAN

1. GENERAL

2. REAL ESTATE REQUIREMENTS

3. FEDERALLY OWNED LANDS AND EXISTING FEDERAL PROJECTS

4. LANDS OWNED BY THE NON-FEDERAL SPONSOR

5. PROPOSED ESTATES

6. NAVIGATIONAL SERVITUDE

7. REAL ESTATE MAPPING

8. INCREASED FLOODING

9. BASELINE COST ESTIMATE FOR REAL ESTATE

10. PUBLIC LAW 91-646 RELOCATIONS

11. MINERAL AND TIMBER ACTIVITY

12. ASSESSMENT OF NON-FEDERAL SPONSOR ACQUISITION CAPABILITY

13. ZONING

14. ACQUISITION SCHEDULE

15. UTILITY AND FACILITY RELOCATIONS

16. ENVIRONMENTAL CONCERNS

17. ATTITUDES OF THE LANDOWNERS

18. NOTIFICATION TO THE NON-FEDERAL SPONSOR

REAL ESTATE PLAN

1. GENERAL

This Real Estate Plan supports the Feasibility Report for the St. Jerome Creek Small Navigation Project, Maryland. The authority for this project is Section 107 of the Rivers and Harbors Act of 1960, (P.L. 86-645), as amended. The subject area of this report is known as the mouth of St. Jerome Creek, located in St. Mary's County, Maryland. St. Jerome Creek flows into the Chesapeake Bay. St. Jerome Point is located on the north side of the mouth of the creek and Deep Point is to the south. The recommended concept level plan, Alternative 7 with Realigned Channel, consists of the construction of two jetties at the entrance to St. Jerome Creek. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 feet east of the tip of the sand spit at the end of St. Jerome Point, and have a length of 1,770 feet. The existing entrance channel will be realigned to make the channel proceed straight through the inlet, which will require the removal of the tip of the sand spit at the end of St. Jerome Point. St. Mary's County will be the Non-Federal Sponsor. A project map is attached as Exhibit "A".

2. REAL ESTATE REQUIREMENTS

a. The following is a brief description of the necessary real estate for the recommended plan:

The two jetties will be constructed on submerged lands considered to be below the mean high water line (MHWL) and subject to navigational servitude, except for the two landward tie-ins. The area within the newly created and aligned (straightened) channel, where the tip of the spit at the end of St. Jerome Point will be removed, is considered to be below the MHWL and subject to navigational servitude, therefore no acquisition is required for the channel itself. The tie-ins would require two small areas (<0.1 acres each) of perpetual channel improvement easements. Any required staging of materials on fast land will be done within this perpetual channel improvement easement area. It is estimated that these two perpetual channel improvement easements would have a nominal value of $500 each. Construction will be done from the water, and no temporary work area easements will be required for access or staging. Dredged material will be hydraulically pumped through piping directly to the existing dredged material placement (DMP) site. The DMP site is provided by the Sponsor as an item of the Local Cooperation Agreement for the existing St. Jerome Creek Federal Navigation Channel. The current lease expires in November 2012, and the NFS will be negotiating for a new lease on this same DMP site. Real estate credit for this C.A.P. 107 project will be given for the cost of the new lease, estimated here to be the same value as the current lease, $125,000, capped at 10% of the total costs of construction of the general navigation features of the project. Operation and maintenance requirements are expected to be minimal, and will be done from the water.

b. Ownership Data:

	Estate	Acreage	Value
Deep Point Jetty Tie-in:			
Willoughby, Mary & Bruce, et al Tax assessor map 71 parcel 188	Channel Improvement Easement	<0.10	$ 500
St. Jerome Point Jetty Tie-in:			
Ludlow, E.Marshall & Mary Tax assessor map 71 parcel 177	Channel Improvement Easement	<0.10	$ 500

3. FEDERALLY-OWNED LANDS AND EXISTING FEDERAL PROJECTS
There is a federally-maintained channel in St. Jerome Creek, below the MHWL. This provides for a channel 7 feet deep with a project length of 4,900 feet. There is no federally-owned land in the project area.

4. LANDS OWNED BY THE NON-FEDERAL SPONSOR
There are no lands owned by the Non-Federal Sponsor, St. Mary's County, in the project area. The existing DMP site is provided by the Sponsor for dredging of the existing St. Jerome Creek Federal Navigation Channel Project. This same DMP site will be used for this CAP Section 107 project.

5. PROPOSED ESTATES
a. Standard Perpetual Channel Improvement Easement – The jetties will each require a tie-in above the MHWL on an upland portion of both St. Jerome Point and Deep Point. Each of these easements will contain approximately 0.10 of an acre or less. Standard Perpetual Channel Improvement Easement estate language:

CHANNEL IMPROVEMENT EASEMENT (Estate No. 8) A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over and across the lands described in Exhibit "A" for the purposes as authorized, including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges, as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

6. NAVIGATIONAL SERVITUDE
Navigational Servitude applies to this project for the jetties and all other lands necessary below the mean high water line (MHWL), including the area of the realigned channel. The Federal government may use any lands below the MHWL, under the rights of navigational servitude, for the purpose of navigation or commerce. The two jetty tie-ins are considered to be above the MHWL, and therefore not subject to navigational servitude. The Sponsor will acquire perpetual channel improvement easements for these two tie-ins. The specific location of the MHWL is subject to verification.

7. REAL ESTATE MAPPING

Real Estate mapping showing the project area is attached as Exhibit “A-2”.

8. INCREASED FLOODING

The proposed project features will not cause increased flooding.

9. BASELINE COST ESTIMATE FOR REAL ESTATE

A detailed cost estimate for the St. Jerome Creek Section 107 Small Navigation Project, in MCACES format, is included as Exhibit “B”. The two required perpetual channel improvement easements are considered to have a nominal value of $500 each. The cost estimate outlines the Non-Federal Sponsor’s administrative and land costs to accomplish the project’s real property requirements and the Corps’ administrative costs to assist and monitor the Non-Federal Sponsor’s real property acquisition.

10. PUBLIC LAW 91-646 RELOCATIONS

It is anticipated that there will be no project features that will require relocations of any persons, farms or businesses in the subject area as would be required under Public Law 91-646, as amended.

11. MINERAL AND TIMBER ACTIVITY

There is no known mineral or timber activity anticipated within the project area.

12. ASSESSMENT OF LOCAL SPONSOR ACQUISITION CAPABILITY

The Non-Federal Sponsor, St. Mary’s County, Maryland, will be responsible for the acquisition of all necessary real estate interests required for this project. St. Mary’s County has sufficient experience in land acquisition and has the necessary manpower and resources to complete the real estate actions in a timely manner. An Assessment of Non-Federal Sponsor’s Real Estate Acquisition Capability is included as Exhibit “C”. For the purposes if this project, the Non-Federal Sponsor is considered to be fully capable of acquiring the real property interests required.

13. ZONING

The enactment of zoning ordinances is not proposed to facilitate acquisition.

14. ACQUISITION SCHEDULE

The anticipated time for Project Partnership Agreement execution has not yet been established. However, following execution of the PPA, acquisition of the two perpetual channel improvement easements is projected to require approximately 9 to 12 months. This includes obtaining title/ownership information, preparation of survey and legal descriptions, completion of tract appraisals, performing negotiations and closings.

15. UTILITY AND FACILITY RELOCATIONS

There are no utility or facility relocations required in connection with this project.

16. ENVIRONMENTAL CONCERNS
There is no known hazardous, toxic, and/or radiological waste (HTRW) contamination in the project area or vicinity.

17. ATTITUDES OF THE LANDOWNERS
There is no known opposition to the project from the landowners.

18. NOTIFICATION TO THE NON-FEDERAL SPONSOR
The Non-Federal Sponsor has been notified of the risks of performing real estate acquisition activities prior to the signing of the PPA. This notification was by letter dated March 30, 2011.

St. Jerome Creek:
St. Mary's County, Maryland

US Army Corps of Engineers
Baltimore District

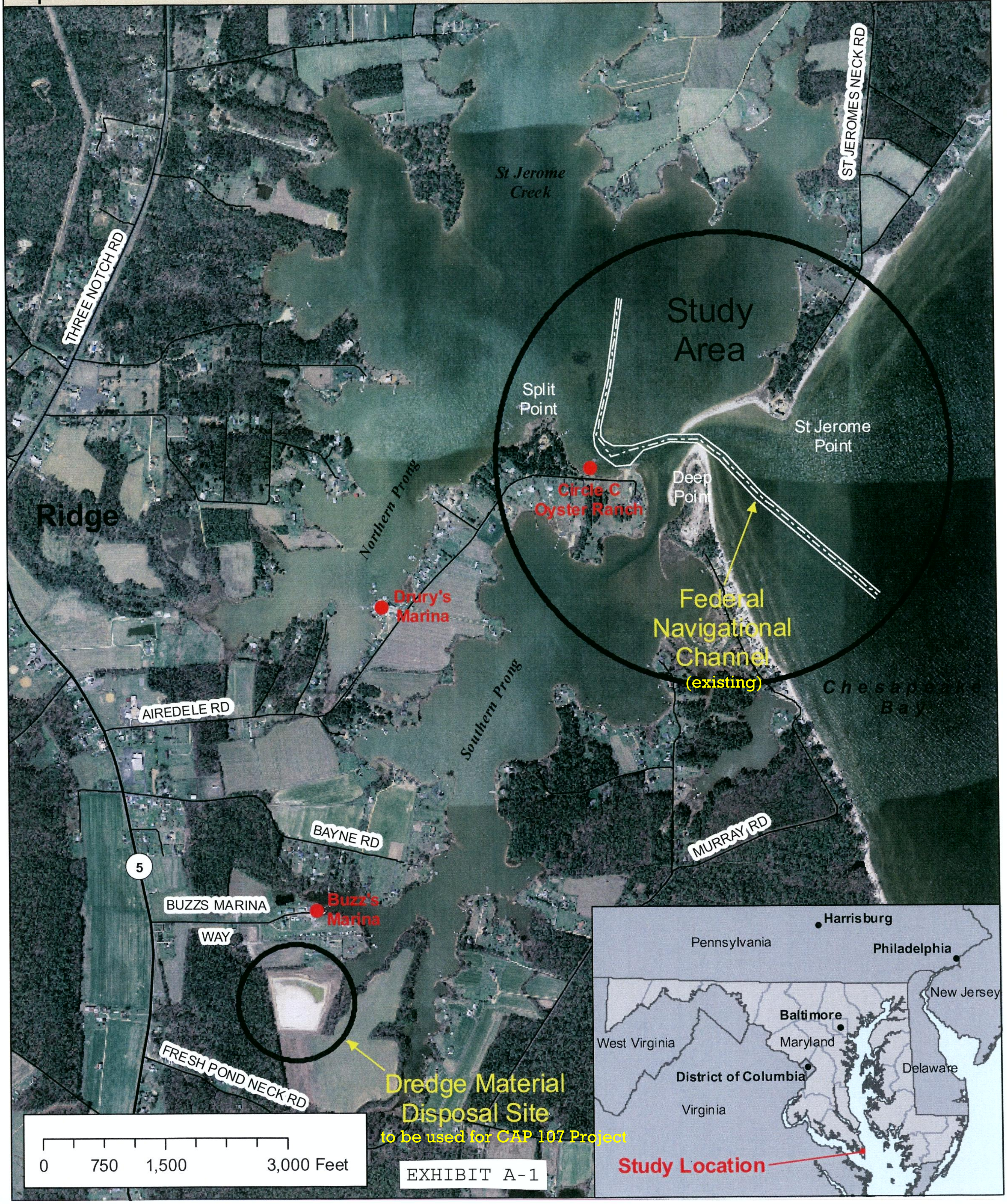
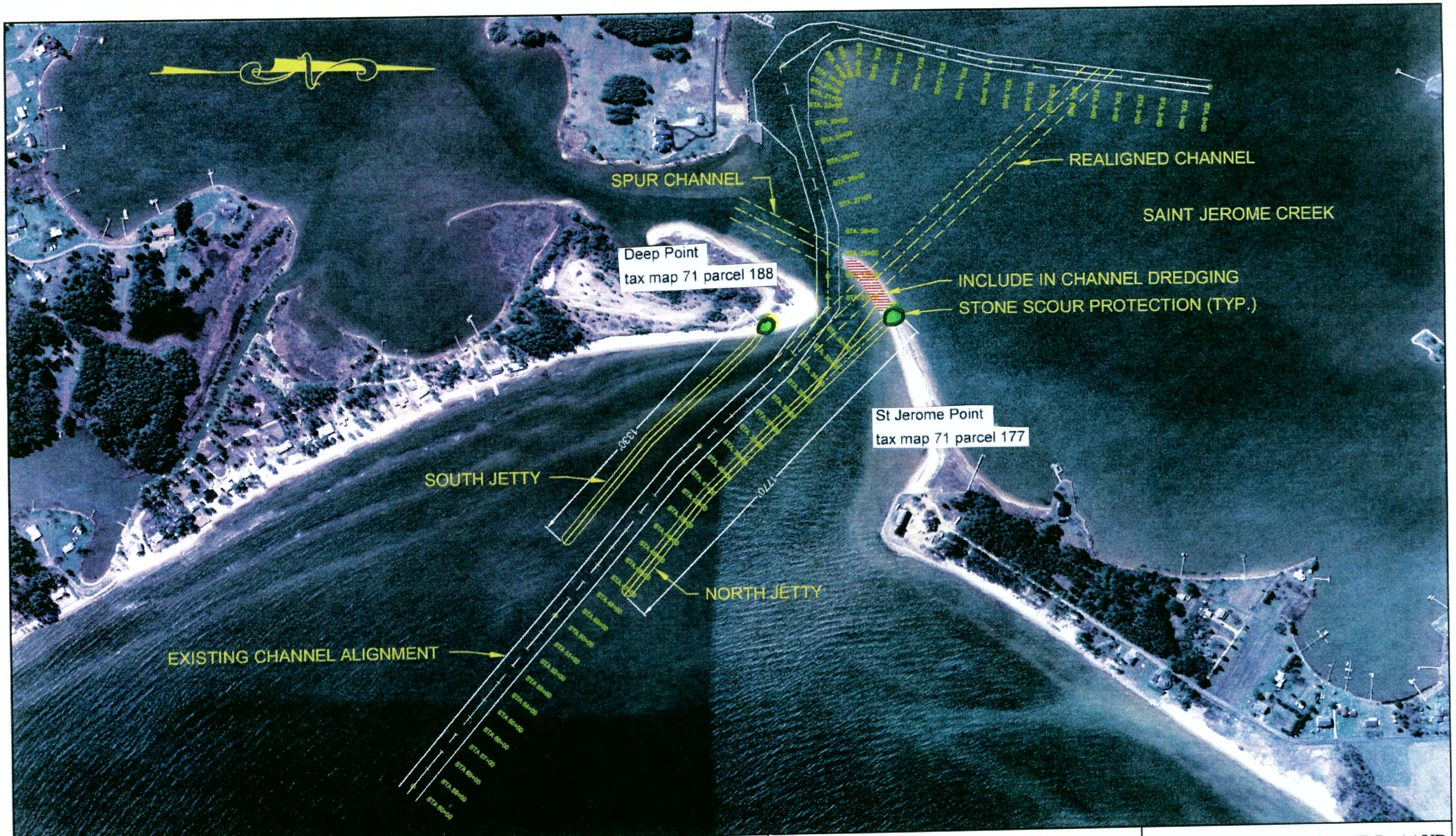


EXHIBIT A-1



SAINT JEROME CREEK SAINT MARY'S COUNTY, MARYLAND SCALE : 1" = 400' 0' 400'	OFFSHORE & COASTAL TECHNOLOGIES, INCORPORATED *Engineering for the Marine Environment* P.O. Box 1366 Chadds Ford, Pennsylvania 19317 Tel. 610-361-0424 Fax 610-361-0425	**Andrews, Miller & Associates** A Division of: DAVIS, BOWEN & FRIEDEL, INC. ARCHITECTS ENGINEERS SURVEYORS	**CONCEPT ALTERNATIVE 7 w/ AND w/o REALIGNED CHANNEL (2007 AERIAL PHOTO)** **FIGURE 17**

Locations of Perpetual Channel Improvement Easements

EXHIBIT A-2

Feasibility Cost Estimate-MCACES Format
Real Estate Acquisition Requirements
St. Jerome Creek Section 107 Small Navigation Project
St. Mary's County, Maryland

	Private			Commercial			Public			Requirement		
	#	$/per	req	#	$/per	req	#	$/per	req	Base	Contingency 10%	Total
0102------- ACQUISITIONS												
010201--- By Government												
010202--- By Non-Federal Sponsor (NFS)												
01020201 Survey and Legal Descriptions	2	750	1,500							1,500	150	1,650
01020102 Title Evidence	2	750	1,500							1,500	150	1,650
01020203 Negotiations	2	750	1,500							1,500	150	1,650
010203--- By Government on Behalf of NFS												
010204--- Review of NFS												
01020401 Survey and Legal Descriptions	2	100	200							200	20	220
01020402 Title Evidence	2	100	200							200	20	220
01020403 Negotiations	2	100	200							200	20	220
SUBTOTAL										5,100	510	5,610
0103------- CONDEMNATIONS												
010301--- By Government												
010302--- By Non-Federal Sponsor (NFS)												
010303--- By Government on Behalf of NFS												
010304--- Review of NFS												
SUBTOTAL												
0105------- APPRAISALS												
010501--- By Government												
010502--- By Non-Federal Sponsor (NFS)	2	750	1,500							1,500	150	1,650
010503--- By Government on Behalf of NFS												
010504--- Review of NFS	2	100	200							200	20	220
SUBTOTAL										1,700	170	1,870
0106------- PL 91-646 ASSISTANCE												
010601--- By Government												
010602--- By Non-Federal Sponsor (NFS)												
010603--- By Government on Behalf of NFS												
010604--- Review of NFS												
SUBTOTAL												
0107------- TEMPORARY PERMITS/LICENSES/RIGHTS-OF-WAY												
010701--- By Government												
010702--- By Non-Federal Sponsor (NFS)										125,000	12,500	137,500
010703--- By Government on Behalf of NFS												
010704--- Review of NFS												
010705--- Other												
010706--- Damage Claims												
SUBTOTAL										125,000	12,500	137,500
0115------- REAL ESTATE PAYMENTS												
011501--- Land Payments												
01150101 By Government												
01150102 By Non-Federal Sponsor (NFS)		1,000								1,000	100	1,100
01150103 By Government on Behalf of NFS												
01150104 Review of NFS												
011502--- PL 91-646 Assistance Payments												
01150201 By Government												
01150202 By Non-Federal Sponsor (NFS)												
01150203 By Government on Behalf of NFS												
01150204 Review of NFS												
011503--- Damage Payments												
01150301 By Government												
01150302 By Non-Federal Sponsor (NFS)												
01150303 By Government on Behalf of NFS												
01150304 Review of NFS												
SUBTOTAL										1,000	100	1,100
Account 02 Facility/Utility Relocations (Construction cost only)												
TOTAL										**$132,800**	**$13,280**	**$146,080**

EXHIBIT B

ASSESSMENT OF NON-FEDERAL SPONSOR'S
REAL ESTATE ACQUISITION CAPABILITY

Project: St. Jerome Creek C.A.P. Section 107 Navigation Project, Maryland

Non-Federal Sponsor: St. Mary's County

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? Yes

b. Does the sponsor have the power of eminent domain for this project? Yes

c. Does the sponsor have "quick-take" authority for this project? No

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? No

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? No

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? No

b. If the answer to II.a. is "yes", has a reasonable plan been developed to provide such training?

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? Yes

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? Yes

e. Can the sponsor obtain contractor support, if required, in a timely fashion? Yes

f. Will the sponsor likely request USACE assistance in acquiring real estate? No

EXHIBIT C

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? Yes

b. Has the sponsor approved the project/real estate schedule/milestones? Yes

IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? Yes

b. With regard to this project, the sponsor is anticipated to be fully capable.

V. Coordination:

a. Has this assessment been coordinated with the sponsor? Yes

b. Does the sponsor concur with this assessment? Yes

Prepared by:

Adam L. Oestreich

ADAM OESTREICH
Realty Specialist

Approved by:

Craig R. Homesley

CRAIG R. HOMESLEY
Chief, Civil Projects Support Branch
Real Estate Division

APPENDIX C

ENGINEERING AND DESIGN DATA

Appendix C
Engineering and Design Data

Saint Jerome Creek, Saint Mary's County

Design For Re-Alignment And Protection Of Navigational Channel And Shoreline Erosion Protection

Section 107 Continuing Authorities Program (Cap)

FINAL REPORT

March 11, 2011

Prepared For
The Baltimore District, U.S. Army Corps of Engineers

Prepared By
CONSULTING ENGINEERS AND SURVEYORS
Andrews, Miller & Associates
A DIVISION OF DAVIS, BOWEN & FRIEDEL, INC.

401 ACADEMY STREET, SUITE 1, CAMBRIDGE, MD 21613

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P.O. Box 1368
Chadds Ford, Pennsylvania 19317
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Engineering Appendix C

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Section C-1
Hydraulic Analysis

1.1 DATA DEVELOPMENT AND ANALYSIS

For the design of the alternatives, an analysis of the hydraulic processes active in the project area, shown in Figure 1) was required. This analysis included the evaluation of the tidal elevations, storm wave conditions, tidal conditions, historical erosion rates and changes in the wetland areas. Components of this analysis are discussed in the following paragraphs.

1.1.1 Water Levels

Normal water level variations in the Saint Jerome Creek area are generally dominated by astronomical tides, although wind effects can be important. Astronomical tides in the area are semi-diurnal tides, with a period of approximately 12.5 hours, resulting in two high tides and two low tides each day. Mean Lower Low Water (MLLW) is selected as the datum for this project. The Mean Tide Level (MTL) is 0.74 feet above MLLW with a mean tide range of 1.33 feet.

During storm conditions, water levels are dominated by storm surge and wave setup in combination with the astronomical tide. The result is a temporary rise in water level generated either by large scale extratropical storms known as northeasters or by hurricanes. Wave setup is a term used to describe the rise in water level due to wave breaking. A comprehensive evaluation of storm-induced water levels for several Chesapeake Bay locations has been conducted by the Virginia Institute of Marine Science (1978) as part of the Federal Flood Insurance Program.

These storm surges result in more extreme water levels, which affect flooding, overtopping of structures and maximum expected depth limited wave heights in shallow areas. The closest station location to Saint Jerome Creek is Cove Point. The data for Cove Point are summarized in Table 1. It is assumed that there is a reasonable chance that the design winds will coincide with the design storm tide inasmuch as the storm tide is somewhat generated by the wind. Accordingly, the development of wave conditions assumes a coincidence of design winds and water levels.

1.1.2 Wind Conditions

Wind data for the Patuxent Naval Air Station for the period from 1945 to 1995 were obtained from the National Oceanic and Atmospheric Administration, National Climatic Data Center. The Patuxent Naval Air Station (NAS) site is considered to be representative of the open bay area. Since the Saint Jerome Creek area is very exposed, the wind statistics should be similar to those at the NAS. Hourly one minute average wind speed and direction data were provided and were adjusted to an elevation of 33 feet. Using these data, various return interval wind speeds for each of the principal compass directions were calculated. The approach used to estimate the return intervals was to divide the wind observations into sixteen principal compass directions, i.e. north, north northeast, northeast, etc. A Gumbel statistical distribution was fit to the maximum wind speeds for a particular direction. Using the Gumbel distribution, the return interval wind speeds were calculated for the 5-year, 10-year, 25-year, 50-year and 100-year storm events for each of the principal sixteen directions. Table 2 shows the various return interval wind speeds by direction.

1.1.3 Wave Conditions

In general, the wave height and period (time in seconds for two successive crests or troughs to pass a fixed point) of waves reaching an area are dependent on the fetch (distance over water that the wind blows for a given direction), depth of water over a given fetch, the wind velocity and duration. Longer fetch lengths, deeper water over the fetch, higher wind velocities and longer durations result in greater wave heights propagating into an area.

1.1.3.a <u>Fetch Determination</u>. The wave approach directions (fetches) critical to the area were chosen and the fetch lengths computed using the procedure contained in ETL 1110-2-305 (September 1983). Fetch lengths, shown in Table 3, were computed for the average length of radials centered about each of the principal sixteen directions and spaced at 4.5 degree increments on either side of the principal compass direction. All directions which can cause waves to propagate towards the project area were evaluated to determine which direction causes the most severe conditions. The average depth along each fetch was also computed. These data are required to calculate the offshore wave heights and periods.

1.1.3.b <u>Annual Wave Climate.</u> An annual wave climatology was developed for the wave approach directions affecting the study area using the shallow water wave forecasting equations as presented in the Automated Coastal Engineering System (ACES 1.07) computer program. Wave heights were developed corresponding to the wind speed group and percent occurrence of that group by direction from the climatology shown in Table 4. The data was adjusted to show the number of occurrences of various wave heights by direction over a typical year period including calms. The procedure used to develop this wave climate is presented in the following paragraphs:

1. The Patuxent hourly wind data were analyzed for 1945-1995 and binned by direction (every 22.5 deg) and by speed (every 5 mph).

2. ACES was applied to determine wave height and period for each speed bin.

3. The number of wave occurrences; period (T, sec), height (H, ft) and angle relative to the shoreline (a, deg) per direction and speed group were entered into an Excel spreadsheet for later use in the GENESIS shoreline change model.

1.1.3.c <u>Storm/Design Wave Climate.</u> The procedure used to develop the storm/design wave climate is presented in the following paragraphs:

1. The project life for the purpose of the conceptual design was considered to be 50 years. Per EM 1110-2-1614, the design, as a minimum, must withstand conditions which have a 50% probability of being exceeded during the project life. Following this criteria, the minimum design would be for approximately a 73 year return period. As discussed in Section 1.1.2, the Patuxent hourly wind data for 1945-1995, shown in Table 4, was analyzed to determine annual maxima and a Gumbel distribution was applied to indicate the extreme winds for 5, 10, 25, 50 and 100-yr return periods from each 22.5 degree direction band. For the design conditions, the extreme winds for the 73 year return interval were determined.

2. ACES 1.07 was used to determine the wave height and period for the 73 year return interval for each of the wave approach directions at the entrance to Saint Jerome Creek. The output from the ACES 1.07 calculations is presented in Section C-4.

The 73 year return period storm waves for the various wave approach directions are shown in Table 5.

1.1.3.d **<u>Design Waves.</u>** Analysis of the storm wave data in Tables 5 indicates that the largest waves impacting the study area are from the E through the SE directions. The 73 year storm tide of +5.0 feet MLLW combined with the average depth of water at the head of the jetties results in a design water depth of 10 feet. For the concept design phase, a design breaking wave height of 7.0 feet is selected.

1.1.4 Shoreline Erosion and Sediment Transport

Based on the field observations and analyses conducted, it is evident that the sediment that is shoaling the entrance channel is being transported to the channel from both north and south of the channel. To gain some preliminary insight into the shoaling problem, a comparison of the available historic shorelines of the area is shown in Figure 2. This data was obtained from the Maryland Geological Survey website. Analysis of these shorelines indicates that in 1849, the entrance into the Saint Jerome Creek area was completely open to the Chesapeake Bay exposure to the SE. Between 1849 and 1942 (93 yrs.), the southern shoreline migrated northward about 1500 feet to the general location of the existing entrance channel. Between 1942 and 1955 (13 yrs), this shoreline accreted bayward. Between 1955 and 1993, this shoreline continued to accrete bayward at a slower rate. The significant northern migration of this shoreline indicates a significant rate of longshore sand transport from the south to the north. The source of this transport appears to be the erosion of the shoreline south of this area.

In 1849 on the north side of the entrance channel, Figure 2 indicates the existence of a sand spit which would have essentially blocked the current entrance into Saint Jerome Creek. Between 1849 to 1942, this spit eroded. Between 1942 to 1955, this spit reformed into the Saint Jerome Creek area in the general location of the current spit. Between 1955 to 1993, the spit remained in the same general location. The reformation of the spit between 1942 to 1955 to 1993 indicates a significant rate of longshore sand transport from the north to the south. The source of this transport appears to be the erosion of the north shoreline during this period. The average shoreline change rates for the Chesapeake Bay shoreline segments, shown in Figure 2, south and north of the entrance into Saint Jerome Creek are shown in Table 6.

Figure 3, based on a 2003 aerial photograph, illustrates the regional longshore sand transport in the project area showing the dynamic nature of the entrance into Saint Jerome Creek and the sand transport pathways into the navigation channel. The pathways of the longshore sand transport from the north (Q south) and from the south (Q north) into the Saint Jerome Creek channel as well as the pathway of sand bypassing across the entrance channel from north to south are clearly shown.

The potential wave-induced longshore sediment transport rate to the area was determined using the GENESIS model. The model was driven by the annual wave time series consisting of hourly wave heights, periods and directions as described above in Section 1.1.3.b. The GENESIS output indicates that the net transport of sand along the shoreline north of the channel entrance is approximately 4,200 cubic yards per year from north to south towards the channel entrance. The net transport of sand along the shoreline south of the channel entrance is approximately 13,300 cubic yards per year from south to north towards the channel entrance.
These rates are potential longshore transport and assumes that there is a source of material in the system which can be transported. Field and aerial photography observations indicate that the shoreline beaches and the nearshore shallow shoals to the south and north of the channel area would provide sand for transport to the project site. In addition, the shallow shoal area bayward of St. Jerome Creek would also provide sand for transport to the channel area.

Figure 4 illustrates the local sand transport pathways into the entrance of Saint Jerome Creek. Sand is transported along the north shoreline to the Saint Jerome Point area where, depending on the tidal current direction, it bypasses the entrance as a result of strong ebb flow tidal currents. During flood currents, bypassing is minimized and sand is transported into the shoal area along the sand spit on the north side of the entrance channel and into the channel. Sand is transported along the south shoreline where it nourishes the Deep Point area and shoals the channel.

1.1.5 Historical Channel Shoaling

Maintenance dredging has historically been performed about once every ten years due to funding limitations. However, shoaling of the channel typically begins to occur within two years of completion of the maintenance dredging. Within five years of the maintenance dredging, the controlling depth in the channel is typically well below the authorized channel depth. As shown in Section 1.1.4, sand transport along the shorelines north and south of the channel entrance causes rapid shoaling at the channel entrance and just inside the mouth of the channel. The past dredging events for the channel are shown in Table 7.

Numerous condition surveys and pre and post dredging surveys of the channel have been performed by the Baltimore District Corps of Engineers. These surveys were obtained in digital format and channel cross-sections were developed at 100 ft. intervals for each survey. These cross-sections were compared and channel shoaling rates were computed and are summarized in Table 8. Analysis of Table 8 indicates that the average channel shoaling rate between 1995 and the pre-dredge survey in 2006 was 3,500 cubic yards per year. Following the channel dredging in 2006, the shoaling rate between the 2006 post dredge survey and the 2009 survey was 6,800 cubic yards per year. The average channel shoaling rate between 1995 and 2009 was 5,100 cubic yards per year.

Although the shoaling volumes and shoaling rates are important in predicting the volume of dredging required, it is important to determine the typical time required for the channel to shoal after a dredging event to a controlling depth that restricts navigation. This is important since it only takes one location in the channel to shoal and restrict the usage of the entire channel.

Once this occurs, the channel needs to be dredged to provide unrestricted navigation. Based on past experience and a review of the current shoaling rates, it is concluded that the depth of the channel is no longer viable by the 5^{th} year after dredging.

In order to further evaluate the typical time required for the channel controlling depth to restrict navigation, an analysis of the channel depth changes was conducted. For the purposes of this evaluation, it was estimated that a controlling depth of -4.0 feet MLLW or less would restrict the navigation in the channel.

For this evaluation, profiles of the controlling depth along the channel centerline, 50 feet left and 50 feet right of the channel centerline of each survey were plotted. Figure 5 shows the channel profile for each survey along the centerline of the channel. This data was then imported into Excel files and analyzed to determine the length of time required for the channel controlling depth to decrease to less than -4.0 feet MLLW following the two dredging events, 1991 and 2006. This analysis indicated that by 1995, 4 years after dredging in 1991, the controlling depth in the channel was between -4.0 to -5.0 feet MLLW in many locations and between -3.0 to -4.0 feet MLLW in several locations. Based on this rate of shoaling it is estimated that within 5 years of dredging, the channel shoals to less than -4.0 feet MLLW in many locations. By 2009, 3 years after dredging in 2006, similar conditions existed. A clear trend in rapid shoaling after dredging events is apparent. Based on this evaluation, the data and shoaling trends support a without-project condition shoaling rate that reduces the controlling depth to less than -4.0 feet MLLW every 5 years.

2.0 PRELIMINARY CONCEPT PLANS

Based on an evaluation of the data developed in Task 1, preliminary concept plan alternatives were developed to determine the most efficient and feasible plan to protect against navigation channel shoaling and beach erosion. The objective was to develop a reasonable list of possible alternatives and then to select the three best alternatives along with the no-action alternative for further evaluation.

Given the layout of the entrance into Saint Jerome Creek, there are a number of preliminary design solutions and preliminary alternative plans that could be implemented to reduce the shoaling in the Saint Jerome Creek navigation channel. The most practical alternatives are discussed in the following paragraphs.

2.1 ALTERNATIVES

Alternative 1 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 6. The south jetty would connect to the shoreline about 400 feet south of the northern tip of Deep Point and would have a length of 1,400 feet, including a 200 foot breakwater section at its bayward end. A second 200 foot breakwater segment would also be constructed with a 200 foot gap from the first breakwater section. The objective of this jetty would be to trap the northerly longshore transport and prevent bypassing of the transport around the jetty. The landward terminus of the jetty is located to minimize potential downdrift impacts along the Deep Point shoreline. The purpose of the breakwater segments would be to increase the sediment storage capacity landward of the jetty. The north jetty would connect to the shoreline about 200 feet west of the southern tip of Saint Jerome Point and would have a length of 1,300 feet. The objective of this jetty would be to trap the southerly longshore transport and prevent bypassing of the transport around the jetty. The proposed crest elevation of the jetties and breakwaters would be +4 feet to + 5 feet MLLW.

Alternative 2 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 7. The south jetty is the same as Alternative 1. The north jetty would connect to the shoreline at the southern tip of Saint Jerome Point and would be perpendicular to the shoreline to the north. The objective of this jetty would be to trap the southerly longshore transport and prevent bypassing of the transport around the jetty. The jetty would have a length of 700 feet and a proposed crest elevation of +4 feet to + 5 feet MLLW.

Alternative 3 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 8. The south jetty would connect to the shoreline about 1,200 feet south of the northern tip of Deep Point and would have a length of 1,100 feet. The objective of this jetty would be to trap the northerly longshore transport and prevent bypassing of the transport around the jetty. The landward terminus of the jetty is located further to the south and would potentially result in downdrift impacts along the Deep Point shoreline. The north jetty would connect to the shoreline about 200 feet west of the southern tip of Saint Jerome Point and would have a length of 1,300 feet. The north jetty is the same as Alternative 1.The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 3a – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 9. The south jetty is the same as Alternative 3. The north jetty is a modification of Alternative 3 with the north jetty connecting to the shoreline about 450 feet west of the southern tip of Saint Jerome Point with a length of 1,600 feet. These modifications would increase the sand storage capacity of the north jetty as well as locate the landward terminus of the jetty further away from the private residence on the point. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 4 – This alternative is a variation of Alternative 3 and consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 10. The south jetty would connect to the shoreline about 500 feet south of the northern tip of Deep Point and would have a length of 985 feet. The location of the landward terminus of this jetty would reduce potential downdrift impacts along the Deep Point shoreline. The north jetty connects to the shoreline about 200 feet west of the southern tip of Saint Jerome Point with a length of 1,300 feet. These modifications would also decrease the construction cost of the project. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 5 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 11. The south jetty would connect to the shoreline about 1,050 feet south of the northern tip of Deep Point and would have a length of 800 feet. The north jetty connects to the shoreline about 200 feet west of the southern tip of Saint Jerome Point with a length of 1,200 feet. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 6 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 12. The south jetty would connect to the shoreline about 1,700 feet south of the northern tip of Deep Point and would have a length of 700 feet. The objective of the south jetty would be to trap the northerly longshore transport along the south side of the jetty. Three (3) offshore breakwaters, 200 feet each, are located north of the south jetty to help stabilize the shoreline north of the jetty due to the downdrift impacts of the jetty. The north jetty would connect to the shoreline about 200 feet west of the southern tip of Saint Jerome Point and would have a length of 1,300 feet. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 7 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 13. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty would probably require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

Alternative 8 – This alternative consists of the construction of one jetty south of the entrance to Saint Jerome Creek as shown in Figure 14. The south jetty would connect to the shoreline about 1,050 feet south of the northern tip of Deep Point and would have a length of 800 feet. Three offshore breakwaters would be constructed south of the jetty to increase the sediment storage capacity of the jetty. The proposed crest elevation of the jetty/breakwaters would be +4 feet to + 5 feet MLLW. This is a modification of Alternative 5 without a north jetty. Its feasibility will depend on a comparison of project costs without the north jetty and more shoaling from the north versus project costs with the north jetty and reduced shoaling from the north over the project economic life.

In addition, the channel is relocated straight into the creek area. Although probably more hydraulically efficient than the existing channel alignment, several issues will have to be addressed to include the fate of the authorized anchorage basin and the potential increase in the local sponsor's (St. Mary's Co.) channel dredging length into the South Prong. Project economics will need to consider these issues.

Alternative 9 – This alternative is a modification of Alternative 5 with offshore breakwaters on the north side of the entrance channel instead of a north jetty as shown in Figure 15. Its feasibility will also depend on a comparison of project costs. Also, the ability of the breakwaters to reduce/eliminate the shoaling from the north will have to be evaluated as well as the consequences of eliminating the breakwaters on the south side.

3.0 CONCEPT PLANS SELECTED FOR FURTHER EVALUATION

The advantages and disadvantages of each of the preliminary alternatives were evaluated by the Project Delivery Team (PDT) during monthly PDT conference calls. Based on these discussions, three (3) alternative plans were selected as Concept Plans for further evaluation. These plans are described below along with the rationale for their selection.

Alternative 4 – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 16. The south jetty would connect to the shoreline about 500 feet south of the northern tip of Deep Point and would have a length of 985 feet. The north jetty connects to the shoreline about 200 feet west of the southern tip of Saint Jerome Point with a length of 1,305 feet. The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

This alternative was selected for further evaluation based on a comparison with the range of alternative plans developed. The general parameters considered which resulted in the selection of this alternative for further evaluation are as follows:

- Increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- Average sediment storage capacity along the updrift sides of the jetties; potential increase in capacity by adding offshore breakwaters
- Good protection of the existing spits from wave induced erosion
- Less downdrift shoreline erosion potential
- Less potential for sand bypassing from the north shoreline

Alternative 7– This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 17. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit would have a length of 1,770 feet. The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty would probably require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative for further evaluation are as follows:

- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- High sediment storage capacity along the updrift side of the north jetty
- Very good protection of the existing spits from wave induced erosion
- Minimal downdrift shoreline erosion potential
- Least potential for sand bypassing from the north shoreline

Alternative 7 – w/ Realigned Channel This alternative, also shown in Figure 17, is the same as Alternative 7 except the entrance channel will be realigned to eliminate the turn in the channel to the left after it passes Deep Point and continues into the existing turning basin. The purpose of the channel section realignment would be to make the channel more hydraulically efficient to reduce shoaling potential. The realigned channel will proceed straight through the through the inlet and intersect the channel section in Saint Jerome Creek. Stone scour protection will be required around the north jetty landward terminus.

The general parameters considered which resulted in the selection of this alternative for further evaluation are the same as Alternative 7 with the addition of:
The potential of decreasing the shoaling in the Saint Jerome Creek section of the channel by re-aligning the channel straight through the inlet

Alternative 7A – This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 18. The south jetty would connect to the shoreline about 100 feet south of the northern tip of Deep Point and would have a length of 2,040 feet. The north jetty would connect at the tip of Saint Jerome Point and would have a length of 1,100 feet. The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. The south jetty would have little downdrift impact along the Deep Point shoreline. The north jetty would some potential downdrift impact along the sand spit shoreline east of Saint Jerome Point due to the reduction in sediment transport to the shoreline. The proposed crest elevation of the jetties would be +4 feet to + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative for further evaluation are as follows:

- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- High sediment storage capacity along the updrift side of the south jetty
- Least potential for sand bypassing from the south shoreline
- Minimal downdrift shoreline erosion potential along Deep Point shoreline
- The estimated construction costs for the Concept Alternative Plans are presented below.

3.1 HYDRODYNAMIC ANALYSIS

Following the selection of the concept plans, an evaluation of the ability of each plan to reduce the shoaling in the entrance channel and decrease the frequency and volume of maintenance dredging was conducted. This evaluation is discussed in the following sections.

3.1.1 Numerical Modeling of Jetty Alternatives

3.1.1.a <u>Introduction</u>. Numerical modeling was conducted to analyze the current alignment of the navigation channel exiting St. Jerome Creek and the proposed concept plans to assess the efficiency and performance of the plans with regard to currents and shoaling in the entrance

SAINT JEROME CREEK CONCEPT PLAN COST ESTIMATES

CONCEPT PLAN ALTERNATIVE 4		Quantity	UOM	Unit Price	Total Price
A. Mob/Demob					
1	Mobilization	1	LS	$ 30,000	$ 30,000
2	Demobilization	1	LS	$ 15,000	$ 15,000
				Subtotal A:	$ 45,000
B. South Jetty					
1	Armor Stone	9,972	TON	$ 70	$ 698,010
2	Bedding Stone	1,843	TON	$ 60	$ 110,603
3	Geotextile Fabric	5,252	SY	$ 4.50	$ 23,635
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal B:	$ 833,248
C. North Jetty					
1	Armor Stone	14,546	TON	$ 70	$ 1,018,205
2	Bedding Stone	3,544	TON	$ 60	$ 212,652
3	Geotextile Fabric	7,356	SY	$ 4.50	$ 33,100
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal C:	$ 1,263,957
F. Dredging					
1	Mob & Demob	50,000	EA	$ 1	$ 50,000
2	Dredging (60' -100' wide to -7.0' MLLW)	16,000	CY	$ 30	$ 480,000
				Subtotal D:	$ 530,000
				Subtotal A - D:	$ 2,673,204
				Contingencies @ 20%:	$ 534,641
				Total A - D:	$ 3,207,845

CONCEPT PLAN ALTERNATIVE 7 WITH CHANNEL		Quantity	UOM	Unit Price	Total Price
A. Mob/Demob					
1	Mobilization	1	LS	$ 30,000	$ 30,000
2	Demobilization	1	LS	$ 15,000	$ 15,000
				Subtotal A:	$ 45,000
B. South Jetty					
1	Armor Stone	13,225	TON	$ 70	$ 925,769
2	Bedding Stone	2,303	TON	$ 60	$ 138,204
3	Geotextile Fabric	7,017	SY	$ 4.50	$ 31,575
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal B:	$ 1,096,548
C. North Jetty					
1	Armor Stone	21,530	TON	$ 70	$ 1,507,131
2	Bedding Stone	6,721	TON	$ 60	$ 403,286
3	Geotextile Fabric	10,461	SY	$ 4.50	$ 47,075
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal C:	$ 1,957,492
F. Dredging					
1	Mob & Demob	50,000	EA	$ 1	$ 50,000
2	Dredging (60' -100' wide to -7.0' MLLW)	22,000	CY	$ 30	$ 660,000
				Subtotal D:	$ 710,000
				Subtotal A - D:	$ 3,810,040
				Contingencies @ 20%:	$ 762,008
				Total A - D:	$ 4,572,048

CONCEPT PLAN ALTERNATIVE 7A		Quantity	UOM	Unit Price	Total Price
A. Mob/Demob					
1	Mobilization	1	LS	$ 30,000	$ 30,000
2	Demobilization	1	LS	$ 15,000	$ 15,000
				Subtotal A:	$ 45,000
B. South Jetty					
1	Armor Stone	22,127	TON	$ 70	$ 1,548,872
2	Bedding Stone	5,145	TON	$ 60	$ 308,722
3	Geotextile Fabric	11,330	SY	$ 4.50	$ 50,985
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal B:	$ 1,909,579
C. North Jetty					
1	Armor Stone	10,277	TON	$ 70	$ 719,406
2	Bedding Stone	1,366	TON	$ 60	$ 81,972
3	Geotextile Fabric	5,628	SY	$ 4.50	$ 25,325
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal C:	$ 826,703
F. Dredging					
1	Mob & Demob	50,000	EA	$ 1	$ 50,000
2	Dredging (60' -100' wide to -7.0' MLLW)	29,000	CY	$ 30	$ 870,000
				Subtotal D:	$ 920,000
				Subtotal A - D:	$ 3,702,282
				Contingencies @ 20%:	$ 740,456
				Total A - D:	$ 4,442,739

CONCEPT PLAN ALTERNATIVE 7 WITHOUT CHANNEL		Quantity	UOM	Unit Price	Total Price
A. Mob/Demob					
1	Mobilization	1	LS	$ 30,000	$ 30,000
2	Demobilization	1	LS	$ 15,000	$ 15,000
				Subtotal A:	$ 45,000
B. South Jetty					
1	Armor Stone	13,225	TON	$ 70	$ 925,769
2	Bedding Stone	2,303	TON	$ 60	$ 138,204
3	Geotextile Fabric	7,017	SY	$ 4.50	$ 31,575
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal B:	$ 1,096,548
C. North Jetty					
1	Armor Stone	21,530	TON	$ 70	$ 1,507,131
2	Bedding Stone	6,721	TON	$ 60	$ 403,286
3	Geotextile Fabric	10,461	SY	$ 4.50	$ 47,075
4	Timber Pile w/ Warning Sign	1	EA	$ 1,000	$ 1,000
				Subtotal C:	$ 1,957,492
F. Dredging					
1	Mob & Demob	0	EA	$ 1	$ -
2	Dredging (60' -100' wide to -7.0' MLLW)	0	CY	$ 30	$ -
				Subtotal D:	$ -
				Subtotal A - D:	$ 3,100,040
				Contingencies @ 20%:	$ 620,008
				Total A - D:	$ 3,720,048

channel. Details of this modeling are presented in Section C-2 of this report. The dimensions and the layout of the structures were determined in the concept design phase of the study as presented in Figures 16–18.

3.1.1.b Description of Action Alternatives. The concept plans were used to accurately delineate the locations of jetty structures, the channel, shoreline armoring, and other features that are required to be represented in the model. Model representations of Alternatives 4, 7, 7 with realigned channel, and 7A are shown in Section C-2.

3.1.1.c Modeling Approach. Modeling of the Saint Jerome Creek study area was conducted by a multi-level approach involving application of three models. The two-dimensional finite element model ADCIRC was applied over a regional scale to calculate tidal water levels, which were then provided to a separate circulation model, CMS-Flow, as boundary conditions. CMS-Flow is a two-dimensional finite volume circulation and sediment transport model that was operated on a local scale. Waves were computed on a local scale by application of the model CMS-Wave, which computed detailed wave properties at the study area. The wave, circulation and sediment transport models were coupled so that the wave model would receive updated tide, depth, and current information, and the circulation and sediment transport model would be provided with updated wave properties. This approach allowed each model to respond to changes in the physical system.

Development of the numerical model grids used bathymetric data including surveys performed by the Baltimore District in 2008, the National Ocean Service (NOS) GEODAS and bathymetry obtained from the regional ADCIRC mesh.

3.1.1.d Model Results. The primary objective of the study is to examine shoaling patterns and rates in the navigation channel. The existing-condition model was run for a time period of 10.5 days and the sediment transport coefficient was set such that this time period would be equivalent to a much longer time period of sedimentation. The model result was compared to historic dredging data (described in the main report) and the 10.5-day simulation was found to be equivalent to a real-world sediment transport time period of 2.5 months. The model reproduced the locations of sediment deposition, as shown in Figure 9 in Section C-2. The three primary areas of historic shoaling are in the back creek area (station 18-28), just seaward of the creek entrance (station 32-36), and where the channel crosses the offshore sediment bypassing bar (station 48-55). The model results in Figure 9 (yellow is accretion, blue is erosion) correlate well with the historic areas of shoaling in the channel.

3.1.1.e Predicted Shoaling Rates and Controlling Depths.

The model was then used to simulate shoaling patterns and shoaling rates in the navigation channel for each of the concept plans. Computational grids for each alternative were developed by incorporating the alternative design into the existing condition grid. Model representations of Alternatives 4, 7, 7 with realigned channel, and 7A are shown in Figures 10 -13, respectively, in Section C-2.

The shoaling volume computed by the model for the existing without project condition was compared to the shoaling volume computed by the model for each concept plan for a 2.5 month simulation to produce a scaling ratio between the existing condition shoaling rate and the concept plans shoaling rates. This scaling ratio was then applied to historic deposition rates to determine the predicted change in the shoaling rate for each alternative. These results are shown in Figure 19 and Table 9. Alternative 7 with the realigned channel exhibits the lowest shoaling rate, indicating that it could provide the most long term reduction in dredging.

Using the shoaling ratios between the existing without project and with project conditions shown in Table 9, an estimate of the time required for the dredged channel in each concept plan to shoal to a controlling depth of -4.0 feet MLLW or less was made. The procedure to develop this estimate assumes that under existing without project conditions, the navigation channel shoals to a controlling depth of -4.0 feet MLLW or less in 5 years. To maintain unrestricted navigation in the channel, dredging would be required every 5 years. The dredge quantity would be on the order of five times the historic annual channel shoaling rate, 5,100 cubic yards per year or 25,500 cubic yards. The modeling results indicate that the shoaling rate in the channel is reduced with the implementatiion of each concept plan alternative. With reduced shoaling rates, it is assumed that the time required to reach a controlling depth of -4.0 feet MLLW would be increased as compared to the without project condition. To estimate the time required for each of the concept plans to reach the limiting controlling depth, the shoaling ratios in Table 9 were used to determine the dredging frequency. It is assumed that the without project condition (shoaling ratio =1.00) will result in a dredging frquency of 5 years (5 yrs./1.00 = 5.0 yrs.). For Concept Alternative 4 with a lower shoaling ratio (0.89), the dredging frequency would be 5.6 years (5 yrs /0.89 = 5.6 yrs.). The dredging frequency required for each concept plan alternative and the total dredging volume for a 50-year project life was determined, as shown in Table 10.

3.1.1.f <u>Conclusions.</u> The implementation of numerical tidal and wave models provides a method of consistently comparing possible alternatives for reducing future dredging requirements at the entrance to Saint Jerome Creek. The results indicate that Concept Plan Alternative 7 with the realigned interior channel section is the most effective in reducing channel shoaling. This alternative does involve the establishment of a new entrance to the creek, possibly requiring some added maintenance dredging during its equilibration period.

3.2 RECOMMENDED CONCEPT LEVEL PLAN

Based on the field investigations conducted, review of existing data, coastal engineering design investigations and numerical modeling investigations, the recommended concept level plan is Alternative 7 w/ Realigned Channel.

This alternative consists of the construction of two jetties at the entrance to Saint Jerome Creek as shown in Figure 17. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit would have a length of 1,770 feet. The existing entrance channel will be realigned to eliminate the turn in the channel to the left after it passes Deep Point and continues into the existing turning basin. The purpose of the channel section realignment would be to make the channel more hydraulically efficient to reduce shoaling potential. The realigned channel will proceed straight through the inlet and intersect the channel section in Saint Jerome Creek.

The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative as the Recommended Concept Plan for further evaluation are as follows:

- Most significant decrease in channel shoaling rate
- Longest interval between future maintenance dredging events
- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties

- Best potential for decreasing the shoaling in the Saint Jerome Creek section of the channel by realigning the channel straight through the inlet
- High sediment storage capacity along the updrift side of the north jetty
- Least potential for sand bypassing from the north shoreline
- Minimal downdrift shoreline erosion potential
- Best protection for the existing shorelines and spits from wave induced erosion

4.0 CONCEPT LEVEL DESIGN

The structural design level for the proposed jetties at the entrance to Saint Jerome Creek is the 50 yr. storm event (with the statistical design level per Corps guidance resulting in designing for the 73 yr. design wave). The design wave height for this event is $H_{73\ Yr.}$ = 7.0 feet. (breaking wave conditions).

4.1 Determination of Stone Sizes

Hudson's stability formula was used to determine the required armor stone size using the ACES 1.07 breakwater design module with the following equation:

$$\mathbf{W = \frac{W_r\, H^3}{K_D\,(S_r - 1)^3\ COT@}}$$

where:

W = weight (lb.) of individual armor unit in the primary cover layer
Wr = unit weight of armor rock (165 lb/cubic ft)
H = design wave height (7.0 ft.)
S_r = specific gravity of armor unit relative to water (2.58)
COT@ = angle of structure side slope measured from the horizontal (degrees); cot@ = 1.5
K_D = stability coefficient that varies primarily with the shape of the armor units, roughness of the armor unit surface, sharpness of edges, and degree of interlocking obtained in placement. K_D values are selected for a breaking wave condition based on depths and slopes at the structure; K_D = 2.0

Based on a design wave height of $H_{73\ Yr.}$ = 7.0 feet for the 73 year return period, the required armor stone weight is calculated to be 4,800 pounds. The range of armor stone was determined using guidance in the SPM 1984 and was determined to be 3,600 pounds to 6,000 pounds with at least 50% of the stones weighing more than 4,800 pounds. The intermediate stone would be W/10 = 360 to 600 pounds.

4.2 Crest Elevation

The primary function of the proposed jetties at Saint Jerome Creek is to eliminate and/or reduce the channel shoaling problem and the shoreline erosion problems along the shorelines at the entrance to Saint Jerome Creek. The required crest height selected for the jetties is +5.0 feet MLLW.

4.3 Crest Width

The crest width of the recommended breakwater section was calculated using ACES 107 – Breakwater Design Using Hudson and Related Equations. The equation used in ACES 107 is:

$$\mathbf{B = nK_d(W_a/W_r)^{1/3}}$$

where:

B = crest width (ft)
n = number of stones (3)
$\mathbf{K_d}$ = layer thickness coefficient (1.0)
$\mathbf{W_a}$ = weight of armor unit in primary cover layer (4,800 lbs)
$\mathbf{W_r}$ = density of armor unit (165 lb./cubic foot)

The minimum crest width was selected to be 9.0 feet.

4.4 Armor Thickness

The thickness of the armor layer was computed using ACES 107 – Breakwater Design Using Hudson and Related Equations. The equation used in ACES 107 is:

$$\mathbf{r = nk_d(W_a/W_r)^{1/3}}$$

where:

r = average thickness (ft)
n = number of layers (2)
$\mathbf{W_a}$ = weight of the individual armor unit (4,800 lbs.)
$\mathbf{W_r}$ = unit weight of the armor unit (165 lb./cubic foot)
$\mathbf{K_d}$ = layer thickness coefficient (1.0)

The armor layer thickness was selected to be 6.0 feet, or 3.0 feet per individual armor unit.

4.5 Jetty Cross-Section

A typical cross-section of the jetty is shown in Figure 20.

5.0 GEOTECHNICAL INVESTIGATION

After the selection of the concept design plan, a geotechnical investigation was conducted to evaluate the foundation conditions in the design plan location. The geotechnical plan, as shown on the plan entitled "Recommended Alternative 7 w/ and w/o Realigned Channel", 2010 in Section C-3, included drilling and sampling a minimum of eleven (11) borings to a minimum depth of 30 feet in accordance with ASTM D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals (2.5'), samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. split spoon sampler. The number of blows required to drive the sampler the final foot to determine the Standard Penetration Resistance, were recorded and used to determine the index of the soil's strength, density and behavior under applied loads.
Standard boring logs with visual classification of soils in accordance with ASTM D- 2488 were prepared with pertinent data for each boring level, including elevation and blow counts. In addition, eight (8) grab samples of material within the existing and proposed realigned channel were taken. Each sample was obtained from the elevation of the existing bottom to -7' MLLW (proposed dredge depth).

Following the completion of the field investigation, an evaluation of the foundation conditions was conducted. This evaluation indicated that the majority of the borings had a range of weight of hammer (WOH) to very low blows per 0.5 ft which indicates that the soil would not support the load of the proposed stone jetties. Numerous discussions with the Baltimore District's

Geotechnical Engineer concluded that constructing the jetties in the proposed location would result in extreme settlement of the structure and possibly failure of the underlying foundation. Since the proposed locations of the jetties were determined to be the optimum location to reduce the shoaling in the navigation channel (based on the hydrodynamics analysis), consideration of an alternative structure design was initiated.

6.0 SHEET-PILE JETTY ALTERNATIVE

Due to the poor foundation conditions at the proposed jetty construction site, consideration was given to constructing pile supported sheet pile wall jetties with the supporting piles driven through the poor foundation layers and into firm foundation material. Two alternative designs were developed as discussed below:

Alternative 1. "Batter Pile/Vinyl Sheet Pile Jetty" - This option consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about – 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14”-3’ diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile.

Alternative 2. "Earth Fill/Vinyl Sheet Pile Jetty" - This option consists of two (2) walls of 46 ft. lengths of vinyl sheet pile separated by a distance of 8 ft. and driven into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about – 41 ft. MLLW. To provide stabilization of the sheet pile walls, structural fill (possibly dredged material) would be placed between the walls and steel tie rods would be placed at 5 ft. intervals on each side of the walls to provide tension between the walls. A concrete cap would be placed on the top of the sheet pile walls.

Evaluation of each of these alternatives resulted in the selection of Alternative 1 for further evaluation. This conclusion was reached due to the significantly higher construction cost of Alternative 2 and the likelihood that the environmental permitting agencies would grant permits for construction of this alternative.

Additional design analysis was conducted for Alternative 1 to optimize the functional performance and cost-effectiveness of the alternative. This analysis consisted of determining the design wave heights expected to impact the two (2) jetties (North Jetty and South Jetty) considering the extensive shoal system in the area. The results of this analysis indicated that the outer 400 LF. of the North Jetty would be subjected to breaking wave heights of about 6.4 ft. The remainder of the North Jetty as well as the entire length of the South Jetty would be subjected to wave heights of about 3.0 ft. Details of the design analysis are presented in Section C-4 of this report. This analysis resulted in the development of the typical batter pile jetty sections shown on Sheet C-2 in Section C-6 of this report. There are two designs for the batter pile jetty: 1) Section A with SG950 vinyl sheet pile for higher wave energy and 2) Section B with SG650 vinyl sheet pile for lower wave energy. Cross-sections of the two designs are shown on Sheet C-2 and will have 12"x12"x48" and 10"x10"x36" batter blocks, respectively. A typical view of the length of the batter pile structure is also shown on Sheet C-2. Additional design analyses will be conducted in the final design phase of the project.

Construction Cost Summary – Detailed construction cost estimates for three (3) options for the selected Alternative 1 - Batter Pile/Vinyl Sheet Pile Jetty, are presented in Section C-5 of this Appendix. Option 1 includes treated timber piles in the construction, Option 2 includes

Timberguard treated timber piles and Option 3 includes pre-cast concrete piles in the construction. These three (3) options were considered to evaluate the cost differential of using treated timber piles which would be less expensive for the initial construction but would have higher maintenance cost and replacement costs during the 50 yr. project life versus pre-cast concrete piles which would have higher construction costs but lower maintenance costs and probably no replacement costs during the project life. Since the cap on the Section 107 Continuing Authorities Program is $ 7,000,000, the Local Sponsor for this project would be required to pay the construction cost differential and assume maintenance costs for the project.

SELECTED ALTERNATIVE 1	**OPTION 1 W/ TIMBER PILES**	**OPTION 2** W/ TIMBERGUARD PILES	**OPTION 2** W/ CONCRETE **PILES**
NORTH BATTER PILE JETTY			
Outer 400 LF. (High Wave Energy)	$ 1,057,600	$1,148,200	$ 1,228,600
Remaining 1,370 LF. (Low Wave Energy)	$ 2,699,700	$3,010,100	$ 3,285,200
SOUTH BATTER PILE JETTY			
Entire 1,330 LF. (Low Wave Energy)	$ 2,620,800	$2,922,200	$ 3,189,200
DREDGING 30,000 CY.	$ 876,800	$ 876,800	$ 876,800
MOBILIZATION/ DEMOBILIZATION	$ 41,500	$ 46,000	$ 50,000
CONTRACT ADMINISTRATION	$ 46,400	$ 48,800	$ 50,000
TOTAL	**$ 7,342,900**	**$8,052,100**	**$8,679,800**

Permits Required – The permits required prior to construction include:

- MDE Water Quality Certification
- MDDNR Consistency Determination
- MDDNR TIdal Wetlands License
- County Building Permit

Typically, these approvals can be obtained in 6 months.

TABLE 1
STORM SURGE TIDE ELEVATIONS – COVE POINT, MARYLAND
(Source: Virginia Institute of Marine Science, Storm Surge Height-Frequency Analyses and Model Prediction for Chesapeake Bay, 1978)

RETURN INTERVAL	ELEVATION (ft MLLW)
10 year	3.5
25 year	4.1
50 year	4.6
73 year	5.0
100 year	5.3

TABLE 2
PATUXENT NAVAL AIR STATION
ONE MINUTE AVERAGE WIND SPEED (mph)
ADJUSTED to 33 Feet ELEVATION

	RETURN PERIODS (years)				
DIRECTION	5	10	25	50	100
N	30.91	34.18	38.31	41.38	44.42
NNE	29.03	32.39	36.63	39.78	42.90
NE	26.75	29.58	33.16	35.81	38.44
ENE	27.66	31.71	36.82	40.61	44.38
E	31.93	37.66	44.89	50.25	55.58
ESE	29.74	34.32	40.12	44.42	48.69
SE	30.02	34.15	39.38	43.25	47.10
SSE	28.43	31.17	34.64	37.20	39.75
S	26.68	28.89	31.68	33.76	35.81
SSW	28.28	30.93	34.27	36.76	39.22
SW	31.54	34.77	38.85	41.87	44.87
WSW	30.64	33.88	37.97	41.00	44.02
W	34.51	38.71	44.02	47.95	51.86
WNW	36.96	40.14	44.15	47.12	50.07
NW	38.18	41.59	45.90	49.10	52.27
NNW	36.02	39.40	43.66	46.83	49.97

TABLE 3

FETCH DIRECTIONS, LENGTHS AND DEPTHS

Direction (Deg.)	Fetch Length (mi)	Mean Depth (ft)
N (0)	0.09	5.0
NNE (22.5)	0.12	5.0
NE (45)	12.72	27.0
ENE (67.5)	15.78	27.0
E (90)	13.46	32.0
ESE (112.5)	17.13	31.0
SE 135)	26.36	27.0
SSE (157.5)	1.04	9.0
S (180)	0.27	5.0

TABLE 4
PATUXENT NAVAL AIR STATION
WIND OCCURRENCES VS. DIRECTION
NO. of OBSERVATONS 1945 to 1995

Direction/ Occurrences	ONE MINUTE AVERAGE WIND SPEED (MPH at 33 feet)										
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	>45	TOTAL
N	4733	12457	7158	2788	721	156	40	6	1	0	28060
NNE	2934	10248	5518	2060	540	93	18	6	2	0	21419
NE	3184	10292	4392	1444	331	52	9	2	0	0	19706
ENE	2491	7016	2920	761	110	33	18	10	1	0	13360
E	3236	8082	2931	717	124	41	11	9	0	3	15154
ESE	2281	6729	2678	712	151	60	17	7	1	3	12639
SE	3119	11793	7144	2454	453	57	20	2	0	2	25044
SSE	3360	11329	7066	2950	455	57	10	1	1	0	25229
S	5971	15842	6847	2179	420	48	4	1	0	0	31312
SSW	3362	11405	7000	2872	453	69	10	2	0	0	25173
SW	3524	12410	8585	4282	1002	154	22	6	0	1	29986
WSW	2795	8407	5650	2550	523	117	31	4	0	1	20078
W	4674	10648	5536	2429	622	171	37	8	3	1	24129
WNW	4031	9266	5028	3590	1468	622	187	50	12	2	24256
NW	5354	12003	7972	6122	3479	1235	381	79	13	3	36641
NNW	4371	11439	7999	4821	1658	466	107	31	6	2	30900
TOTAL	59420	169366	94424	42731	12510	3431	922	224	40	18	383086

TABLE 5 SAINT JEROME CREEK DESIGN WAVE HEIGHTS (ft.)				
	73 YEAR RETURN PERIOD Storm Surge (s) = +5.0 ft. MLLW Water Depth (d) At Jetty Head = 5.0 ft. Design Water Depth (d_s) = 10.0 ft.			
DIRECTION	**H (ft.)**	**T (sec.)**	**H_b (ft.) (CEM 2.01)**	**D_b (ft.) (CEM 2.01)**
N	1.63	2.96	1.84	2.28
NNE	1.78	3.19	2.04	2.52
NE	4.41	4.11	4.66	5.89
ENE	5.28	4.50	5.58	7.05
E	7.30	5.32	7.73	9.76
ESE	6.66	5.35	7.20	9.03
SE	6.68	5.49	7.29	9.12
SSE	2.85	4.14	3.29	4.06
S	1.58	3.24	2.05	2.48

TABLE 6 HISTORICAL SHORELINE CHANGE RATES (Source: Maryland Geological Survey)			
SOUTHERN SHORELINE		**NORTHERN SHORELINE**	
1942 – 1955	5.9 FT. PER YR.	1942 – 1955	-2.2 FT. PER YR.
1955 – 1993	0.3 FT. PER YR.	1955 – 1993	-1.1 FT. PER YR.

TABLE 7 PAST MAINTENANCE DREDGING QUANTITIES & COSTS	
YEAR: 1991	**YEAR: 2006**
Dredge Quantity: 21,630 CY Contract Cost: $183,195	Dredge Quantity: 39,675CY Contract Cost: $937,100

TABLE 8
CHANNEL SHOALING HISTORY

	1995 to 1999	1999 to 2001	2001 to 2004	2004 to 2005	2005 to 2006 Pre	2006 Pre to 2006 Post Dredge	2006 Post-Dredge to 2009	AVG. Shoaling 1995 to 2006	AVG. Shoaling 2006 to 2009	
Total Shoaling Volume (cy)	12157	13960	4990	5852	1000	-50765	20419			
Average Shoaling Rate (cy/yr)	3039	6980	1663	5852	1000	NA	6806	3451	6806	

TABLE 9
ST. JEROME CREEK
W/O PROJECT & W/ PROJECT SHOALING RATES

Concept Plan Alternative	Shoaled Volume From Modeling 2.5 Mo. Simulation		W/ Project Shoaling Ratio Compared To W/O Project	Predicted Shoaling Based On Historic Shoaling 1995-2009	
W/O Project	1607	cy	100.00%	5100	cy/yr
Alt 4	1446	cy	89.99%	4590	cy/yr
Alt 7	1389	cy	86.41%	4407	cy/yr
Alt 7A	889	cy	55.32%	2821	cy/yr
Alt 7 - Realigned Channel	765	cy	47.60%	2428	cy/yr

TABLE 10
ST. JEROME CREEK
MAINTENANCE DREDGING REQUIREMENTS

Concept Plan Alternative	W/ Project Shoaling Ratio Compared To W/O Project	Predicted Shoaling Based On Historic Shoaling 1995-2009	Dredging Frequency (25,500 cy Ea. Event)	Dredging Volume Per 50 Yr. Life (No. Events)
W/O Project	100.00%	5100 cy/yr	5 yrs	255000 cy (10)
Alt 4	89.99%	4590 cy/yr	5.6 yrs	229500 cy (9)
Alt 7	86.41%	4407 cy/yr	5.8 yrs	229500 cy (9)
Alt 7A	55.32%	2821 cy/yr	9.0 yrs	153000 cy (6)
Alt 7 - Realigned Channel	47.60%	2428 cy/yr	10.5 yrs	127500 cy (5)

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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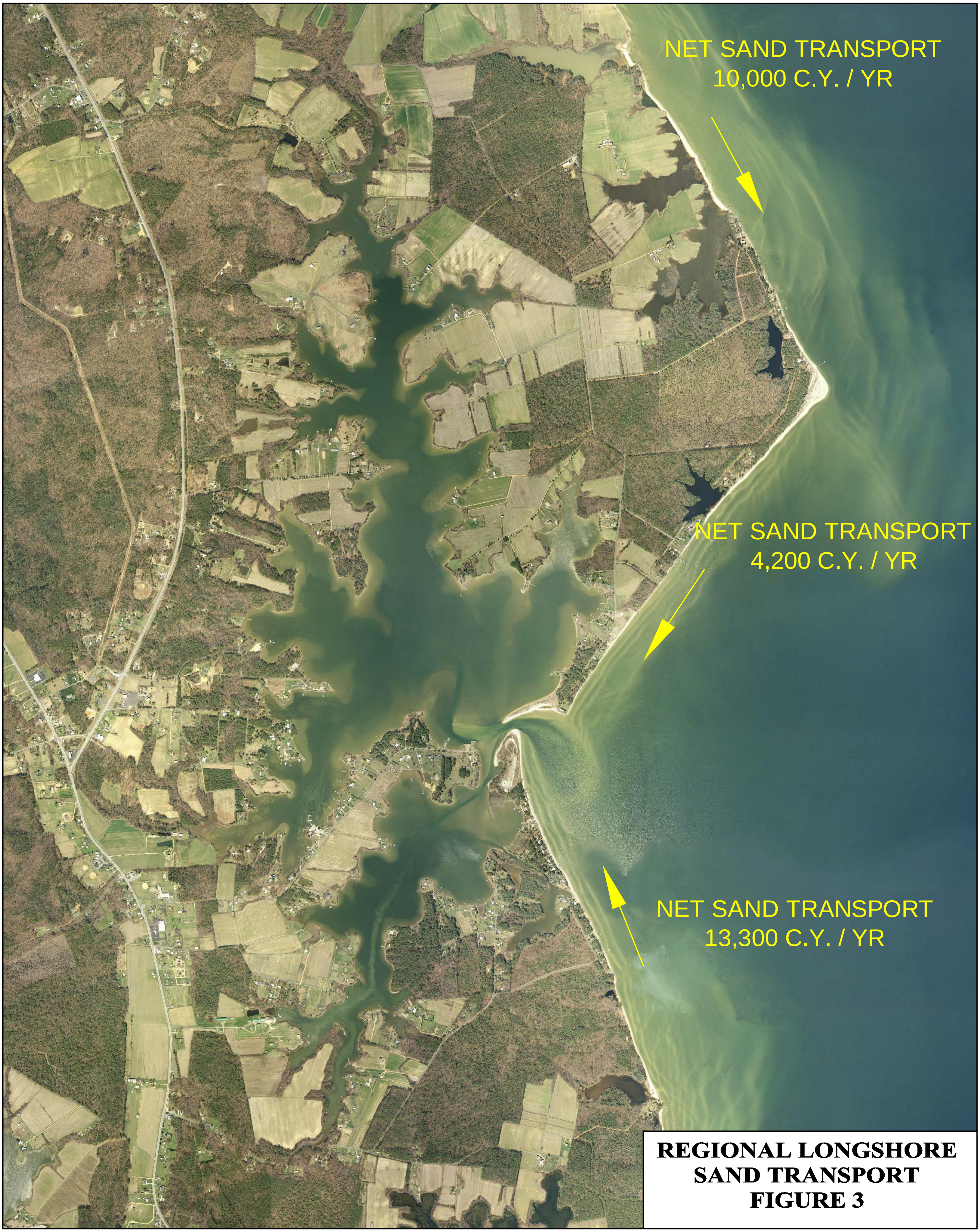
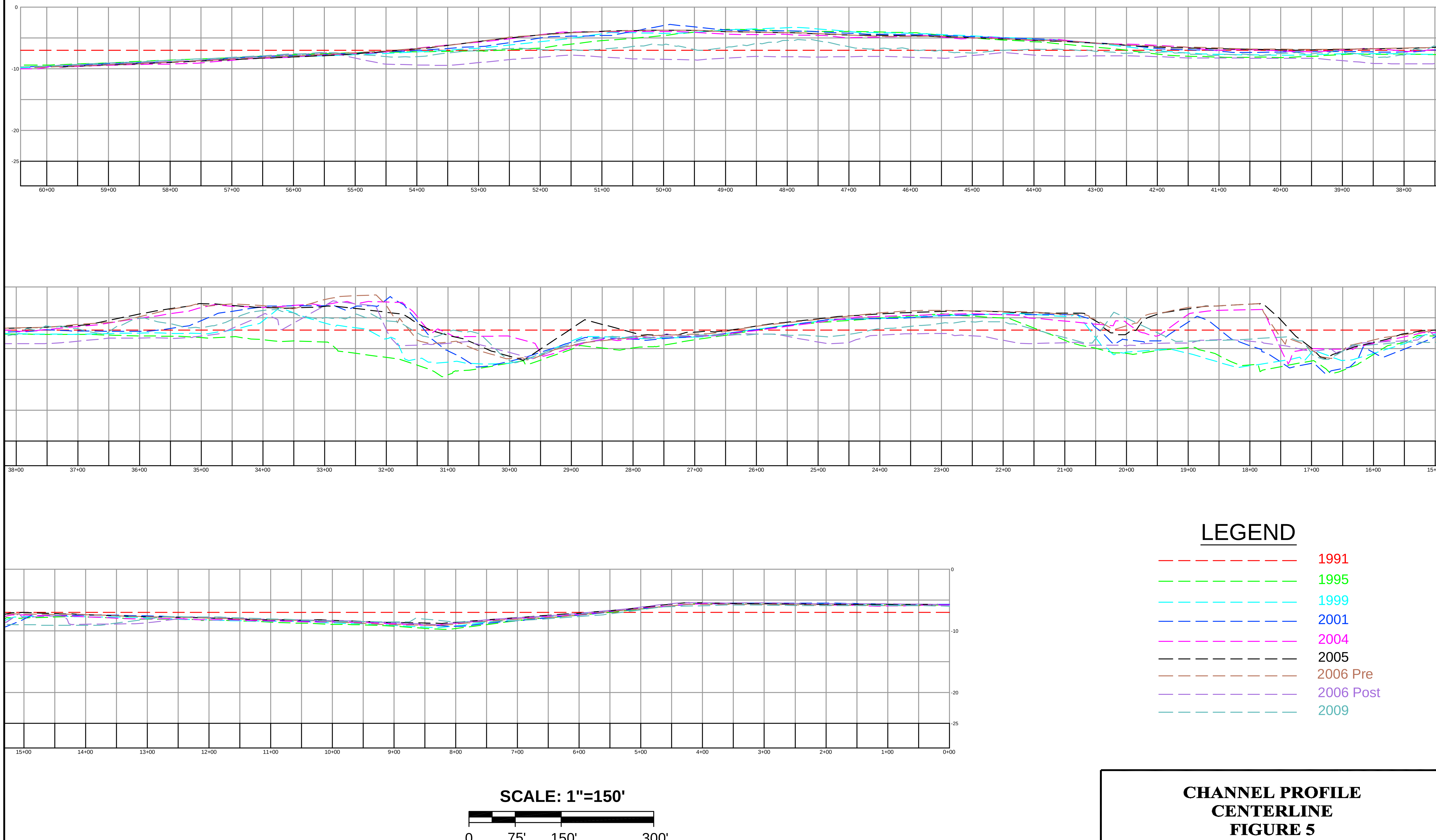
PROJECT AREA
FIGURE 1

HISTORICAL SHORELINE CHANGES
(2007 AERIAL PHOTO)
FIGURE 2



REGIONAL LONGSHORE SAND TRANSPORT
FIGURE 3

LOCAL LONGSHORE SAND TRANSPORT
FIGURE 4



CHANNEL PROFILE
CENTERLINE
FIGURE 5

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'
0' 400'

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ALTERNATIVE 1
(2007 AERIAL PHOTO)
FIGURE 6

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 2
(2007 AERIAL PHOTO)
FIGURE 7

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 3
(2007 AERIAL PHOTO)
FIGURE 8

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 3a
(2007 AERIAL PHOTO)
FIGURE 9

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 4
(2007 AERIAL PHOTO)
FIGURE 10

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 5
(2007 AERIAL PHOTO)
FIGURE 11

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 6
(2007 AERIAL PHOTO)
FIGURE 12

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 7 w/ AND w/o REALIGNED CHANNEL (2007 AERIAL PHOTO)
FIGURE 13

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400' 0' 400'

OFFSHORE & COASTAL TECHNOLOGIES, INCORPORATED
Engineering for the Marine Environment
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MILFORD, DELAWARE (302) 424-1441
EASTON, MARYLAND (410) 770-4744

ALTERNATIVE 8
(2007 AERIAL PHOTO)
FIGURE 14

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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ALTERNATIVE 9
(2007 AERIAL PHOTO)
FIGURE 15

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400' 0' 400'

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CONCEPT ALTERNATIVE 4
(2007 AERIAL PHOTO)
FIGURE 16

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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CONCEPT ALTERNATIVE 7 w/ AND w/o REALIGNED CHANNEL (2007 AERIAL PHOTO)
FIGURE 17

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400'

0' 400'

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CONCEPT ALTERNATIVE 7A
(2007 AERIAL PHOTO)
FIGURE 18

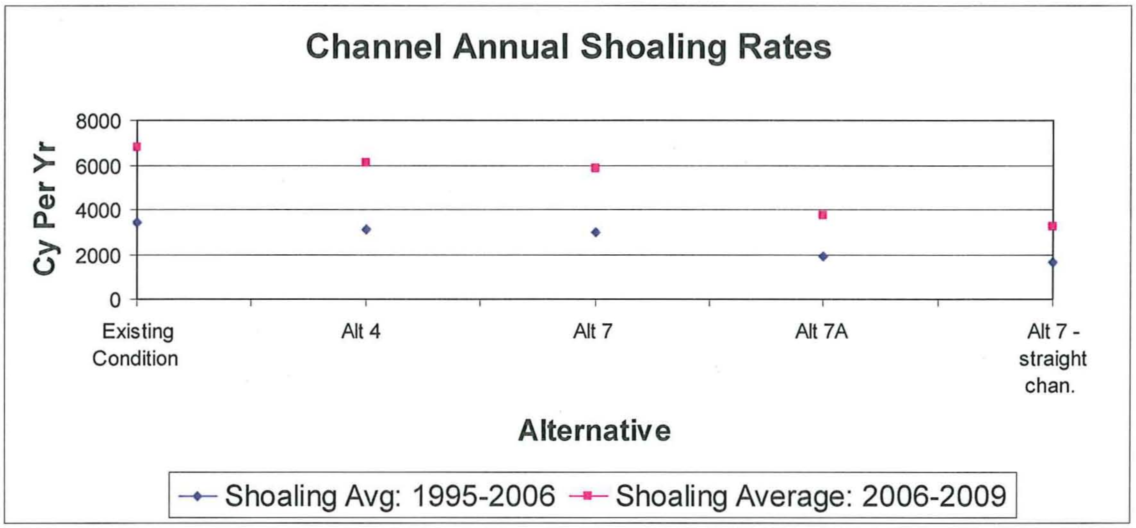
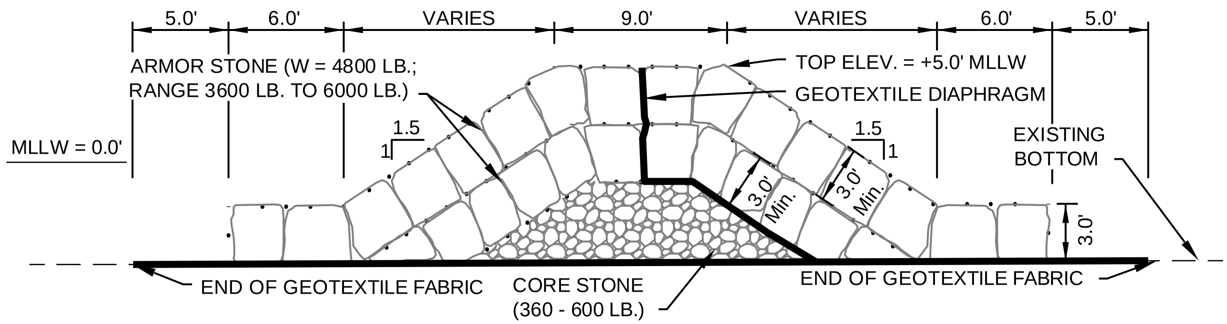


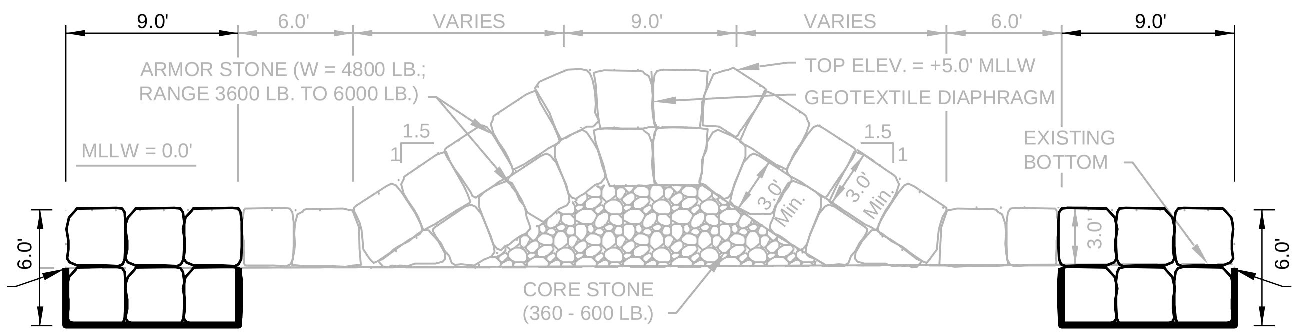
Figure 19 – Channel Annual Shoaling Rates



TYPICAL JETTY SECTION

SCALE: 1" = 10'

0 5' 10'



TYPICAL JETTY SCOUR PROTECTION SECTION

SCALE: 1" = 10'

0 5' 10'

TYPICAL JETTY / JETTY SCOUR PROTECTION SECTION
FIGURE 20

SECTION C-2

HYDRODYNAMIC ANALYSIS REPORT

Numerical Modeling of Jetty Alternatives for

St. Jerome Creek, Maryland

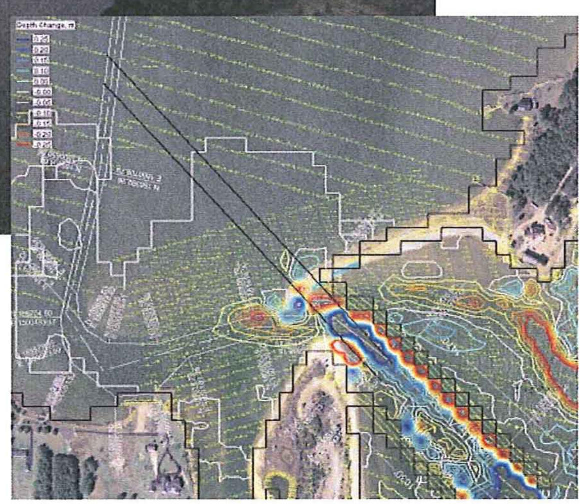
By

Offshore & Coastal Technologies, Incorporated

P.O. Box 1368

Chadds Ford, PA 19317

January 6, 2010



Numerical Modeling of Jetty Alternatives for

St. Jerome Creek, Maryland

January 6, 2010

Introduction

This numerical modeling results presented in this Appendix analyzes the current alignment of the navigation channel exiting St. Jerome Creek in St. Mary's County, Maryland, along the western shore of the Chesapeake Bay. The modeling assesses the efficiency and performance with regard to currents and shoaling of the present alignment and the apparent more "natural" alignment directly toward the east. The lengths of the structures were determined in the concept design phase of the study, which accounted for the sediment budget in the area and the potential for sand influx into the channel.

Description of Action Alternatives

The existing channel and four concept alternatives were considered in the numerical modeling study for this project. The main report describes the method for determining the four alternatives and the details about each alternative (length, spacing, etc.). Concept drawings were used to accurately delineate the locations of jetty structures, the channel, shoreline armoring, and other features that needed to be represented in the model. Model representations of Alternatives 4, 7, 7 with channel, and 7A are shown later in this Appendix.

Modeling Approach

Modeling of the St. Jerome Creek study area was conducted by a multi-level approach involving application of three models. The two-dimensional finite element model ADCIRC (Westerink et al 1992) was applied by the Coastal and Hydraulics Laboratory over a regional scale to calculate tidal water levels, which were then provided to a separate circulation model, CMS-Flow, as boundary conditions. CMS-Flow (Buttolph et al 2006) is a two-dimensional finite volume circulation and sediment transport model that was operated on a local scale. Waves were computed on a local scale by application of the model CMS-Wave (Mase et al 2005, Lin et al 2006), which computed detailed wave properties at the study area.

The wave, circulation, and sediment transport models were coupled so that the wave model would receive updated tide, depth, and current information, and the circulation and sediment transport model would be provided with updated wave properties. This approach allowed each model to respond to changes in the physical system.

The following sections provide details on the sources of model input, development of the model grids, model setups and boundary conditions, and results and discussion of transport processes.

Sources of Bathymetric Data

Development of numerical model grids requires bathymetric data that is mapped to the grid cell centers. Bathymetric data applied in the development of CMS-Flow and CMS-Wave models were obtained from three sources. Local surveys were performed by the Baltimore District in 2008 (Figure 1) and 2009 (Figure 2) for the inlet and limited areas in the back bay and main bay. These surveys covered the inlet, navigation channel, flood shoal, ebb shoal, large portion of back bay, and areas that include proposed structures. Bathymetric data were also obtained from the National Ocean Service (NOS) GEODAS archives and applied within the model domain in areas not covered by the recent local surveys. The spatial coverage of the GEODAS data applied in the modeling is shown in Figure 3. Areas of the grid not covered by the recent surveys or the GEODAS data were filled in with bathymetry obtained from the regional ADCIRC mesh.

Figure 1. 2008 bathymetric survey

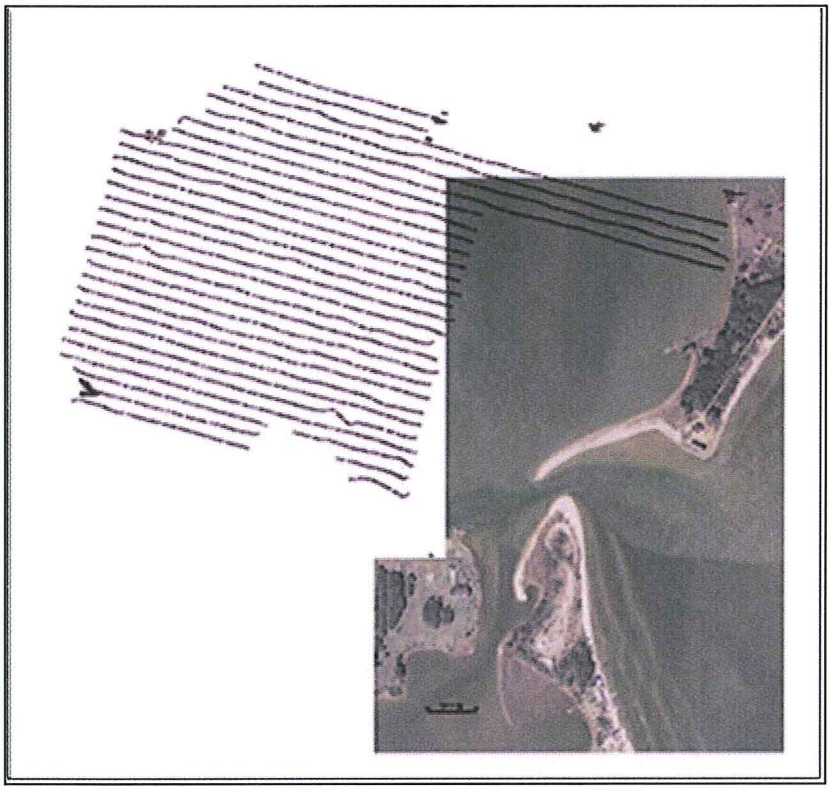


Figure 2. 2009 bathymetric survey

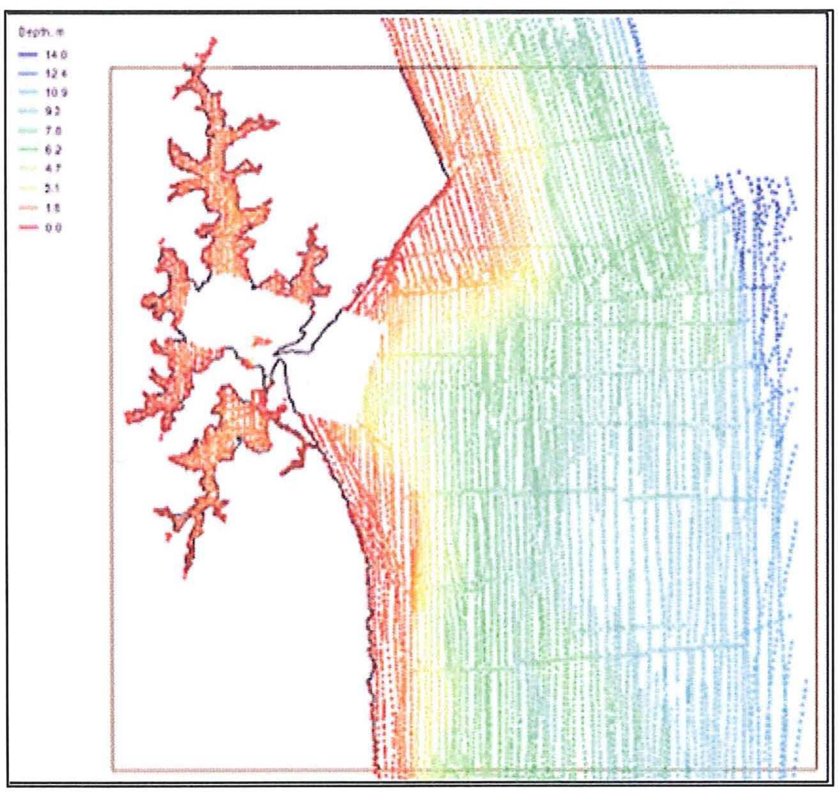


Figure 3. GEODAS data applied in CMS-Flow and CMS-Wave models

Model Development

Two circulation models were applied that consisted of a regional ADCIRC mesh and a local CMS-Flow grid. The ADCIRC solution provided boundary conditions for the local CMS-Flow model as no gauge data are available near the CMS-Flow boundary. In addition, a local CMS-Wave model having the same domain as the local CMS-Flow grid was developed to calculate wave properties and provide them to the CMS-Flow model.

Interactions between the models are shown graphically in Figure 4. Items shown in blue denote information provided between models. Items shown in red denote interactions conducted within CMS-Flow. The ADCIRC regional model simulation was conducted separately and prior to application of CMS-Flow. Water-surface elevation values calculated by the ADCIRC regional model are provided to CMS-Flow for its boundary conditions. CMS-Flow and CMS-Wave are run within the SMS Steering Module, which controls the interactions between the circulation and wave models. CMS-Flow provides total water depth to CMS-Wave, which includes the ambient depth and any deviation in water-surface elevation owing to the tide and waves (set up and set down). Over time, this allows the wave model to respond to changing bathymetry and water-surface elevation values. CMS-Wave provides updated wave properties, radiation stresses, and wave dissipation to CMS-Flow for its calculation of water-surface elevation, current velocity, and sediment transport.

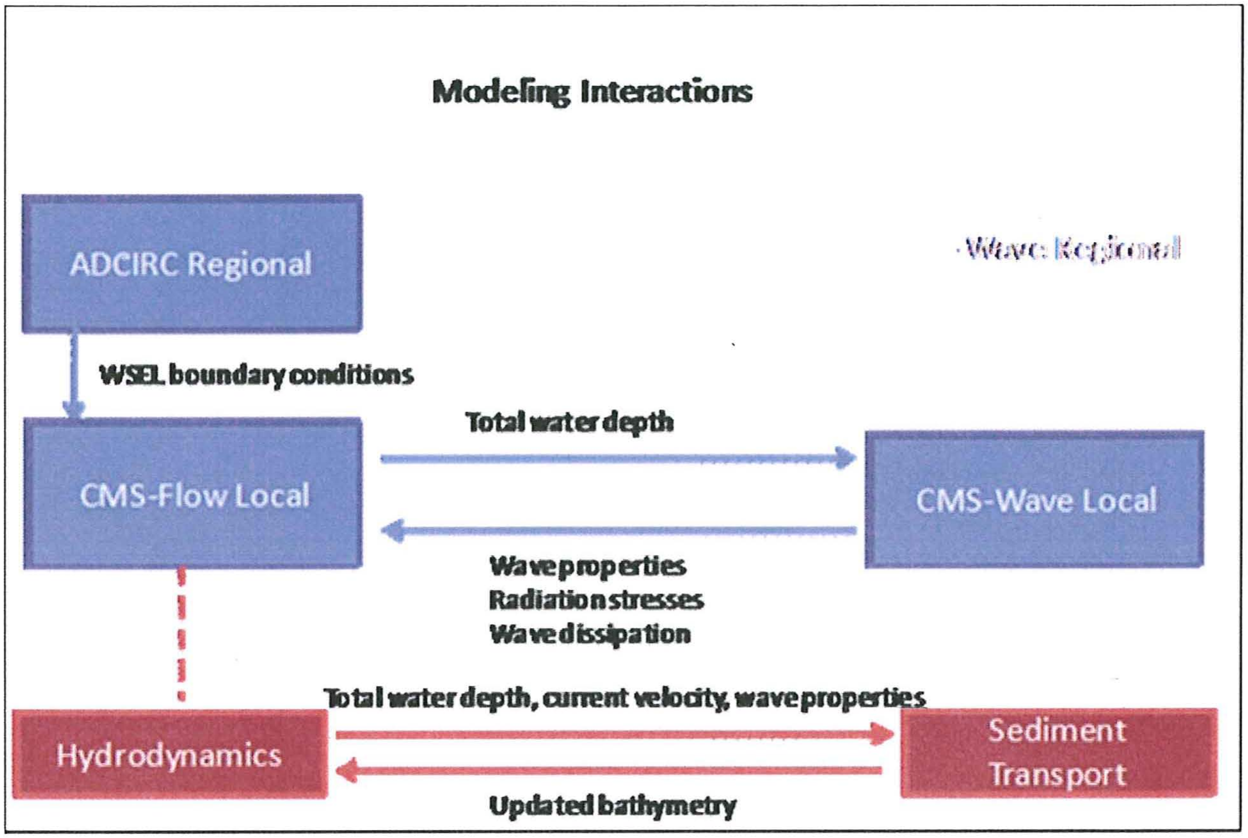


Figure 4. Flowchart of model interactions

Within the CMS-Flow model, the hydrodynamic and sediment transport calculations are conducted in separate modules and at different time steps. Sediment transport is calculated less frequently than water-surface elevation and current velocity. At specified intervals, called the sediment transport time step, CMS-Flow provides the total depth (water-surface elevation and ambient depth), current velocity, and wave properties to the sediment transport model which computes instantaneous transport rates. At larger time intervals, called the morphology change time step, the instantaneous transport rates are averaged over the morphology change time step, and then applied to compute the change in ambient depth. This updated depth is then provided back to the hydrodynamic portion of the model so that the water-surface elevation and current velocity calculations can respond to the morphology change.

The regional ADCIRC model extends into deep water of the North Atlantic Ocean, with its northern extent being the Bay of Fundy and its southern extent reaching to the coast of Florida (Figure 5). Greatest resolution is specified within the Chesapeake Bay. In addition, resolution has been enhanced over the shelf break to promote accurate calculation of tidal propagation and transformation across the sloped bathymetry.

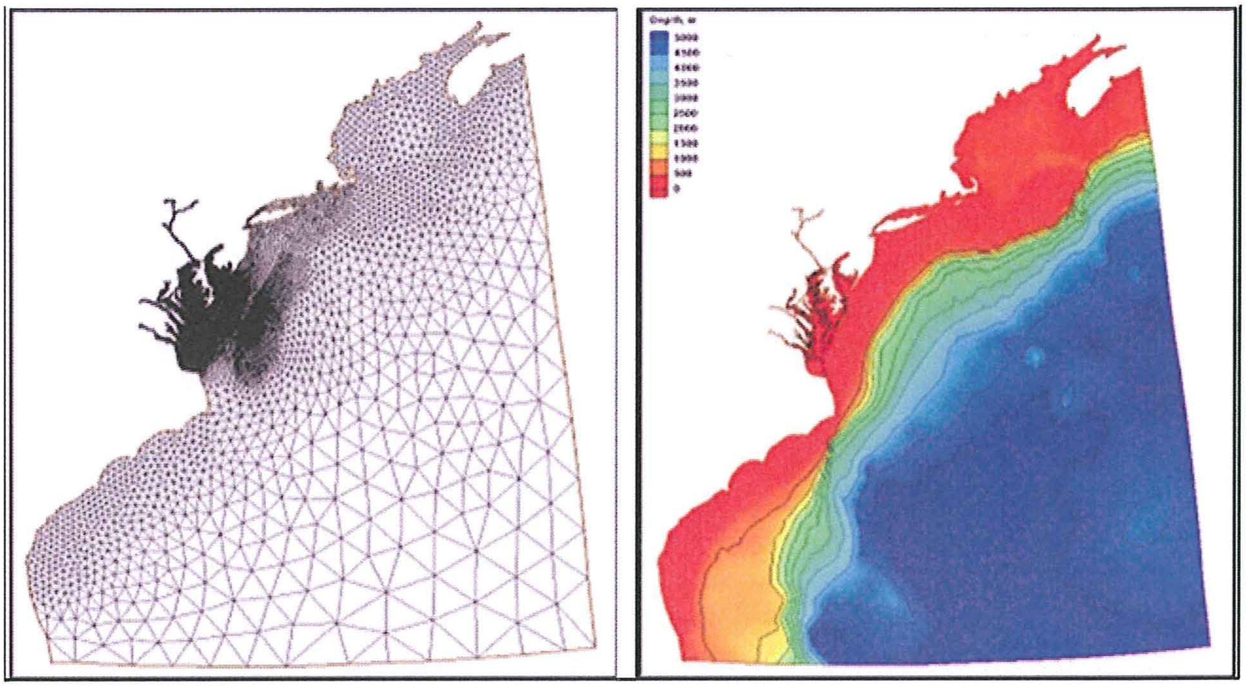


Figure 5. Regional ADCIRC mesh and bathymetry

The CMS-Flow grid and bathymetry for the existing condition is shown in Figure 6. This local grid contains 109,298 ocean cells having cell side dimensions of 20 m. Figure 7 shows detail of the CMS-Flow grid at the study area for the existing condition. The CMS-Wave grid was generated by making a duplicate of the CMS-Flow grid and saving it as a CMS-Wave grid. Thus, the CMS-Flow and CMS-Wave grids are identical.

Median grain size was assigned to cells in the CMS-Flow model based on the description of grain sizes provided in the 2009 field report conducted for this project. The field report provided a value of 0.04 mm for the interior channel, however, the minimum allowable D50 value in the CMS-Flow sediment transport module is 0.065 mm. Thus, D50 for the interior channel and the back bay (outside of areas described in the field report) were set to 0.065 mm. Figure 8 shows the D50 values assigned in the model.

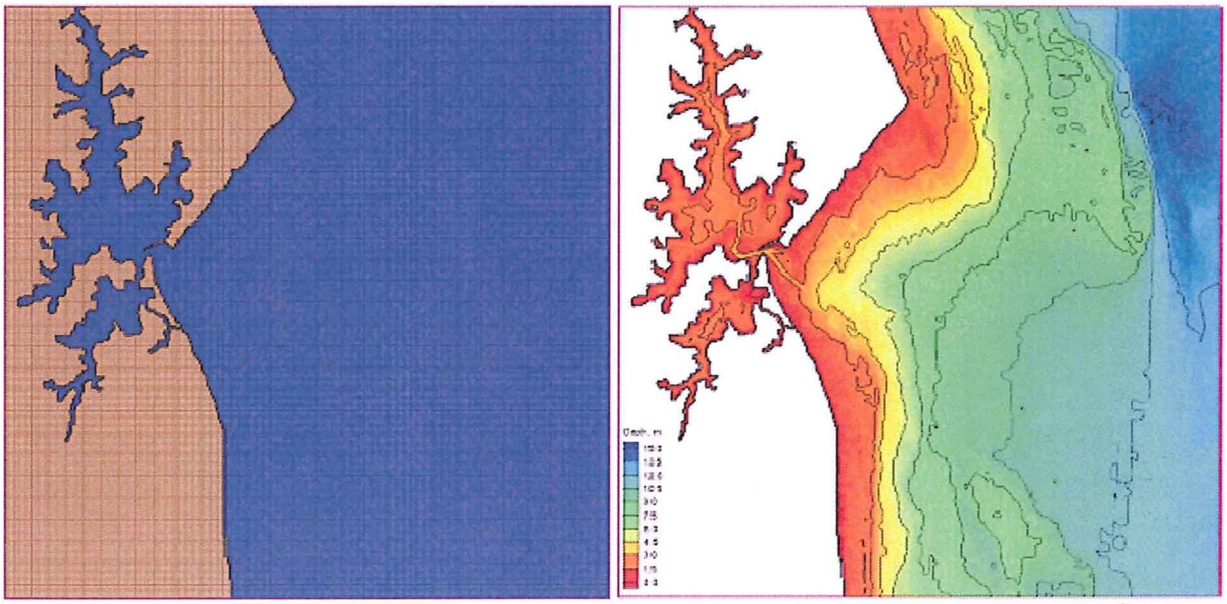


Figure 6. CMS-Flow grid and bathymetry

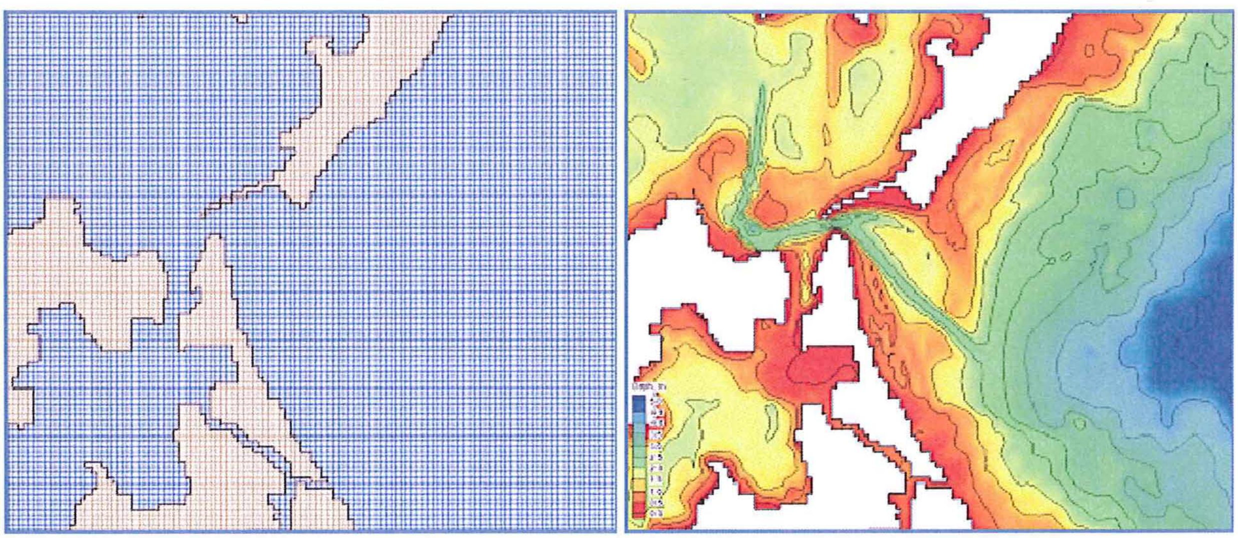


Figure 7. CMS-Flow grid and bathymetry in vicinity of inlet

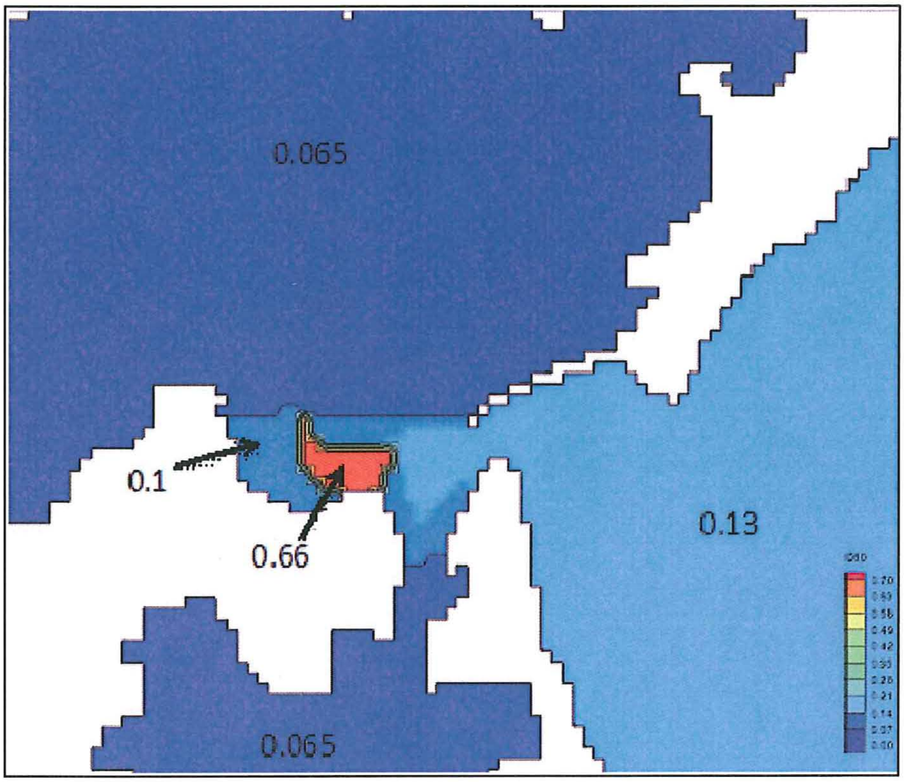


Figure 8. D50 values applied in CMS-Flow model

Current measurements over a tidal cycle were made to generally assess typical magnitudes and directions in the project area favorably compared to the CMS-Flow calculations.

Because the primary objective of the study is to examine shoaling patterns and rates in the navigation channel, the existing-condition model was run for a time period of 10.5 days. The sediment transport coefficient was set such that this time period would be equivalent to a much longer time period of sedimentation. The model result was compared to historic dredging data (described in the main report) and the 10.5-day simulation was found to be equivalent to a real-world sediment transport time period of 2.5 months. The model reproduced the locations of sediment deposition, as shown in Figure 9. The three primary areas of historic shoaling are in the back creek area (station 18-28), just seaward of the creek entrance (station 32-36), and where the channel crosses the offshore sediment bypassing bar (station 48-55). The model results in Figure 9 (yellow is accretion, blue is erosion) correlate well with the historic areas of shoaling in the channel.

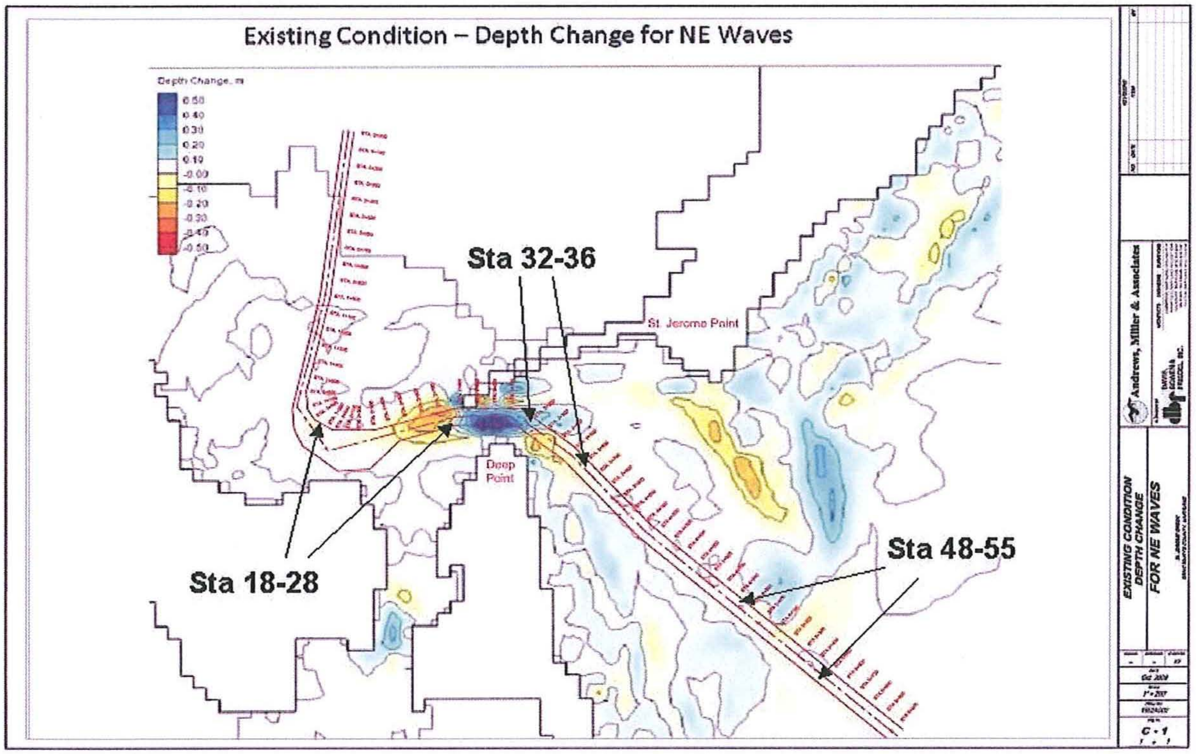


Figure 9. Channel station locations where shoaling occurs and modeled deposition areas (yellow).

Four grids for the action alternatives were developed based on engineering drawings and dimensions provided by the Baltimore District, USACE. Computational grids for each alternative were developed by incorporating the alternative design into the existing condition grid. Model representations of Alts 4, 7, 7 with channel, and 7A are shown in Figures 10 through 13, respectively.

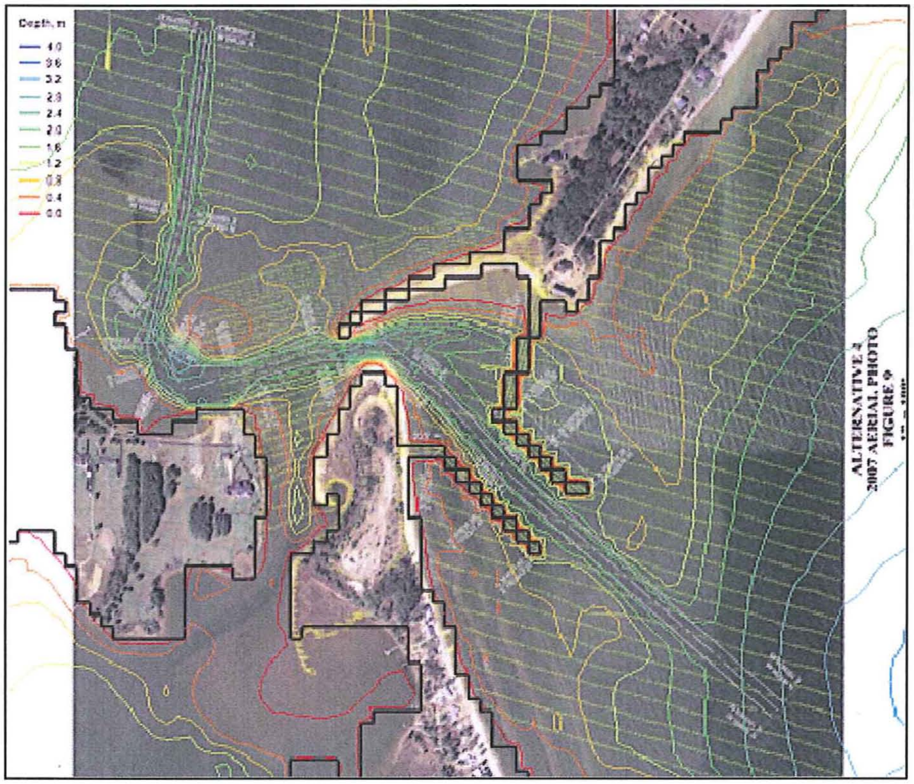


Figure 10. Model representation of Alt 4

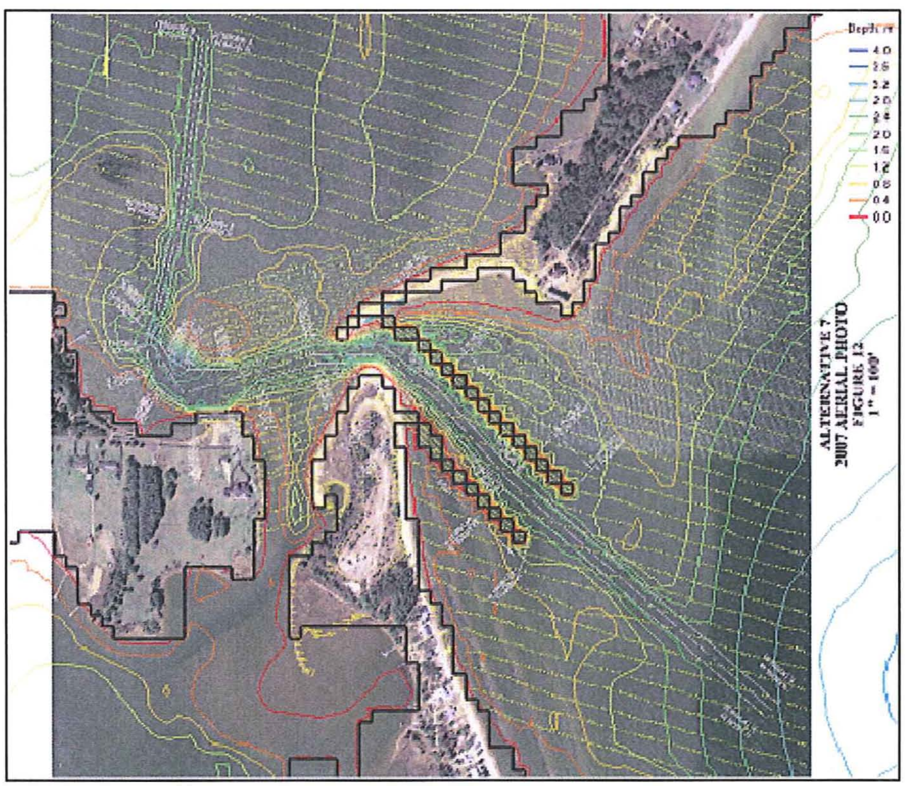


Figure 11. Model representation of Alt 7

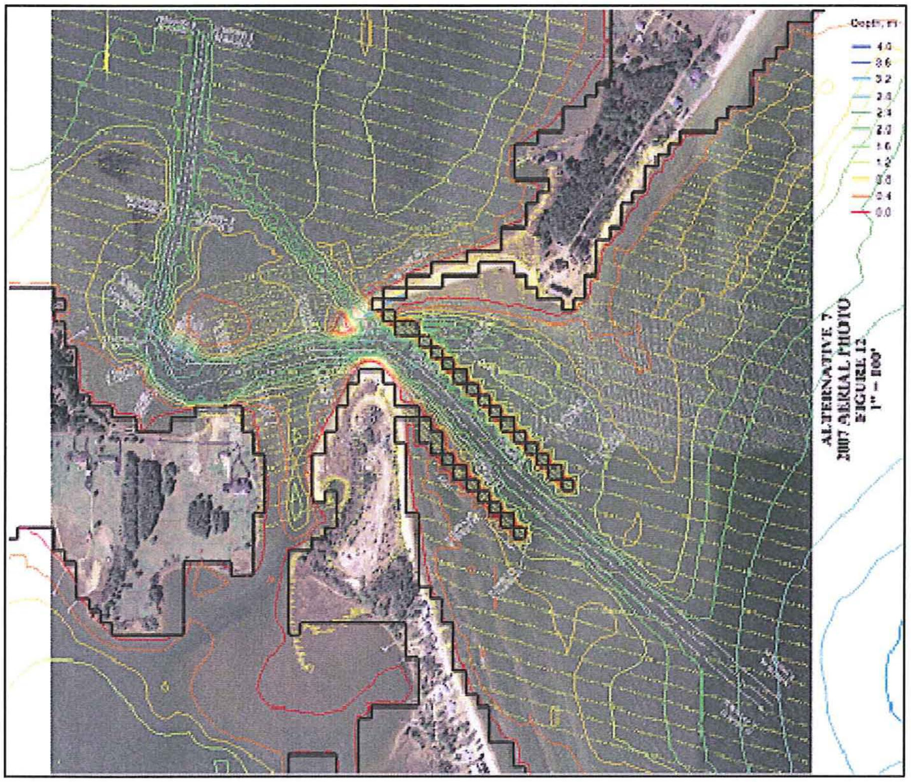


Figure 12. Model representation of Alt 7 with channel

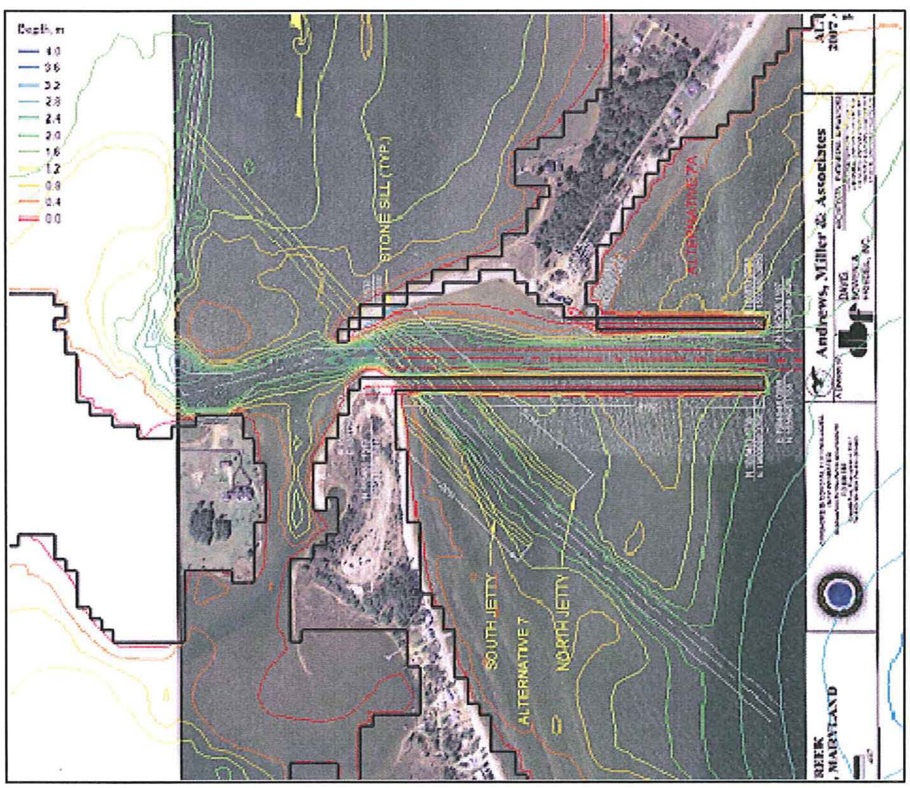


Figure 13. Model representation of Alt 7A

Production Simulations

Simulations for each alternative consisted of one 2.5-month run for each of two wave conditions. During each simulation, the wave condition input into CMS-Wave was held constant. Wave model boundary conditions were H = 0.6 m and T = 7 sec for both simulations. Direction was from the NE for one simulation and from the SE for the second simulation. Interaction between CMS-Flow and CMS-Wave was specified to take place at 6-hr intervals. CMS-Flow provided water-surface elevation, ambient depth, and current fields to CMS-Wave. CMS-Wave provided wave height, period, direction, radiation stresses, breaking index, and dissipation values to CMS-Flow.

CMS-Flow was set to have a hydrodynamic time step of 1 sec. Ramp duration was specified to be 12 hr. Global output files for water-surface elevation, morphology, transport rates, and current velocity were output at 0.5-hr increments.

Sediment transport and morphology change were modeled by applications of the non-equilibrium transport algorithm with the Lund-CIRP transport capacity formula. Instantaneous transport rates were computed every 2 sec and morphology change was calculated every 0.25 hr.

Results

Waves approaching the study area undergo refraction (Figure 14) such that their breaking patterns induce south-directed longshore currents north of the inlet, and north-directed longshore currents south of the inlet (Figure 15), for waves originating from both the NE and SE. Thus, the overall current patterns near the inlet for the NE and SE waves are similar. However, waves originating from the NE force a more well-developed longshore current on the north side of the inlet, as compared to waves from the SE. Similarly, waves from the SE produce a stronger and more well-developed longshore current south of the inlet, as compared to the waves from the NE.

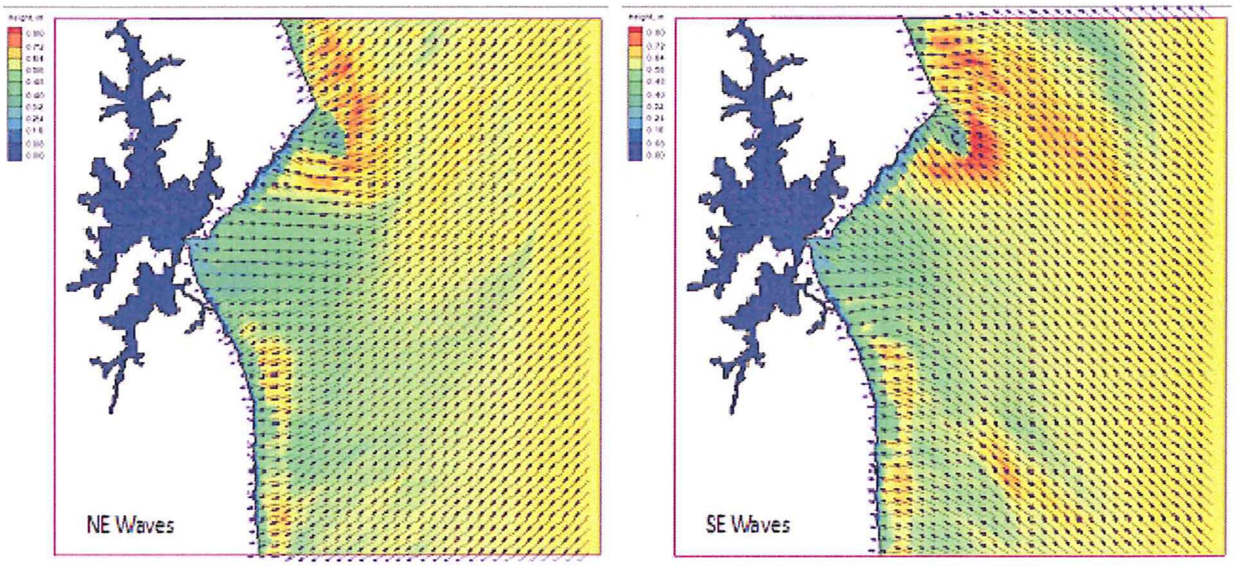


Figure 14. Waves fields for existing condition

Peak flood current fields for the existing condition, Alt 4, Alt 7, Alt 7 with channel, and Alt 7A are shown in Figures 15 through 19 respectively. The contour scales for these figures, and for similar figures of the ebb current, range from 0 to 0.8 m/sec. In all cases, with the exception of Alt 7 with channel, the strongest current is located at the narrowest point in the inlet. For the action alternatives, the strongest current found between the jetties is located in the back portion of the jetties (that is, the section of jetties closer to the inlet), except for Alt 7A which has its strongest current within the central portion of the jetties. All of the action alternatives have greater current speed at peak flood in the section between the jetties as compared to the same location for the existing condition.

For both NE and SE waves, Alt 7A develops well-defined currents along the outside of the jetties along almost their entire lengths.

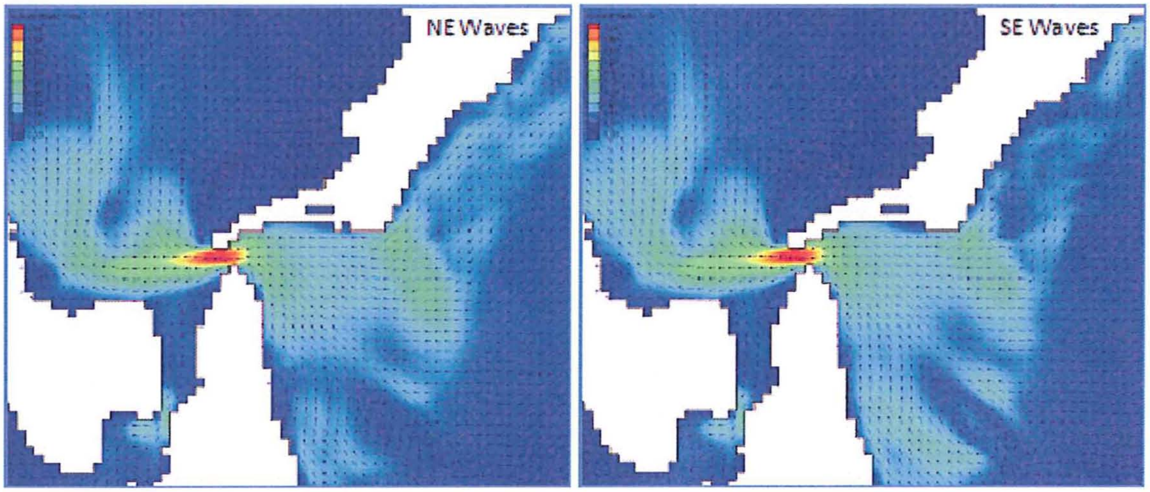


Figure 15. Peak flood current for existing condition for NE and SE waves

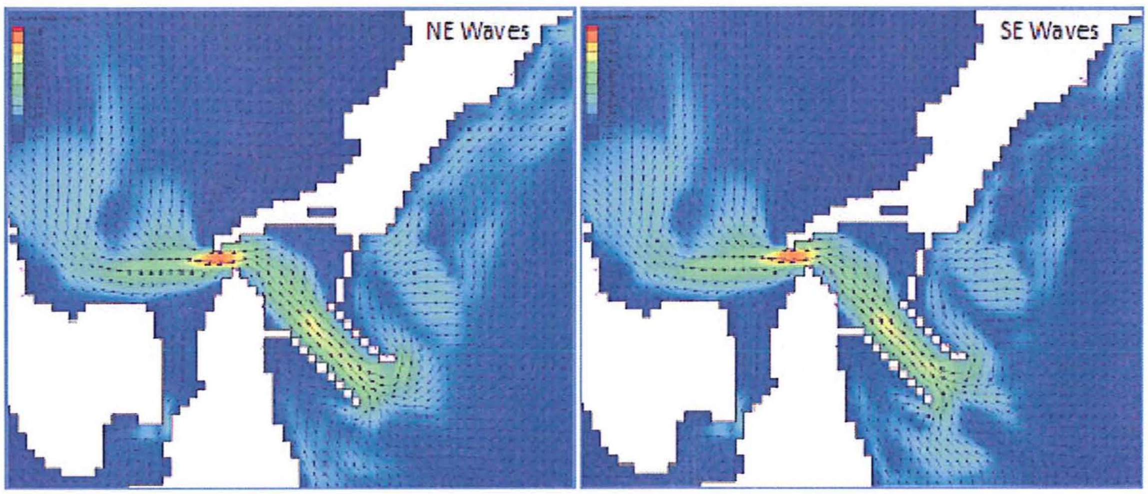


Figure 16. Peak flood current for Alt 4 for NE and SE waves

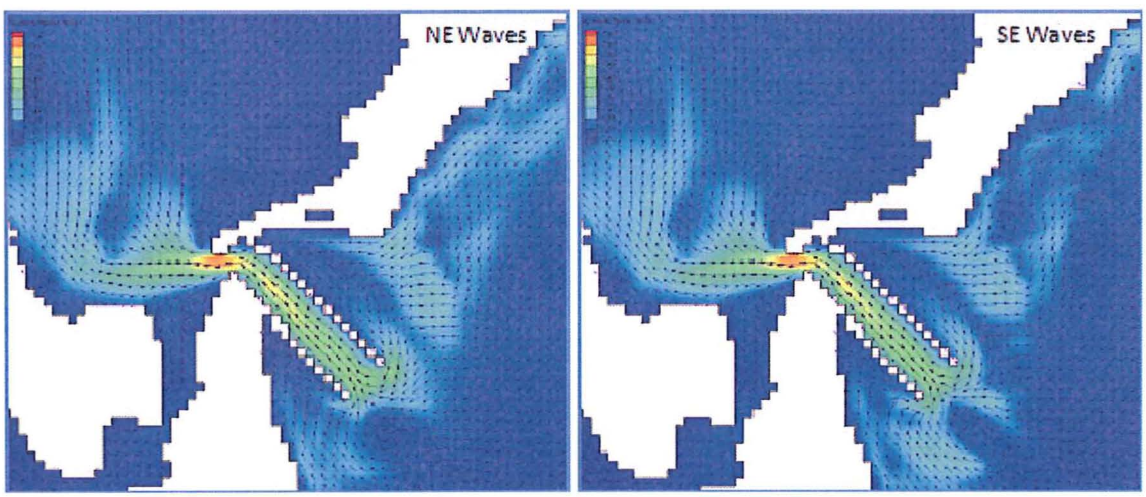


Figure 17. Peak flood current for Alt 7 for NE and SE waves

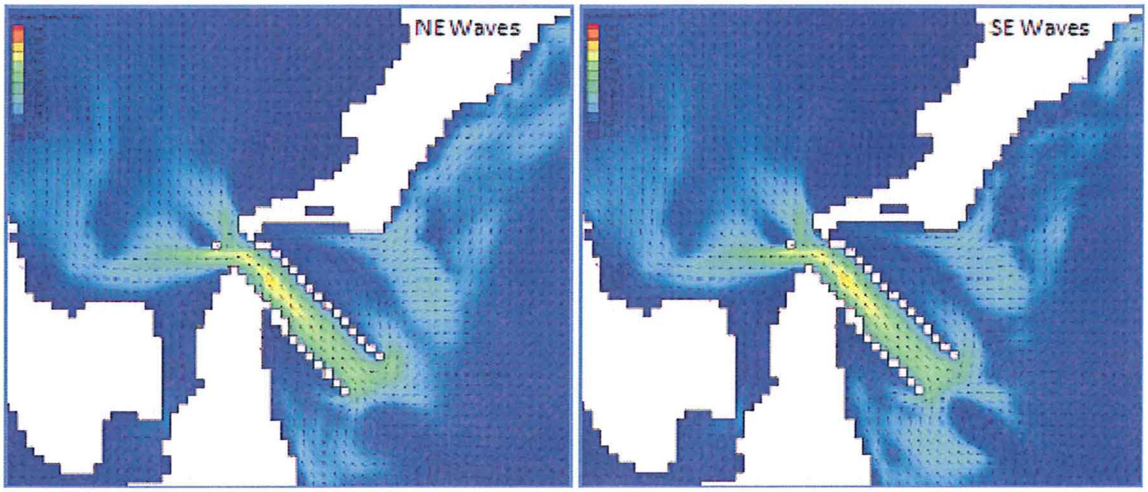


Figure 18. Peak flood current for Alt 7 with channel for NE and SE waves

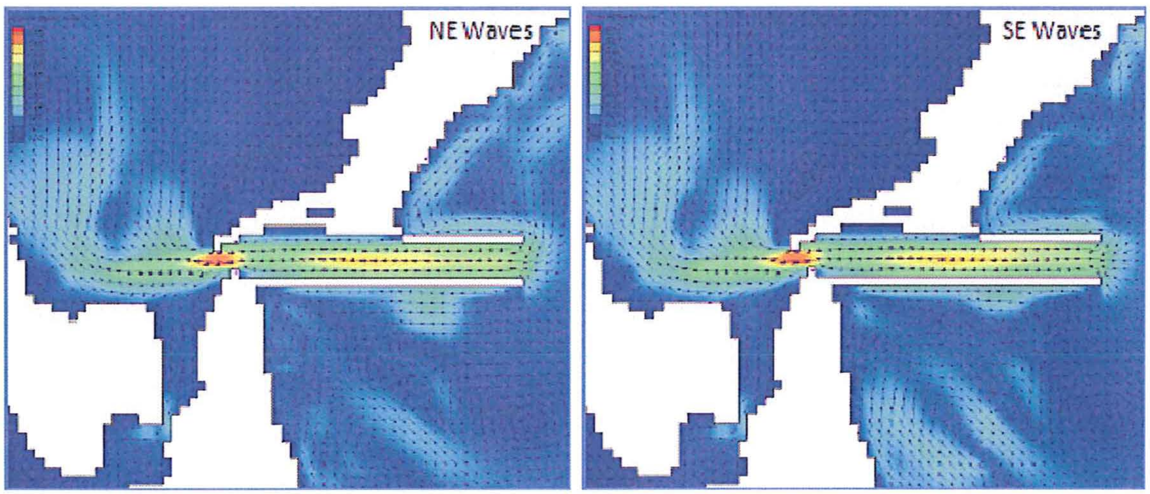


Figure 19. Peak flood current for Alt 7A for NE and SE waves

Peak ebb current fields for the existing condition, Alt 4, Alt 7, Alt 7 with channel, and Alt 7A are shown in Figures 20 through 24, respectively. During peak ebb flow, the existing condition exhibits the strongest current speed at the narrowest part of the inlet, as compared to all of the action alternatives.

For both NE and SE waves, Alt 7A develops well-defined currents along the outside of the jetties along almost their entire lengths for ebb current as well as flood current.

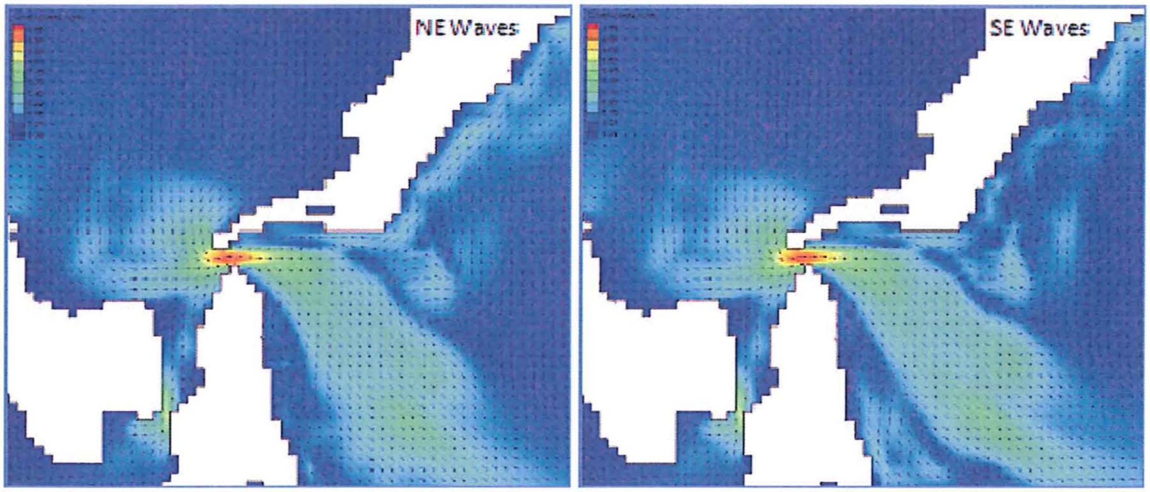


Figure 20. Peak ebb current for existing condition for NE and SE waves

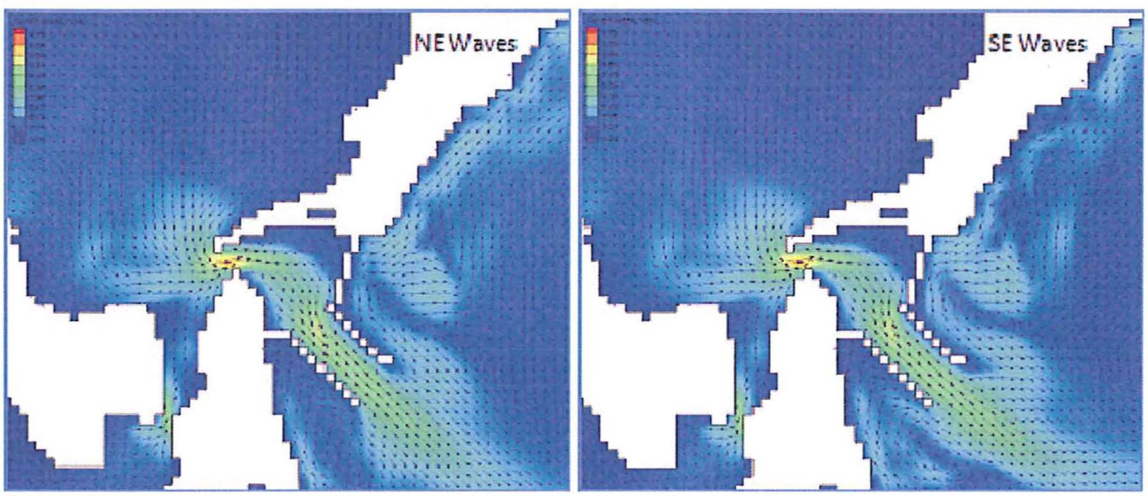


Figure 21. Peak ebb current for Alt 4 for NE and SE waves

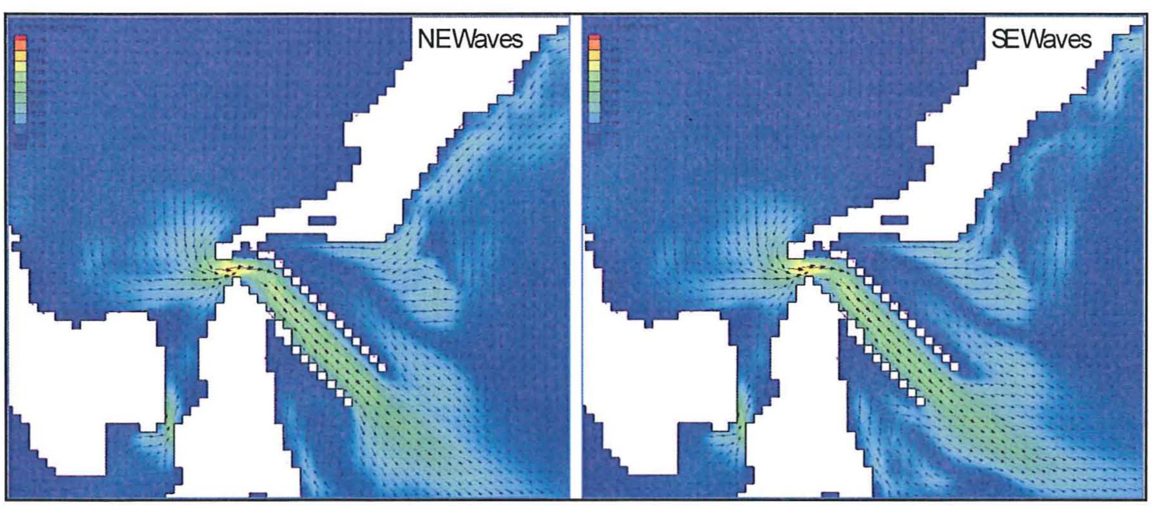


Figure 22. Peak ebb current for Alt 7 for NE and SE waves

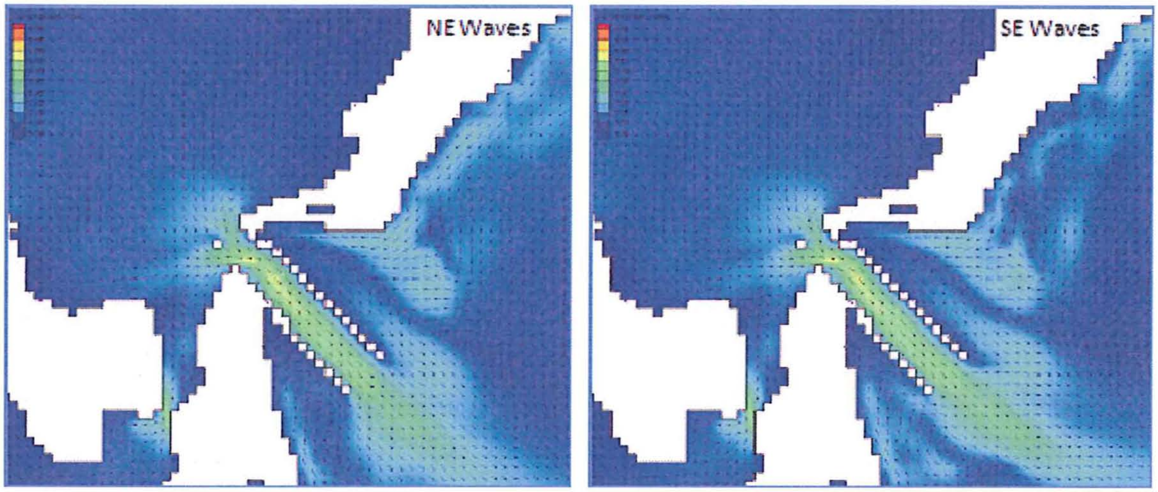


Figure 23. Peak ebb current for Alt 7 with channel for NE and SE waves

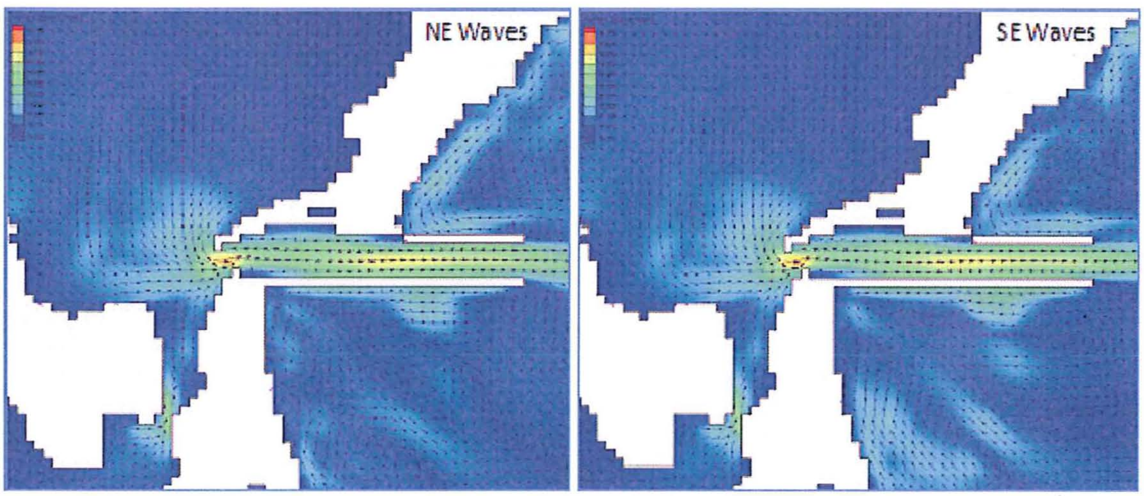


Figure 24. Peak ebb current for Alt 7A for NE and SE waves

Calculation of morphology change over the 2.5-month simulation is shown by comparison of beginning and ending bathymetry for each simulation, as well as contour plots of depth change. Because of the short simulation time for each alternative, model results give an initial response to each physical situation, but do not show long-term evolution. To determine the morphologic evolution over a long period of time, the simulations would need to be extended. However, the simulations do give an indication of whether or not the channel will be self-scouring, where locations of chronic erosion may occur, and changes to the immediate.

Initial bathymetry for the existing condition is shown in Figure 25, and ending bathymetry and morphologic change are shown in Figure 26 for both NE and SE waves. In Figure 26 and corresponding figures for the action alternatives, the top two panels display the ending bathymetry and the bottom two panels show the morphology change with blue denoting erosion, and yellow/orange/red denoting accretion. For the existing condition, the NE and SE wave simulations give overall similar responses for morphology change. Both show scour of the inlet at its narrowest point with deposition directly east. The portion of the navigation channel that extends toward the southeast (into the main bay) is fairly neutral in terms of morphology change for the NE waves, but shows a tendency toward self-scouring for the SE waves over the outer two thirds of its length.

Initial bathymetry for Alt 4 is shown in Figure 27, and ending bathymetry and morphologic change are shown in Figure 28 for both NE and SE waves. For both wave conditions, scour takes place at the narrowest part of the inlet, although the area of scour is smaller than for the existing condition. Similarly, deposition occurs directly east of the inlet throat scour area, but the accretion is not as great as for the existing condition. Alt 4 shows accretion in the channel between about where the south jetty connects to the shore to the location where the channel bends toward the west. The channel is primarily self-scouring from about where the south jetty attaches to the shore to the jetty tips. The region between the south jetty and the shoreline is predominately accretionary. The area adjacent to and just north of the north jetty is erosional between the jetty and the bypass bar. The deeper portion of the bypass bar may erode away or to a different equilibrium depth.

Initial bathymetry for Alt 7 is shown in Figure 29, and ending bathymetry and morphologic change are shown in Figure 30 for both NE and SE waves. For both wave conditions, Alt 7 exhibits erosion at the narrowest part of the inlet along the channel, but also accretion along the channel flanks. Deposition takes place just west of the inlet narrow point. Along the entire length of the proposed jetties, there is a mixed response in terms of accretion and erosion between the jetties, although the area between the jetty tips is erosional. That erosion starts to extend around the south jetty tip and along the outside of the south jetty. Adjacent to and north of the north jetty, a wide area of erosion occurs, cutting into the bypass bar. This erosional area is larger for the SE waves.

Initial bathymetry for Alt 7 with straight-in channel is shown in Figure 31, and ending bathymetry and morphologic change are shown in Figure 32 for both NE and SE waves. For both wave conditions, Alt 7 with channel exhibits almost identical morphologic response to Alt 7. The only area of difference is near the junction where the proposed new channel extension enters the inlet. For Alt 7 with channel, the area near the junction and within the proposed new channel shows much less shoaling from that location in toward the turning basin as compared to existing conditions and other alternatives.

Initial bathymetry for Alt 7A is shown in Figure 33, and ending bathymetry and morphologic change are shown in Figure 34 for both NE and SE waves. As with the other alternatives, Alt 7A erodes in the narrowest part of the inlet and has a depositional area directly to the west. In addition, Alt 7A also has a depositional area along about the western third of the south jetty. The area between the jetty tips is self-scouring to about 20 to 25% of the length of the south jetty. In between the western third and the eastern quarter, the erosion and deposition are mixed and a longer simulation would be required to determine the overall tendency in this area. Both north and south of the jetties, the accretional and erosional patterns are mixed. There does appear to be impoundment of material between the north jetty and the shoreline. In addition, a finger shoal develops on the south side of the south jetty about half way along its length, with a scour hole located just to the east of the finger shoal. Alt 7A shows less definitive trends than the other action alternatives. Most likely, this result owes to Alt 7A being the largest deviation from the present configuration, such that it will take a longer amount of time to come into an established pattern of morphological features and response.

Overall, results of the simulations do not show large differences in morphologic response between the NE and SE waves. This lack of large difference owes primarily to the angles of the shoreline and wave refraction. Wave-driven longshore currents are not the same for the NE and SE waves, but they do not show significant variation between these two directions. Because of this situation, the uncertainty in response owing to the distribution of incoming wave direction should be low.

The sediment deposition in the channel itself was compared to the existing condition deposition for the 2.5 month simulation. This scaling ratio was then applied to historic deposition rates to determine the possible change in rate if each alternative was implemented. The results are shown in Figure 35. Alternative 7 with the straight channel exhibits the lowest shoaling rate, indicating that it could provide the most long term reduction in dredging.

In order to evaluate potential impacts of each alternative on the volume of water entering and exiting the creek entrance during a tidal cycle, the model results for a typical tidal cycle were extracted at the location where the channel enters the creek. The flows were time-integrated to determine a total flow volume. The results are shown in Table 1.

Table 1. Total flow during the ebb and flood tide phases of a typical tidal cycle (cubic meters per second).

	Existing	Alt 4	Alt 7	Alt 7 with straight channel	Alt 7A
Q ebb tide	1,077,000	1,128,000	1,083,000	992,000	1,075,000
Q flood tide	957,600	997,000	960,000	895,000	956,000

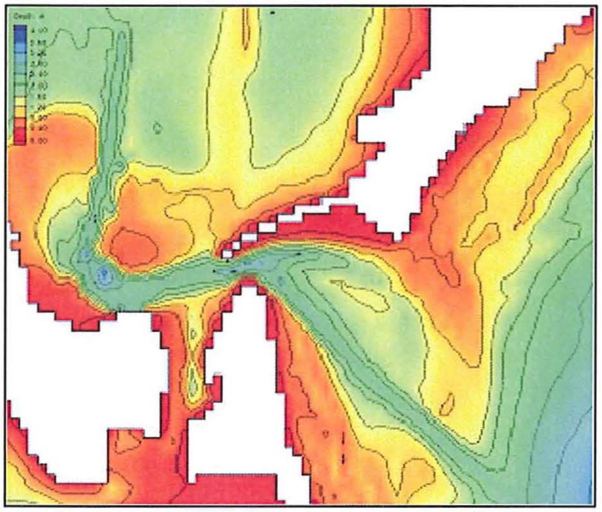


Figure 25. Initial bathymetry for existing condition

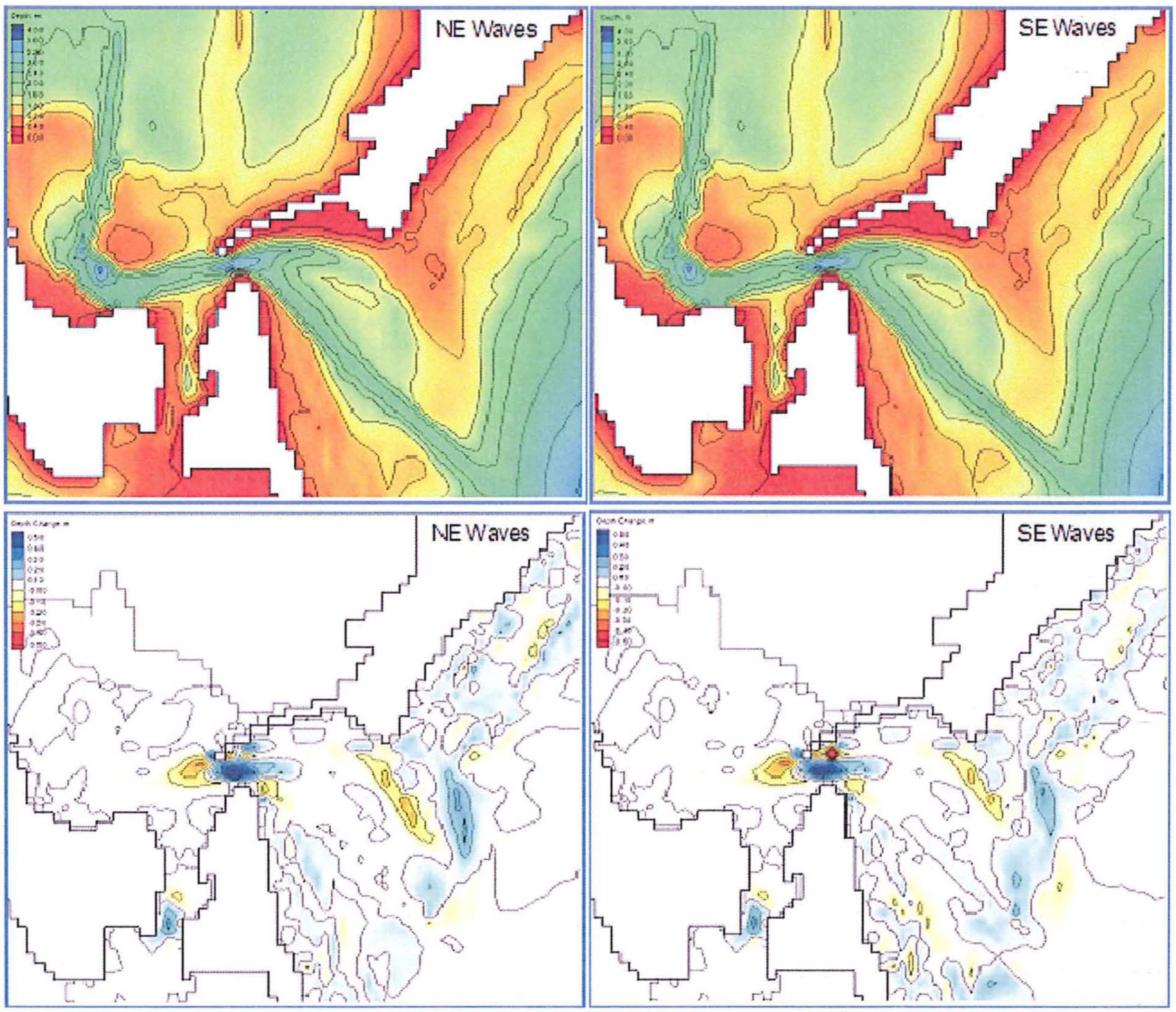


Figure 26. Ending bathymetry and morphology change for existing condition, NE and SE waves

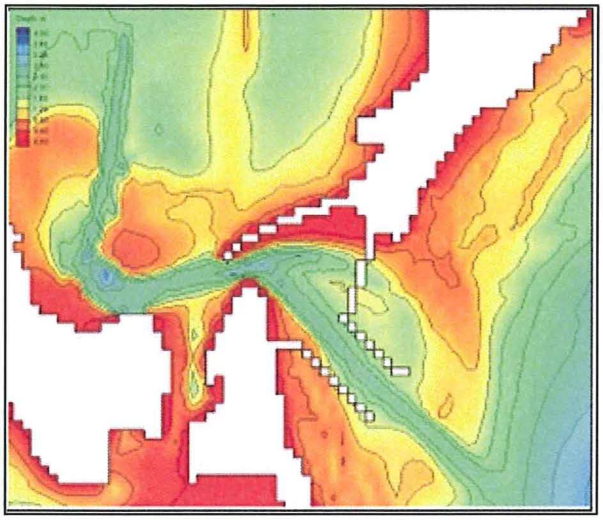


Figure 27. Initial bathymetry for Alt 4

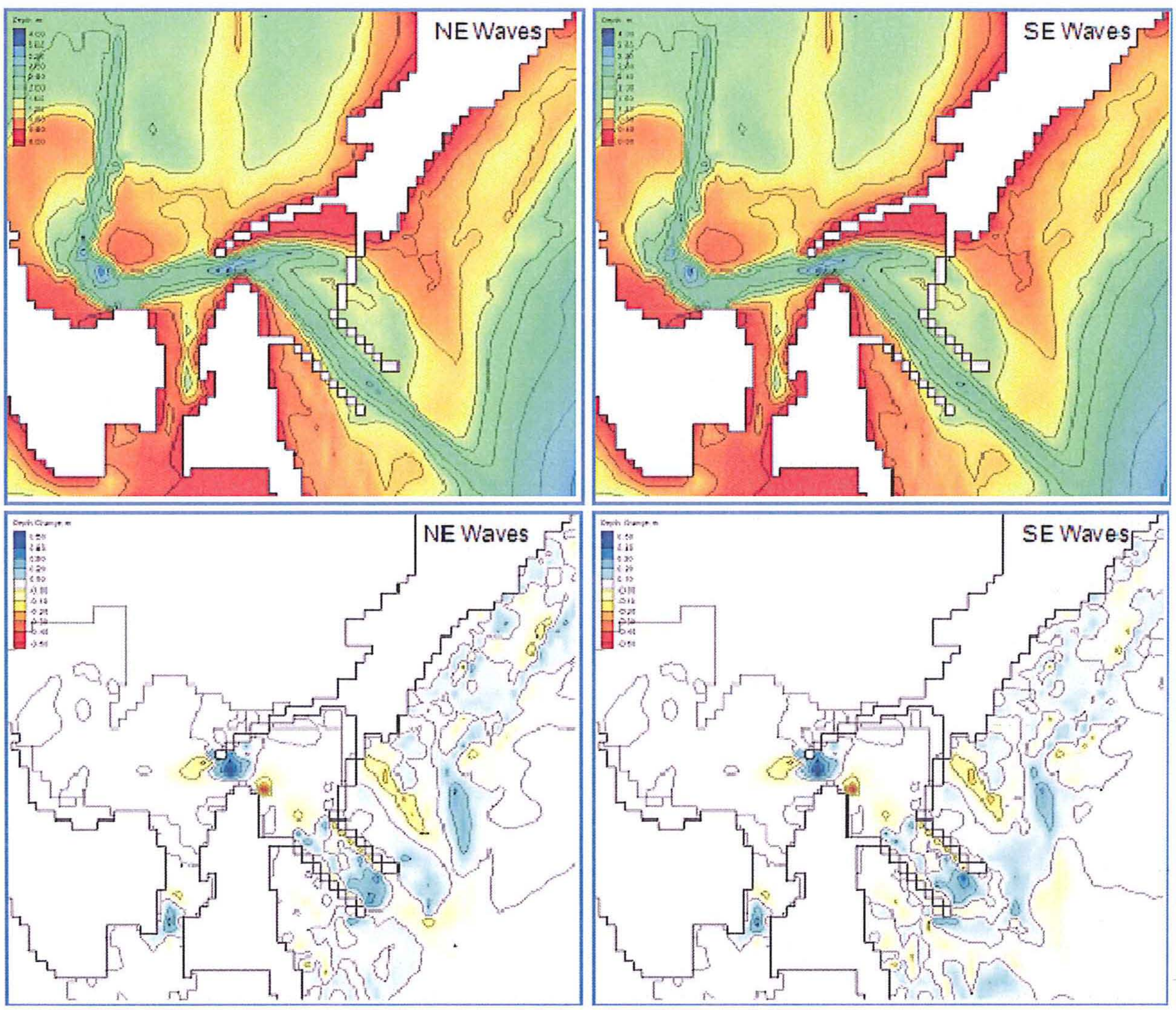


Figure 28. Ending bathymetry and morphology change for Alt 4, NE and SE waves

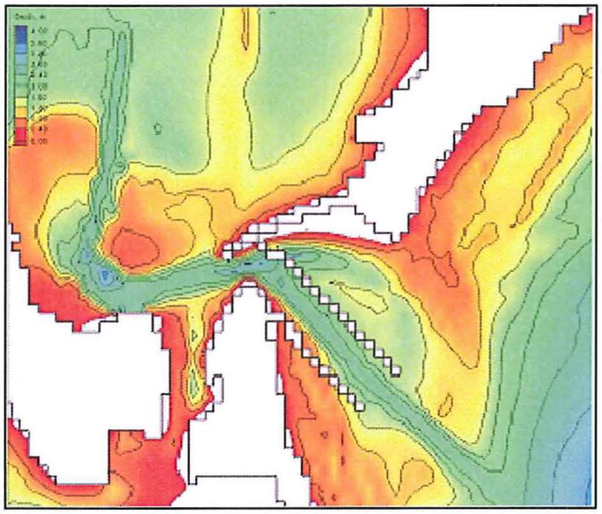


Figure 29. Initial bathymetry for Alt 7

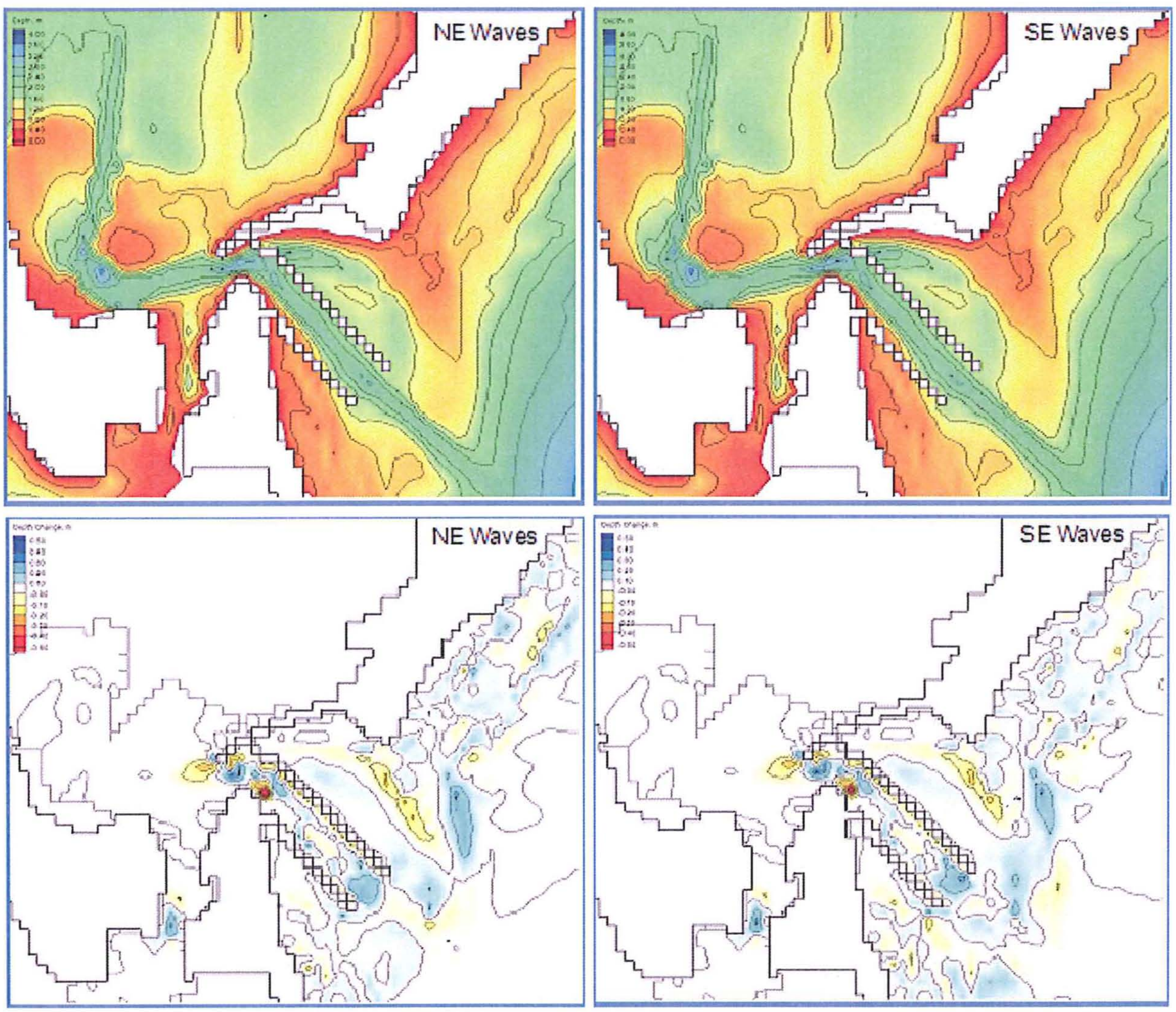


Figure 30. Ending bathymetry and morphology change for Alt 7, NE and SE waves

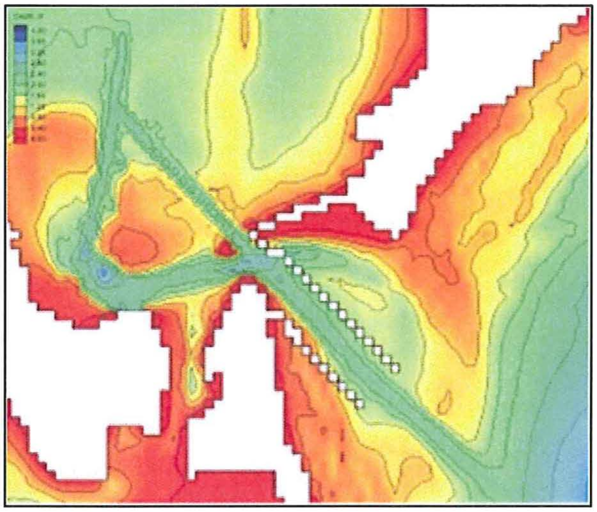


Figure 31. Initial bathymetry for Alt 7 with channel

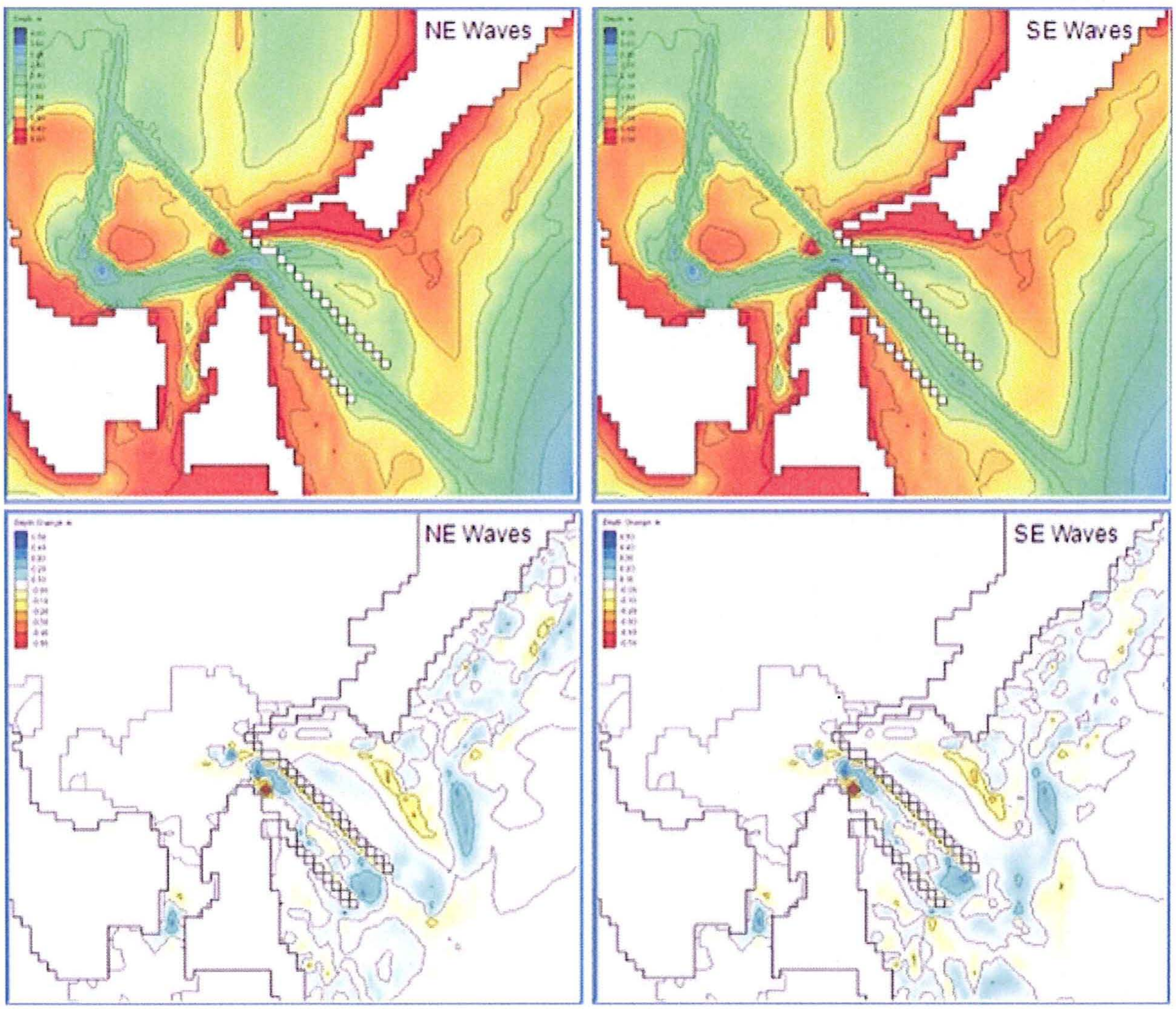


Figure 32. Ending bathymetry and morphology change for Alt 7 with channel, NE and SE waves

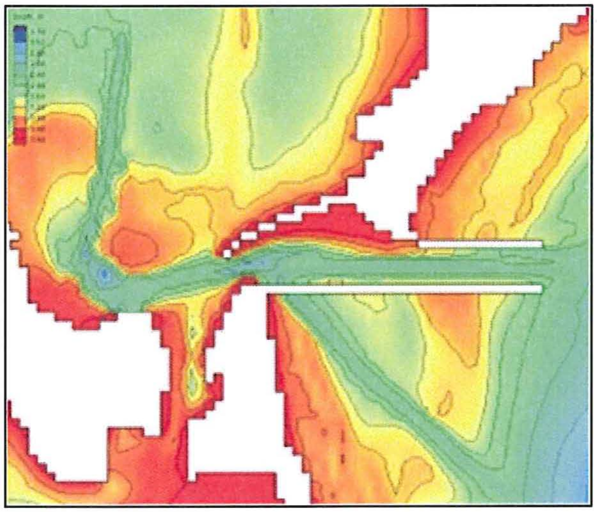


Figure 33. Initial bathymetry for Alt 7A

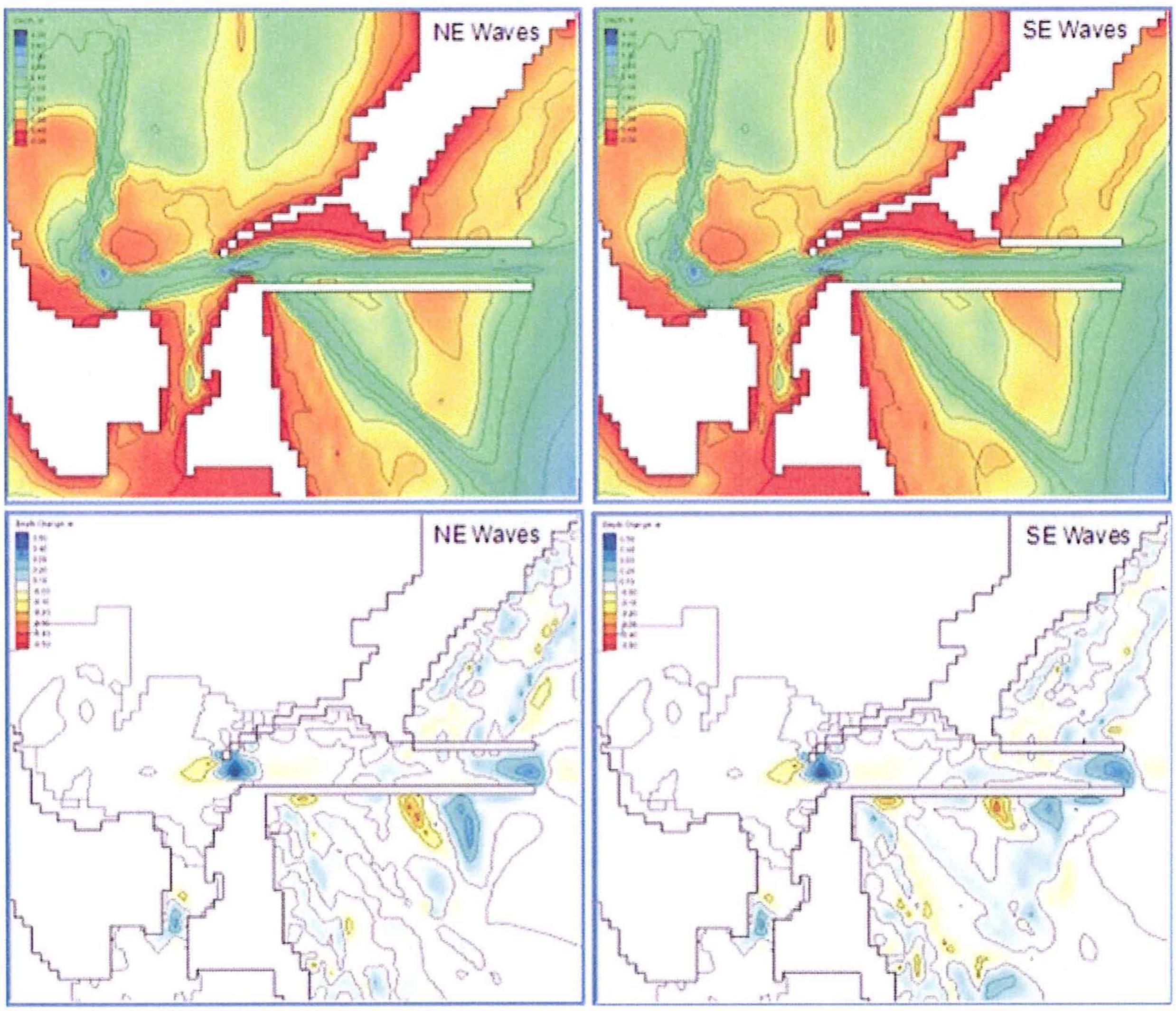


Figure 34. Ending bathymetry and morphology change for Alt 7A, NE and SE waves

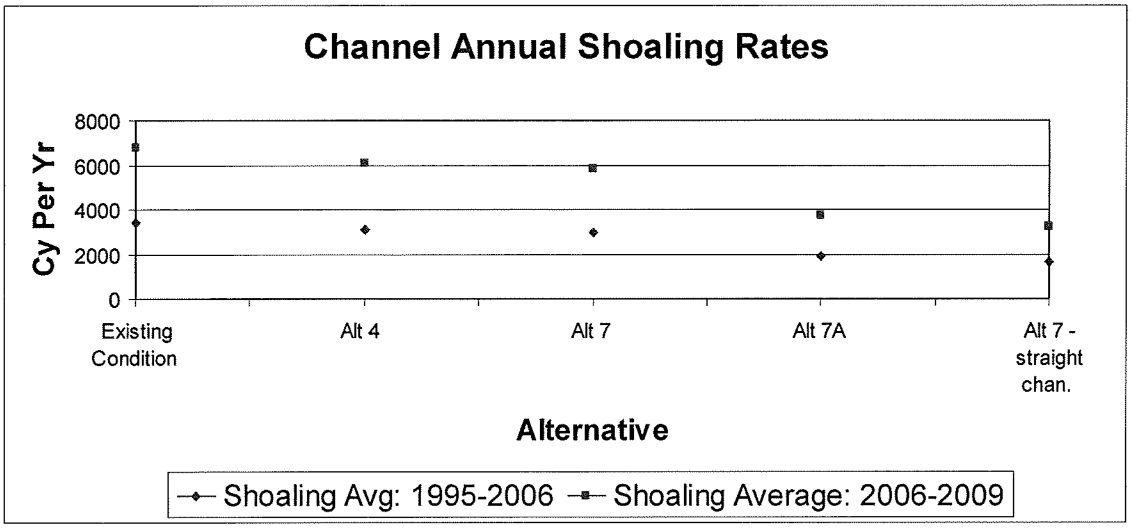


Figure 35. Estimated annual shoaling rate for each alternative, determined using model results.

Long Term Simulation of Alternative 7 with straight channel

Based upon the results described above, further engineering investigations described in the main report, and directive from the Baltimore District, alternative 7 with the straight channel was selected as the preferred alternative. An additional model simulation of the alternative was made to extend the duration of the run by a factor of three to 7.5 months. The results are shown in Figures 36 and 37, for waves from the northeast and from the southeast, respectively.

For waves from the northeast, the longer-term run shows continued growth of the sediment deposition area to the north of the north jetty as sediment is moved along the shoreline and out into the creek entrance. The channel appears to show improved self-scouring along its entire length except for a localized area where the new channel makes its entrance into the creek. That short length of new channel is still equilibrating with respect to the surrounding area and may need some short term maintenance before it, too, becomes self-scouring.

For waves from the southeast, the longer-term run shows some deposition along the outer parts of the navigation channel but within the jetties, the results are similar to the northeast wave case. For both northeast waves and southeast waves, there is a small area of deposition in the inner creek off toward the turning basin. Until this area equilibrates, there may also be some maintenance dredging required to avoid incursion on the county channel.

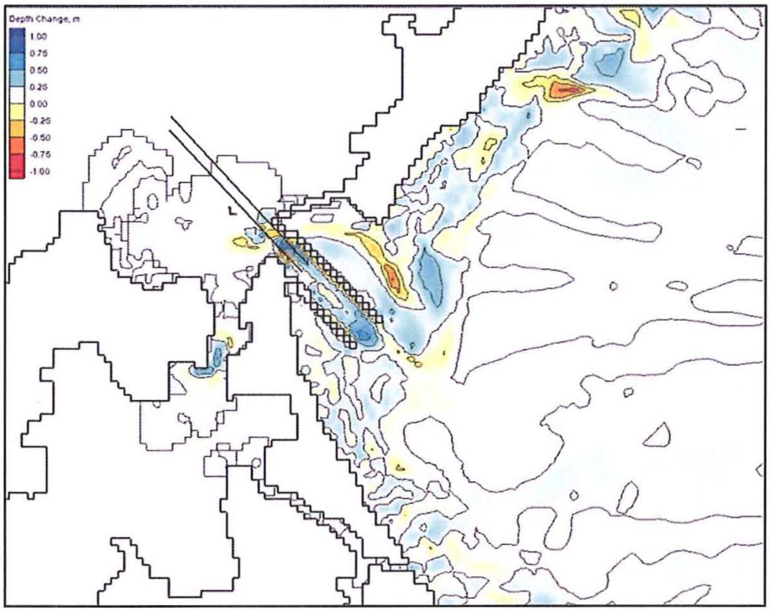


Figure 36. Morphology change for Alternative 7 with straight channel with NE waves after 7.5 months.

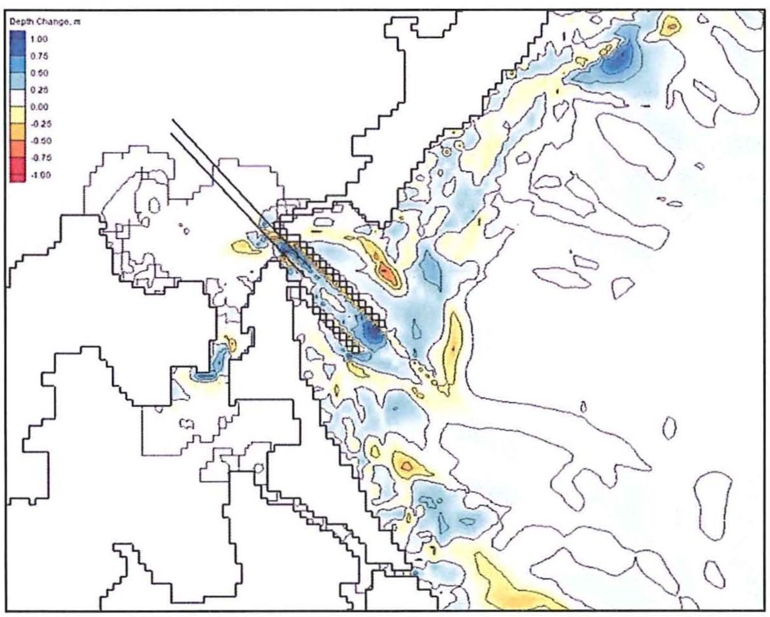


Figure 37. Morphology change for Alternative 7 with straight channel with SE waves after 7.5 months.

Conclusions

The implementation of numerical tidal and wave models provides a method of consistently comparing possible alternatives for reducing future dredging requirements at the entrance to St. Jerome Creek. The results indicate that Alternative 7 with the straight channel is most effective in reducing channel shoaling. This alternative does involve the establishment of a new entrance to the creek, possibly requiring some added maintenance dredging during its equilibration period. Table 2 presents a comparison of the possible impacts of each alternative and other considerations noted during the modeling effort.

Table 2. Comparison of attributes associated with alternatives under consideration for St. Jerome Creek.

Potential Concern	Existing Condition	Alt 4	Alt 7	Alt 7 w/straight creek channel	Alt 7A
Jetties	None	Approx. 2300 ft of jetty structures required	Approx. 2500 ft of jetty structures required	Approx. 2500 ft of jetty structures required	Approx. 3100 ft of jetty structures required
Dredging Requirement	Channel shoals at about 6,800 cy/yr	Results in about 15% reduction in shoaling	Results in about 20% reduction in shoaling	Results in about 60% reduction in shoaling due to improved hydraulic efficiency	Largest initial dredging volume; results in about 30% reduction in shoaling
North of Project Area	Sand transport from north enters channel and bypassing bar	North jetty fillet will provide medium to long term containment of sand transport	North jetty fillet will provide long term containment of sand transport	North jetty fillet will provide long term containment of sand transport	North jetty fillet will provide medium to long term containment of sand transport; sand may eventually bypass and enter channel
South of	Sand transport	South jetty fillet has very	South jetty fillet has very	South jetty fillet has very	South jetty fillet has

Project Area	from south builds Deep Point, enters channel and shoals in back creek	limited capacity (6-10 years) but can be lengthened or supplemented with segmented breakwaters to increase capacity	limited capacity (6-10 years) but can be lengthened or supplemented with segmented breakwaters to increase capacity	limited capacity (6-10 years) but can be lengthened or supplemented with segmented breakwaters to increase capacity	nearly unlimited containment capacity
Offshore Portion of Navigation Channel	Dredging is required to maintain channel through offshore bypassing bar	Dredging may be required to maintain channel through offshore bypassing bar	Dredging may be required to maintain channel through offshore bypassing bar	Dredging may be required to maintain channel through offshore bypassing bar	Offshore ends of jetties are in deep water
Mid-Portion of Navigation Channel	Channel shoaling at offshore end of navigation channel and close to creek entrance	Offshore portion between jetties is self-scouring; shoaling occurs where inner jetties diverge toward shore	Channel is self-scouring between jetties along its entire length	Channel is self-scouring between jetties along its entire length	Offshore portion between jetties is self-scouring; shoaling occurs in channel west of north jetty terminus
Creek Portion of Navigation Channel (including County Channel)	Shoal grows inside creek toward county channel and turning basin	Shoal grows inside creek toward county channel and turning basin	Shoal grows inside creek toward county channel and turning basin		Shoal grows inside creek toward county channel and turning basin
Navigation	Boats must turn 90 degrees to	Boats must turn 90 degrees to exit	Boats must turn 90 degrees to exit	Boats transit through interior	Gradual turn to exit county channel and

	exit county channel and enter Federal navigation channel	county channel and enter Federal navigation channel	county channel and enter Federal navigation channel between stone structures	channel and then exit straight from creek to bay between stone structures	enter Federal navigation channel between stone structures
Auxiliary Structures		Sand spit north of navigation channel will need erosion stabilization	Deep Point may need to be stabilized to prevent erosion due to higher currents in channel	Deep Point may need to be stabilized to prevent erosion due to higher currents in channel	Sand spit north of navigation channel will need erosion stabilization
Private Property Issues		May require landowner permission to construct jetty termini for north and south jetties			May require landowner permission to construct jetty terminus for north jetty

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SECTION C-3

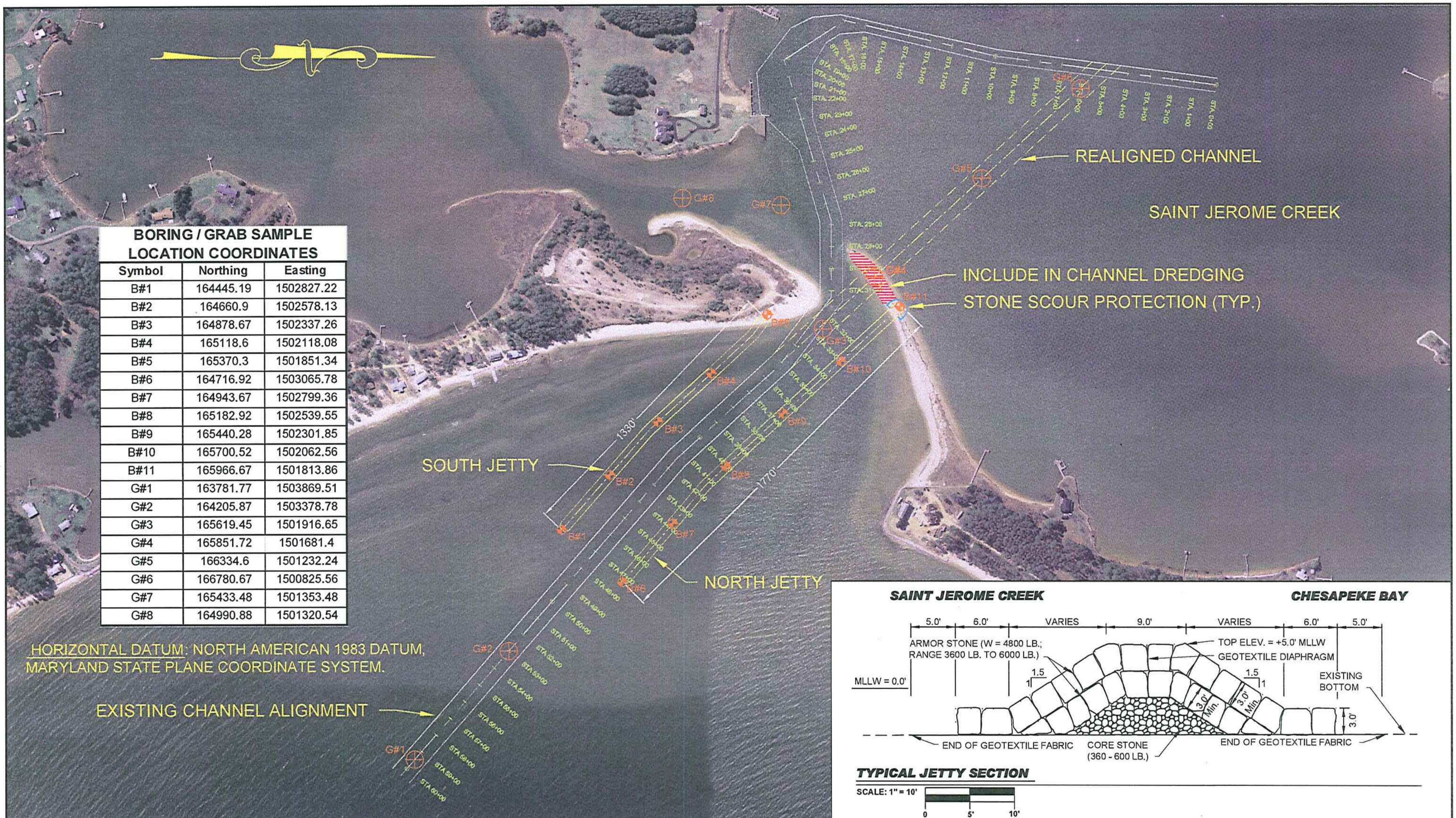
GEOTECHNICAL ANALYSIS

GEOTECHNICAL ANALYSIS AND REPORT

A detailed geotechnical investigation and analysis is forthcoming. Due to the extremely soft material encountered within the project area, a decision was made after drilling was completed to hold off on any testing or geotechnical engineering analysis/report. Additional drilling will be accomplished in the Preconstruction Engineering and Design (PED) phase to evaluate the foundation conditions and complete the design of the sheet pile/battered pile jetties.

The geotechnical program that was undertaken for this feasibility study included a Phase 1 “Geotechnical Subsurface Investigation Plan” and Phase 2 “Laboratory Testing Program”. The geotechnical subsurface field investigation included drilling, overburden (soil/sediment) sampling and undisturbed Shelby tube samples along the jetty alignments and tie-ins. While the testing program involved forwarding the materials obtained in the field investigation to the USACE approved testing laboratory for testing.

Results for Phase 1 and Phase 2 can be found in pages 78 thru 117 of this Appendix.



BORING / GRAB SAMPLE LOCATION COORDINATES

Symbol	Northing	Easting
B#1	164445.19	1502827.22
B#2	164660.9	1502578.13
B#3	164878.67	1502337.26
B#4	165118.6	1502118.08
B#5	165370.3	1501851.34
B#6	164716.92	1503065.78
B#7	164943.67	1502799.36
B#8	165182.92	1502539.55
B#9	165440.28	1502301.85
B#10	165700.52	1502062.56
B#11	165966.67	1501813.86
G#1	163781.77	1503869.51
G#2	164205.87	1503378.78
G#3	165619.45	1501916.65
G#4	165851.72	1501681.4
G#5	166334.6	1501232.24
G#6	166780.67	1500825.56
G#7	165433.48	1501353.48
G#8	164990.88	1501320.54

SAINT JEROME CREEK
SAINT MARY'S COUNTY, MARYLAND

SCALE : 1" = 400' 0' 400'

OFFSHORE & COASTAL TECHNOLOGIES, INCORPORATED
Engineering for the Marine Environment
P.O. Box 1368
Chadds Ford, Pennsylvania 19317
Tel. 610-361-0424 Fax 610-361-0425

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RECOMMENDED ALTERNATIVE 7 w/ AND w/o REALIGNED CHANNEL (2007 AERIAL PHOTO) GEOTECHNICAL INVESTIGATION PLAN

1951A002 February 15, 2010

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,445.2 E 1,502,827.2	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 13; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME: STARTED 3/25/10 1400; COMPLETED 3/25/10 1700
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.8 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 31.50 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.8	0.00	Silty fine, SAND **(SM)** medium gray with pale olive, stratified, beds ~1"-6", wet								
-5.3	1.50		J-1	SPT	4-2-1		0.9	60%		
-6.3	2.50									
-7.8	4.00	Olive gray	J-2	SPT	WOH-WOH-WOH		0.4	27%		
-8.8	5.00									
-10.3	6.50	Sandy LEAN CLAY **(CL)** trace shell fragments, olive gray, wet	J-3	SPT	1-0-0		0.9	60%		
-11.3	7.50									
-12.8	9.00	Trace decayed stem	J-4	SPT	WOH-WOH-WOH		1.5	100%		
-13.8	10.00									
-15.3	11.50	LEAN CLAY **(CL)** with fine sand, olive gray, trace decayed stem, wet	J-5	SPT	WOH-WOH-WOH		1.5	100%		
-16.3	12.50									
-17.8	14.00		J-6	SPT	WOH-WOH-WOH		1.4	93%		
-18.8	15.00									
-20.3	16.50	Trace fine sand PP: 0.0, 0.0, 0.0	J-7	SPT	WOH-WOH-WOH		1.5	100%		
-21.3	17.50									
-22.8	19.00	PP: 0.0, 0.0, 0.0	J-8	SPT	WOH-WOH-WOH		1.5	100%		
-23.8	20.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-1/B#1
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-25.3	21.50		PP: 0.0, 01, 0.0	J-9	SPT	WOH-WOH-WOH		1.5	100%		
-26.3	22.50										
-27.8	24.00		No fine sand PP: 0.1, 0.2, 0.1	J-10	SPT	WOH-WOH-WOH		1.5	100%		
-28.8	25.00										
-30.3	26.50		Trace shell fragments PP: 0.0, 0.0, 0.1	J-11	SPT	WOH-2-1		1.5	100%		
-31.3	27.50										
-32.8	29.00		PP: 0.1, 0.0, 0.1	J-12	SPT	1-0-1		1.5	100%		
-33.8	30.00										
-35.3	31.50		PP: 0.0, 0.0, 0.1	J-13	SPT	1-0-1		1.4	93%		
			BOTTOM OF HOLE Notes: 1. Soils are field visually classified in accordance with the Unified Soils Classification System 2. Depth to water bottom: 5.0' 3. Water surface relative to MLLW: +0.6' 4. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-10/B#10

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT: St. Jerome Creek Navigation Improvement, St. Marys County, MD
2. BORING LOCATION (Coordinates or Station): N 165,700.5 E 1,502,062.6
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Adam Gattuso and Scott Forbes
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 41.50 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM:
11b. HORIZONTAL DATUM:
12. MANUFACTURER'S DESIGNATION OF DRILL: CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
14. TOTAL # OF CORE RUNS:
15. ELEVATION GROUND WATER: ft
16. DATE/TIME: STARTED 4/2/10 0840; COMPLETED 4/6/10 1820
17. ELEVATION TOP OF HOLE: -7.5 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-7.5	0.00		Fine to medium, SAND **(SP)** with fine gravel, trace coarse sand, wet, pale yellow, poorly graded Fine to coarse, SAND medium gray	J-1 & J-2	SPT	2-2-2		0.5	33%		
-9.0	1.50										
- 10.0	2.50		Dark gray, presence of coarse gravel sized fall-in	J-3	SPT	4-4-7		0.6	40%		
-11.5	4.00										
-12.5	5.00		Trace shell fragments, trace silt, wet, mediuim gray, lensed, olive gray silt lenses ~0.05' thick	J-4	SPT	3-4-4		1.1	73%		
-14.0	6.50										
-15.0	7.50		SAND **(SP-SM)** trace shell fragments, trace fine gravel, wet, olive gray, poorly graded								
- 15.5	8.00		LEAN CLAY **(CL)** trace fine sand, wet, olive gray PP: 0.0, 0.0, 0.0	J-5 & J-6	SPT	1-WOR-WOR		1.3	87%		
-16.5	9.00										
-17.5	10.00		Trace decayed stem PP: 0.2, 0.0, 0.05	J-7	SPT	WOH-WOH-1		1.4	93%		
-19.0	11.50										
-20.0	12.50		Trace shell fragments PP: 0.0, 0.0, 0.0	J-8	SPT	1-0-0		1.3	87%		
-21.5	14.00										
-22.5	15.00										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft		Hole No. DH-10/B#10
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District		SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-24.0	16.50		Shelly	J-9	SPT	WOH-1-1		0	0%		
-25.0	17.50										
-26.5	19.00		LEAN CLAY **(CL)** with shell fragments, wet, olive gray, very soft	J-10	SPT	WOR-WOR-WOR		0.1	7%		
-27.5	20.00										
-29.0	21.50		PP: 0.0, 0.0, 0.0	J-11	SPT	WOH-1-2		1.1	73%		
-30.0	22.50										
-31.5	24.00		Grades from soupy to more cohesive with increasing depth PP: 0.0, 0.0, 0.2	J-12	SPT	WOH-WOH-WOH		1.4	93%		
-32.5	25.00										
-34.0	26.50		LEAN CLAY **(CL)** wet, olive gray and reddish orange, mottled, mottled or speckled reddish orange inclusions are small clumps of FeO2 with some crystalline precipitates in trace amounts PP: 0.3, 0.3, 0.3	J-13	SPT	WOH-WOH-WOH		1.5	100%		
-35.0	27.50										
-35.8	28.30		PP: 0.3, 0.1, 0.1	J-14 & J-15	SPT	1-1-2		1.5	100%		
-36.5	29.00		Sandy angular to subrounded, LEAN CLAY **(CL)** with shell fragments, wet, olive gray, firm nodules of clay present								
-37.5	30.00										
-39.0	31.50		SILT **(ML)** trace clay, wet, olive gray and yellowish brown, clumps of silt and clays present PP: 0.5, 0.5, 0.6	J-16	SPT	1-2-3		0.9	60%		
-40.0	32.50										
			Subrounded, fine to medium, SAND **(SP-SM)** with silt, and shell fragments,								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-10/B#10**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-41.0	33.50		wet, yellowish green and bluish green, poorly graded, mottled or speckled reddish orange inclusions are small clumps of FeO2	J-17 & J-18	SPT	7-5-5		1.5	100%		
-41.5	34.00		PP: 0.5, 1.0								
			SILT (ML) wet, olive gray and reddish orange								
-42.5	35.00										
			SILT (ML) with shell fragments, olive gray								
			PP: 0.25, 0.5, 0.6	J-19	SPT	3-1-2		1.4	93%		
-44.0	36.50										
-45.0	37.50										
			No shell fragments								
			PP: 0.75, 1.3, 0.75	J-20	SPT	3-3-4		1.5	100%		
-46.5	39.00										
-47.5	40.00										
			PP: 0.3, 0.75, 1.0	J-21	SPT	3-4-6		1.2	80%		
-49.0	41.50										
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.4'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-11/B#11

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,966.7 E 1,501,813.9	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 13; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft; ▽ ft; ▼ 0.40 ft; ▼ ft
7. THICKNESS OF OVERBURDEN ft	16. DATE/TIME STARTED 3/27/10 1300; COMPLETED 3/27/10 1435
8. DEPTH DRILLED INTO ROCK ft	17. ELEVATION TOP OF HOLE + 2.7 ft
9. TOTAL DEPTH OF HOLE 31.50 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
+2.7	0.00	Fine to coarse, SAND **(SP)** trace fine gravel, trace shell fragments, trace plant debris, wet, pale brown, poorly graded	J-1	SPT	1-0-2		1.2	80%		
+1.2	1.50									
+0.2	2.50	No plant debris, light gray	J-2	SPT	1-1-3		1.2	80%		
-1.3	4.00									
-2.3	5.00	Gravelly fine to coarse, SAND **(SP)** trace shell fragments, wet, white, poorly graded	J-3 & J-4	SPT	4-5-4		0.5	33%		
-3.3	6.00	Gravelly fine to coarse, SAND **(SP)** with silt, wet, light gray with reddish yellow, poorly graded								
-3.8	6.50									
-4.8	7.50	Sandy fine, GRAVEL **(GP)** wet, light gray	J-5 & J-6	SPT	1-2-1		0.5	33%		
-6.1	8.80									
-6.3	9.00	Fine to medium, SAND **(SP)** with fine gravel, trace silt, wet, dark gray, poorly graded								
-7.3	10.00	Sandy SILT **(ML)** trace fine to coarse sand, trace shell fragments, wet, olive gray	J-7	SPT	2-2-1		0.4	27%		
-8.8	11.50									
-9.8	12.50	SILT **(ML)** with fine gravel, trace fine to coarse sand, wet, olive gray	J-8	SPT	1-0-0		0.1	7%		
-11.3	14.00									
-12.3	15.00	Silty CLAY **(CL)** trace shell fragments, wet, olive gray PP: 0.0, 0.0, 0.0	J-9	SPT	1-0-1		1.3	87%		
-13.8	16.50									
-14.8	17.50	LEAN CLAY **(CL)** with silt, trace coarse sand, wet, olive gray PP: 0.0, 0.0, 0.0	J-10	SPT	1-2-1		0.6	40%		
-16.3	19.00									
-17.3	20.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-11/B#11
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-18.8	21.50		PP: 0.1, 0.2, 0.25	J-11	SPT	1-0-1		1.3	87%		
-19.8	22.50										
-21.3	24.00		LEAN CLAY **(CL)** trace shell fragments, wet, olive gray PP: 0.0, 0.0, 0.0	J-12	SPT	1-1-1		1	67%		
-22.3	25.00										
-23.8	26.50		PP: 0.25, 0.0, 0.0	J-13	SPT	WOH-WOH-WOH		1.5	100%		
-24.8	27.50										
-26.3	29.00		Note: Sand on rind of clay in jar is not sample PP: 0.2, 0.2, 0.2	J-14	SPT	WOH-WOH-1		1.4	93%		
-27.3	30.00										
-28.8	31.50		PP: 0.05, 0.3, 0.3	J-15	SPT	WOH-WOH-WOH		1.5	100%		

BOTTOM OF HOLE

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 5.7'
3. Sampling suspended at 4.0' due to rough seas and resumed when conditions improved later in the day
4. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".
5. Groundwater: 0.4' upon completion
6. Jar 5 fell out of the boat cab and was destroyed

Hole No. DH-2/B#2

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT: St. Jerome Creek Navigation Improvement, St. Marys County, MD
2. BORING LOCATION (Coordinates or Station): N 164,660.9 E 1,502,578.1
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara and John Blackson
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 44.00 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM:
11b. HORIZONTAL DATUM:
12. MANUFACTURER'S DESIGNATION OF DRILL: CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 18; UNDISTURBED 0
14. TOTAL # OF CORE RUNS:
15. ELEVATION GROUND WATER: ft
16. DATE/TIME: STARTED 4/1/10 0815; COMPLETED 4/1/10 1030
17. ELEVATION TOP OF HOLE: -5.4 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

▽ ft ▼ ft ▼ ft

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/BOX	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.4 / -6.9	0.00 / 1.50		Sandy SILT **(ML)** trace shell fragments, wet, dark olive gray and olive gray, lensed, lenses of silt and sand	J-1	SPT	1-3-2		0.9	60%		
-7.9	2.50										
-9.4	4.00		SILT **(ML)** with sand, trace shell fragments, wet, olive gray	J-2	SPT	WOH-WOH-WOH		1.3	87%		
-10.4	5.00										
-11.9	6.50		Trace decayed stem	J-3	SPT	WOH-WOH-WOH		1	67%		
-12.9	7.50										
-14.4	9.00		SILT **(ML)** with fine sand, and clay, trace decayed stem, wet, olive gray	J-4	SPT	WOH-WOH-WOH		1.2	80%		
-15.4	10.00										
-16.9	11.50		CLAY **(CL)** with sand, and silt, trace shell fragments, wet, olive gray, trace decayed stem PP: 0.0, 0.0, 0.0	J-5	SPT	WOH-1-1		1.5	100%		
-17.9	12.50										
-19.4	14.00		LEAN CLAY **(CL)** trace silt, trace fine sand, trace shell fragments, wet, olive gray PP: 0.0, 0.0, 0.0	J-6	SPT	1-0-1		0.7	47%		
-20.4	15.00										

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-2/B#2
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-21.9	16.50		Trace decayed stem PP: 0.1, 0.1, 0.0	J-7	SPT	WOH-WOH-WOH		1.5	100%		
-22.9	17.50										
-24.4	19.00		With shell fragments PP: 0.1, 0.1, 0.0	J-8	SPT	1-0-1		1.5	100%		
-25.4	20.00										
-26.9	21.50		No shell fragments PP: 0.0, 0.1, 0.0	J-9	SPT	WOH-WOH-WOH		1.5	100%		
-27.9	22.50										
-29.4	24.00		No decayed stem, no fine sand PP: 0.05, 0.25, 0.2	J-10	SPT	WOH-WOH-WOH		1.4	93%		
-30.4	25.00										
-31.9	26.50		Trace shell fragments PP: 0.5, 0.4, 0.2	J-11	SPT	1-0-1		1.2	80%		
-32.9	27.50										
-34.4	29.00		No shell fragments, trace decayed stem PP: 0.25, 0.4, 0.4	J-12	SPT	WOH-WOH-WOH		1.5	100%		
-35.4	30.00										
-36.9	31.50		No decayed stem PP: 0.4, 0.3, 0.45	J-13	SPT	WOH-WOH-WOH		1.2	80%		
-37.9	32.50										
			With shell fragments								

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-2/B#2**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-39.4	34.00		PP: 0.25, 0.25, 0.25	J-14	SPT	1-1-2		1	67%		
-40.4	35.00										
-41.9	36.50		PP: 0.5, 0.4, 0.25	J-15	SPT	1-0-1		1	67%		
-42.9	37.50										
-44.4	39.00		No shell fragments, trace decayed stem PP: 0.4, 0.4, 0.5	J-16	SPT	1-0-1		1.4	93%		
-45.4	40.00										
-46.9	41.50		PP: 0.5, 0.5, 0.5	J-17	SPT	WOH-WOH-WOH		1.5	100%		
-47.9	42.50										
-49.4	44.00		Trace shell fragments PP: 0.5, 0.4, 0.3	J-18	SPT	WOH-WOH-WOH		1.5	100%		
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 6.0'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,878.7 E 1,502,337.3	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft (ft / ft / ft)
	16. DATE/TIME: STARTED 3/31/10 1730; COMPLETED 3/31/10 1905
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.5 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 41.50 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
	0.00	PEAT (PT) trace fine sand, trace roots, wet, charcoal gray, oily appearance								
-5.0	1.50	Silty SAND (SM) trace shell fragments, wet, dark gray	J-1 & J-2	SPT	1-1-2		1.2	80%		
-6.0	2.50									
-7.5	4.00	Silty fine, SAND (SM) with peat, trace shell fragments, trace roots, wet, charcoal gray and dark gray, stratified, alternating layers of peat (PT) and silty sand (SM) from 3.3' to 4.0'	J-3	SPT	1-0-1		0.8	53%		
-8.5	5.00									
-10.0	6.50	Sandy SILT (ML) with peat, trace shell fragments, wet, dark gray, lensed	J-4	SPT	1-1-1		1.4	93%		
-11.0	7.50									
-12.5	9.00	LEAN CLAY (CL) trace fine sand, trace silt, wet, olive gray PP: 0.25, 0.25, 0.1	J-5	SPT	WOH-WOH-WOH		1.5	100%		
-13.5	10.00									
-15.0	11.50	No fine sand PP: 0.2, 0.1, 0.05	J-6	SPT	WOH-WOH-WOH		1.5	100%		
-16.0	12.50									
-17.5	14.00	Trace decayed stem PP: 0.25, 0.25, 0.1	J-7	SPT	WOH-WOH-WOH		1.3	87%		
-18.5	15.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-3/B#3**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-20.0	16.50		PP: 0.25, 0.25, 0.1	J-8	SPT	WOH-WOH-WOH		0.9	60%		
-21.0	17.50										
-22.5	19.00		PP: 0.25, 0.3, 0.2	J-9	SPT	WOH-WOH-WOH		1.5	100%		
-23.5	20.00										
-25.0	21.50		PP: 0.3, 0.3, 0.4	J-10	SPT	WOH-WOH-1		1.3	87%		
-26.0	22.50										
-27.5	24.00		PP: 0.25, 0.25, 0.25	J-11	SPT	WOH-WOH-WOH		1.5	100%		
-28.5	25.00										
-30.0	26.50		PP: 0.4, 0.25, 0.4	J-12	SPT	WOH-WOH-WOH		1.5	100%		
-31.0	27.50										
-32.5	29.00		PP: 0.3, 0.4, 0.4	J-13	SPT	WOH-WOH-WOH		1.5	100%		
-33.5	30.00										
-35.0	31.50		PP: 0.3, 0.45, 0.4	J-14	SPT	WOH-WOH-1		1.5	100%		
-36.0	32.50										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: ft

Hole No. DH-3/B#3

PROJECT: St. Jerome Creek Navigation Improvement

INSTALLATION: Baltimore District

SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-37.5	34.00		PP: 0.6, 0.4, 0.2	J-15	SPT	WOH-WOH-WOH		1.5	100%		
-38.5	35.00										
-40.0	36.50		PP: 0.6, 0.5, 0.4	J-16	SPT	WOH-WOH-WOH		1.5	100%		
-41.0	37.50										
-42.5	39.00		PP: 0.5, 0.5, 0.4	J-17	SPT	WOH-WOH-WOH		1.5	100%		
-43.5	40.00										
-45.0	41.50		Trace shell fragments PP: 0.5, 0.5, 0.5	J-18	SPT	WOH-WOH-WOH		1.5	100%		
			BOTTOM OF HOLE Notes: 1. Soils are field visually classified in accordance with the Unified Soils Classification System 2. Depth to water bottom: 6.3' 3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,118.6 E 1,502,118.1	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME: STARTED 3/31/10 1500; COMPLETED 3/31/10 1730
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.5 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 41.50 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
- 3.5	0.00		Silty fine to coarse, SAND **(SM)** trace shell fragments, wet, stratified, gray with black and tan	J-1	SPT	1-3-2		0.7	47%		
-5.0	1.50										
-6.0	2.50		Medium to coarse, SAND **(SP)** with gravel, and wood, trace shell fragments, wet, light gray, poorly graded, gravel concentrated in top 0.1' of sample	J-2	SPT	1-1-2		0.8	53%		
-7.5	4.00										
-8.5	5.00		Fine to coarse, SAND **(SP)** wet, white, poorly graded	J-3 & J-4	SPT	2-2-2		0.8	53%		
-9.9	6.40		Sandy SILT **(ML)** wet, olive gray								
-10.0	6.50										
-11.0	7.50		Fine to coarse, SAND **(SP)** trace fine gravel, trace shell fragments, wet, light gray, poorly graded	J-5	SPT	3-4-3		0.9	60%		
				J-6 & J-7	SPT	1-2-1		1	71%		
-14.9	11.40		Sandy CLAY **(CL)** wet, olive gray								
-15.0	11.50										
-16.0	12.50		LEAN CLAY **(CL)** trace silt, trace decayed stem, olive gray PP: 0.25, 0.25, 0.25	J-8	SPT	WOH-WOH-WOH		1.5	100%		
-17.5	14.00										
-18.5	15.00										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE ft **Hole No. DH-4/B#4**

PROJECT St. Jerome Creek Navigation Improvement | INSTALLATION Baltimore District | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-20.0	16.50		PP: 0.1, 0.25, 0.25	J-9	SPT	1-0-1		1.5	100%		
-21.0	17.50										
-22.5	19.00		Trace shell fragments, no decayed stem PP: 0.0, 0.3, 03	J-10	SPT	1-0-1		1.5	100%		
-23.5	20.00										
-25.0	21.50		PP: 0.25, 0.25, 0.25	J-11	SPT	WOH-WOH-WOH		1.5	100%		
-26.0	22.50										
-27.5	24.00		PP: 0.5, 0.5, 0.25	J-12	SPT	1-0-0		1.2	80%		
-28.5	25.00										
-30.0	26.50		Trace decayed stem, no shell fragments PP: 0.25, 0.4, 0.25	J-13	SPT	WOH-WOH-WOH		1.5	100%		
-31.0	27.50										
-32.5	29.00		No decayed stem PP: 0.0, 0.4, 0.5	J-14	SPT	WOH-WOH-WOH		1.5	100%		
-33.5	30.00										
-35.0	31.50		Sandy CLAY **(CL)** trace shell fragments, wet, olive gray PP: 0.2, 0.0, 0.5	J-15	SPT	1-0-1		1.5	100%		
-36.0	32.50										
			Sandy SILT **(ML)** with clay, trace shell fragments, wet, olive gray								

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-4/B#4**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-37.5	34.00		PP: 0.0, 0.0, 0.0	J-16	SPT	WOH-1-1		1.4	93%		
-38.5	35.00										
-40.0	36.50			J-17	SPT	WOH-1-1		1	67%		
-41.0	37.50										
-42.5	39.00		Sandy SILT **(ML)** with shell fragments, trace clay, wet, olive gray	J-18	SPT	1-1-4		1.33	89%		
-43.5	40.00										
-44.2	40.70		With fine gravel	J-19 & J-20	SPT	2-1-1		1.4	93%		
-45.0	41.50		SILT **(ML)** wet, olive yellow and light gray, mottled								
			BOTTOM OF HOLE								

BOTTOM OF HOLE

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 5.0'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-5/B#5

DRILLING LOG

DIVISION	INSTALLATION	SHEET
North Atlantic Division	Baltimore District	1 OF 3 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,370.3 E 1,501,851.3	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft (▽ ft, ▼ ft, ▼ ft)
	16. DATE/TIME: STARTED 3/27/10 0850; COMPLETED 3/25/10 1900
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.0 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 41.50 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.0											
-3.4	0.00 0.40		Gravelly fine to coarse, SAND **(SP)** wet, pale yellow, poorly graded								
-4.5	1.50		Fine to coarse, SAND **(SP)** trace fine gravel, wet, pale yellow, poorly graded	J-1 & J-2	SPT	2-2-4		0.8	53%		
-5.5	2.50										
-7.0	4.00		Trace shell fragments, wet, lensed, lense of medium gray clayey sand 0.15' thick in J-3	J-3	SPT	5-2-5		0.6	40%		
-8.0	5.00										
-9.2	6.20			J-4 & J-5	SPT	1-6-8		1.5	100%		
-9.5	6.50		Fine to coarse, SAND **(SP-SM)** with silt, and fine gravel, wet, medium gray, poorly graded								
-10.5	7.50										
-12.0	9.00		Fine to coarse, SAND **(SP-SM)** with silt, wet, medium gray, poorly graded	J-6	SPT	3-4-3		0.5	33%		
-13.0	10.00										
-14.5	11.50		Silty fine to coarse, SAND **(SM)** with fine gravel, wet, medium gray, fining upwards sequence from 11.3' (gravel) to 10.2' (silty sand)	J-7	SPT	3-2-2		1.3	87%		
-15.5	12.50										
-16..8	13.80		SAND **(SP)** trace silt, trace fine gravel, wet, medium gray, poorly graded	J-8 & J-9	SPT	4-5-5		1.5	100%		
-17.0	14.00		Sandy SILT **(ML)** wet, medium gray, fining upwards sequence from 16.2' (gravel) to sand with silt directly below								
-18.0	15.00										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-5/B#5
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-19.5	16.50		Fine to coarse, SAND **(SP)** with fine gravel, trace silt, wet, medium gray, poorly graded	J-10	SPT	1-4-4		1.5	100%		
-20.5	17.50										
-21.6	18.60		Pale yellow, fining upwards sequence from 18.55' (gravel) to 17.5' (fine to medium sand)	J-11 & J-12	SPT	1-1-1		1.5	100%		
-22.0	19.00		SILT **(ML)** with clay, and fine to medium sand, wet, medium gray								
-23.0	20.00										
-24.5	21.50		LEAN CLAY **(CL)** with silt, trace shell fragments, wet, medium gray PP: 0.3, 0.3, 0.4	J-13	SPT	1-0-1		1	67%		
- 25.5	22.50										
-27.0	24.00		LEAN CLAY trace silt, trace shell fragments, wet, medium gray PP: 0.5, 0.4, 0.25	J-14	SPT	2-1-1		1.2	80%		
-28.0	25.00										
-29.5	26.50		PP: 0.25, 0.3, 0.3	J-15	SPT	WOH-1-2		1.5	100%		
-30.5	27.50										
-32.0	29.00		PP: 0.25, 0.25, 0.0	J-16	SPT	2-1-2		1	67%		
-33.0	30.00										
-34.5	31.50		Trace decayed stem PP: 0.3, 0.25, 0.3	J-17	SPT	1-1-1		1.5	100%		
-35.5	32.50										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-5/B#5**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-37.0	34.00		PP: 0.3, 0.3, 0.3	J-18	SPT	1-2-2		1.4	93%		
-38.0	35.00										
-38.5	36.50		PP: 0.5, 0.4, 0.5	J-19	SPT	1-1-1		1.5	100%		
-40.5	37.50										
-42.0	39.00		PP: 0.25, 0.1, 0.0	J-20	SPT	1-2-1		1.5	100%		
-43.0	40.00										
-44.5	41.50		PP: 0.0, 0.25, 0.25	J-21	SPT	1-2-2		1.4	93%		

BOTTOM OF HOLE

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Depth to water bottom: 3.1'
4. Sampling suspended at 16.5' due to rough seas and resumed when conditions improved later in the day
5. Jar 10 fell out of the boat cab and was destroyed

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-6/B#6

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,716.9 E 1,503,065.8	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME STARTED 3/27/10 0800 COMPLETED 3/27/10 1715
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.8 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 41.50 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.8	0.00	Fine, SAND **(SP)** trace shell fragments, wet, light brownish gray, poorly graded Silty fine, SAND **(SM)** trace shell fragments, wet, medium gray	J-1 & J-2	SPT	WOH-3-3		0.6	40%		
-5.3	1.50									
-6.3	2.50		J-3	SPT	WOH-3-1		0.8	53%		
-7.8	4.00									
-8.8	5.00	Sandy SILT **(ML)** with clay, wet, olive gray	J-4	SPT	1-0-1		0.8	53%		
-10.3	6.50									
-11.3	7.50	Trace shell fragments, trace decayed stem	J-5	SPT	WOH-WOH-WOH		1.3	87%		
-12.8	9.00									
-13.8	10.00	No shell fragments	J-6	SPT	WOH-WOH-WOH		1.2	80%		
-15.3	11.50									
-16.3	12.50	LEAN CLAY **(CL)** with silt, trace shell fragments, trace decayed stem, wet, olive gray PP: 0.0, 0.2, 0.5	J-7	SPT	WOH-WOH-WOH		1.4	93%		
- 17.8	14.00									
-18.8	15.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

NAB FORM 1836 NOV 06 ∇ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE ft

Hole No. DH-6/B#6

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-20.3	16.50		PP: 0.0, 0.0, 0.0	J-8	SPT	WOH-WOH-WOH		1.5	100%		
-21.3	17.50										
-22.8	19.00		PP: 0.0, 0.0, 0.0	J-9	SPT	WOH-WOH-WOH		0.7	47%		
-23.8	20.00										
-25.3	21.50		PP: 0.1, 0.0, 0.05	J-10	SPT	WOH-WOH-1		1.5	100%		
-26.3	22.50										
-27.8	24.00		PP: 0.0, 0.0, 0.0	J-11	SPT	1-1-1		1.5	100%		
-28.8	25.00										
-30.3	26.50		LEAN CLAY **(CL)** trace decayed stem, wet, olive gray PP: 0.0, 0.2, 0.2	J-12	SPT	WOR-WOH-WOH		1.5	100%		
-31.3	27.50										
-32.8	29.00		No decayed stem PP: 0.25, 0.25, 0.2	J-13	SPT	WOH-1-0		1.5	100%		
-33.8	30.00										
-35.3	31.50		PP: 0.2, 0.0, 0.2 with shells from 30.8' to 31.5' -34.6 to -35.3	J-14	SPT	1-1-1		1.3	87%		
-36.8	32.50										
			Trace shell fragments								

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: ft

Hole No. DH-6/B#6

PROJECT: St. Jerome Creek Navigation Improvement

INSTALLATION: Baltimore District

SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-37.8	34.00		PP: 0.25, 0.0, 0.0	J-15	SPT	1-1-2		1.4	93%		
-38.8	35.00										
-40.3	36.50		shelly from 35.4' to 36.0' PP: 0.4, 0.4, 0.0	J-16	SPT	3-2-1		1	67%		
-41.3	37.50										
-42.8	39.00		Trace decayed stem PP: 0.0, 0.0, 0.25	J-17	SPT	1-1-2		1.5	100%		
-43.8	40.00										
-45.3	41.50		PP: 0.3, 0.4, 0.45	J-18	SPT	1-1-0		1.5	100%		

BOTTOM OF HOLE

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 5.7'
3. Sampling suspended at 4.0' due to rough seas and resumed when conditions improved later in the day
4. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-6A/B#6A

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,716.9 E 1,503,065.8	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
5. NAME OF INSPECTOR Scott Forbes	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft; ▽ ft; ▼ ft; ▼ ft
	16. DATE/TIME: STARTED 4/5/10 0800; COMPLETED 4/5/10 1100
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 17.00 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.8			Attempts were made for undistrubed Shelby sampling at 5.0' and 15.0'. No recovery was achieved. -8.8 and -18.8								
-8.8	5.00										
-11.8	7.00							0	0%		
-18.8	15.00										
-20.8	17.00							0	0%		
			BOTTOM OF HOLE Notes: 1. Attempts were made for undistrubed Shelby sampling at 5.0' and 15.0'. No recovery was achieved.								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,943.7 E 1,502,799.4	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
7. THICKNESS OF OVERBURDEN ft	16. DATE/TIME STARTED 4/1/10 1040; COMPLETED 4/1/10 1300
8. DEPTH DRILLED INTO ROCK ft	17. ELEVATION TOP OF HOLE -5.0 ft
9. TOTAL DEPTH OF HOLE 39.50 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/BOX	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.0	0.00	Fine, SAND **(SP-SM)** with silt, trace shell fragments, wet, olive gray, poorly graded	J-1	SPT	1-1-0					
-6.5	1.50									
-7.5	2.50	Silty CLAY **(CL)** with fine sand, trace shell fragments, trace decayed stem, wet, olive gray	J-2	SPT	WOH-WOH-WOH		0.8	53%		
-9.0	4.00									
-10.0	5.00	CLAY **(CL)** with silt, and fine sand, trace decayed stem, wet, olive gray PP: 0.1, 0.25, 0.0	J-3	SPT	WOH-WOH-WOH		1.4	93%		
-11.5	6.50									
-12.5	7.50	PP: 0.0, 0.2, 0.2	J-4	SPT	WOH-WOH-WOH		1.5	100%		
-14.0	9.00									
-15.0	10.00	CLAY **(CL)** with silt, trace fine sand, olive gray PP: 0.0, 0.0, 0.25	J-5	SPT	WOH-WOH-WOH		1.5	100%		
-16.5	11.50									
-17.5	12.50	LEAN CLAY **(CL)** trace silt, trace fine gravel, trace shell fragments, wet, olive gray, trace decayed stem PP: 0.0, 0.3, 0.25	J-6	SPT	WOH-WOH-WOH		1.5	100%		
-19.0	14.00									
-20.0	15.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | Hole No. DH-7/B#7

PROJECT St. Jerome Creek Navigation Improvement | INSTALLATION Baltimore District | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-21.5	16.50		PP: 0.05, 0.0, 0.0	J-7	SPT	WOH-WOH-WOH		1.4	93%		
-22.5	17.50										
-24.0	19.00		PP: 0.25, 0.25, 0.25	J-8	SPT	WOH-WOH-WOH		1.4	93%		
-25.0	20.00										
-26.5	21.50		PP: 0.25, 0.25, 0.25	J-9	SPT	WOH-WOH-WOH		1.5	100%		
-27.5	22.50										
-29.0	24.00		No fine sand, no shell fragments PP: 0.25, 0.25, 0.2	J-10	SPT	WOH-WOH-WOH		1.5	100%		
-30.0	25.00										
-31.5	26.50		PP: 0.45, 0.4, 0.5	J-11	SPT	WOH-WOH-WOH		1.5	100%		
-32.5	27.50										
-34.0	29.00		Trace fine sand, no decayed stem PP: 0.4, 0.0, 0.0	J-12	SPT	WOH-WOH-WOH		0.8	53%		
-35.0	30.00										
-36.5	31.50		No fine sand PP: 0.2, 0.25, 0.0	J-13	SPT	WOH-1-0		1.4	93%		
-37.5	32.50										

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-7/B#7
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-39.0	34.00		PP: 0.4, 0.4, 0.3	J-14	SPT	1-1-2		1.4	93%		
-40.0	35.00										
-41.5	36.50		No decayed stem PP: 0.4, 0.4, 0.5	J-15	SPT	1-1-1		1.5	100%		
-42.5	37.50										
-44.5	39.50		Trace shell fragments, trace decayed stem PP: 0.3, 0.25, 0.5, 0.3	J-16	SPT	1-1-1-2		2	100%		
			BOTTOM OF HOLE								

BOTTOM OF HOLE

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 6.0'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30"

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. DH-8/B#8

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT
St. Jerome Creek Navigation Improvement, St. Marys County, MD
2. BORING LOCATION (Coordinates or Station)
N 165,182.9 E 1,502,539.6
3. DRILLING AGENCY
Baltimore District
4. NAME OF DRILLER
Albert McNamara
5. NAME OF INSPECTOR
Adam Gattuso
6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN ft
8. DEPTH DRILLED INTO ROCK ft
9. TOTAL DEPTH OF HOLE 41.50 ft

10. SIZE AND TYPE OF BIT
11a. VERTICAL DATUM
11b. HORIZONTAL DATUM
12. MANUFACTURER'S DESIGNATION OF DRILL
CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN : DISTURBED 17 : UNDISTURBED 0
14. TOTAL # OF CORE RUNS
15. ELEVATION GROUND WATER ft
16. DATE/TIME : STARTED 4/1/10 1400 : COMPLETED 4/1/10 1630
ft / ft / ft
17. ELEVATION TOP OF HOLE -5.7 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.7	0.00		CLAY **(CL)** with silt, and fine sand, trace shell fragments, wet, olive gray	J-1	SPT	2-1-1		0.1	7%		
-7.2	1.50										
-8.2	2.50		No shell fragments PP: 0.3, 0.3, 0.25	J-2	SPT	WOH-WOH-WOH		1.5	100%		
-9.7	4.00										
-10.7	5.00		LEAN CLAY **(CL)** trace silt, wet, olive gray PP: 0.25, 0.25, 0.25	J-3	SPT	WOH-WOH-WOH		1.5	100%		
-12.2	6.50										
-13.2	7.50		PP: 0.0, 0.2, 0.0	J-4	SPT	WOH-WOH-WOH		1.4	93%		
-14.7	9.00										
-15.7	10.00		PP: 0.0, 0.2, 0.0	J-5	SPT	WOH-WOH-WOH		1.5	100%		
-17.2	11.50										
-18.2	12.50		PP: 0.0, 0.0, 0.0	J-6	SPT	WOH-WOH-WOH		1.5	100%		
-19.7	14.00										
-20.7	15.00										

PRELIMINARY
INSPECTOR'S LOG
CLASSIFICATION
NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-8/B#8
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-22.2	16.50		PP: 0.0, 0.0, 0.1	J-7	SPT	WOH-WOH-WOH		1.5	100%		
-23.2	17.50										
-24.7	19.00		PP: 0.3, 0.2, 01	J-8	SPT	WOH-WOH-WOH		1.5	100%		
-25.7	20.00										
-27.2	21.50		Trace fine sand PP: 0.25, 0.0, 0.25	J-9	SPT	WOH-WOH-WOH		1.5	100%		
-28.2	22.50										
-29.7	24.00		Trace decayed stem PP: 0.3, 0.5, 0.25	J-10	SPT	WOH-WOH-WOH		1.5	100%		
-30.7	25.00										
-32.2	26.50		Trace shell fragments PP: 0.25, 0.25, 0.25	J-11	SPT	WOH-1-1		1.4	93%		
-33.2	27.50										
-34.7	29.00		PP: 0.0, 0.5, 0.25	J-12	SPT	WOH-WOH-WOH		1.5	100%		
-35.7	30.00										
-37.2	31.50		Sandy SILT **(ML)** with clay, trace shell fragments, trace decayed stem, wet, dark olive gray PP: 0.25, 0.25, 0.25	J-13	SPT	WOH-WOH-WOH		1.2	80%		
-38.2	32.50										
			Light olive brown and light gray, lensed, lenses 0-1" of golden color								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE ft | **Hole No. DH-8/B#8**

PROJECT: St. Jerome Creek Navigation Improvement | INSTALLATION: Baltimore District | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-39.7	34.00			J-14	SPT	WOH-WOH-2		1.5	100%		
-40.7	35.00										
-42.2	36.50			J-15	SPT	1-2-3		1.5	100%		
-43.2	37.50										
-44.5	38.80		Clayey SILT **(ML)** with fine sand, wet, light gray PP: 0.7, 0.5	J-16 & J-17	SPT	2-1-3		1.3	87%		
-44.7	39.00		Clayey SILT wet, olive gray								
-45.7	40.00										
-47.2	41.50		Sandy SILT **(ML)** wet, olive gray	J-18	SPT	8-24-21		1.3	87%		
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.4'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30".

PRELIMINARY
INSPECTOR'S LOG
CLASSIFICATION
NOT FINAL

Hole No. DH-9/B#9

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,440.3 E 1,502,301.9	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 9; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
7. THICKNESS OF OVERBURDEN ft	16. DATE/TIME: STARTED 4/1/10 1655; COMPLETED 4/1/10 1805
8. DEPTH DRILLED INTO ROCK ft	17. ELEVATION TOP OF HOLE -5.9 ft
9. TOTAL DEPTH OF HOLE 21.50 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/BOX	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.9	0.00	Silty fine, SAND **(SM)** trace wood, wet, olive gray to dark gray								
-6.9	1.00		J-1 & J-2	SPT	WOH-2-2		0.6	40%		
-7.4	1.50	Fine to medium, SAND **(SP-SM)** with silt, wet, light gray, poorly graded								
-8.4	2.50									
-9.9	4.00	LEAN CLAY **(CL)** trace fine to medium sand, trace shell fragments, wet, olive gray PP: 0.2, 0.1, 0.05	J-3	SPT	WOH-WOH-WOH		0.9	60%		
-10.9	5.00									
-12.4	6.50	Trace silt, no fine to medium sand PP: 0.25, 0.05, 0.0	J-4	SPT	WOH-WOH-WOH		1.4	93%		
-13.4	7.50									
-14.9	9.00	LEAN CLAY **(CL)** with fine sand, and silt, trace decayed stem, wet, olive gray PP: 0.0, 0.2, 0.25	J-5	SPT	WOH-WOH-WOH		1.4	93%		
-15.9	10.00									
-17.4	11.50	Silty fine, SAND **(SM)** trace decayed stem, wet, pistachio green	J-6	SPT	2-4-10		1.3	87%		
-18.4	12.50									
-19.9	14.00	No decayed stem, mottled, contains spots up to 0.25" of brownish gold, hard, fine sand and silt	J-7	SPT	5-8-4		1.1	73%		
-20.4	15.00									

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE ft	Hole No. DH-9/B#9
PROJECT St. Jerome Creek Navigation Improvement	INSTALLATION Baltimore District	SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-22.4	16.50		Slightly mottled with dark, yellowish brown, hard soil up to 0.75"	J-8	SPT	5-10-4		1.1	73%		
-23.4	17.50										
-24.9	19.00		Sandy SILT **(ML)** wet, light olive brown	J-9	SPT	1-5-6		0.4	27%		
-25.9	20.00										
-27.0	21.10		Silty fine, SAND **(SM)** wet, light olive brown	J-10 & J-11	SPT	3-6-6		1.4	93%		
-27.4	21.50		Wet, pale olive, slightly mottled with dark, yellowish brown								
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 8.0'
3. Sampled using a standard 1 3/8" split spoon driven manally by a 140 lb. hammer dropped 30"

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-1

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 163,781.8 E 1,503,869.5	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF INSPECTOR Scott Forbes	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME: STARTED 4/6/10 0000; COMPLETED 4/6/10 0000
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -9.3 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 2.00 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-9.3	0.00		Sandy SILT **(ML)** wet, olive gray, organic odor	J-1	SPT	WOH-WOH-WOH		0.5	25%		
-11.3	2.00										
			BOTTOM OF HOLE Notes: 1. Soils are field visually classified in accordance with the Unified Soils Classification System 2. Depth to water bottom: 7.2' 3. Sampled using a standard 1 3/8" split spoon								

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-2

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT: St. Jerome Creek Navigation Improvement, St. Marys County, MD
2. BORING LOCATION (Coordinates or Station): N 164,205.9 E 1,503,378.8
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara and John Blackson
5. NAME OF INSPECTOR: Scott Forbes
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 2.00 ft

10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM:
11b. HORIZONTAL DATUM:
12. MANUFACTURER'S DESIGNATION OF DRILL: CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 ; UNDISTURBED 0
14. TOTAL # OF CORE RUNS: ∇ ft
15. ELEVATION GROUND WATER: ft ∇ ft
16. DATE/TIME: STARTED 4/6/10 0000 ; COMPLETED 4/6/10 0000 ∇ ft
17. ELEVATION TOP OF HOLE: -6.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-6.0	0.00		No sample could be obtained after several attempts.								
	2.00		BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 6.5'
3. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-3

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT: St. Jerome Creek Navigation Improvement, St. Marys County, MD
2. BORING LOCATION (Coordinates or Station): N 165,619.5 E 1,501,916.7
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara and John Blackson
5. NAME OF INSPECTOR: Scott Forbes
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 2.00 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM:
11b. HORIZONTAL DATUM:
12. MANUFACTURER'S DESIGNATION OF DRILL: CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
14. TOTAL # OF CORE RUNS:
15. ELEVATION GROUND WATER: ft
16. DATE/TIME: STARTED 4/6/10 0000; COMPLETED 4/6/10 0000
17. ELEVATION TOP OF HOLE: -8.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-8.0	0.00		Subangular to rounded, fine to medium, SAND **(SP-SM)** wet, dark olive gray and light green, poorly graded, organic odor	J-1	SPT	WOH-WOH-WOH		0.5	25%		
-10.0	2.00										
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.4'
3. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-4

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,851.7 E 1,501,681.4	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME: STARTED 3/28/10 0000; COMPLETED 3/28/10 0000
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -3.5 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 6.00 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.5 / -5.5	0.00 / 2.00		Fine to coarse, SAND **(SP)** with fine gravel, wet, light gray, poorly graded	J-1	SPT			0.3	15%		
	2.00 / 6.00		SAND **(SP-SM)** with silt, trace shell fragments, wet, medium gray, poorly graded	J-2	SPT			1	50%		
	6.00		BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 2.0'
3. Water surface relative to MLLW: +0.4'
4. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

NAB FORM 1836 NOV 06 — ▽ DURING DRILLING; ▼ AT COMPLETION; ▼ AFTER DRILLING

Hole No. G-5

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT: St. Jerome Creek Navigation Improvement, St. Marys County, Md.
2. BORING LOCATION (Coordinates or Station): N 166,334.6 E 1,501,232.2
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara and John Blackson
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 2.00 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: 11b. HORIZONTAL DATUM:
12. MANUFACTURER'S DESIGNATION OF DRILL: CME- 45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
14. TOTAL # OF CORE RUNS: ft
15. ELEVATION GROUND WATER: ft; ft; ft
16. DATE/TIME: STARTED 3/28/10 0000; COMPLETED 3/28/10 0000
17. ELEVATION TOP OF HOLE: -5.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.0	0.00		LEAN CLAY with silt, with organics, trace shell fragments, wet, medium gray, very soft	J-1	SPT			2	100%		
-7.0	2.00										
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.0'
3. Water surface relative to MLLW: +0.3'
4. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 166,780.7 E 1,500,825.6	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 1 — UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME STARTED 3/28/10 0000 COMPLETED 3/28/10 0000
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -5.5 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 2.00 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.5	0.00		LEAN CLAY **(CL)** with silt, and organics, trace shell fragments, wet, medium gray, very soft	J-1	SPT			2	100%		
-7.5	2.00										
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.0'
3. Water surface relative to MLLW: +0.3'
4. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-7

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 165,433.5 E 1,501,353.5	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME STARTED 3/28/10 0000 COMPLETED 3/28/10 0000
7. THICKNESS OF OVERBURDEN ft	17. ELEVATION TOP OF HOLE -4.0 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 2.00 ft	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-4.0	0.00		Sandy fine, GRAVEL **(GP)** wet, medium gray with tan, poorly graded, small volume of actual recovery	J-1	SPT			2	100%		
-6.0	2.00										
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 6.9'
3. Water surface relative to MLLW: +0.5'
4. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

Hole No. G-8

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 1 SHEETS

1. PROJECT St. Jerome Creek Navigation Improvement, St. Marys County, MD	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 164,990.9 E 1,501,320.5	11a. VERTICAL DATUM / 11b. HORIZONTAL DATUM
3. DRILLING AGENCY Baltimore District	12. MANUFACTURER'S DESIGNATION OF DRILL CME- 45
4. NAME OF DRILLER Albert McNamara and John Blackson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF INSPECTOR Adam Gattuso	14. TOTAL # OF CORE RUNS
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
7. THICKNESS OF OVERBURDEN ft	16. DATE/TIME: STARTED 3/28/10 0000; COMPLETED 3/28/10 0000
8. DEPTH DRILLED INTO ROCK ft	17. ELEVATION TOP OF HOLE -5.3 ft
9. TOTAL DEPTH OF HOLE 2.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-5.3	0.00		LEAN CLAY wet, pale yellow								
-5.8	0.50		SILT with sand, wet, dark gray								
-7.3	2.00		POORLY GRADED SAND with silt, and organics, trace shell fragments, wet, dark gray	J-1				1.1	55%		
			BOTTOM OF HOLE								

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Depth to water bottom: 7.5'
3. Water surface relative to MLLW: +0.6'
4. Sampled using a standard 1 3/8" split spoon

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

SECTION C-4

DESIGN DATA

Design Summary

Non-Breaking Wave - [Force perpendicular to wall]

h_i =	3.0	ft	[wave height]
d =	8.0	ft (EL 5.0')	[still water depth]
F =	3,686	lb/ft	[wave force]
V =	35.9	kips	[shear force to be resisted by bolts on batter piles]

bolts: (4) 1 1/2" dia. ASTM A449 bolts
sheetpile: CMI SG-950 vinyl sheetpiles

Breaking Wave - [Force 45° to wall]

H_b =	6.4	ft	[wave height]
d_s =	5.3	ft (EL 2.3')	[still water depth]
F =	6,102	lb/ft	[wave force]
V =	91.2	kips	[shear force to be resisted by bolts on batter piles]

bolts: (6) 2" dia. ASTM A449 bolts
sheetpile: CMI SG-950 vinyl sheetpiles

Breaking Wave - [Force perpendicular to wall]

H_b =	6.4	ft	[wave height]
d_s =	5.3	ft (EL 2.3')	[still water depth]
F =	8,629	lb/ft	[wave force]
V =	129	kips	[shear force to be resisted by bolts on batter piles]

bolts: (9) 2" dia. ASTM A449 bolts
sheetpile: PZ 22 steel sheetpiles

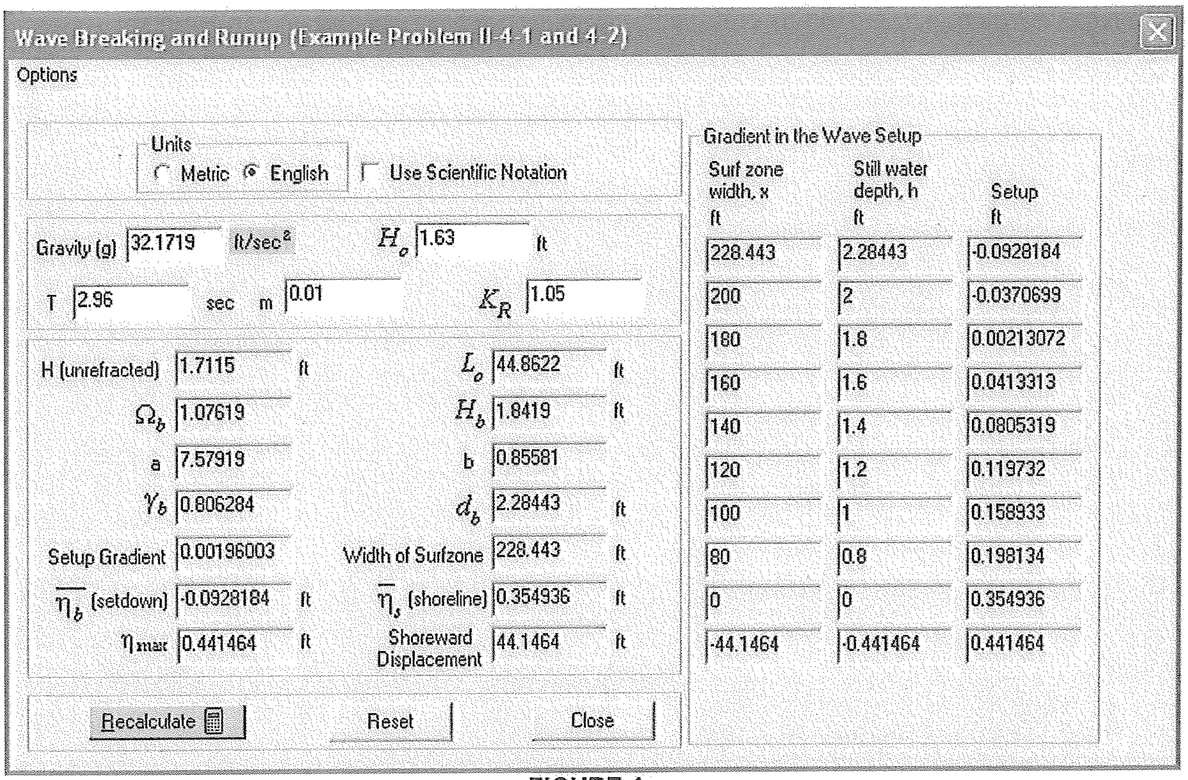


FIGURE 4a

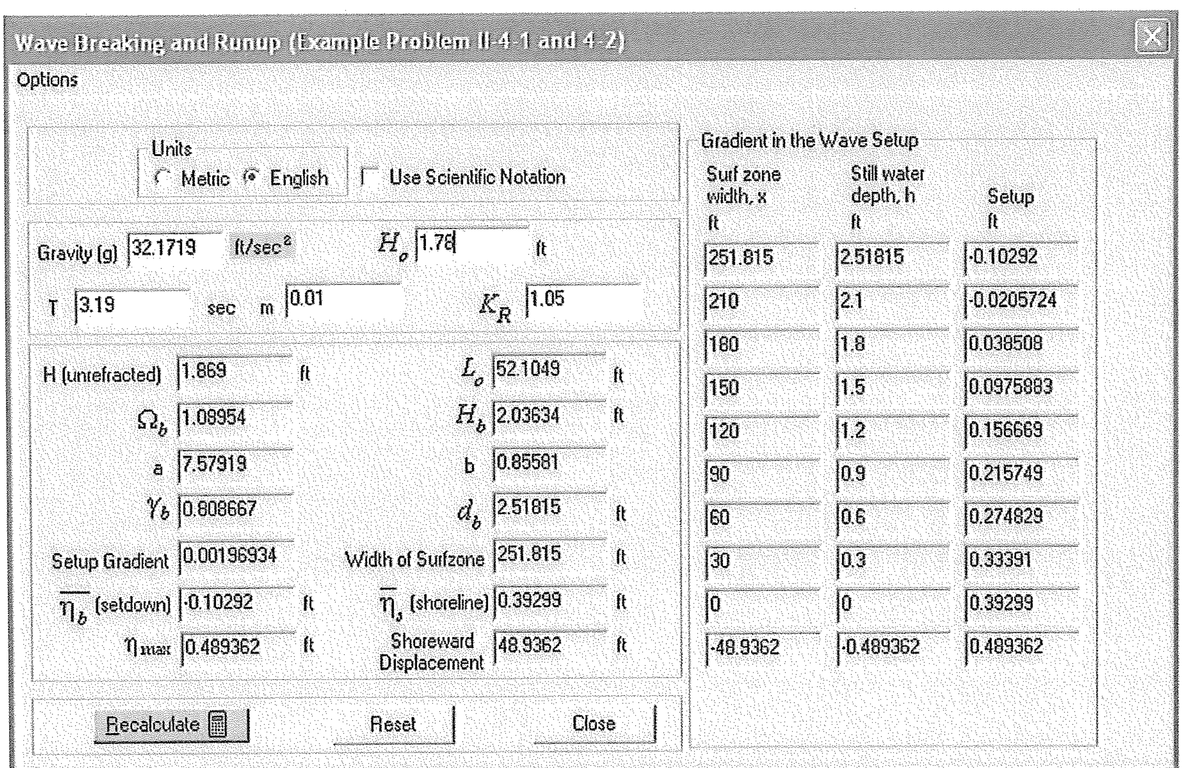


FIGURE 4b

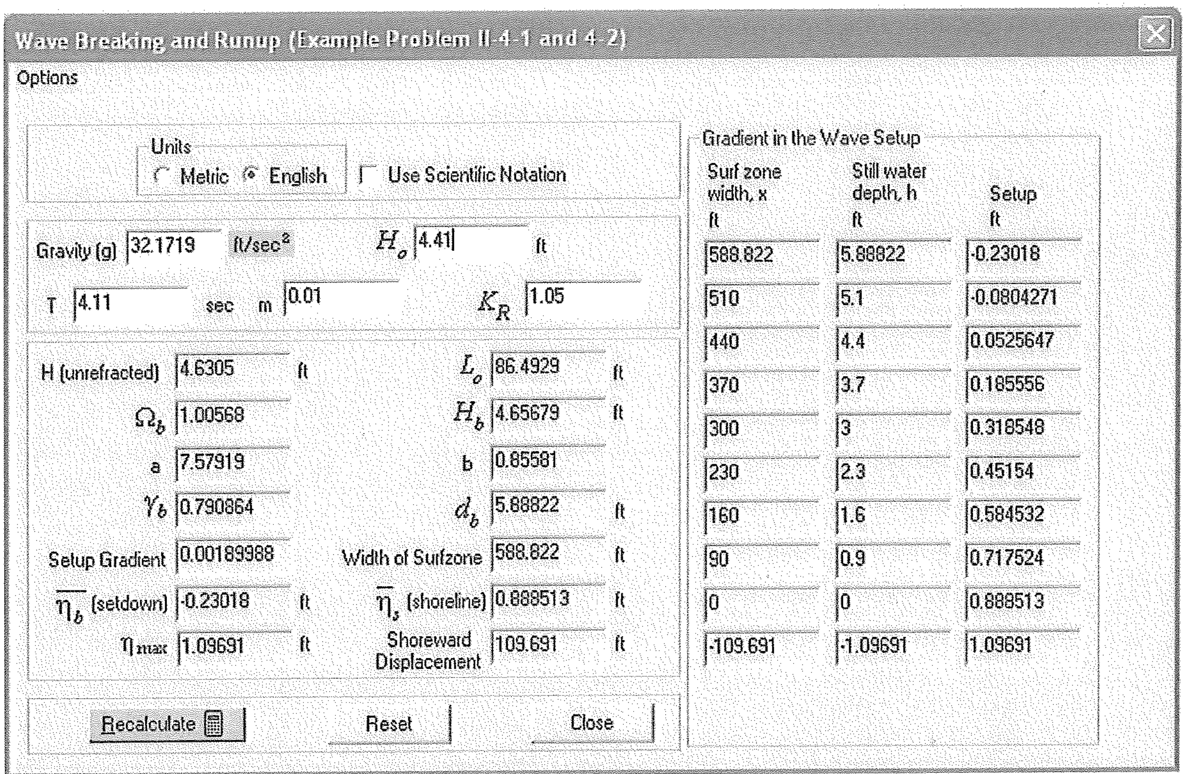


FIGURE 4c

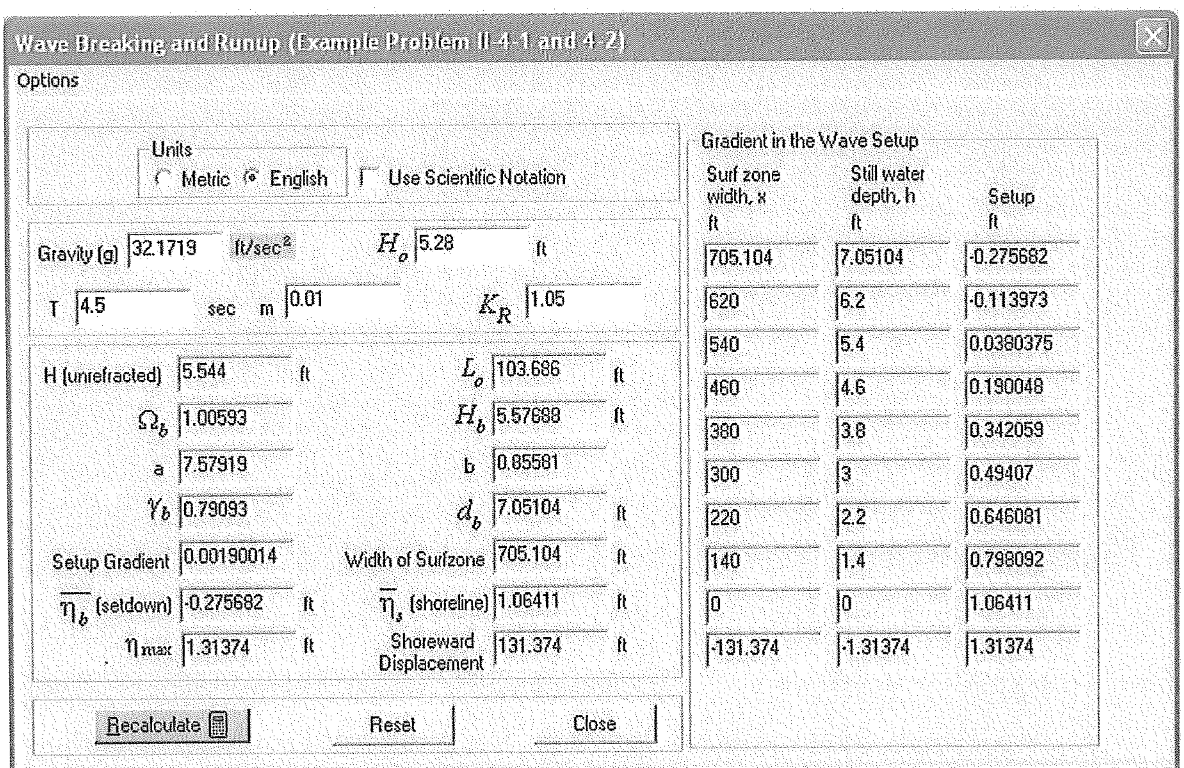


FIGURE 4d

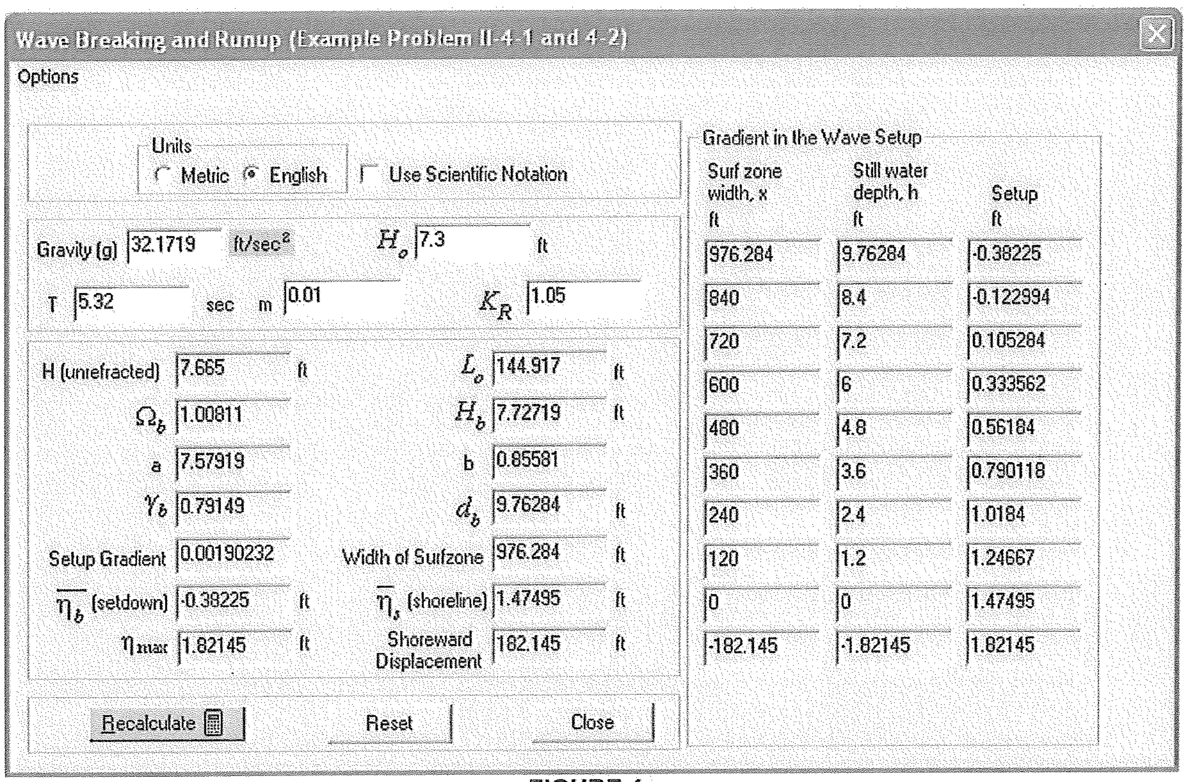


FIGURE 4e

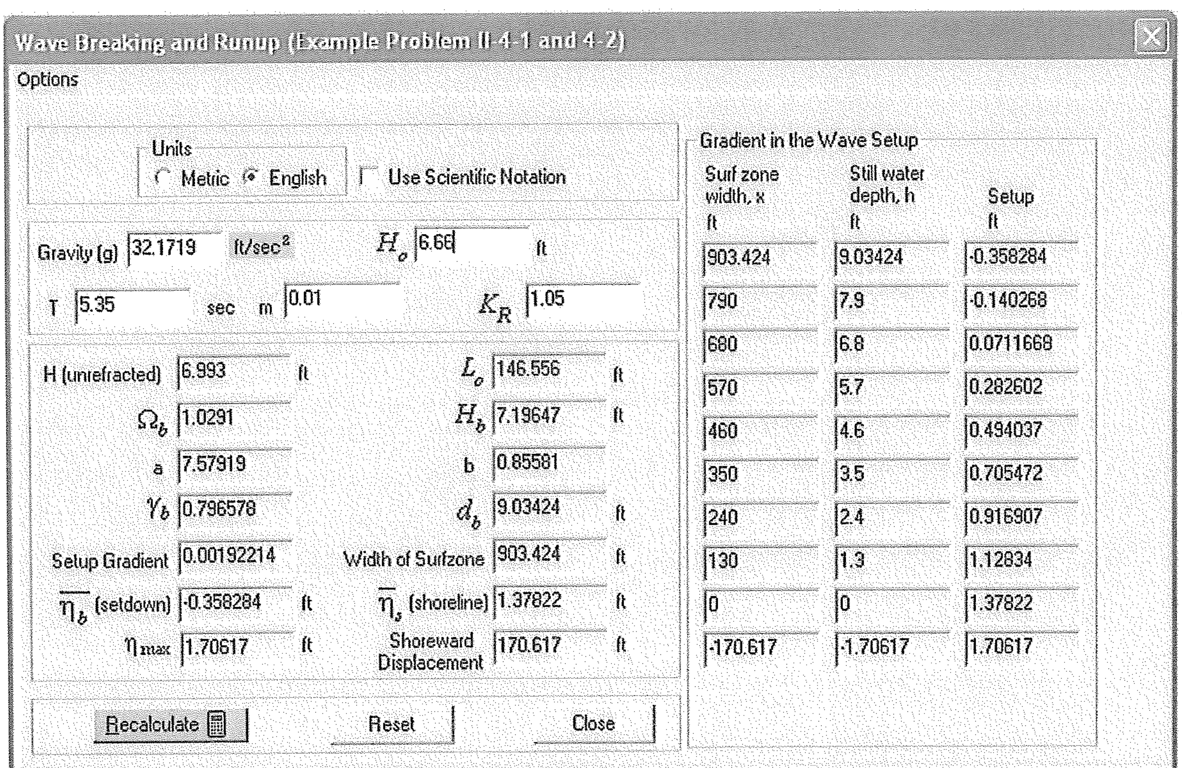


FIGURE 4f

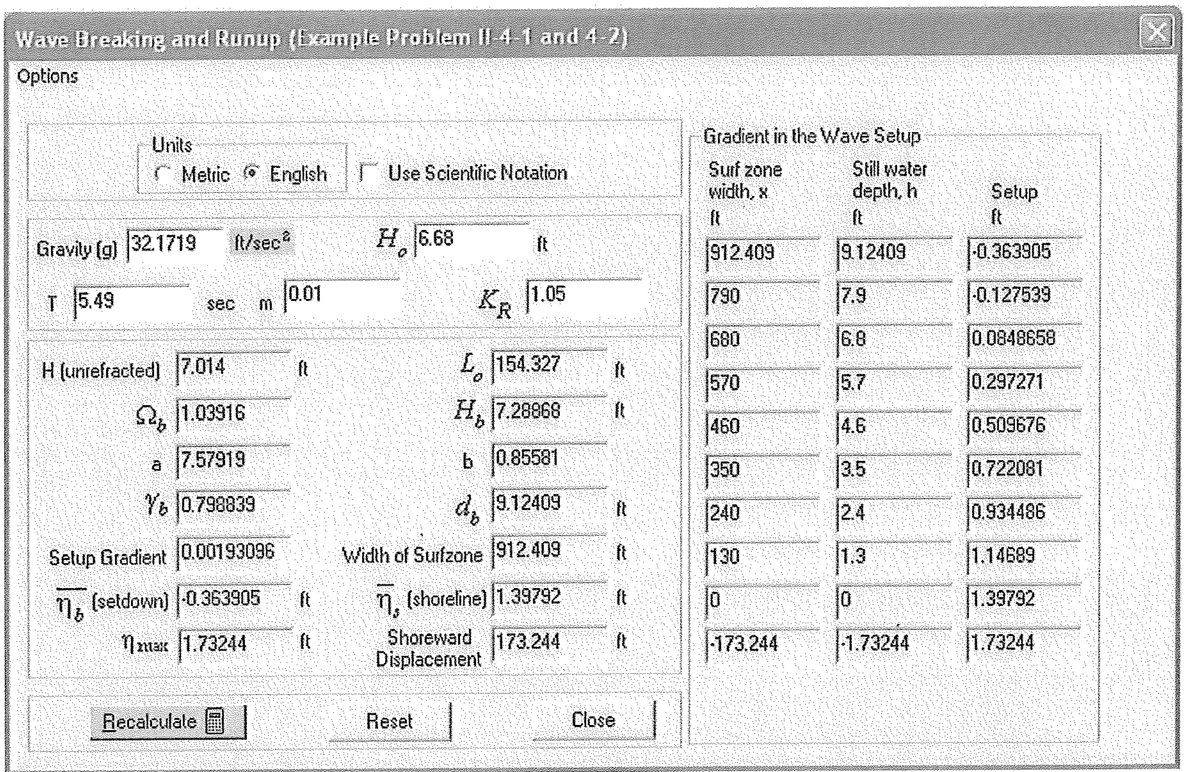


FIGURE 4g

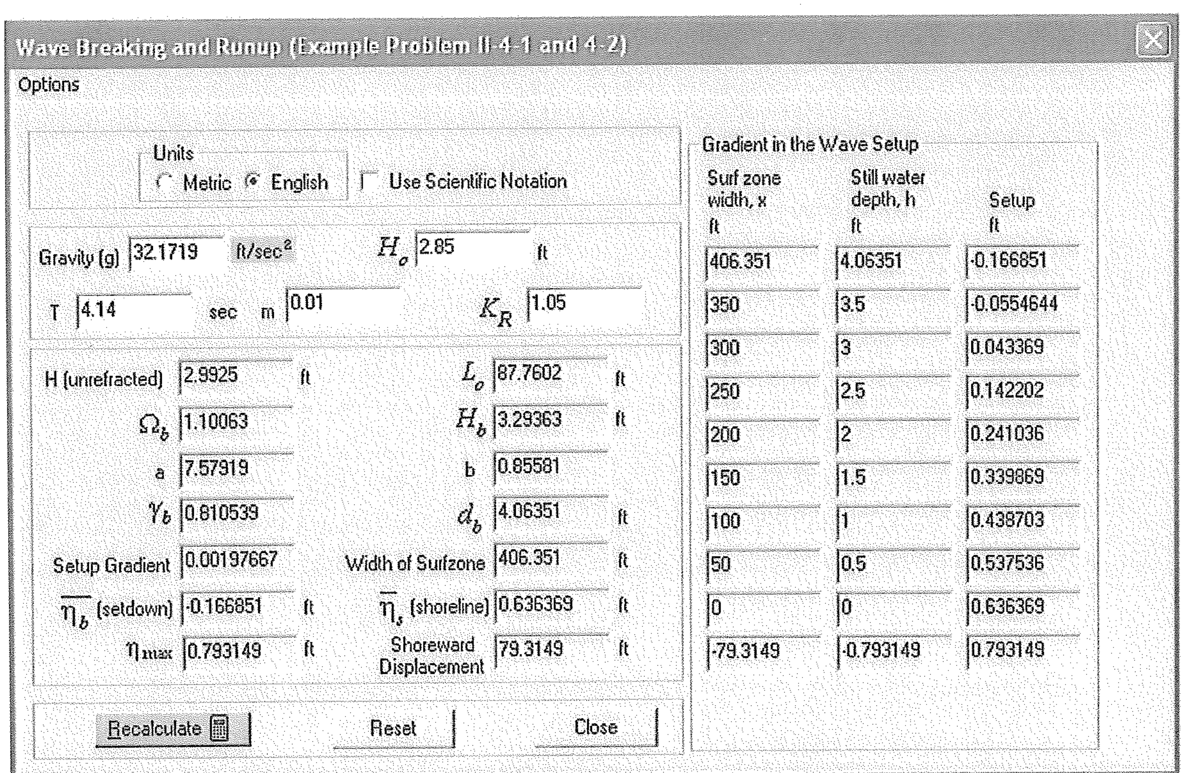


FIGURE 4h

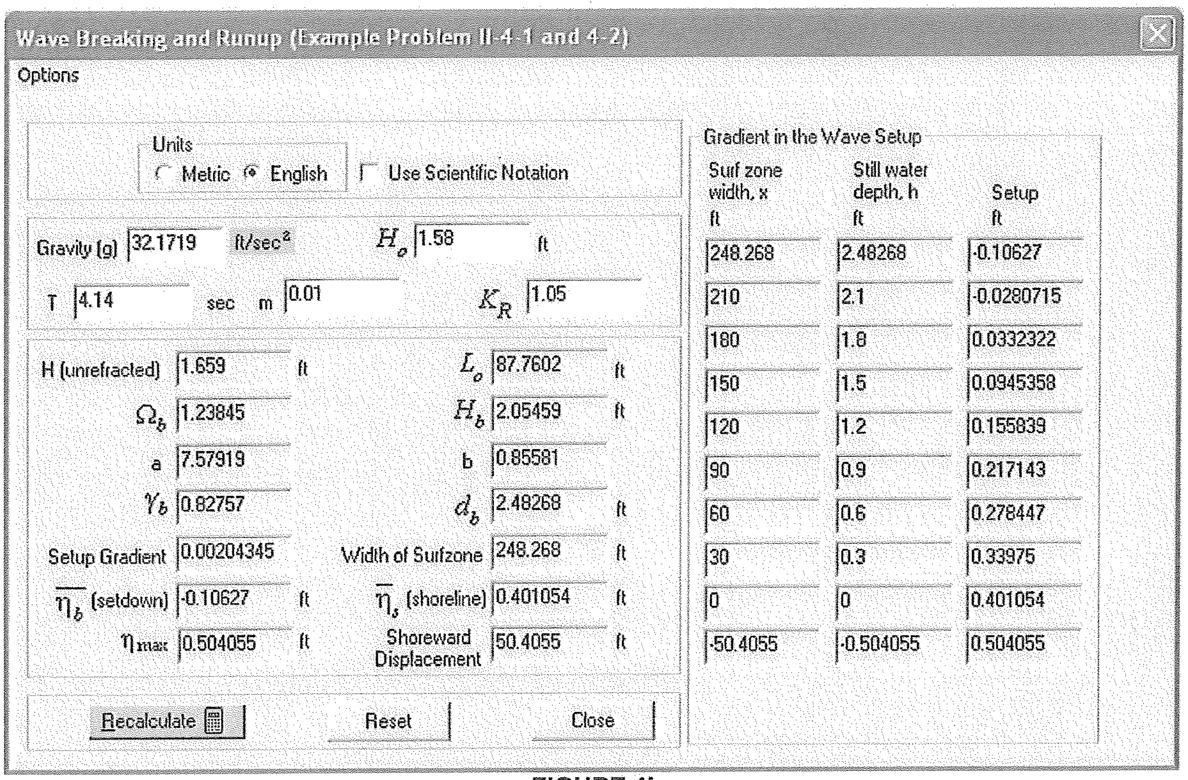

Wave Breaking and Runup (Example Problem II-4-1 and 4-2)
Options
Units
Metric
English
Use Scientific Notation
Gravity (g) 32.1719 ft/sec²
H_o 1.58 ft
T 4.14 sec
m 0.01
K_R 1.05
H (unrefracted) 1.659 ft
L_o 87.7602 ft
Ω_b 1.23845
H_b 2.05459 ft
a 7.57919
b 0.85581
γ_b 0.82757
d_b 2.48268 ft
Setup Gradient 0.00204345
Width of Surfzone 248.268 ft
$\overline{\eta_b}$ (setdown) -0.10627 ft
$\overline{\eta_s}$ (shoreline) 0.401054 ft
η_{max} 0.504055 ft
Shoreward Displacement 50.4055 ft
Recalculate
Reset
Close
Gradient in the Wave Setup
Surf zone width, x ft
Still water depth, h ft
Setup ft
248.268 2.48268 -0.10627
210 2.1 -0.0280715
180 1.8 0.0332322
150 1.5 0.0945358
120 1.2 0.155839
90 0.9 0.217143
60 0.6 0.278447
30 0.3 0.33975
0 0 0.401054
-50.4055 -0.504055 0.504055

FIGURE 4i

Project: St. Jerome Creek
Group: N 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	1.63	0.83	3.48	ft
Wave period (T)	2.96			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	83.00	65.67	88.42	deg
Wavelength (L)	44.54	40.89	44.86	ft
Celerity (C)	15.05	13.81	15.16	ft/sec
Group Velocity (Cg)	7.82	8.88	7.58	ft/sec
Energy density (E)	21.25	5.54	96.98	ft-lb/ft^2
Energy flux (P)	166.28	49.19	734.89	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	0.40	1.39		
Steepness (H/L)			0.08	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	3.32	ft
		Breaker depth (db):	4.33	ft

Project: St. Jerome Creek
Group: NNE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	1.78	1.38	1.92	ft
Wave period (T)	3.19			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	67.50	55.53	69.68	deg
Wavelength (L)	51.33	45.80	52.10	ft
Celerity (C)	16.09	14.36	16.33	ft/sec
Group Velocity (Cg)	8.63	9.72	8.17	ft/sec
Energy density (E)	25.34	15.21	29.53	ft-lb/ft^2
Energy flux (P)	218.81	147.94	241.12	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	0.59	2.89		
Steepness (H/L)			0.04	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	2.21	ft
		Breaker depth (db):	2.75	ft

Project: St. Jerome Creek
Group: NE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	4.41	4.08	5.01	ft
Wave period (T)	4.11			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	45.00	35.19	50.32	deg
Wavelength (L)	79.47	64.76	86.49	ft
Celerity (C)	19.34	15.76	21.04	ft/sec
Group Velocity (Cg)	12.26	12.36	10.52	ft/sec
Energy density (E)	155.55	133.46	200.70	ft-lb/ft^2
Energy flux (P)	1907.02	1649.96	2111.73	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	3.48	17.13		
Steepness (H/L)			0.06	

Nearshore slope (cot):	100.00	
Breaker height (Hb):	5.15	ft
Breaker depth (db):	6.55	ft

Project: St. Jerome Creek
Group: ENE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	5.28	5.31	5.83	ft
Wave period (T)	4.50			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	22.50	17.70	25.77	deg
Wavelength (L)	91.27	72.53	103.68	ft
Celerity (C)	20.28	16.12	23.04	ft/sec
Group Velocity (Cg)	13.71	13.16	11.52	ft/sec
Energy density (E)	222.98	225.40	272.28	ft-lb/ft²
Energy flux (P)	3057.49	2965.19	3136.67	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	5.50	27.92		
Steepness (H/L)			0.06	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	6.04	ft
		Breaker depth (db):	7.68	ft

Project: St. Jerome Creek
Group: E 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	7.20	7.66	7.87	ft
Wave period (T)	5.32			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	0.00	0.00	0.00	deg
Wavelength (L)	115.41	88.49	144.91	ft
Celerity (C)	21.69	16.63	27.24	ft/sec
Group Velocity (Cg)	16.27	14.38	13.62	ft/sec
Energy density (E)	414.63	469.09	495.31	ft-lb/ft^2
Energy flux (P)	6745.80	6745.80	6745.80	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	11.99	59.97		
Steepness (H/L)			0.05	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	8.22	ft
		Breaker depth (db):	10.42	ft

Project: St. Jerome Creek
Group: ESE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	6.66	6.97	7.47	ft
Wave period (T)	5.35			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	22.50	17.05	28.84	deg
Wavelength (L)	116.28	89.07	146.55	ft
Celerity (C)	21.73	16.65	27.39	ft/sec
Group Velocity (Cg)	16.35	14.42	13.70	ft/sec
Energy density (E)	354.77	388.80	446.66	ft-lb/ft²
Energy flux (P)	5800.43	5605.13	6117.41	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	11.26	55.31		
Steepness (H/L)			0.05	

Nearshore slope (cot):	100.00	
Breaker height (Hb):	7.93	ft
Breaker depth (db):	10.02	ft

Project: St. Jerome Creek
Group: SE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	6.68	6.55	9.44	ft
Wave period (T)	5.49			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	45.00	32.63	65.09	deg
Wavelength (L)	120.31	91.76	154.32	ft
Celerity (C)	21.91	16.71	28.11	ft/sec
Group Velocity (Cg)	16.71	14.58	14.05	ft/sec
Energy density (E)	356.90	343.59	712.52	ft-lb/ft^2
Energy flux (P)	5965.24	5008.83	10014.00	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	12.09	55.18		
Steepness (H/L)			0.06	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	9.57	ft
		Breaker depth (db):	12.23	ft

Project: St. Jerome Creek
Group: SSE 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	2.85	2.22	7.27	ft
Wave period (T)	4.14			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	66.00	47.98	85.82	deg
Wavelength (L)	80.38	65.36	87.75	ft
Celerity (C)	19.42	15.79	21.20	ft/sec
Group Velocity (Cg)	12.38	12.43	10.60	ft/sec
Energy density (E)	64.97	39.30	423.30	ft-lb/ft²
Energy flux (P)	804.02	488.49	4486.30	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	2.30	9.47		
Steepness (H/L)			0.08	
		Nearshore slope (cot):	100.00	
		Breaker height (Hb):	6.83	ft
		Breaker depth (db):	8.94	ft

Project: St. Jerome Creek
Group: S 73 Yr

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	1.58	0.93	3.09	ft
Wave period (T)	3.24			sec
Water depth (d)	20.00	10.00		ft
Crest angle (alpha)	79.00	60.53	86.97	deg
Wavelength (L)	52.83	46.86	53.75	ft
Celerity (C)	16.31	14.46	16.59	ft/sec
Group Velocity (Cg)	8.82	9.90	8.29	ft/sec
Energy density (E)	19.97	6.90	76.53	ft-lb/ft²
Energy flux (P)	176.11	68.31	634.78	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	0.55	2.04		
Steepness (H/L)			0.06	

Nearshore slope (cot): 100.00

Breaker height (Hb): 3.18 ft

Breaker depth (db): 4.05 ft

Project: St. Jerome Creek
Group: Storm Wave Climate

Case: ENE Waves - 73 Yr

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	43.00	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	42.60	mph
Adjusted Wind Speed (Ua)	60.63	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	5.28	feet
Wave Period (Tp)	4.50	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	0.22	feet
Wave Period (Tp)	0.97	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	0.29	feet
Wave Period (Tp)	1.12	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	0.40	feet
Wave Period (Tp)	1.32	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	0.42	feet
Wave Period (Tp)	1.35	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	0.43	feet
Wave Period (Tp)	1.37	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	0.35	feet
Wave Period (Tp)	1.34	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	0.47	feet
Wave Period (Tp)	1.51	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	0.45	feet
Wave Period (Tp)	1.44	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 7.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	7.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	5.46	mph
Adjusted Wind Speed (Ua)	5.22	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	0.32	feet
Wave Period (Tp)	1.23	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	0.56	feet
Wave Period (Tp)	1.52	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	0.67	feet
Wave Period (Tp)	1.71	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	1.13	feet
Wave Period (Tp)	2.12	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	1.19	feet
Wave Period (Tp)	2.17	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	1.26	feet
Wave Period (Tp)	2.24	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	1.35	feet
Wave Period (Tp)	2.35	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	1.61	feet
Wave Period (Tp)	2.55	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.15	feet
Wave Period (Tp)	2.28	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 12.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	12.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	11.27	mph
Adjusted Wind Speed (Ua)	11.76	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	0.74	feet
Wave Period (Tp)	1.93	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	0.80	feet
Wave Period (Tp)	1.87	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	0.93	feet
Wave Period (Tp)	2.08	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	1.81	feet
Wave Period (Tp)	2.66	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	1.88	feet
Wave Period (Tp)	2.71	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	2.03	feet
Wave Period (Tp)	2.82	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	2.28	feet
Wave Period (Tp)	3.01	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	2.57	feet
Wave Period (Tp)	3.22	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.59	feet
Wave Period (Tp)	2.80	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 17.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	17.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	16.61	mph
Adjusted Wind Speed (Ua)	18.55	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	0.98	feet
Wave Period (Tp)	2.34	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	1.00	feet
Wave Period (Tp)	2.15	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	1.14	feet
Wave Period (Tp)	2.37	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	2.46	feet
Wave Period (Tp)	3.09	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	2.56	feet
Wave Period (Tp)	3.14	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	2.77	feet
Wave Period (Tp)	3.28	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	3.12	feet
Wave Period (Tp)	3.54	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	3.43	feet
Wave Period (Tp)	3.75	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.94	feet
Wave Period (Tp)	3.19	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 22.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	22.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	21.80	mph
Adjusted Wind Speed (Ua)	25.82	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.18	feet
Wave Period (Tp)	2.66	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	1.17	feet
Wave Period (Tp)	2.38	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	1.32	feet
Wave Period (Tp)	2.62	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	3.11	feet
Wave Period (Tp)	3.46	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	3.23	feet
Wave Period (Tp)	3.52	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	3.51	feet
Wave Period (Tp)	3.68	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	3.91	feet
Wave Period (Tp)	3.98	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	4.21	feet
Wave Period (Tp)	4.20	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	2.24	feet
Wave Period (Tp)	3.52	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 27.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	27.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	26.90	mph
Adjusted Wind Speed (Ua)	33.55	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.35	feet
Wave Period (Tp)	2.92	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	1.33	feet
Wave Period (Tp)	2.59	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	1.49	feet
Wave Period (Tp)	2.83	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	3.77	feet
Wave Period (Tp)	3.80	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	3.90	feet
Wave Period (Tp)	3.87	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	4.25	feet
Wave Period (Tp)	4.04	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	4.66	feet
Wave Period (Tp)	4.38	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	4.95	feet
Wave Period (Tp)	4.60	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	2.52	feet
Wave Period (Tp)	3.81	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 32.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	32.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	31.99	mph
Adjusted Wind Speed (Ua)	41.81	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.51	feet
Wave Period (Tp)	3.14	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	12.58	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	0.00	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	46.00	deg
Wave Height (Hmo)	1.48	feet
Wave Period (Tp)	2.77	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	15.04	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	22.50	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	56.00	deg
Wave Height (Hmo)	1.65	feet
Wave Period (Tp)	3.03	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.08	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	45.00	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	61.00	deg
Wave Height (Hmo)	4.41	feet
Wave Period (Tp)	4.11	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	16.25	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	67.50	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	64.00	deg
Wave Height (Hmo)	4.56	feet
Wave Period (Tp)	4.18	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	19.43	MILES
Avg Fetch Depth (d)	32.00	feet
Wind Direction (WDIR)	90.00	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	101.00	deg
Wave Height (Hmo)	4.99	feet
Wave Period (Tp)	4.37	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	31.00	feet
Wind Direction (WDIR)	112.50	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	5.38	feet
Wave Period (Tp)	4.74	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.23	MILES
Avg Fetch Depth (d)	27.00	feet
Wind Direction (WDIR)	135.00	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	146.00	deg
Wave Height (Hmo)	5.64	feet
Wave Period (Tp)	4.96	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	9.00	feet
Wind Direction (WDIR)	157.50	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	2.78	feet
Wave Period (Tp)	4.07	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

Project: St. Jerome Creek
Group: Annual Wave Climate

Case: 37.5 mph

Windspeed Adjustment and Wave Growth

Breaking criteria 0.780

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	37.50	mph
Air Sea Temp. Diff. (dT)	10.00	deg F
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	38.00	deg
Results		
Wind Fetch Length (F)	42.11	MILES
Avg Fetch Depth (d)	5.00	feet
Wind Direction (WDIR)	180.00	deg
Eq Neutral Wind Speed (Ue)	37.04	mph
Adjusted Wind Speed (Ua)	50.51	mph
Mean Wave Direction (THETA)	147.00	deg
Wave Height (Hmo)	1.66	feet
Wave Period (Tp)	3.34	sec

Wave Growth: Shallow

Wind Obs Type	Wind Fetch Options
Overwater	Shallow restricted

Restricted Fetch Geometry

#	Fetch Angle (deg)	Fetch Length (miles)
1	0.00	0.09
2	4.50	0.09
3	9.00	0.10
4	13.50	0.10
5	18.00	0.11
6	22.50	0.12
7	27.00	0.13
8	31.50	0.17
9	36.00	0.31
10	40.50	13.12
11	45.00	12.72
12	49.50	12.85
13	54.00	13.46
14	58.50	17.04
15	63.00	16.98
16	67.50	15.78
17	72.00	14.56
18	76.50	13.96
19	81.00	13.61
20	85.50	13.45
21	90.00	13.46
22	94.50	16.45
23	99.00	16.33
24	103.50	25.92
25	108.00	17.68
26	112.50	17.13
27	117.00	17.52
28	121.50	18.51
29	126.00	19.52
30	130.50	22.02
31	135.00	26.36
32	139.50	39.71
33	144.00	41.22
34	148.50	42.80
35	153.00	46.44
36	157.50	1.04
41	180.00	0.27

SECTION C-5

COST ENGINEERING

U.S. Army Corps of Engineers
Project StJermeCrk: 65% Submittal
ST. JEROMES CREEK

65% Submittal
RECOMMENDED PLAN - ALTERNATIVE NO. 7
TIMBER PILINGS OPTION

Project Scope to include:
1,330 LF South Jetty.
1,770 LF North Jetty.
Hydraulic Dredging for Navigational Channel Realignment.

Construction: Batter Pile / Vinyl Sheet Pile System
30' Long Vinyl Sheet Piles.
50' Long Timber Batter Piles at 5' Intervals on Each Side.

Estimate assumes project will be constructed by water and no stockpiles or staging areas will be on land. Costs for multiple handling of material will be negligible.

Vinyl Sheet Piling Material/ Construction Costs Provided by Crane Materials International (CMI) (Mike Napior, 800-256-8857X1121).

Price for wood materials is based on bid results from recently bid projects using similar material.

Hydraulic dredging to be performed by sub-contractor.

Estimate for hydraulic dredging is based on 2006 dredging bid prices of St. Jerome Creek indexed to 2011 and 2011 Means Estimating Handbook.

Construction Start Date is Estimated.

Estimated by	ETF, Andrews, Miller & Associates
Designed by	ETF, Andrews, Miller & Associates
Prepared by	Kelly Wright
Preparation Date	8/4/2011
Effective Date of Pricing	11/11/2011
Estimated Construction Time	315 Days

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Designed by
ETF, Andrews, Miller & Associates
Estimated by
ETF, Andrews, Miller & Associates
Prepared by
Kelly Wright

Design Document	65%
Document Date	8/4/2011
District	Baltimore
Contact	Kelly Wright
Budget Year	2011
UOM System	English

Direct Costs
LaborCost
EQCost
MatlCost
UserCost1

Timeline/Currency

Preparation Date	8/4/2011
Escalation Date	1/1/2012
Eff. Pricing Date	11/11/2011
Estimated Duration	315 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Labor A:

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP07R02: MII Equipment Region 2r 2007

02 MIDEAST

Sales Tax	6.00
Working Hours per Year	1,450
Labor Adjustment Factor	1.07
Cost of Money	5.25
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.130
Gas	2.900
Diesel Off-Road	2.500
Diesel On-Road	3.300

Shipping Rates

Over 0 CWT	7.31
Over 240 CWT	7.32
Over 300 CWT	6.32
Over 400 CWT	5.97
Over 500 CWT	3.56
Over 700 CWT	3.56
Over 800 CWT	4.88

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
St. Jerome Creek				**2,229,305.77**	**2,005,043.09**	**197,547.94**	**1,324,000.00**	**579,824.10**	**5,755,896.80**	**8,221,740.40**
Breakwater and Seawalls	**LS**	**1.0**	**Prime Contractor**	**2,229,305.77**	**2,005,043.09**	**197,547.94**	**1,324,000.00**	**579,824.10**	**5,755,896.80**	**8,221,740.40**
Jetty Construction	**LS**	**1.0**	**Prime Contractor**	**2,194,805.77**	**1,798,943.09**	**197,547.94**	**0.00**	**579,824.10**	**4,191,296.80**	**6,419,565.09**
Mobilization / Demobilization	**LS**	**1.0**	**No Contractor**	**20,750.00**	**20,750.00**	**0.00**	**0.00**	**0.00**	**41,500.00**	**41,500.00**
Mob / Demob Equipment	LS	1.0	No Contractor	20,750.00	20,750.00	0.00	0.00	0.00	41,500.00	41,500.00
(Note: 1% of Jetty Construction (Bare Costs Only))										
Light Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**920,192.60**	**752,639.44**	**83,660.60**	**0.00**	**245,422.94**	**1,756,492.64**	**2,699,652.32**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	27,414.0	Prime Contractor	314,493.41	257,228.91	26,235.20	0.00	83,566.29	597,957.52	919,229.22
(Note: (1,370 lf x 6.67 pieces x 30' VF) / 10' Sections = 27414 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,604.0	Prime Contractor	32,218.67	26,352.14	2,701.74	0.00	8,562.91	61,272.55	94,192.01
(Note: (1370 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,604 bf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 14' Long	BF	20,446.0	Prime Contractor	45,107.02	36,893.72	3,782.51	0.00	11,988.31	85,783.25	131,871.39
(Note: (1370 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 20,446 bf)										
				9.29	*7.60*	*0.90*	*0.00*	*10.00%*	*17.79*	*27.33*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	54,800.0	Prime Contractor	509,040.97	416,352.31	49,320.00	0.00	136,167.33	974,713.28	1,497,840.62
(Note: (1370 lf x 8.0 pilings x 50' VF) / 10' Sections = 54,800 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Timber Batter Block - 3' Lengths	BF	8,763.0	Prime Contractor	19,332.53	15,812.37	1,621.16	0.00	5,138.10	36,766.05	56,519.08
(Note: (1370 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,763 bf)										
Light Construction - Southerly Wall	**LS**	**1.0**	**Prime Contractor**	**893,319.35**	**730,659.40**	**81,217.43**	**0.00**	**238,255.63**	**1,705,196.18**	**2,620,811.89**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	26,613.0	Prime Contractor	305,304.34	249,713.03	25,468.64	0.00	81,124.60	580,486.01	892,370.58
(Note: (1,330 lf x 6.67 pieces x 30' VF) / 10' Sections = 26,613 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,178.0	Prime Contractor	31,278.85	25,583.44	2,622.93	0.00	8,313.13	59,485.22	91,444.42
(Note: (1,330 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,178 bf)										

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 14' Long	BF	19,849.0	Prime Contractor	43,789.95	35,816.46	3,672.07	0.00	11,638.26	83,278.47	128,020.90
(Note: (1,330 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 19,849 bf)										
				9.29	*7.60*	*0.90*	*0.00*	*10.00%*	*17.79*	*27.33*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	53,200.0	Prime Contractor	494,178.46	404,196.04	47,880.00	0.00	132,191.64	946,254.50	1,454,108.05
(Note: (1,330 lf x 8.0 pilings x 50' VF) / 10' Sections = 53,200 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Timber Batter Block - 3' Lengths	BF	8,507.0	Prime Contractor	18,767.75	15,350.43	1,573.80	0.00	4,987.99	35,691.97	54,867.94
(Note: (1,330 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,507 bf)										
Heavy Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**360,543.83**	**294,894.25**	**32,669.90**	**0.00**	**96,145.53**	**688,107.98**	**1,057,600.88**
				19.95	*16.32*	*1.69*	*0.00*	*10.00%*	*37.96*	*58.36*
Vinyl Sheeting - 30' Lengths	VLF	8,004.0	Prime Contractor	159,690.24	130,613.06	13,558.78	0.00	42,463.82	303,862.08	467,101.97
(Note: (400 lf x 6.67 pieces x 30' VF) / 10' Sections = 8,004 vlf)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
10" x 10" Wale - 10' Long	BF	6,664.0	Prime Contractor	14,701.81	12,024.83	1,326.14	0.00	3,919.71	28,052.78	43,116.76
(Note: (400 lf x 2 x 8.33 bf/lf x 10') / 10' Sections = 6,664 bf)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
10" x 10" Wale - 14' Long	BF	9,330.0	Prime Contractor	20,583.42	16,835.49	1,856.67	0.00	5,487.82	39,275.57	60,366.05
(Note: (400 lf x 2 x 8.33 bf/lf x 14') / 10' Sections = 9,330 bf)										
				9.29	*7.60*	*0.90*	*0.00*	*10.00%*	*17.79*	*27.33*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	16,000.0	Prime Contractor	148,625.10	121,562.72	14,400.00	0.00	39,756.88	284,587.82	437,325.73
(Note: (400 lf x 8.0 pilings x 50' VF) / 10' Sections = 16,000 vlf)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
12" x 12" Timber Batter Block - 4' Lengths	BF	7,680.0	Prime Contractor	16,943.26	13,858.15	1,528.32	0.00	4,517.31	32,329.73	49,690.38
(Note: (400 lf x 4 x 12.0 bf/lf x 4') / 10' Sections = 7,680 bf)										
				34,500.00	*206,100.00*	*0.00*			*1,260,600.00*	*1,498,175.30*
Hydraulic Dredging	**EA**	**1.0**		**34,500.00**	**206,100.00**	**0.00**	**1,020,000.00**	**0.00**	**1,260,600.00**	**1,498,175.30**
Existing DMP Retrofit	**LS**	**1.0**		**0.00**	**0.00**	**0.00**	**720,000.00**	**0.00**	**720,000.00**	**898,070.18**
Retrofit / Excavation of Material in DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	400,000.00	0.00	400,000.00	498,927.88
Transport and Disposal of Excavated Material within 5 miles of DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	320,000.00	0.00	320,000.00	399,142.30

Currency in US dollars

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
Mobilization / Demobilization	**LS**	**1.0**		**0.00**	**0.00**	**0.00**	**300,000.00**	**0.00**	**300,000.00**	**300,000.00**
Hydraulic Mobilization / Demobilization	LS	1.0	No Contractor	0.00	0.00	0.00	300,000.00	0.00	300,000.00	300,000.00
Hydraulic Dredging	**LS**	**1.0**		**34,500.00**	**206,100.00**	**0.00**	**0.00**	**0.00**	**240,600.00**	**300,105.12**
				1.15	*6.87*	*0.00*	*0.00*	*0.00%*	*8.02*	*10.00*
Hydraulic Dredge of Channel (60'L x 100' W to -7.0' mllw)	CY	30,000.0	Hydraulic Dredging Contractor	34,500.00	206,100.00	0.00	0.00	0.00	240,600.00	300,105.12
Contract Administration	**LS**	**1.0**	**No Contractor**	**0.00**	**0.00**	**0.00**	**304,000.00**	**0.00**	**304,000.00**	**304,000.00**
Construction Management	LS	1.0	No Contractor	0.00	0.00	0.00	304,000.00	0.00	304,000.00	304,000.00

Currency in US dollars

U.S. Army Corps of Engineers
Project StJermeCrk: 65% Submittal
ST. JEROMES CREEK

65% Submittal
RECOMMENDED PLAN - ALTERNATIVE NO. 7
TIMBER PILINGS WITH TIMBERGUARD OPTION

Project Scope to include:
1,330 LF South Jetty.
1,770 LF North Jetty.
Hydraulic Dredging for Navigational Channel Realignment.

Construction: Batter Pile / Vinyl Sheet Pile System
30' Long Vinyl Sheet Piles.
50' Long Timber Batter Piles at 5' Intervals on Each Side.

Estimate assumes project will be constructed by water and no stockpiles or staging areas will be on land. Costs for multiple handling of material will be negligible.

Vinyl Sheet Piling Material/ Construction Costs Provided by Crane Materials International (CMI) (Mike Napior, 800-256-8857X1121).

Price for wood materials is based on bid results from recently bid projects using similar material.

Hydraulic dredging to be performed by sub-contractor.

Estimate for hydraulic dredging is based on 2006 dredging bid prices of St. Jeromes Creek indexed to 2011 and 2011 Means Estimating Handbook.

Construction Start Date is Estimated.

Estimated by	ETF, Andrews, Miller & Associates
Designed by	ETF, Andrews, Miller & Associates
Prepared by	Kelly Wright
Preparation Date	8/4/2011
Effective Date of Pricing	11/11/2011
Estimated Construction Time	315 Days

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Designed by
ETF, Andrews, Miller & Associates
Estimated by
ETF, Andrews, Miller & Associates
Prepared by
Kelly Wright

Design Document	65%
Document Date	8/4/2011
District	Baltimore
Contact	Kelly Wright
Budget Year	2011
UOM System	English

Direct Costs
LaborCost
EQCost
MatlCost
UserCost1

Timeline/Currency

Preparation Date	8/4/2011
Escalation Date	1/1/2012
Eff. Pricing Date	11/11/2011
Estimated Duration	315 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Labor A:

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP07R02: MII Equipment Region 2r 2007

02 MIDEAST

Sales Tax	6.00
Working Hours per Year	1,450
Labor Adjustment Factor	1.07
Cost of Money	5.25
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.130
Gas	2.900
Diesel Off-Road	2.500
Diesel On-Road	3.300

Shipping Rates

Over 0 CWT	7.31
Over 240 CWT	7.32
Over 300 CWT	6.32
Over 400 CWT	5.97
Over 500 CWT	3.56
Over 700 CWT	3.56
Over 800 CWT	4.88

Currency in US dollars

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
St. Jerome Creek				**2,322,093.77**	**2,081,345.49**	**1,201,947.94**	**1,324,000.00**	**643,683.77**	**6,929,387.20**	**8,928,696.78**
Breakwater and Seawalls	**LS**	**1.0**	**Prime Contractor**	**2,322,093.77**	**2,081,345.49**	**1,201,947.94**	**1,324,000.00**	**643,683.77**	**6,929,387.20**	**8,928,696.78**
Jetty Construction	**LS**	**1.0**	**Prime Contractor**	**2,287,593.77**	**1,875,245.49**	**1,201,947.94**	**0.00**	**643,683.77**	**5,364,787.20**	**7,126,521.48**
Mobilization / Demobilization	**LS**	**1.0**	**No Contractor**	**23,000.00**	**23,000.00**	**0.00**	**0.00**	**0.00**	**46,000.00**	**46,000.00**
Mob / Demob Equipment	LS	1.0	No Contractor	23,000.00	23,000.00	0.00	0.00	0.00	46,000.00	46,000.00
(Note: 1% of Jetty Construction (Bare Costs Only))										
Light Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**960,204.55**	**785,365.82**	**527,540.60**	**0.00**	**273,644.79**	**2,273,110.98**	**3,010,092.72**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	27,414.0	Prime Contractor	314,493.41	257,228.91	26,235.20	0.00	83,566.29	597,957.52	919,229.22
(Note: (1370 lf x 6.67 pieces x 30' VF) / 10' Sections = 27414 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,604.0	Prime Contractor	32,218.67	26,352.14	2,701.74	0.00	8,562.91	61,272.55	94,192.01
(Note: (1370 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,604 bf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 14' Long	BF	20,446.0	Prime Contractor	45,107.02	36,893.72	3,782.51	0.00	11,988.31	85,783.25	131,871.39
(Note: (1370 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 20,446 bf)										
				10.02	*8.19*	*9.00*	*0.00*	*10.00%*	*27.21*	*33.00*
14" - 3' Diameter Timber Piling - 50' Lengths w/ TimberGuard	VLF	54,800.0	No Contractor	549,052.93	449,078.69	493,200.00	0.00	164,389.18	1,491,331.62	1,808,281.02
(Note: (1,370 lf x 8.0 pilings x 50' VF) / 10' Sections = 54,800 vlf. TimberGuard Piling unit price quote provided by CMI, Inc.)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Timber Batter Block - 3' Lengths	BF	8,763.0	Prime Contractor	19,332.53	15,812.37	1,621.16	0.00	5,138.10	36,766.05	56,519.08
(Note: (1370 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,763 bf)										
Light Construction - Southerly Wall	**LS**	**1.0**	**Prime Contractor**	**932,163.07**	**762,430.27**	**512,137.43**	**0.00**	**265,653.49**	**2,206,730.77**	**2,922,188.34**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	26,613.0	Prime Contractor	305,304.34	249,713.03	25,468.64	0.00	81,124.60	580,486.01	892,370.58
(Note: (1,330 lf x 6.67 pieces x 30' VF) / 10' Sections = 26,613 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,178.0	Prime Contractor	31,278.85	25,583.44	2,622.93	0.00	8,313.13	59,485.22	91,444.42
(Note: (1,330 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,178 bf)										

Currency in US dollars

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
8" x 8" Wale - 14' Long	BF	19,849.0	Prime Contractor	*2.21* 43,789.95	*1.80* 35,816.46	*0.19* 3,672.07	*0.00* 0.00	*10.00%* 11,638.26	*4.20* 83,278.47	*6.45* 128,020.90
(Note: (1,330 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 19,849 bf)										
14" - 3' Diameter Timber Piling - 50' Lengths w/ TimberGuard	VLF	53,200.0	No Contractor	*10.02* 533,022.18	*8.19* 435,966.90	*9.00* 478,800.00	*0.00* 0.00	*10.00%* 159,589.50	*27.21* 1,447,789.09	*33.00* 1,755,484.50
(Note: (1,330 lf x 8.0 pilings x 50' VF) / 10' Sections = 53,200 vlf. TimberGuard Piling unit price quote provided by CMI, Inc.)										
8" x 8" Timber Batter Block - 3' Lengths	BF	8,507.0	Prime Contractor	*2.21* 18,767.75	*1.80* 15,350.43	*0.19* 1,573.80	*0.00* 0.00	*10.00%* 4,987.99	*4.20* 35,691.97	*6.45* 54,867.94
(Note: (1,330 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,507 bf)										
Heavy Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**372,226.15**	**304,449.40**	**162,269.90**	**0.00**	**104,385.49**	**838,945.45**	**1,148,240.42**
Vinyl Sheeting - 30' Lengths	VLF	8,004.0	Prime Contractor	*19.95* 159,690.24	*16.32* 130,613.06	*1.69* 13,558.78	*0.00* 0.00	*10.00%* 42,463.82	*37.96* 303,862.08	*58.36* 467,101.97
(Note: (400 lf x 6.67 pieces x 30' VF) / 10' Sections = 8,004 vlf)										
10" x 10" Wale - 10' Long	BF	6,664.0	Prime Contractor	*2.21* 14,701.81	*1.80* 12,024.83	*0.20* 1,326.14	*0.00* 0.00	*10.00%* 3,919.71	*4.21* 28,052.78	*6.47* 43,116.76
(Note: (400 lf x 2 x 8.33 bf/lf x 10') / 10' Sections = 6,664 bf)										
10" x 10" Wale - 14' Long	BF	9,330.0	Prime Contractor	*2.21* 20,583.42	*1.80* 16,835.49	*0.20* 1,856.67	*0.00* 0.00	*10.00%* 5,487.82	*4.21* 39,275.57	*6.47* 60,366.05
(Note: (400 lf x 2 x 8.33 bf/lf x 14') / 10' Sections = 9,330 bf)										
14" - 3' Diameter Timber Piling - 50' Lengths w/ TimberGuard	VLF	16,000.0	No Contractor	*10.02* 160,307.42	*8.19* 131,117.87	*9.00* 144,000.00	*0.00* 0.00	*10.00%* 47,996.84	*27.21* 435,425.29	*33.00* 527,965.26
(Note: (400 lf x 8.0 pilings x 50' VF) / 10' Sections = 16,000 vlf. TimberGuard Piling unit price quote provided by CMI, Inc.)										
12" x 12" Timber Batter Block - 4' Lengths	BF	7,680.0	Prime Contractor	*2.21* 16,943.26	*1.80* 13,858.15	*0.20* 1,528.32	*0.00* 0.00	*10.00%* 4,517.31	*4.21* 32,329.73	*6.47* 49,690.38
(Note: (400 lf x 4 x 12.0 bf/lf x 4') / 10' Sections = 7,680 bf)										
Hydraulic Dredging	**EA**	**1.0**	**Hydraulic Dredging Contractor**	*34,500.00* **34,500.00**	*206,100.00* **206,100.00**	*0.00* **0.00**	**1,020,000.00**	**0.00**	*1,260,600.00* **1,260,600.00**	*1,498,175.30* **1,498,175.30**
Existing DMP Retrofit	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**0.00**	**0.00**	**0.00**	**720,000.00**	**0.00**	**720,000.00**	**898,070.18**

Currency in US dollars

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
Retrofit / Excavation of Material in DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	400,000.00	0.00	400,000.00	498,927.88
Transport and Disposal of Excavated Material within 5 miles of DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	320,000.00	0.00	320,000.00	399,142.30
Mobilization / Demobilization	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**0.00**	**0.00**	**0.00**	**300,000.00**	**0.00**	**300,000.00**	**300,000.00**
Hydraulic Mobilization / Demobilization	LS	1.0	No Contractor	0.00	0.00	0.00	300,000.00	0.00	300,000.00	300,000.00
Hydraulic Dredging	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**34,500.00**	**206,100.00**	**0.00**	**0.00**	**0.00**	**240,600.00**	**300,105.12**
				1.15	*6.87*	*0.00*	*0.00*	*0.00%*	*8.02*	*10.00*
Hydraulic Dredge of Channel (60'L x 100' W to -7.0' mllw)	CY	30,000.0	Hydraulic Dredging Contractor	34,500.00	206,100.00	0.00	0.00	0.00	240,600.00	300,105.12
Contract Administration	**LS**	**1.0**	**No Contractor**	**0.00**	**0.00**	**0.00**	**304,000.00**	**0.00**	**304,000.00**	**304,000.00**
Construction Management	LS	1.0	No Contractor	0.00	0.00	0.00	304,000.00	0.00	304,000.00	304,000.00

Currency in US dollars

U.S. Army Corps of Engineers
Project StJermeCrk: 65% Submittal
ST. JEROMES CREEK

65% Submittal
RECOMMENDED PLAN - ALTERNATIVE NO. 7
CONCRETE PILINGS OPTION

Project Scope to include:
1,330 LF South Jetty.
1,770 LF North Jetty.
Hydraulic Dredging for Navigational Channel Realignment.

Construction: Batter Pile / Vinyl Sheet Pile System
30' Long Vinyl Sheet Piles.
50' Long Pre-Cast Concrete Batter Piles at 5' Intervals on Each Side.

Estimate assumes project will be constructed by water and no stockpiles or staging areas will be on land. Costs for multiple handling of material will be negligible.

Vinyl Sheet Piling Material/ Construction Costs Provided by Crane Materials International (CMI) (Mike Napior, 800-256-8857X1121).

Price for wood materials is based on bid results from recently bid projects using similar material.

Hydraulic dredging to be performed by sub-contractor.

Estimate for hydraulic dredging is based on 2006 dredging bid prices of St. Jerome Creek indexed to 2011 and 2011 Means Estimating Handbook.

Construction Start Date is Estimated.

Estimated by	ETF, Andrews, Miller & Associates
Designed by	ETF, Andrews, Miller & Associates
Prepared by	Kelly Wright
Preparation Date	8/4/2011
Effective Date of Pricing	11/11/2011
Estimated Construction Time	315 Days

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Designed by
ETF, Andrews, Miller & Associates
Estimated by
ETF, Andrews, Miller & Associates
Prepared by
Kelly Wright

Design Document	65%
Document Date	8/4/2011
District	Baltimore
Contact	Kelly Wright
Budget Year	2011
UOM System	English

Direct Costs
LaborCost
EQCost
MatlCost
UserCost1

Timeline/Currency

Preparation Date	8/4/2011
Escalation Date	1/1/2012
Eff. Pricing Date	11/11/2011
Estimated Duration	315 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Labor A:

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP07R02: MII Equipment Region 2r 2007

02 MIDEAST

Sales Tax	6.00
Working Hours per Year	1,450
Labor Adjustment Factor	1.07
Cost of Money	5.25
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.130
Gas	2.900
Diesel Off-Road	2.500
Diesel On-Road	3.300

Shipping Rates

Over 0 CWT	7.31
Over 240 CWT	7.32
Over 300 CWT	6.32
Over 400 CWT	5.97
Over 500 CWT	3.56
Over 700 CWT	3.56
Over 800 CWT	4.88

Currency in US dollars

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
St. Jerome Creek				**2,571,269.35**	**2,285,514.14**	**457,947.94**	**1,324,000.00**	**700,264.59**	**6,638,731.43**	**9,555,085.79**
Breakwater and Seawalls	**LS**	**1.0**	**Prime Contractor**	**2,571,269.35**	**2,285,514.14**	**457,947.94**	**1,324,000.00**	**700,264.59**	**6,638,731.43**	**9,555,085.79**
Jetty Construction	**LS**	**1.0**	**Prime Contractor**	**2,536,769.35**	**2,079,414.14**	**457,947.94**	**0.00**	**700,264.59**	**5,074,131.43**	**7,752,910.49**
Mobilization / Demobilization	**LS**	**1.0**	**No Contractor**	**25,000.00**	**25,000.00**	**0.00**	**0.00**	**0.00**	**50,000.00**	**50,000.00**
Mob / Demob Equipment	LS	1.0	No Contractor	25,000.00	25,000.00	0.00	0.00	0.00	50,000.00	50,000.00
(Note: 1% of Jetty Construction (Compute from Bare Costs Only))										
Light Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**1,069,440.21**	**874,711.32**	**198,740.60**	**0.00**	**298,649.86**	**2,142,892.14**	**3,285,148.51**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	27,414.0	Prime Contractor	314,493.41	257,228.91	26,235.20	0.00	83,566.29	597,957.52	919,229.22
(Note: (1370 lf x 6.67 pieces x 30' VF) / 10' Sections = 27414 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,604.0	Prime Contractor	32,218.67	26,352.14	2,701.74	0.00	8,562.91	61,272.55	94,192.01
(Note: (1370 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,604 bf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 14' Long	BF	20,446.0	Prime Contractor	45,107.02	36,893.72	3,782.51	0.00	11,988.31	85,783.25	131,871.39
(Note: (1370 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 20,446 bf)										
				12.01	*9.83*	*3.00*	*0.00*	*10.00%*	*24.84*	*38.02*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	54,800.0	Prime Contractor	658,288.59	538,424.19	164,400.00	0.00	189,394.26	1,361,112.78	2,083,336.81
(Note: (1370 lf x 8.0 pilings x 50' VF) / 10' Sections = 54,800 vlf.)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Timber Batter Block - 3' Lengths	BF	8,763.0	Prime Contractor	19,332.53	15,812.37	1,621.16	0.00	5,138.10	36,766.05	56,519.08
(Note: (1370 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,763 bf)										
Light Construction - Southerly Wall	**LS**	**1.0**	**Prime Contractor**	**1,038,209.37**	**849,167.14**	**192,937.43**	**0.00**	**289,928.48**	**2,080,313.94**	**3,189,213.30**
				11.47	*9.38*	*0.96*	*0.00*	*10.00%*	*21.81*	*33.53*
Vinyl Sheeting - 30' Lengths	VLF	26,613.0	Prime Contractor	305,304.34	249,713.03	25,468.64	0.00	81,124.60	580,486.01	892,370.58
(Note: (1,330 lf x 6.67 pieces x 30' VF) / 10' Sections = 26,613 vlf)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 10' Long	BF	14,178.0	Prime Contractor	31,278.85	25,583.44	2,622.93	0.00	8,313.13	59,485.22	91,444.42
(Note: (1,330 lf x 2 x 5.33 bf/lf x 10') / 10' Sections = 14,178 bf)										

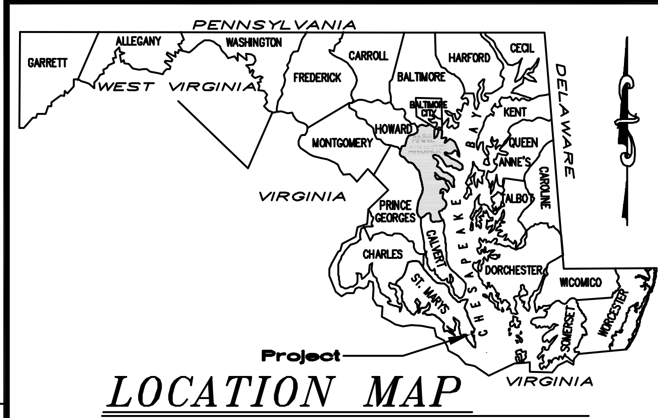
Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Wale - 14' Long	BF	19,849.0	Prime Contractor	43,789.95	35,816.46	3,672.07	0.00	11,638.26	83,278.47	128,020.90
(Note: (1,330 lf x 2 x 5.33 bf/lf x 14') / 10' Sections = 19,849 bf)										
				12.01	*9.83*	*3.00*	*0.00*	*10.00%*	*24.84*	*38.02*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	53,200.0	Prime Contractor	639,068.48	522,703.78	159,600.00	0.00	183,864.50	1,321,372.26	2,022,509.46
(Note: (1,330 lf x 8.0 pilings x 50' VF) / 10' Sections = 53,200 vlf.)										
				2.21	*1.80*	*0.19*	*0.00*	*10.00%*	*4.20*	*6.45*
8" x 8" Timber Batter Block - 3' Lengths	BF	8,507.0	Prime Contractor	18,767.75	15,350.43	1,573.80	0.00	4,987.99	35,691.97	54,867.94
(Note: (1,330 lf x 4 x 5.33 bf/lf x 3') / 10' Sections = 8,507 bf)										
Heavy Construction - Northerly Wall	**LS**	**1.0**	**Prime Contractor**	**404,119.77**	**330,535.67**	**66,269.90**	**0.00**	**111,686.24**	**800,925.35**	**1,228,548.68**
				19.95	*16.32*	*1.69*	*0.00*	*10.00%*	*37.96*	*58.36*
Vinyl Sheeting - 30' Lengths	VLF	8,004.0	Prime Contractor	159,690.24	130,613.06	13,558.78	0.00	42,463.82	303,862.08	467,101.97
(Note: (400 lf x 6.67 pieces x 30' VF) / 10' Sections = 8,004 vlf)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
10" x 10" Wale - 10' Long	BF	6,664.0	Prime Contractor	14,701.81	12,024.83	1,326.14	0.00	3,919.71	28,052.78	43,116.76
(Note: (400 lf x 2 x 8.33 bf/lf x 10') / 10' Sections = 6,664 bf)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
10" x 10" Wale - 14' Long	BF	9,330.0	Prime Contractor	20,583.42	16,835.49	1,856.67	0.00	5,487.82	39,275.57	60,366.05
(Note: (400 lf x 2 x 8.33 bf/lf x 14') / 10' Sections = 9,330 bf)										
				12.01	*9.83*	*3.00*	*0.00*	*10.00%*	*24.84*	*38.02*
14" - 3' Diameter Timber Piling - 50' Lengths	VLF	16,000.0	Prime Contractor	192,201.05	157,204.14	48,000.00	0.00	55,297.59	397,405.19	608,273.52
(Note: (400 lf x 8.0 pilings x 50' VF) / 10' Sections = 16,000 vlf.)										
				2.21	*1.80*	*0.20*	*0.00*	*10.00%*	*4.21*	*6.47*
12" x 12" Timber Batter Block - 4' Lengths	BF	7,680.0	Prime Contractor	16,943.26	13,858.15	1,528.32	0.00	4,517.31	32,329.73	49,690.38
(Note: (400 lf x 4 x 12.0 bf/lf x 4') / 10' Sections = 7,680 bf)										
				34,500.00	*206,100.00*	*0.00*			*1,260,600.00*	*1,498,175.30*
Hydraulic Dredging	**EA**	**1.0**	**Hydraulic Dredging Contractor**	**34,500.00**	**206,100.00**	**0.00**	**1,020,000.00**	**0.00**	**1,260,600.00**	**1,498,175.30**
Existing DMP Retrofit	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**0.00**	**0.00**	**0.00**	**720,000.00**	**0.00**	**720,000.00**	**898,070.18**

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01

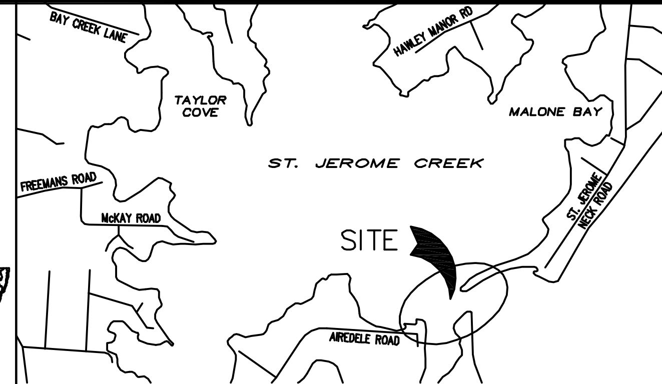
Description	UOM	Quantity	Contractor	LaborCost	EQCost	MatlCost	UserCost1	Contingency	BareCost	ProjectCost
Retrofit / Excavation of Material in DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	400,000.00	0.00	400,000.00	498,927.88
Transport and Disposal of Excavated Material within 5 miles of DMP	LS	1.0	Prime Contractor	0.00	0.00	0.00	320,000.00	0.00	320,000.00	399,142.30
Mobilization / Demobilization	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**0.00**	**0.00**	**0.00**	**300,000.00**	**0.00**	**300,000.00**	**300,000.00**
Hydraulic Mobilization / Demobilization	LS	1.0	No Contractor	0.00	0.00	0.00	300,000.00	0.00	300,000.00	300,000.00
Hydraulic Dredging	**LS**	**1.0**	**Hydraulic Dredging Contractor**	**34,500.00**	**206,100.00**	**0.00**	**0.00**	**0.00**	**240,600.00**	**300,105.12**
				1.15	*6.87*	*0.00*	*0.00*	*0.00%*	*8.02*	*10.00*
Hydraulic Dredge of Channel (60'L x 100' W to -7.0' mllw)	CY	30,000.0	Hydraulic Dredging Contractor	34,500.00	206,100.00	0.00	0.00	0.00	240,600.00	300,105.12
Contract Administration	**LS**	**1.0**	**No Contractor**	**0.00**	**0.00**	**0.00**	**304,000.00**	**0.00**	**304,000.00**	**304,000.00**
Construction Management	LS	1.0	No Contractor	0.00	0.00	0.00	304,000.00	0.00	304,000.00	304,000.00

Labor ID: A EQ ID: EP07R02 Currency in US dollars TRACES MII Version 3.01



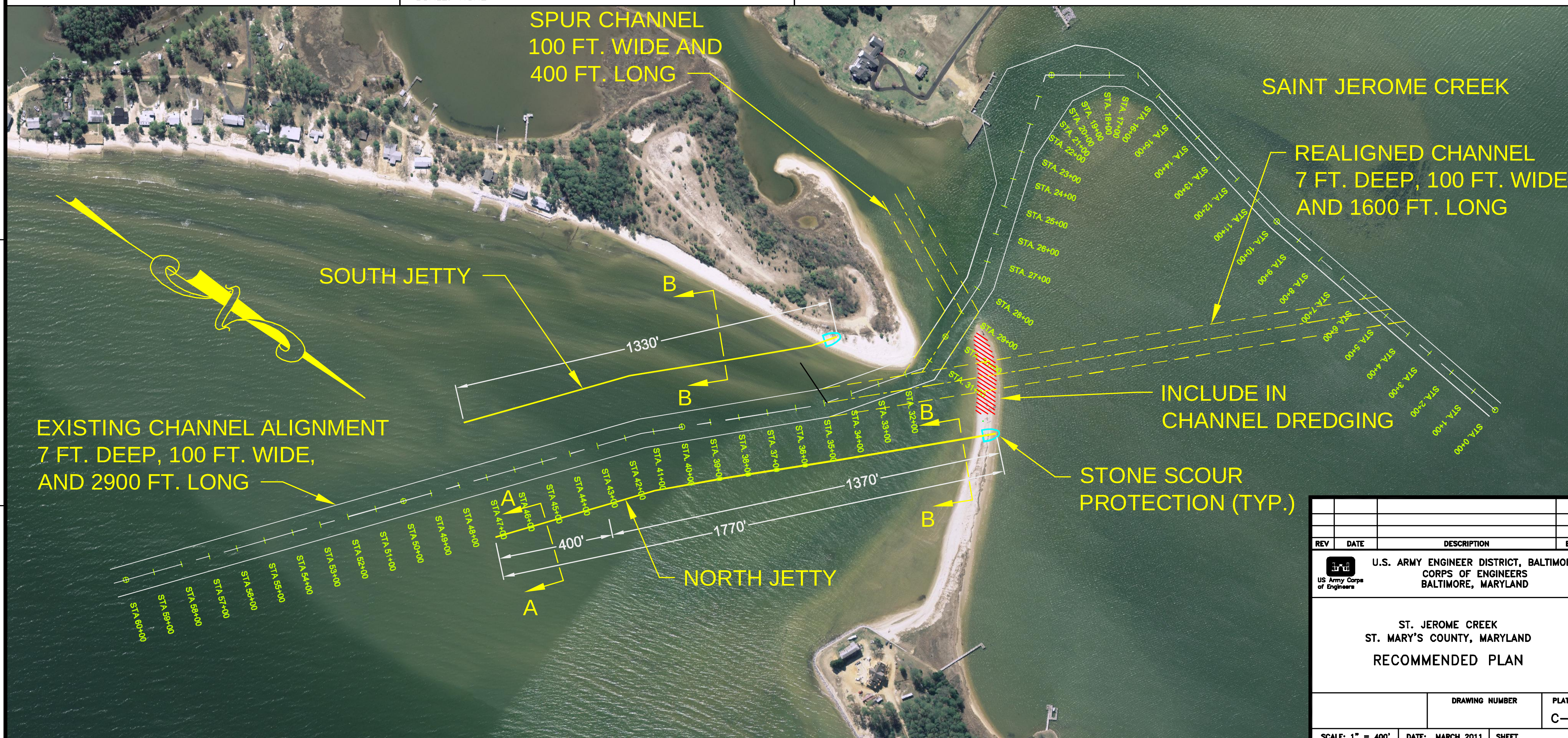
LOCATION MAP

SCALE: NONE



VICINITY MAP

SCALE: NONE



REV	DATE	DESCRIPTION	BY

US Army Corps of Engineers

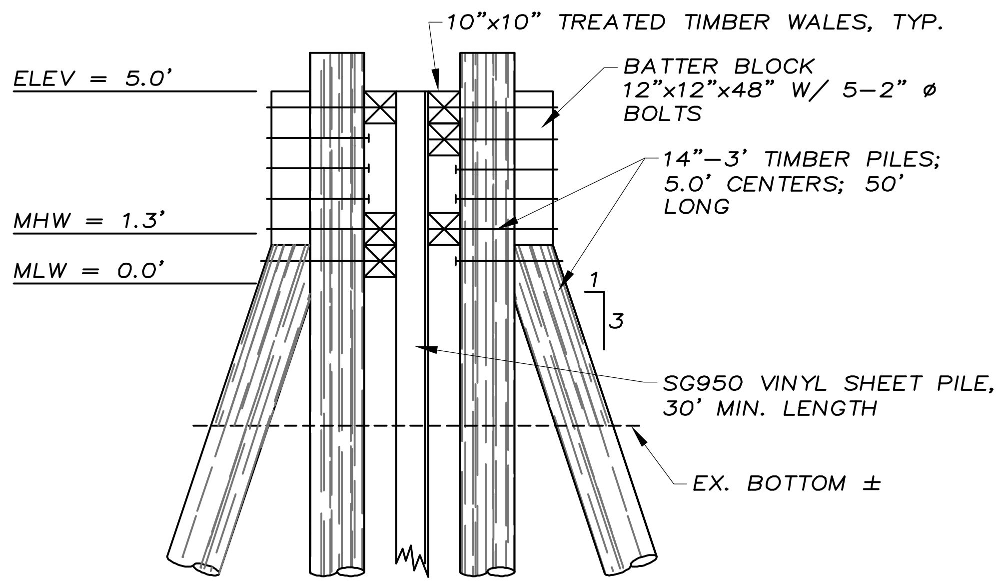
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

ST. JEROME CREEK
ST. MARY'S COUNTY, MARYLAND
RECOMMENDED PLAN

DRAWING NUMBER

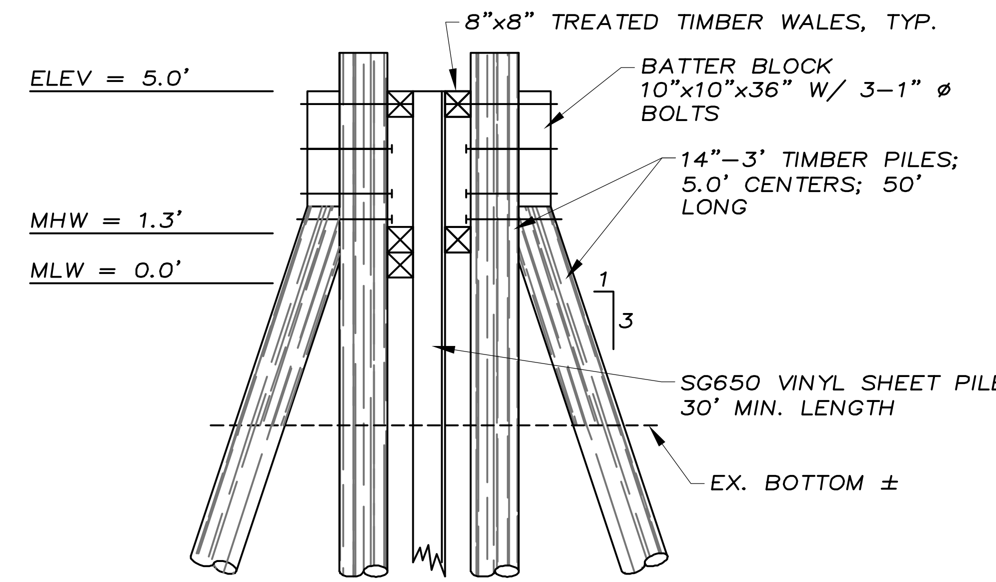
PLATE C-1

SCALE: 1" = 400' DATE: MARCH 2011 SHEET



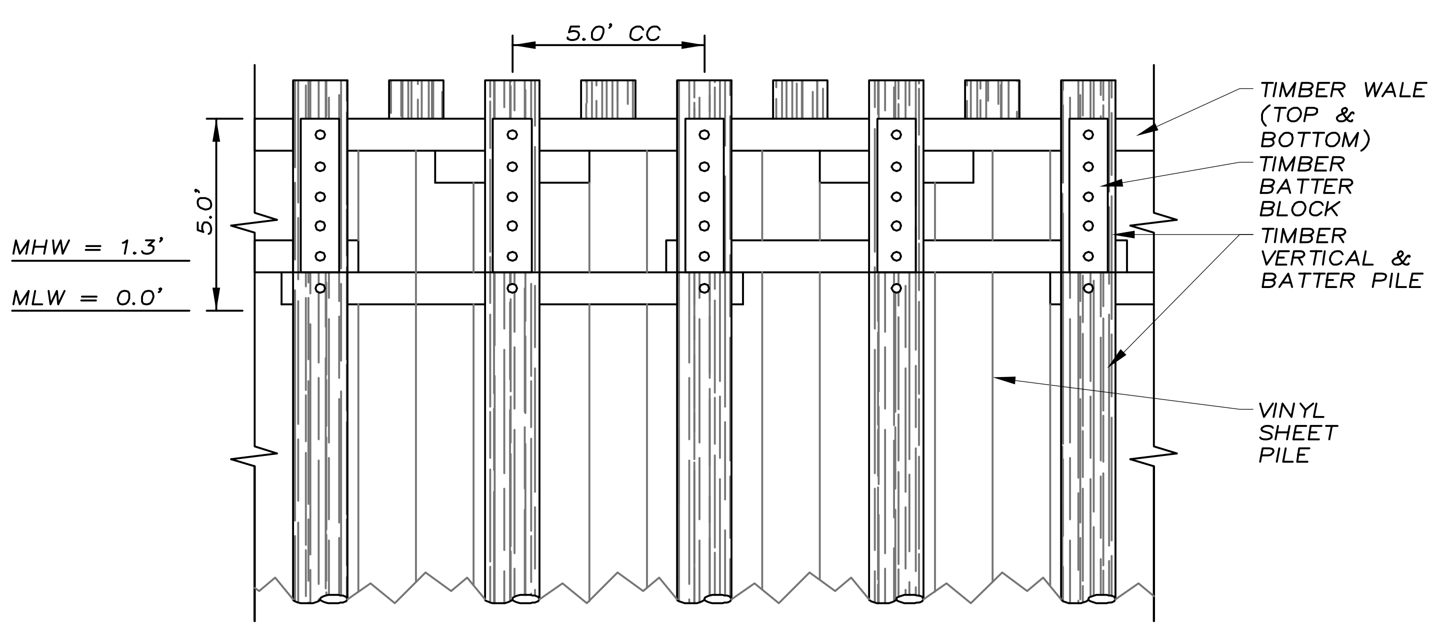
TYPICAL BATTER PILE JETTY SECTION A–A

SCALE: 5 2.5 0 5



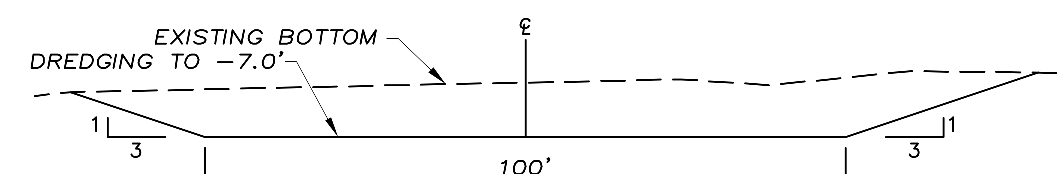
TYPICAL BATTER PILE JETTY SECTION B–B

SCALE: 5 2.5 0 5



TYPICAL BATTER PILE JETTY ELEVATION

SCALE: 5 2.5 0 5



TYPICAL CHANNEL SECTION

SCALE: HORZ.: 30 15 0 30

VERT.: 1 0.5 0 1

REV	DATE	DESCRIPTION	BY

US Army Corps of Engineers

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

ST. JEROME CREEK
ST. MARY'S COUNTY, MARYLAND

RECOMMENDED PLAN

DRAWING NUMBER	PLATE
	C–2

SCALE: AS SHOWN | DATE: MARCH 2011 | SHEET

This estimate is escalated to 4th Qtr 2014 from 4th Qtr 2011 using CWICCIS dated 31 Mar 2014

Assume that it will be a competitive bid with at least 4 bidders. Assume Prime will be doing the Timber Piling work and sub contracting out the rest (i.e., dredging).

RECOMMENDED PLAN - ALTERNATIVE NO. 7

TIMBER PILINGS WITH TIMBERGUARD OPTION

Project Scope to include:

1,330 LF South Jetty.

1,770 LF North Jetty.

Hydraulic Dredging for Navigational Channel Realignment.

Construction: Batter Pile / Vinyl Sheet Pile System

30' Long Vinyl Sheet Piles.

50' Long Timber Batter Piles at 5' Intervals on Each Side.

Estimate assumes project will be constructed by water and no stockpiles or staging areas will be on land. Costs for multiple handling of material will be negligible.

Vinyl Sheet Piling Material/ Construction Costs Provided by Crane Materials International (CMI) (Mike Napior, 800-256-8857X1121).

Price for wood materials is based on bid results from recently bid projects using similar material.

Hydraulic dredging to be performed by sub-contractor.

Estimate for hydraulic dredging is based on 2006 dredging bid prices of St. Jeromes Creek indexed to 2011 and 2011 Means Estimating Handbook.

Estimated by	ETF, Andrews, Miller & Associates
Designed by	ETF, Andrews, Miller & Associates
Prepared by	Luan Ngo
Preparation Date	8/4/2011
Effective Date of Pricing	3/31/2014
Estimated Construction Time	315 Days

Currency in US dollars

Construction Start Date is Estimated.

Estimated by	ETF, Andrews, Miller & Associates
Designed by	ETF, Andrews, Miller & Associates
Prepared by	Luan Ngo
Preparation Date	8/4/2011
Effective Date of Pricing	3/31/2014
Estimated Construction Time	315 Days

Description	ContractCost	Contingency	Escalation	ProjectCost
Cost Summary	**9,054,874.75**	**490,230.34**	**598,572.12**	**10,143,677.21**
Breakwater and Seawalls	**8,177,214.75**	**438,789.34**	**598,572.12**	**9,214,576.21**
Jetty Construction	**6,215,965.15**	**333,548.69**	**455,008.65**	**7,004,522.49**
Mobilization / Demobilization	**57,376.71**	**3,078.83**	**4,199.97**	**64,655.52**
Light Construction - Northerly Wall	**2,613,479.71**	**140,239.32**	**191,306.71**	**2,945,025.74**
Light Construction - Southerly Wall	**2,537,156.95**	**136,143.84**	**185,719.89**	**2,859,020.68**
Heavy Construction - Northerly Wall	**1,007,951.80**	**54,086.69**	**73,782.07**	**1,135,820.56**
Hydraulic Dredging	**1,961,249.59**	**105,240.65**	**143,563.47**	**2,210,053.71**
Existing DMP Retrofit	**1,120,180.63**	**60,108.89**	**81,997.22**	**1,262,286.75**
Mobilization / Demobilization	**466,741.93**	**25,045.37**	**34,165.51**	**525,952.81**
Hydraulic Dredging	**374,327.03**	**20,086.39**	**27,400.74**	**421,814.15**
Planning Engineering Design	**726,500.00**	**36,325.00**	**0.00**	**762,825.00**
Construction Management	**151,160.00**	**15,116.00**	**0.00**	**166,276.00**

Currency in US dollars

APPENDIX D

ST. MARY'S COUNTY COMMISSIONERS LETTER OF INTENT

ST. MARY'S COUNTY GOVERNMENT

BOARD OF COUNTY COMMISSIONERS

Francis Jack Russell, President
Lawrence D. Jarboe, Commissioner
Cynthia L. Jones, Commissioner
Todd B. Morgan, Commissioner
Daniel L. Morris, Commissioner

August 28, 2012

RECEIVED
AUG 31 2012
St. Mary's County
Dept. Public Works & Transportation

Mr. Robert S. Pace
Chief, Planning Division
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

Re: St. Jerome Creek Letter of Intent

Dear Mr. Pace

The Board of County Commissioners for St. Mary's County, Maryland, has received the draft Project Partnership Agreement (PPA) for the St. Jerome Creek Shallow Draft Navigation Project. We have no comments on the Agreement at this time and have no objections to the U.S. Army Corps of Engineers finalizing the PPA in order to cost-share design and implementation of the project. We have included the project as part of our FY2013-2018 capital improvement program and understand that the recommended scope of work includes two sheet pile jetties with batter piles and a realigned entrance channel to St. Jerome Creek located in St. Mary's County, Maryland.

We understand that based on language in the draft PPA, as the non-Federal sponsor, we are responsible for 10 percent of the total costs of design and construction of the general navigation features (GNF), including costs of construction of dredged material disposal facilities, a portion of which will be offset by the value of lands, easements, rights-of-way, relocations, and disposal areas (LERRD) provided by St. Mary's County for the project. However, operation and maintenance (O&M) of the GNF will be a Federal responsibility.

We recognize our required share could increase if the Federal costs of planning, design, and implementation for the project exceed the statutory Federal per project participation limit for this authority ($7,000,000). Based on our FY 2013-2018 approved capital improvement budget, the total non-Federal share programmed for design, land acquisition, and construction is $3,984,419. Please accept this correspondence as our local support for the project and it's continuance to the design and implementation phase, subject to the availability of funding and an updated cost estimate from the Army Corps of Engineers.

Mr. Robert S. Pace
Page 2
August 28, 2012

Should you have any questions or need additional information, please feel free to contact us at your earliest convenience.

Sincerely,
BOARD OF COUNTY COMMISSIONERS
FOR ST. MARY'S COUNTY, MARYLAND

Francis Jack Russell

Francis Jack Russell, President

Lawrence D. Jarboe

Lawrence D. Jarboe, Commissioner

Cynthia L. Jones

Cynthia L. Jones, Commissioner

Todd B. Morgan, Commissioner

Daniel L. Morris, Commissioner

BOCC/GAE/ZR/dg
T:All/Consent/7050
cc: Congressman Steny Hoyer
John Savich, County Administrator
George R. Sparling, County Attorney
George A. Erichsen, P.E., Director, Department of Public Works & Transportation

APPENDIX E

AGENCY AND PUBLIC COORDINATION

CHRONOLOGY OF AGENCY COORDINATION

3 June 2009	Study initiation letter from USACE to Maryland Department of Planning State Clearinghouse, Chesapeake Bay Program, Maryland Dept. of Housing and Community Development, MDNR, Chesapeake Bay Critical Area Commission, MDE, NOAA, USEPA, NMFS, MWA, NRCS-USDA, USFWS, CBF, Senator Mikulski, Senator Cardin, Representative Hoyer and various St. Mary's County agencies. The letter provided preliminary project information and the time and location of the public scoping meetings.
16 June 2009	Email received from Maryland Historic Trust (MHT) confirming that the Study Initiation Letter was received. MHT requested to review the project when further specifics are determined for potential effects on historical and archaeological properties.
7 July 2009	Letter received from Maryland Department of Planning stating that the project application was received and that all Maryland Intergovernmental review and Coordination (MIRC) process requirements have been met and the review process concluded.
13 July 2009	Letter received from USFWS providing preliminary input and requesting that a Scope of Work be developed for a standard Fish and Wildlife Coordination Report. USFWS identified that their preliminary review of the project has not revealed any serious environmental resource issues such as the presence of Federally listed threatened/endangered species, vegetated wetlands, or SAV.
23 July 2009	Letter received from MDNR's Wildlife and Heritage Service stating that there are no State or Federal records for rare, threatened, or endangered species within the project boundaries. As a result, they identified no specific comments or requirements at that time. MDNR requested that if there is to be any construction of water-dependent facilities, that we perform further coordination for technical assistance regarding waterfowl.
September 2009	Email sent from USACE to NMFS requesting concurrence with our initial determination of species to include in the project's EFH assessment.
19 September 2009	Email received from NMFS stating that the EFH designation for the primary tributary closest to the project area (the Potomac River) should be used for this project. NMFS identified that the species to be included in the EFH assessment are summer flounder (adults and juveniles), bluefish (adults and juveniles), Spanish mackerel (adults and juveniles), and red drum (juveniles).

CHRONOLOGY OF AGENCY COORDINATION (continued)

1 December 2009 Letter sent to USFWS requesting an exemption from federal funding prohibitions under the CBRA.

3 December 2009 Email received from USFWS requested that the study consider the effect that jetty construction would have on tidal circulation. USFWS communicated concern that the jetties could potentially reduce the already poor tidal circulation in St. Jerome Creek.

15 December 2009 Email received from MDNR communicating the status of time-of-year restrictions for waterfowl for water-dependent construction activities. Currently, the time-of-year restriction period is November 15 through March 1. However, MDNR, stated that the dredging of navigation channels is typically exempt from these restrictions because of the importance of navigation.

16 December 2009 Letter received from USFWS stating that CBRA exception is sufficiently broad to allow for the construction of new jetties to improve the functioning of the existing Federal channel. Therefore, USFWS concurs with USACE's determination that proposed project qualifies as an exception to the limitations on Federal expenditures under section 6(a)(2) of CBRA.

7 January 2010 Email sent to USACE from MDNR stating time-of-year restrictions pertinent to proposed project.

4 November 2010 Email sent to USFWS. The proposed project had changed from a typical rock jetty construction to a vinyl pile jetty. USACE requested concurrence from USFWS that this modification still qualifies the project for an exception to the limitations on federal expenditures under section 6(a)(2) of CBRA.

5 November 2010 Email received from USFWS concurring that the modification to a vinyl pile jetty still qualifies for an exception to the limitations on Federal expenditures under section 6(a)(2) of CBRA.

25 February 2011 Letter sent to NMFS requesting initiation of Section 7 Endangered Species Act coordination. USACE provided details on the recommended plan and requested NMFS's comments with respect to endangered species for the proposed project.

1 March 2011 Email sent to the St. Mary's County Soil Conservation District requesting the District's concurrence that the proposed project is in compliance with the Prime and Unique Farmlands E.O. and would provide no further impacts to the prime and unique soils located at the dredged material placement site.

7 March 2011 Letter received from NMFS identifying the species listed under Section 7 of the Endangered Species Act (ESA) that are likely to be present in the study area and could be affected by the proposed project are sea turtles and Shortnose sturgeon (*Acipenser brevirostrum*). NMFS requested that USACE should submit a determination of the effects with a justification, and a request for concurrence when project plans are complete. NMFS will conduct a consultation under Section 7 of the ESA at that time. NMFS also communicated the likelihood of a status change for Atlantic sturgeon (*Acipenser oxyrinchus*) and recommended that USACE obtain current status information for that species and that the project consider conservation actions to limit the potential for adverse impacts on Atlantic sturgeon (*Acipenser oxyrinchus*) from the proposed project.

4 April 2011 Email received from St. Mary's County Soil Conservation District concurring with USACE's determination that the proposed project is in compliance with the Prime and Unique Farmlands E.O. and would provide no further impacts to the prime and unique soils located at the dredged material placement site.

12 May 2011 Phone log with Mary Owens to discuss the Critical Area Commission's review process. The draft report will be provided to the Critical Area Commission and should include information about land access and any necessary staging areas.

5 August 2011 Email received from Maryland Historical Trust to inform USACE on their recommendations regarding whether or not underwater archeological investigations are warranted for the proposed St. Jerome's Creek project. It is requested that USACE perform a Phase I submerged archeological investigations of the project's area for potential effects.

August 2011 EFH Assessment sent to NMFS (Habitat Conservation Division-Chesapeake Bay Office).

August 2011 Section 7 of the ESA Consultation letter sent to NFMS (Regional Office).

6 October 2011 Letter received from NFMS in response to Section 7 of the ESA Consultation letter provided in August 2011. Based on information provided by USACE, NMFS concurs with the USACE determination that the proposed project is not likely to affect any listed species under NMFS jurisdiction.

CHRONOLOGY OF AGENCY COORDINATION (continued)

1 March 2012	Email received from NMFS in response to EFH Assessment provided to NMFS in August 2011. NFMS stated that they have no objections to the proposed project because as proposed, the project would have minimal impacts to EFH.
27 September 2013	Letter received from State of Maryland Critical Area Commission stating that the proposed project is consistent with the Critical Area law and Criteria, and therefore with the Maryland Coastal Zone Management Program.
21 October 2013	Fish and Wildlife Coordination Act Report received from USFWS requesting additional analysis on the effect of the project on the creek's circulation and flushing.
17 January 2014	USACE and MD SHPO executed a Programmatic Agreement (PA), dated January 17, 2014, that stipulates USACE conduct a Phase I submerged archaeological investigation prior to implementation of the project's proposed actions.
27 January 2014	Teleconference call with Chris Guy and George Ruddy of USFWS to discuss their project concerns related to circulation and flushing, and evaluations that could be undertaken to address those concerns.
28 January 2014	Phone conversation with Keeve Brine, MDE, regarding shellfish harvest closures and water quality monitoring in St. Jerome Creek.
6 February 2014	Phone conversation with Kathy Brohawn, MDE, regarding water quality in St. Jerome Creek and potential impacts from proposed project.
24 June 2014	Teleconference call with Chris Guy to present modeling completed to investigate circulation and flushing as well as input from MDE. Based on the information provided, USFWS was satisfied with USACE's evaluation of circulation and flushing in St. Jerome Creek with respect to the proposed project. Email received from USFWS documenting compliance with the Fish and Wildlife Coordination Act.

US Army Corps
of Engineers
Baltimore District

Planning Division

Study Initiation Notice

St. Jerome's Creek Small Navigation Project
St. Mary's County, Maryland

JUN 3 2009

The U.S. Army Corps of Engineers, Baltimore District (USACE) in conjunction with St. Mary's County, is investigating opportunities to protect the existing Federal navigation channel and turning basin at St. Jerome's Creek in St. Mary's County, Maryland (Enclosure). The purpose of this notice is to inform you of the study and our upcoming efforts.

The goals of this study are to investigate and implement protection measures within the study area. This study is being conducted under Section 107 of the River and Harbor Act of 1960, as amended. The authority allows USACE to develop and construct small navigation projects, such as dredging channels or constructing breakwaters and jetties for harbor protection.

The study is currently in the feasibility phase, which includes collecting and analyzing data, identifying problems, needs and opportunities, developing alternatives, and evaluating impacts. The final product of the feasibility phase will be a report, including the National Environmental Policy Act documentation, which will identify plans for protection of St. Jerome Creek and the associated impacts of the protection measures. Please notify us if you would like to receive a copy of this report.

For Federal and State resource agencies receiving a copy of this letter, we request that you provide information concerning interests within your organization's area of responsibility or expertise within 30 days from the date of this notice to the address below. A timely review of the enclosed information and a written response will be greatly appreciated. Some agencies will also receive specific requests for information from our office in the near future. If you have any questions regarding this project, please contact Mr. Tony Clark of our Civil Project Development Branch at (410) 962-3413 or by e-mail at anthony.a.clark@usace.army.mil.

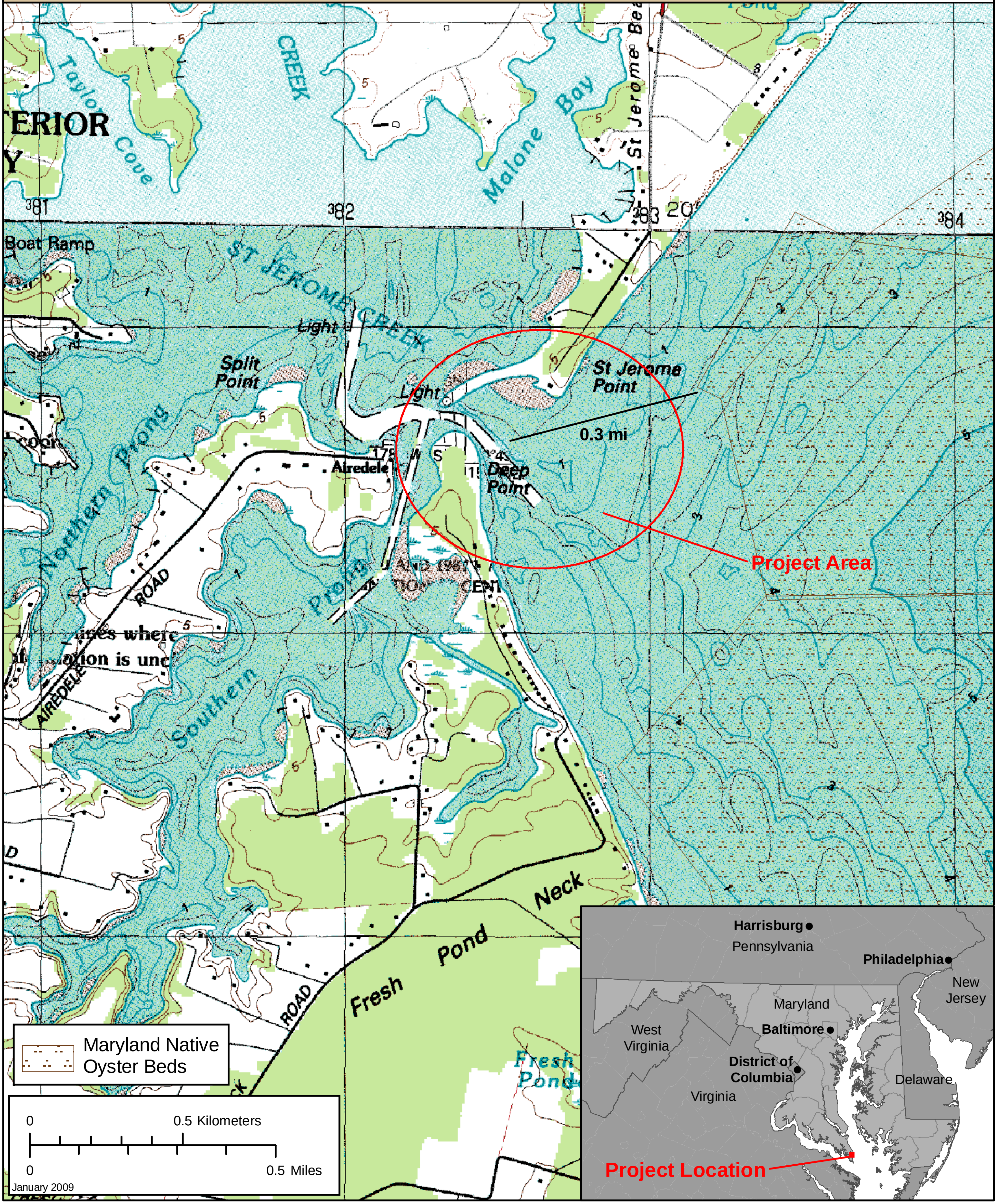
U.S. Army Corps of Engineers, Baltimore District
ATTN: CENAB-PL-P (Clark)
P.O. Box 1715
Baltimore, Maryland 21203-1715

Amy M. Guise

Amy M. Guise
Chief, Civil Project Development Branch

St. Jerome Creek:
St. Mary's County, Maryland

US Army Corps of Engineers
Baltimore District



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

2009 JUL 13 AM 10 12

June 30, 2009

Amy M. Guise
Chief, Civil Projects Development Branch
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Attn: Michele Gomez

Re: St. Jerome Creek Navigation Study

Dear Ms. Guise:

This responds to your letter, dated June 3, 2009, initiating coordination on the St. Jerome Creek Small Navigation Study, St. Mary's County, Maryland. Our preliminary review of the project location has not revealed any serious environmental resource issues such as the presence of federally listed threatened/endangered species, vegetated wetlands, or beds of submerged aquatic vegetation. If the project would involve the disposal of dredged material, identifying a suitable disposal option would be a concern.

We believe the project will require a relatively low level of Service effort (e.g., a few meetings, a field review, and preparation of a Coordination Act Report). In accordance with the 2006 Protocol for Coordination between the US Fish and Wildlife Service Chesapeake Bay Field Office and the ACE Baltimore District, we suggest that a Scope of Work be developed for a standard Fish and Wildlife Coordination Act (FWCA) Report. The level of effort would be 10 biologist days. Our current reimbursable cost rate is $568/day plus the 38 percent overhead specified for FWCA activities. The point of contact will be George Ruddy, who can be reached at (410)573-4528 or george_ruddy@fws.gov.

We look forward to working with you on this project.

Sincerely,

Leopoldo Miranda
Supervisor

Maryland Department of Planning

Martin O'Malley
Governor
Anthony G. Brown
Lt. Governor

Richard Eberhart Hall
Secretary
Matthew J. Power
Deputy Secretary

July 7, 2009

Mr. Tony Clark
Project Manager, Civil Project Development Branch
U.S. Army Corps of Engineers, Baltimore District
CENAB-PL-P (Clark)
P.O. Box 1715
Baltimore, MD 21203-1715

STATE CLEARINGHOUSE REVIEW PROCESS
State Application Identifier: MD20090605-0739
Project Description: St. Jerome's Creek Small Navigation Project: feasibility phase of a study to investigate and implement protection measures for the existing Federal navigation channel, and turning basin
Project Location: County of St. Mary's
Clearinghouse Contact: Bob Rosenbush

Dear Mr. Clark:

Thank you for submitting your project for intergovernmental review. Participation in the Maryland Intergovernmental Review and Coordination (MIRC) process helps ensure project consistency with plans, programs, and objectives of State agencies and local governments.

Notice of your application is being provided to State and local public officials through the ***Intergovernmental Monitor***, which is a weekly Internet publication identifying projects received by the State Clearinghouse for Intergovernmental Assistance. This document may be viewed at http://www.mdp.state.md.us/CLHOUSE/monitor_fy04.htm. The project has been assigned a unique State Application Identifier that should be used on all documents and correspondence.

Two forms are enclosed with this letter. Please return the completed "Project Survey" form within 14 days of the date of this letter. The "Project Status Form" should be completed and returned after you receive notice that your project was approved or disapproved.

All MIRC requirements have been met in accordance with Code of Maryland Regulations (COMAR 34.02.01.04-.06) and this concludes the review process for the above referenced project. If you need assistance or have questions, contact the State Clearinghouse staff person noted above at 410-767-4490 or through e-mail at **brosenbush@mdp.state.md.us**. Thank you for your cooperation with the MIRC process.

Sincerely,

Linda C. Janey

Linda C. Janey, J.D., Assistant Secretary
for Clearinghouse and Communications

LCJ:BR
Enclosure(s)
cc: John Savich - STMA
09-0739_NM.NEW9.doc

Grundy, Jo Ann NAB02

From: Clark, Anthony A NAB02
Sent: Wednesday, July 22, 2009 3:05 PM
To: Grundy, Jo Ann NAB02
Subject: FW: St. Jerome's Creek Small Navigation Project

Please read below

-----Original Message-----
From: B Jordan [mailto:BJordan@mdp.state.md.us]
Sent: Tuesday, June 16, 2009 12:43 PM
To: Clark, Anthony A NAB02
Subject: St. Jerome's Creek Small Navigation Project

Hello Tony,

The Maryland Historical Trust (MHT) received the Study Initiation Notice on the St. Jerome's Creek Small Navigation Project in St. Mary's County, Maryland. As there was no specifics on the project nor its potential impacts to the bottomlands, we don't have any comments at this time. We would be interested in reviewing the project in the future for potential effects on historical an archaeological properties when there is more information.

Sincerely,

Brian

Brian A. Jordan, Ph.D.
Assistant State Underwater Archaeologist Office of Preservation Services
BJordan@mdp.state.md.us
410.514.7668 410.987.4071/fax
Toll Free: 1.800.756.0119 x7668

Maryland Department of Planning
Maryland Historical Trust
100 Community Place www.marylandhistoricaltrust.net
Crownsville, MD 21032 www.mdp.state.md.us
E-mail written using Spranq eco font to reduce printer ink

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
John R. Griffin, Secretary
Eric Schwaab, Deputy Secretary

July 23, 2009

Ms. Amy M. Guise
U.S.A.C.E. - Baltimore District
ATTN: CENAB-PL-P (Clark)
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Environmental Review for St. Jerome's Creek Small Navigation Project, St. Mary's County, Maryland.

Dear Ms. Guise:

The Wildlife and Heritage Service has determined that there are no State or Federal records for rare, threatened or endangered species within the boundaries of the project site as delineated. As a result, we have no specific comments or requirements pertaining to protection measures at this time. This statement should not be interpreted however as meaning that rare, threatened or endangered species are not in fact present. If appropriate habitat is available, certain species could be present without documentation because adequate surveys have not been conducted.

We would also like to point out that the open waters that are adjacent to or part of the site are known historic waterfowl concentration areas. If there is to be any construction of water-dependent facilities please contact Larry Hindman of the WHS Service at (410) 221-8838 for further technical assistance regarding waterfowl. Please note that the utilization of state funds, or the need to obtain a state-authorized permit, may warrant additional evaluations that could lead to protection or survey recommendations by the Wildlife and Heritage Service.

Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at (410) 260-8573.

Sincerely,

Lori A. Byrne

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER #2009.0905.sm
Cc: K. Charbonneau, CAC
L. Hindman, DNR

Grundy, Jo Ann NAB02

From: John Nichols [John.Nichols@noaa.gov]
Sent: Thursday, September 17, 2009 2:35 PM
To: Grundy, Jo Ann NAB02
Subject: Re: St. Jerome Creek EFH designations

Follow Up Flag: Follow up
Flag Status: Yellow

Jo Ann:
NOAA Fisheries in Annapolis (i..e, me) does not recommend referring to the Chesapeake Bay-wide EFH designations for projects in Maryland waters, because it includes many species confined to the lower Bay (or Virginia waters). For Maryland projects, I recommend referring to the EFH Designation for the primary tributary closest to the project area, with similar salinity regime. In this case, it is the Potomac River estuary. Based on the Potomac River designation, you can drop butterfish and black seabass from the designation (and the requirement to address them in an EFH assessment.)

Designations for Maryland Bay tributaries are also not acurate relative to the presence of certain federal species, based on species ecology and salinity tolerances. As with the Potomac River designation, only summer flounder (adults and juveniles), bluefish (adults and juveniles), Spanish mackerel (adults and juveniles), and red drum (juveniles) are expected to be in the project area of St. Jeromes Creek. Therefore, your EFH assessment can focus on these species and their life stages.

The species of skate you listed may be in the project area. However, at present, NOAA is not requiring that they be addressed in EFH assessments for projects in Maryland waters of the Chesapeake Bay.

Grundy, Jo Ann NAB02 wrote:
>
> Sorry John, I accidentally hit "send" to my previous message before I
> finished. I wanted to know if you concurred with the information below
> and if I can eliminate some of the EFH species listed below based on
> previous communication with you for a project in close proximity to
> this one, or if, based on your knowledge, you can narrow down the list
> below.
>
> Thank you,
>
> Jo Ann
>
> _Previous message sent today:_
>
> I took a look through the EFH designations for our study area (mouth
> of St. Jerome Creek along the western shore of the Chesapeake Bay,
> approximately 5 miles north of the Potomac River) and found the
> following nine species of finfish listed (some species were dropped
> from the original list due to known salinities in the study area):
>
> /- Atlantic butterfish (all life stages)/
> /- Black sea bass (juvenille, adult)/
> /- Bluefish (juvenille, adult)/
> /- Cobia (all life stages)/
> /- King Mackeral (all life stages)/
> /- Spanish Mackeral (all life stages)/
> /- Summer flounder (larvae, juvenille, adult)/
> /- Windowpane flounder (juvenille, adult)/
> /- Red drum (all life stages)/
>
> In addition, three skate species were listed:

>
> /- Clearnose skate (juvenille, adult)/
> /- Little skate (juvenille, adult)/
> /- Winter skate (juvenille, adult)/
>
> There is a previous study in close proximity to the study area, which
> conducted EFH assessment in 2006 (St. Mary's River Watershed
> Restoration Study). This St. Mary's study states the following:
>
> "Through further District coordination with John Nichols, National
> Marine Fisheries Service (NMFS), it was concluded that of species
> with EFH designated in the Potomac River, only juvenile and adult
> summer flounder, adult and juvenile bluefish, and juvenile red drum
> were likely to occur at the proposed project site (Nichols, personal
> communication 2006)."
>
>

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF

DEC 01 2009

Planning Division

Mr. George Ruddy
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21014

Dear Mr. Ruddy:

This letter is in reference to the U.S. Army Corps of Engineers, Baltimore District's (USACE) proposal to construct jetties and possibly breakwaters to protect an existing Federal navigation channel at the mouth of St. Jerome Creek. The creek is located in St. Mary's County, Maryland, along the western shore of the Chesapeake Bay between St. Jerome Neck and Fresh Pond Neck. Currently, the project is in the feasibility phase and USACE is conducting a Small Navigation Study under Section 107 of the Rivers and Harbors Act of 1960, as amended.

We appreciate your involvement in this study to date. Recently you informed us that a portion of the proposed project is mapped as a unit (MD-45) within the Coastal Barrier Resources System (CBRS). The two jetties would tie into one of the two land features contained within this unit (St. Jerome Point and Deep Point). Such areas are subject to Federal funding prohibitions, as specified in the Coastal Barriers Resource Act (CBRA), to discourage development or modifications to coastal barriers. Federal monies can be spent within the CBRS for certain exempted activities, including maintenance of existing Federal navigational channels, after consultation with the USFWS. Since the sole purpose of this project is to reduce shoaling rates of the existing channel, we are requesting an exemption from Federal funding prohibitions under the CBRA. The jetties, and possibly breakwaters, would be designed to trap sediment to keep the channel clear and reduce dredging from a two year to a ten year cycle. The proposed action would restore vessel utilization of the channel and reduce the frequency of future maintenance dredging.

Please reply within 30 days of the date of this letter with your concurrence that the above proposed project qualifies under the CBRA exemption mentioned above. If you have any questions, please call Ms. Jo Ann Grundy at (410) 962-6136.

Sincerely,

Amy M. Guise

Amy M. Guise
Chief, Civil Project Development Branch

Grundy, Jo Ann NAB02

From: George_Ruddy@fws.gov
Sent: Thursday, December 03, 2009 2:41 PM
To: Grundy, Jo Ann NAB02
Subject: St Jerome Creek

Follow Up Flag: Follow up
Flag Status: Orange

Jo Ann: One potential concern that I have about the jetty construction is the possibility that they could reduce the tidal circulation in the creek. There are several indications that the existing water circulation is not particularly good. For example, the existing mouth of the creek is quite narrow in relation to the area of the entire creek (over 1,000 acres). The relatively narrow mouth appears to be causing bottom scouring in the entrance channel region, and this would be an indication that the tidal circulation in the creek may be somewhat restricted. During the our boat trip inspection of the project area, I noticed that the water color was noticeably darker in the upper reach of the Southern Prong than it was when we got closer to the creek mouth. This was an indication to me that the tidal flushing was not very great in the upper reaches. The mean tidal range in the Chesapeake Bay in this region (Point No Point) is only 1.3 feet. St Jerome Creek has several branches and coves which may hinder the tidal and wind driven circulation. The Southern Prong has a narrow section near the mouth that is also not helpful in this regard. While the central portion of the creek near the mouth has good enough water quality (based on the MDE bacteria standards) to permit shellfish harvesting, the water quality in the branches and coves is impaired and shellfish harvesting is prohibited.

Under these conditions it seems that reducing the tidal circulation would be detrimental to the creek's water quality. I do not know whether the jetties would have this effect or not, but it is conceivable since some of the alternatives would lengthen the narrow passage that the tidal flow would have to transit to and from the creek. Therefore, I think that the potential effect of the jetties on the creek's tidal circulation should be considered during the study. Of course, I would encourage you to develop alternatives that will not worsen the circulation in the creek.

George Ruddy
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401
(410) 573-4528

Grundy, Jo Ann NAB02

From: Hindman, Larry [LHINDMAN@dnr.state.md.us]
Sent: Tuesday, December 15, 2009 11:24 AM
To: Grundy, Jo Ann NAB02
Cc: Byrne, Lori
Subject: RE: Waterfowl and St. Jerome Creek

Hi Jo Ann:

Under the State's Critical Area law, DNR was directed to establish and map Historic Waterfowl Concentration and Staging Areas based on the Department's annual waterfowl survey data and MDE agreed to place a time of year restriction for waterfowl on their tidal wetland permits. The waterfowl concentration areas are included in the County Critical Area maps. The Historic Waterfowl Concentration and Staging Areas were established to protect areas important to wintering and migrating waterfowl and not for waterfowl breeding. Originally, the Department established two time of year restriction periods depending on the species of waterfowl at the site. These restricted periods were 15 October through 31 March to protect early arriving and departing species such as Canada Geese and 15 November through 30 April for later arriving and departing species such as diving ducks. Following meetings with marine contractors and a review of the projects receiving waterfowl time of year restrictions, the Department, in 2006, modified it recommendations to MDE regarding the placement of the waterfowl time of year restriction on water-dependent construction activities. The Department combined the two restriction periods into a single time of year restriction period, 15 November through 1 March. The Department also agreed to exempt the following projects from the waterfowl time of year restrictions for historic waterfowl concentration and staging areas:

1. Pier Construction that is 150 linear feet or less in length
2. Riprap construction of 375 linear shoreline feet or less
3. Timber bulkhead replacement of 350 linear shoreline feet or less
4. Vinyl bulkhead construction of 350 linear shoreline feet or less
5. Marsh creation of 375 linear shoreline feet or less

Regarding the dredging of navigational channels, we generally exempt such projects from the waterfowl time of year restrictions in recognition of the importance of marine navigation.

If you require additional information regarding waterfowl in Maryland, please feel free to me.

Larry Hindman, Waterfowl Project Manager

Maryland DNR

828B Airpax Road, Suite 500

Cambridge, MD 21613

Tel 410-221-8838 x105

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

December 16, 2009

Amy M. Guise
Chief, Civil Project Development Branch
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715
Attn: Ms. Jo Ann Grundy

Re: St. Jerome Creek Jetty Construction

Dear Ms. Guise:

This responds to your letter dated December 1, 2009, concerning your proposal to construct jetties at the entrance to St. Jerome Creek, St. Mary's County, Maryland. The project is located within a unit (MD-45) of the Coastal Barrier Resources System (CBRS). The Coastal Barrier Resources Act (CBRA) restricts Federal expenditures for projects affecting CBRS units. The CBRA and the 1990 amendments known as the Coastal Barrier Improvement Act (CBIA) exempt certain activities from these restrictions. You state your belief that the current project should qualify for the CBRA exception that allows for maintenance of existing Federal navigational channels. You are requesting our concurrence in accordance with the CBRA requirement for consultation with the Secretary of Interior (which has since been delegated to the Service).

The CBRA exception that allowed for maintenance of existing navigation channels (section 6(a)(2)) was amended in the CBIA to allow maintenance or construction of improvements of existing Federal navigation channels and related structures such as jetties. It is our opinion that this exception is sufficiently broad to allow for the construction of new jetties to improve the functioning of the existing Federal channel. Therefore, we concur that the proposed project qualifies as an exception to the limitations on expenditures under section 6(a)(2) of CBRA.

Thank you for your coordination on this project. If there are any questions on this determination, please contact George Ruddy at (410) 573-4528.

Sincerely,

For Leopoldo Miranda
Supervisor

From:	Limpert, Roland
To:	Sowers, Angela NAB02
Cc:	Golden, Greg
Subject:	RE: St. Jerome Creek
Date:	Thursday, January 07, 2010 11:57:20 AM

Hi Angie,

The proposed project would have a time of year restriction on the dredging to minimize potential impacts to oysters and wintering waterfowl of no dredging from 15 November through March 1 if the dredging is done hydraulically. If the dredging is done mechanically the restricted period would be extended through March 14th. There would also be a summer time of year restriction to protect oysters of no dredging from 1 June through 30 September. The all aspects of the proposed jetty construction would have a time of year restriction to protect wintering waterfowl and no construction activity should be performed during the period 15 November through 1 March. If the proposed jetty construction would involve the removal of unsuitable substrate material prior to the placement of the rock or removal and backfilling of the trench with suitable material such as sand, then the removal and any backfilling operation would also have the same time of year restrictions as the channel dredging.

Finally, the feasibility study/EA should also address the potential impacts from the jetties to littoral drift, particularly the potential for downdrift areas to be starved of sediment and have increased erosion rates. The study should also address any changes in sediment deposition on the mapped Natural Oyster bars located to the north, east and south of the proposed jetties and realigned channel.

If you have any questions please let me know.

Roland

Roland Limpert

Maryland Department of Natural Resources

Environmental Review Unit

Tawes State Office Building, B-3

Annapolis, MD 21401

410.260.8333

410.260.8339 (fax)

-----Original Message-----
From: Grundy, Jo Ann NAB02 [mailto:Jo.Ann.Grundy@usace.army.mil]

From:	George_Ruddy@fws.gov
To:	Sowers, Angela NAB02
Cc:	Clark, Anthony A NAB02; Bob_Zepp@fws.gov
Subject:	Re: St. Jerome"s Creek
Date:	Friday, November 05, 2010 8:16:48 AM

Angie: It is our opinion that that the revised project design concept, a batter pile/vinyl sheet pile jetty, continues to qualify as an exception to the limitation on Federal expenditures under section 6(a)(2) of the Coastal Barrier Resources Act (CBRA). I refer you to our letter of December 16, 2009, to Ms. Guise of your office which provided the formal response to your request for consultation under the CBRA. Thank you for keeping us informed about the progress of this study.

George Ruddy
U.S. Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
410-573-4528
Inactive hide details for "Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

11/04/2010 03:34 PM

To

<George_Ruddy@fws.gov>

cc

"Clark, Anthony A NAB02" <Anthony.A.Clark@usace.army.mil>

Subject

St. Jerome's Creek

Hi George,

We will have an updated schedule to you this month. There are still a few things getting worked out. In the mean time, would you mind providing us an email that documents your conclusion that the new jetty being considered is included in the exemption that we currently have?

Thanks,
Angie

Angie Sowers, Ph.D.
U.S. Army Corps of Engineers
Baltimore District- Planning Division
Civil Project Development Branch
Integrated Water Resources Management Specialist

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF

Ms. Julie Crocker
National Marine Fisheries Service
U.S. Department of Commerce
Protected Resources Division
One Blackburn Drive
Gloucester, MA 01930-2298

FEB 25 2011

Dear Ms. Crocker:

The purpose of this letter is to initiate consultation with your office as required under Section 7 of the Endangered Species Act. The Baltimore District, U.S. Army Corps of Engineers (USACE) in partnership with St. Mary's County (MD) has initiated a feasibility study to examine the navigation-related problems affecting the local users of St. Jerome Creek. The scope of this feasibility study involves a detailed investigation to determine the best solution for reducing the rapid rate of siltation occurring in the channel approach to the St. Jerome Creek Inlet.

St. Jerome Creek is located in St. Mary's County, Maryland (see Figure 1), along the western shore of the Chesapeake Bay between St. Jerome Neck and Fresh Pond Neck. The St. Jerome Creek Small Navigation Project is located at the mouth of St. Jerome Creek and its confluence with the Chesapeake Bay (Figure 1). The area is shown on the Point Lookout, Maryland U.S.G.S. 7.5' quadrangle topographic map, and National Ocean Service Chart No. 12233. The site lies at -076.34° longitude and 38.12° latitude.

USACE currently maintains a Federal navigation channel in St. Jerome Creek. The existing Federal navigation channel in the creek is approximately five miles north of the mouth of the Potomac River and six miles southeast of St. Mary's City. See Figure 1 for study area. Dredging of the channel was originally authorized by the River and Harbors Act of 1881. The project was modified and re-authorized by the River and Harbor Act of August 26, 1937. The St. Jerome Creek project was completed in 1939 and provides for a channel 7 ft deep and 100 ft wide from deep water in the Chesapeake Bay to Airdale, then 7 ft deep and 60 ft wide to deep water in the creek, with a turning basin of the same depth, 200 ft wide and 300 ft long, opposite Airdale.

Water depths in the St. Jerome Creek project area range from 2 to 8 ft with an average of 5 ft. The Mean Tide Level (MTL) is 0.74 feet above MLLW with a mean tide range of 1.33 feet. Storm surges are 4.6 and 5.3 ft at the 50 and 100 year return interval, respectively, as reported for Cove Point, the closest station location to St. Jerome Creek. Salinity just east of the study area in the Chesapeake Bay mainstem near Point No Point, typically varies between 7.49 and 21.76 parts per thousand (ppt). The mean range of salinity (from 1985 through 2008) is between 15 and 17 ppt. Water temperatures have been monitored just east of the Creek and range from roughly 34 degrees Fahrenheit in the winter to 80 degrees Fahrenheit in the summer month.

Within the study area of St. Jerome Creek, mature trees and scrub-shrub vegetation exist along the north and south shorelines. The north and south Chesapeake Bay shorelines consist of low-lying beaches for a couple miles to the north and south, with varied homeowner stabilization measures like small revetments, home-made seawalls, and groins made from well rings. The main bay shorelines exhibit a flat, shallow nearshore beach profile. As an embayment off of the Chesapeake Bay, the St. Jerome Creek area, including the northern and southern prong, is geologically suited to wetland areas. Estuarine and marine marshes have been mapped along St. Jerome and Deep Point and freshwater wetlands have been identified adjacent to the dredged material placement site. SAV is not known to exist in the proposed study area (letter dated June 30, 2009, from USFWS).

Various jetty alignments, with and without breakwaters, were considered. Initial recommendations included dual (south and north) rock jetties to protect the mouth of the creek and realignment of the navigation channel. However, subsequent geotechnical investigations found the foundation material was unsuitable for typical rock jetty construction. Various other materials have been considered. The current recommended plan is to construct a dual batter pile/vinyl sheet pile jetty and realign the navigation channel to provide a better flushed system that reduces shoaling. The proposed project includes dredging of the navigation channel to the authorized depth of 7 ft. Figure 2 depicts the proposed jetty alignment as well as the channel realignment. This option consists of driving 30 ft lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The stabilization of the sheet pile would be completed by driving 50 ft long treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 12 in. x 12 in. x 32 in. treated timber batter blocks. See Figure 2 and 3 for a depiction of the proposed jetty layout and design.

The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 ft east of the tip of the sand spit and would have a length of 1,770 feet. The existing entrance channel will be realigned to eliminate the turn in the channel to the left after it passes Deep Point and continue into the existing turning basin. The realigned channel will proceed straight through the inlet and intersect the channel section in St. Jerome Creek. The objective of the jetties is to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW. The existing Federal channel within the inlet will be maintained to 7 ft up to its intersection with the county channel (directly west of the northern tip of Deep Point on Figure 2).

It is anticipated that the proposed project will be constructed using hydraulic dredging with placement of the material in the County's dredged material placement site. The proposed design will not require material removal or backfill.

The proposed project would observe time of year restrictions on construction to minimize potential impacts to oysters and wintering waterfowl. No dredging or construction will be performed from 15 November through March 1. No dredging will be performed from 1 June to 30 September to protect oysters.

The proposed project will comply with the Endangered Species Act, and as such, is not expected to have any adverse affect on endangered species. Federally listed endangered species that may be found in the study area are shortnose sturgeon *(Acipenser brevirostrum)* and sea turtles including loggerhead (*Caretta caretta*), Kemp's ridley *(Lepidochelys kempii)*, green (*Chelonia mydas)*, and leatherback (*Dermochelys coriacea)*.

In accordance with the National Environmental Policy Act of 1969, USACE is requesting your agency's comments with respect to endangered species for the proposed project to assist in the preparation of the Environmental Assessment. Please provide any pertinent information within 30 days of receipt of this letter. If you have any questions, please contact Ms. Angie Sowers at angela.sowers@usace.army.mil or (410) 962-7440.

Sincerely,

Amy M. Guise

Encls

Amy M. Guise
Chief, Civil Project Development Branch

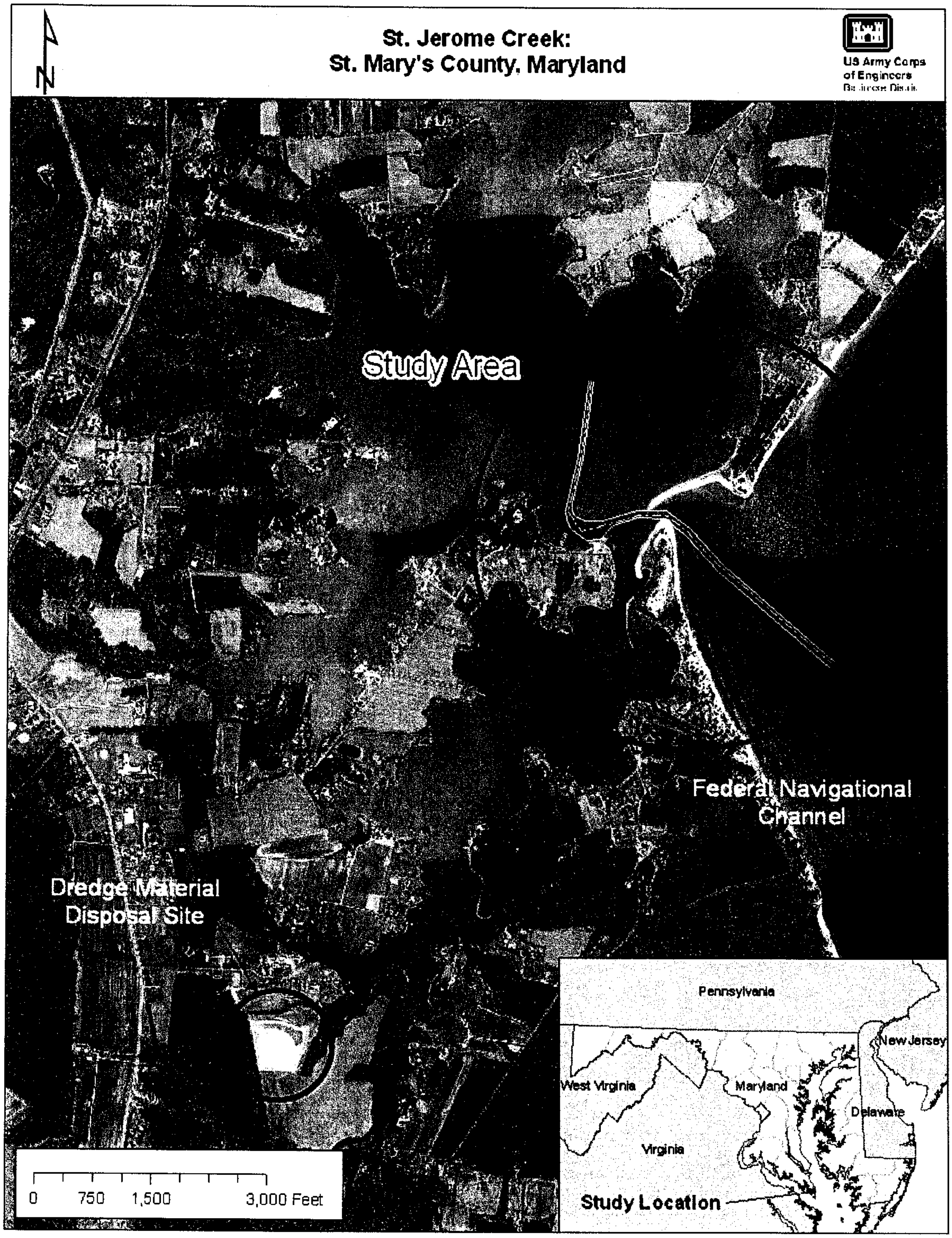


Figure 1: Study Area

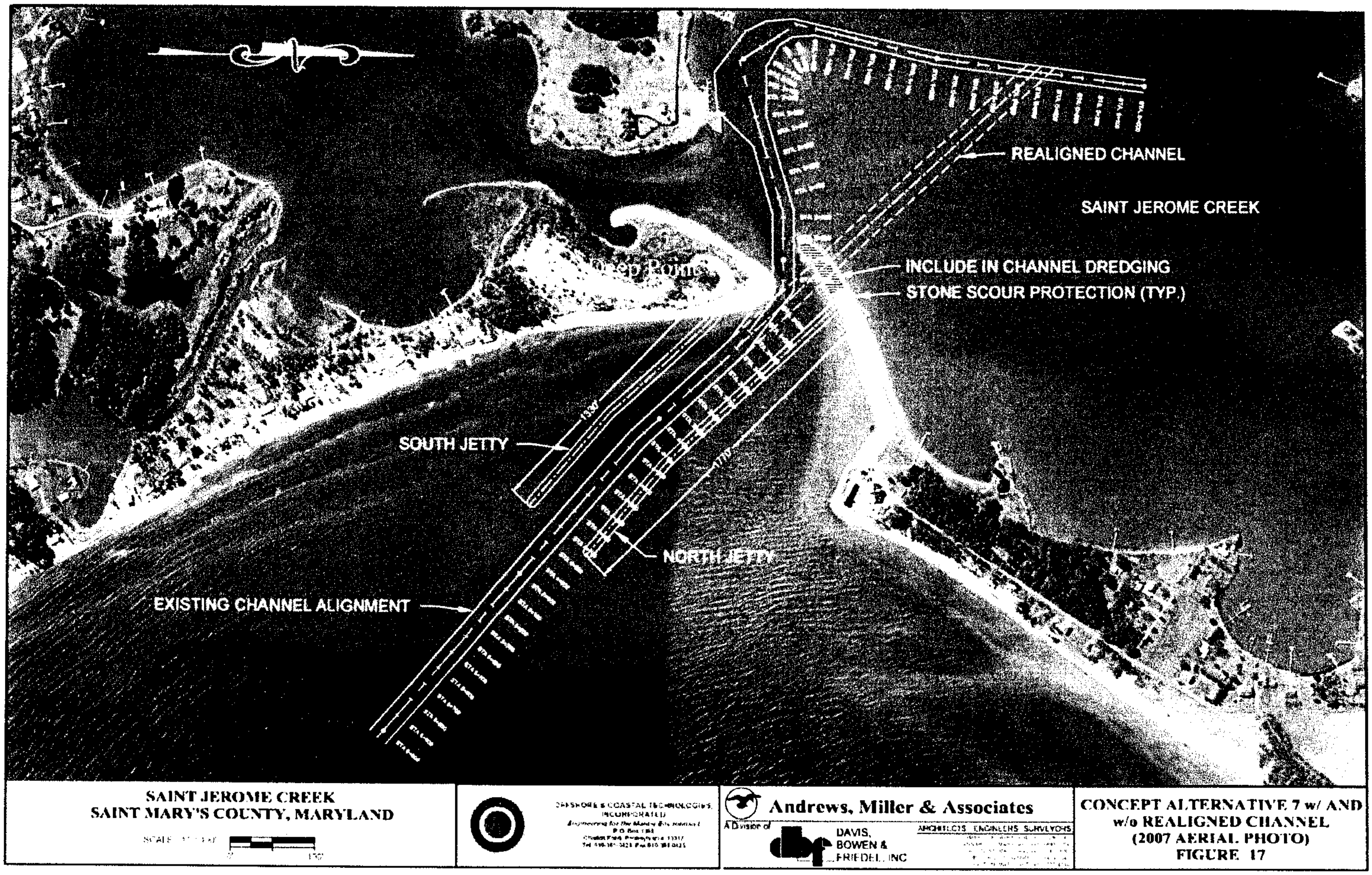


Figure 2: Proposed Project Design

JOB DESCRIPTION ______ SHEET ____ OF ____

SUBJECT ______

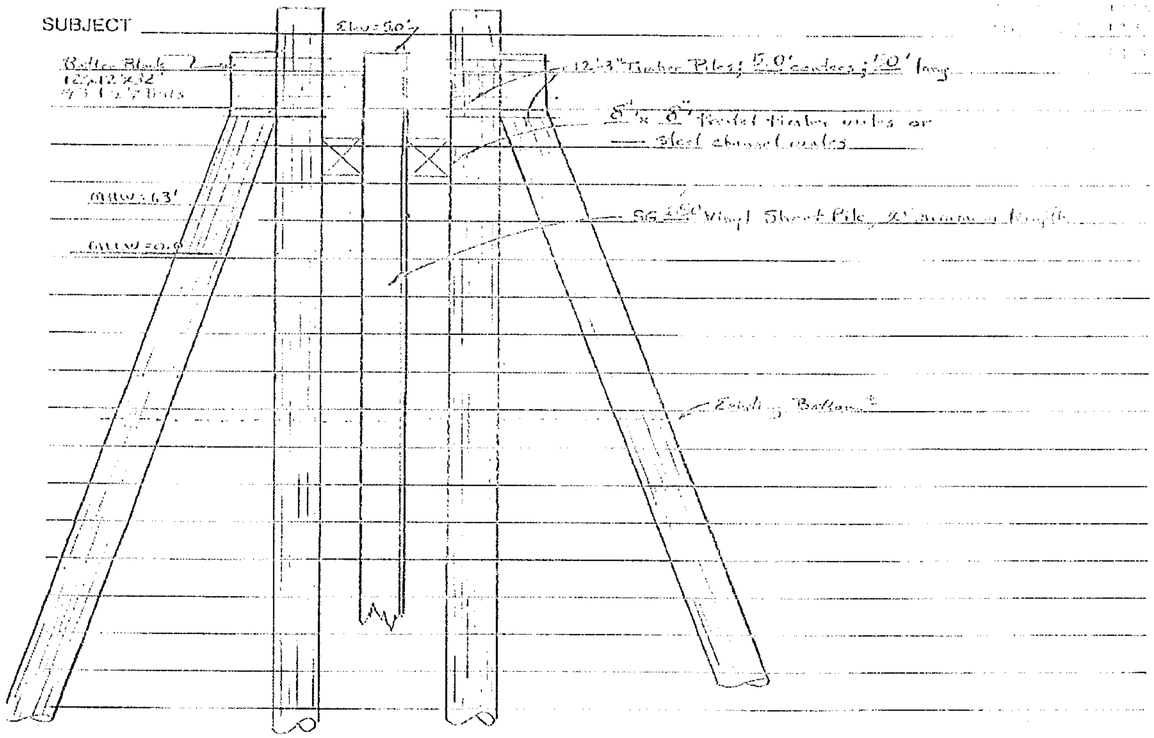


Figure 3: Batter Pile/Vinyl Sheet Pile Jetty Concept Design

From:	Sowers, Angela NAB02
To:	Bruce.Young@md.nacdnet.net
Subject:	St. Jerome Creek
Date:	Tuesday, March 01, 2011 9:12:42 AM
Attachments:	St Jerome Creek Study Area.docx

Dear Mr. Young,

The Baltimore District, U.S. Army Corps of Engineers (USACE) in partnership with St. Marys County has initiated a feasibility study and environmental assessment (EA) to examine the navigation-related problems affecting the local users of St. Jeromes Creek. USACE currently maintains a Federal navigation channel in St. Jerome Creek. See the attached figure for the study area. The scope of this feasibility study involves a detailed investigation to determine the best solution for reducing the rapid rate of siltation occurring in the channel approach to the St Jerome Creek Inlet. The current recommended plan is to construct a dual batter pile/vinyl sheet pile jetty and realign the navigation channel to provide a better flushed system that reduces shoaling. The proposed project includes dredging of the navigation channel to the authorized depth of 7 ft.

Dredging of the current channel was originally authorized by the River and Harbors Act of 1881. Modifications to the project by the River and Harbor Act of August 26, 1937 provided for a channel 7 ft deep and 100 ft wide from deep water in the Chesapeake Bay to Airdale, then 7 ft deep and 60 ft wide to deep water in the creek, with a turning basin of the same depth, 200 ft wide and 300 ft long, opposite Airdale.

Since 2004, the material from maintenance dredging has been placed on an 11-acre site on the Orebaugh farm, approximately 550 feet south of Buzzs Marina Way. This site was previously in crop rotation for soybean production and was selected as a placement site following evaluation by a maintenance dredging EA performed by USACE in 2004. In order to contain the dredged material, a 10 12 ft earthen dike was constructed from material found at the placement site. The site was chosen over another site due to its size and ability to contain the projected maximum need of 60,000 cy of dredged material from one maintenance dredging event. The EA determined that the material to be placed at the site was free from contaminants and consisted of primarily sand.

The 2004 EA identified the location of both Matapeake (MmB2, fine sandy loam, 2-5% slopes moderately) and Mattapex (MuA, silt loam, 0-2% slopes) soil types at the placement site. These soils are listed as prime farmland soils. Othello soil types are also found in the dredged material placement site and are considered farmland of statewide importance (USDA NRCS, 2009). Through coordination of the 2004 EA, the St. Mary's soil conservation district determined that placement of the dredged material would have no impact to future agricultural yields of the site and was in compliance with Prime and Unique Farmlands Executive Order (CEQ Memorandum, 11 August 1980). As of the fall of 2009, the proposed dredged material placement site still contained material from the last dredge cycle (39,675 cy), which took place in 2006. Upon commencement of the proposed jetty construction, it is planned that the material currently held at the placement site would be removed to provide space for the newly dredged material. It is anticipated that the placement area would be in use for approximately one to two years for the dewatering of the dredged material. Upon the completion of this activity, the material would be hauled off-site and the placement area would be regraded. It is expected that this area would be returned to agricultural use.

The prime farmland soils located at the proposed dredged material placement area would be covered with the dredged material from the proposed work, but USACE anticipates the area would ultimately be returned to productive farmland. Although not expected, any reduction in productivity of this agricultural field area could be reversed with application of lime and fertilizer to reach the proper soil chemistry for productive farmland. Use of this site for dredged material placement would be a continuation of the current use of the site and would only extend the length of time that these soils are buried.

We are requesting your concurrence that the proposed project is in compliance with the Prime and Unique Farmlands Executive Order and would provide no further impacts to the prime and unique soils located at the site. If you have any questions, please feel free to contact me at (443) 676-4679.

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF
Planning Division

Ms. Julie Crocker
National Marine Fisheries Service
U.S. Department of Commerce
Protected Resource Division
One Blackburn Drive
Gloucester, MA 01930-2298

Dear Ms. Crocker,

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 et. seq.) requires every Federal agency, in consultation with and with the assistance of the United States Fish and Wildlife Serve (USFWS) and the National Marine Fisheries Service (NMFS), to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The purpose of this letter is to request your review of the ESA Section 7(a)(2) assessment the U.S. Army Corps of Engineers, Baltimore District, has prepared for the proposed St. Jerome Creek Section 107 Small Draft Navigation Project in St. Mary's County, Maryland. A feasibility report with an integrated Environmental Assessment (EA) is currently being prepared.

Section 7(a)(2) consultation was initiated by a Study Initiation Notice provided to USFWS and NMFS as well as a coordination letters submitted to NMFS on February 25, 2011. In a letter dated July 13, 2009, USFWS identified that no federally endangered or threatened species under their purview were present in the project area. A letter dated March 7, 2011, from NMFS identified the presence of shortnose sturgeon (*Acipenser brevirostrum*), and four species of federally threatened and endangered sea turtles. The listed sea turtles are the federally threatened loggerhead (*Caretta caretta*), and the federally endangered Kemp's ridley (*Lepidochelys kempi*), green sea turtles (*Chelonia mydas*), and leatherback sea turtles (*Dermochelys coriacea*).

The District's ESA assessment for the proposed project is enclosed. The District is requesting your occurrence that the proposed project is not likely to adversely affect the listed species or designated critical habitats under your jurisdiction. Please review the enclosed ESA assessment and provide your agency's occurrence or comments within 30 days of the date of this letter.

If you have any questions, please contact Ms. Angie Sowers at (410) 962-7440.

Sincerely,

Amy M. Guise

Amy M. Guise
Chief, Civil Project Development Branch

Enclosure

St. Jerome Creek
Section 107 Shallow Draft Navigation Project
St. Mary's County, Maryland

Endangered Species Act- Section 7 Consultation
August 2011

Prepared By U.S. Army Corps of Engineers

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 et. seq.) requires every Federal agency, in consultation with and with the assistance of the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In pursuant with Section 7(a)(2), the following information is provided to NMFS and USFWS in order to initiate Section 7(a)(2) consultation. This assessment includes:

1. A description of the proposed action;
2. A listing of the species of concern;
3. An analysis of the effects of the proposed action; and,
4. The Federal agency's opinions regarding the effects of the proposed action.

1. DESCRIPTION OF PROPOSED ACTION

The proposed St. Jerome Creek Small Navigation Project would establish two new jetty structures and straighten the course of the existing federal channel to reduce shoaling in the navigation channel. Figure 1 shows the proposed study area. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. Approximately 0.5 ac of this sand pit, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel.

The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative as the Recommended Concept Plan for further evaluation are as follows:

- Most significant decrease in channel shoaling rate
- Longest interval between future maintenance dredging events

- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- Best potential for decreasing the shoaling in the Saint Jerome Creek section of the channel by realigning the channel straight through the inlet
- High sediment storage capacity along the updrift side of the north jetty
- Least potential for sand bypassing from the north shoreline
- Minimal downdrift shoreline erosion potential
- Best protection for the existing shorelines and spits from wave induced erosion

Jetty construction consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile. Figure 2 depicts the proposed jetty and federal channel alignment. Figure 3 shows the batter pile/vinyl pile jetty design.

The existing navigational channel would be dredged, resulting in hydraulic dredging of approximately 1,600 feet to a depth of 7 feet mean lower low water (MLLW) and a width of 100 feet. Approximately 30,000 cubic yards of material removed from the channel would be placed in an approved upland dredge disposal site that has been used for previous maintenance dredging (Figure 1).

Water depths are less than 10 feet (MLLW) in the project area. Salinity just east of the study area in the Chesapeake Bay Mainstem near Point No Point, typically varies between 7.49 and 21.76 parts per thousand (ppt). The mean range of salinity (from 1985 through 2008) is between 15 and 17 ppt (MDNR 2009). Water temperatures have been monitored just east of the Creek and range from roughly 34 degrees Fahrenheit in the winter to 80 degrees Fahrenheit in the summer months. (MDNR 2009).

In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix following dredging. The substrate changes could potentially lead to different organisms colonizing the benthos or may be quickly covered by sand deposition. Further, the sediment substrate would be permanently converted to a jetty within the jetty footprint. This loss of bottom habitat would occur across a distance of 1,330 feet for the south jetty and 1,770 feet for the north jetty. The footprint of the south jetty above the water surface would be 8,313 square feet, and that of the north jetty would be 11,563 square feet; a 0.46 acre area. Depending on water depth, the jetties' width would vary due to driving the timber piles into the bottom at an angle. The maximum width of the jetties at their deepest point is 30 feet resulting in a maximum potential disturbance to 2.13 acres of bottom habitat.

The time of year restriction for the hydraulic dredging activity is June 1 through September 30 and November 15 through March 1, inclusive, to protect oysters and wintering and migrating

Figure 1: Study Area

Figure 2: Proposed Project

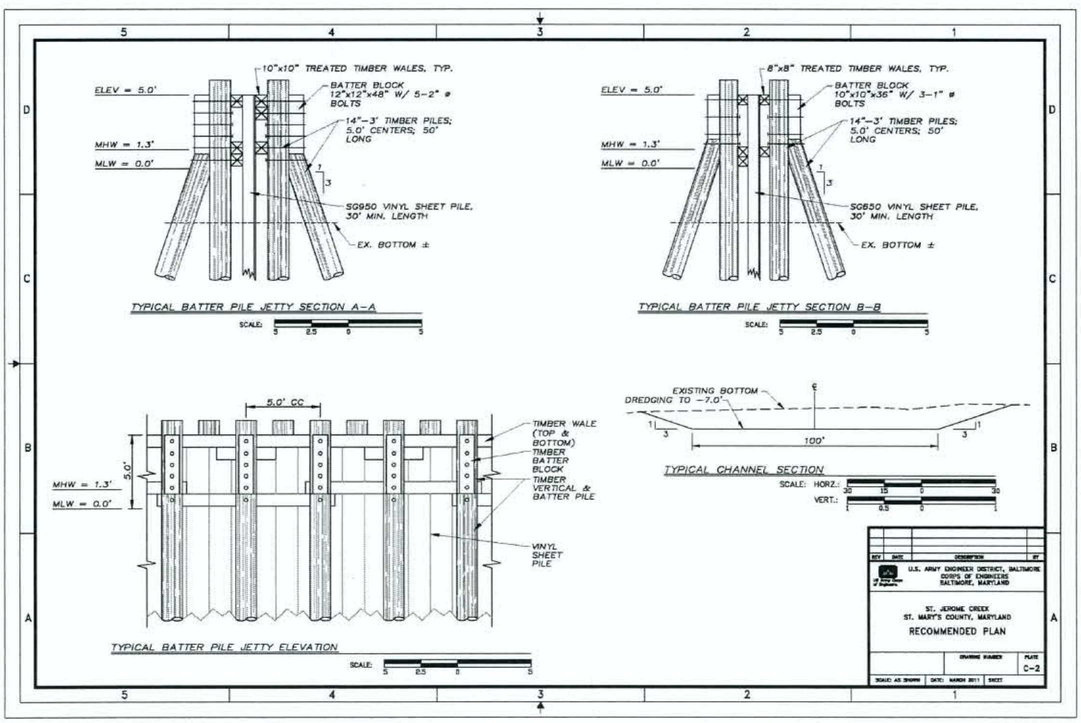


Figure 3: Batter Pile/Vinyl Sheet Pile Jetty

waterfowl. All construction activities would have a time of year restriction where no construction activity should be performed during the period 15 November through 1 March. The regulatory and resource agencies have stated that allowances may be made if necessary. Should an event occur that additional time is needed to finish dredging; USACE would need to make a formal request to agencies for their review.

2. SPECIES OF CONCERN

The National Marine Fisheries Service (NMFS) has indicated that four species of federally threatened and endangered sea turtles may be found in the project area as well as the federally endangered shortnose sturgeon (*Acipenser brevirostrum*). The sea turtles potentially found in the project area are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Federally endangered green sea turtles (*Chelonia mydas*) and federally endangered leatherback sea turtles (*Dermochelys coriacea*) also occur seasonally in the Chesapeake Bay. Figure 4 shows the location of dead sea turtle strandings in the project area in the past 5 years.

Shortnose sturgeon are most prevalent in the upper Chesapeake Bay and within the Potomac River. There is no data to suggest their presence in the project area and none have been documented within St. Jerome Creek. However, there are occasional get reports of shortnose sturgeon near the mouth of the Potomac River, which is adjacent to the project area. Of the 99 shortnose sturgeon reports, four were found at the mouth of the Potomac River site.

Atlantic sturgeon are found throughout the tidal waters of the Chesapeake Bay. There have been 1,664 documented wild Atlantic sturgeon reports and 562 hatchery-origin Atlantic sturgeon reports since 1996. Some of these reports are multiple recaptures of individual fish. Although no wild Atlantic sturgeon have been reported from the mouth of St. Jerome's Creek, there was one hatchery fish reported from that area in 1997 (hatchery fish are not displayed on Figure 5) that was caught in a pound net. Therefore, it is possible that Atlantic sturgeon could be present near the mouth of St. Jerome's Creek. However, it is likely that they are uncommon in the area. The pound net sites are frequently fished every year and if sturgeon were common there would be more reports. The project area does not produce many reward program capture reports.

NMFS is currently reviewing whether Atlantic sturgeon (*Acipenser oxyrinchhus*) should be listed as threatened or endangered under the ESA. On October 6, 2010, NMRS published two rules proposing to list four distinct population segments (DPS) of Atlantic sturgeon as endangered, including one for the Chesapeake Bay. St. Jerome Creek lies within the Atlantic sturgeon's habitat range, but the species has not been documented in the project area (Figure 5).

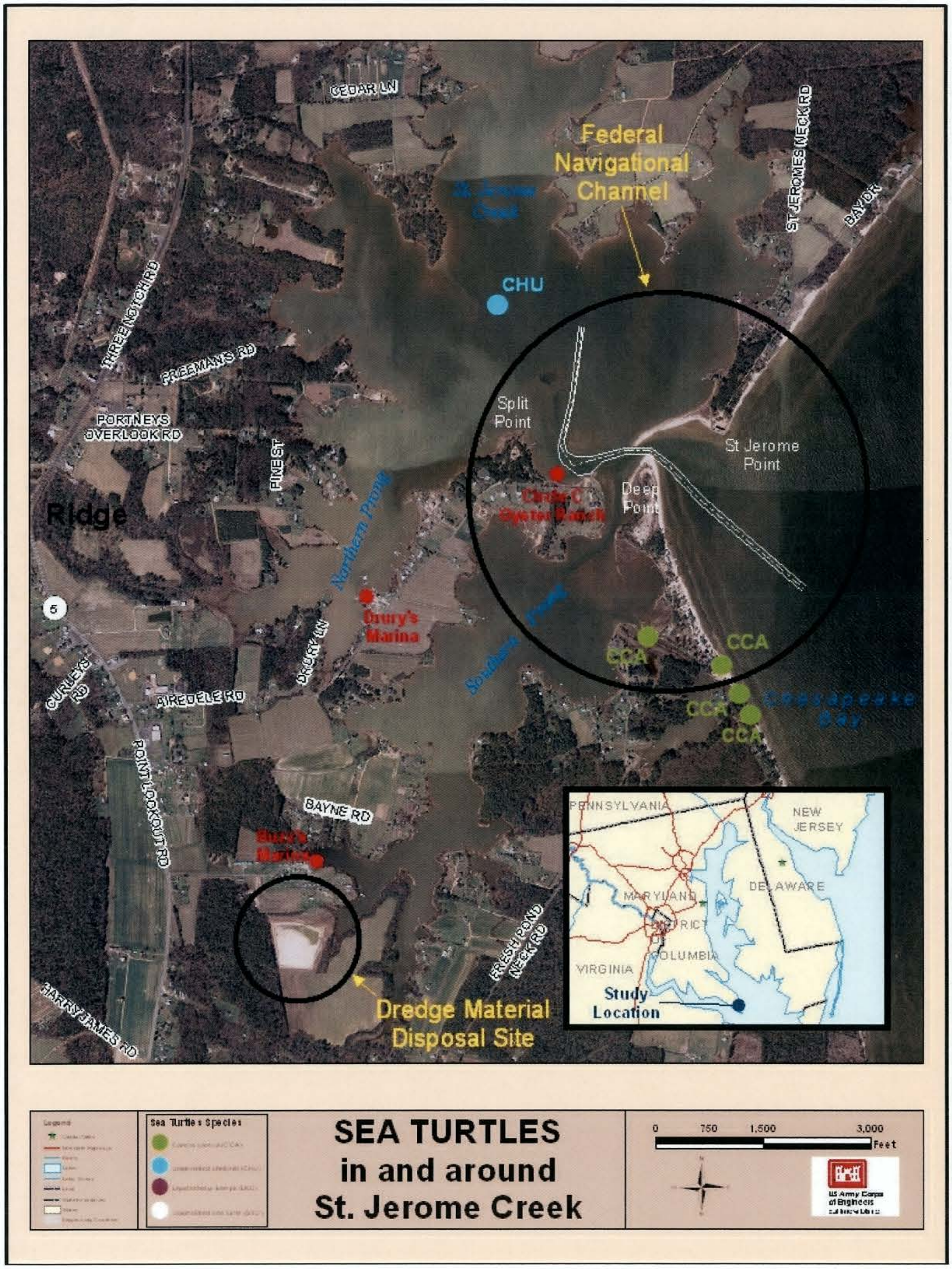


Figure 4 – Sea Turtles

3. AN ANALYSIS OF THE EFFECTS OF THE PROPOSED PROJECT

Ongoing monitoring efforts have identified that is very unlikely that shortnose sturgeon would be in the project area. No impacts are anticipated to shortnose sturgeon.

Sea turtles are transient to the Chesapeake Bay and the project vicinity. Kemp's ridley and loggerhead turtles are the most frequent visitors to the Chesapeake Bay. Leatherback sea turtles typically continue migrating north past the Chesapeake Bay and prefer nesting on the high wave energy beaches of the eastern seaboard. No nesting by sea turtle species has yet been recorded in the Chesapeake Bay (Evans et al. 1997).

Although direct monitoring was not performed as part of the feasibility study, a small number of dead sea turtle strandings have been reported in the vicinity in the past five years with one being in the direct project area. No data on live strandings is available. Sea turtles are migratory individuals that are seasonal transients to the project area. During cooler weather months when construction would occur, sea turtles are unlikely to be present. No negative impacts are expected to sea turtles.

Atlantic sturgeon could be present in the project area, but monitoring suggests that they are not common. Due to the unlikelihood of their presence, no negative impacts are expected to Atlantic sturgeon.

4. THE FEDERAL AGENCY'S OPINION REGARDING THE EFFECTS OF THE PROPOSED ACTION

The shortnose sturgeon and various breeds of endangered sea turtles may be present in the project area. Ongoing monitoring efforts have identified that is very unlikely that shortnose sturgeon would be in the project area. Therefore, no impacts are anticipated to shortnose sturgeon.

Sea turtles are transient to the Chesapeake Bay and the project vicinity. Kemp's ridley and loggerhead turtles are the most frequent visitors to the Chesapeake Bay. Leatherback sea turtles typically continue migrating north past the Chesapeake Bay and prefer nesting on the high wave energy beaches of the eastern seaboard. No nesting by sea turtle species has yet been recorded in the Chesapeake Bay (Evans et al. 1997).

Although direct monitoring was not performed as part of the feasibility study, a small number of dead sea turtle strandings have been reported in the vicinity in the past five years with one being in the direct project area. No data on live strandings is available. Sea turtles are migratory individuals that are seasonal transients to the project area. During cooler weather months when construction would occur, sea turtles are unlikely to be present. No negative impacts are expected to sea turtles.

Atlantic sturgeon could be present in the project area, but monitoring suggests that they are not common. Due to the unlikelihood of their presence, no negative impacts are expected to Atlantic sturgeon.

Correspondence from both the USFWS and MDNR, indicated that neither agency had any Federal or state listed rare, threatened or endangered species, respectfully. Therefore, no impacts are expected to these resources.

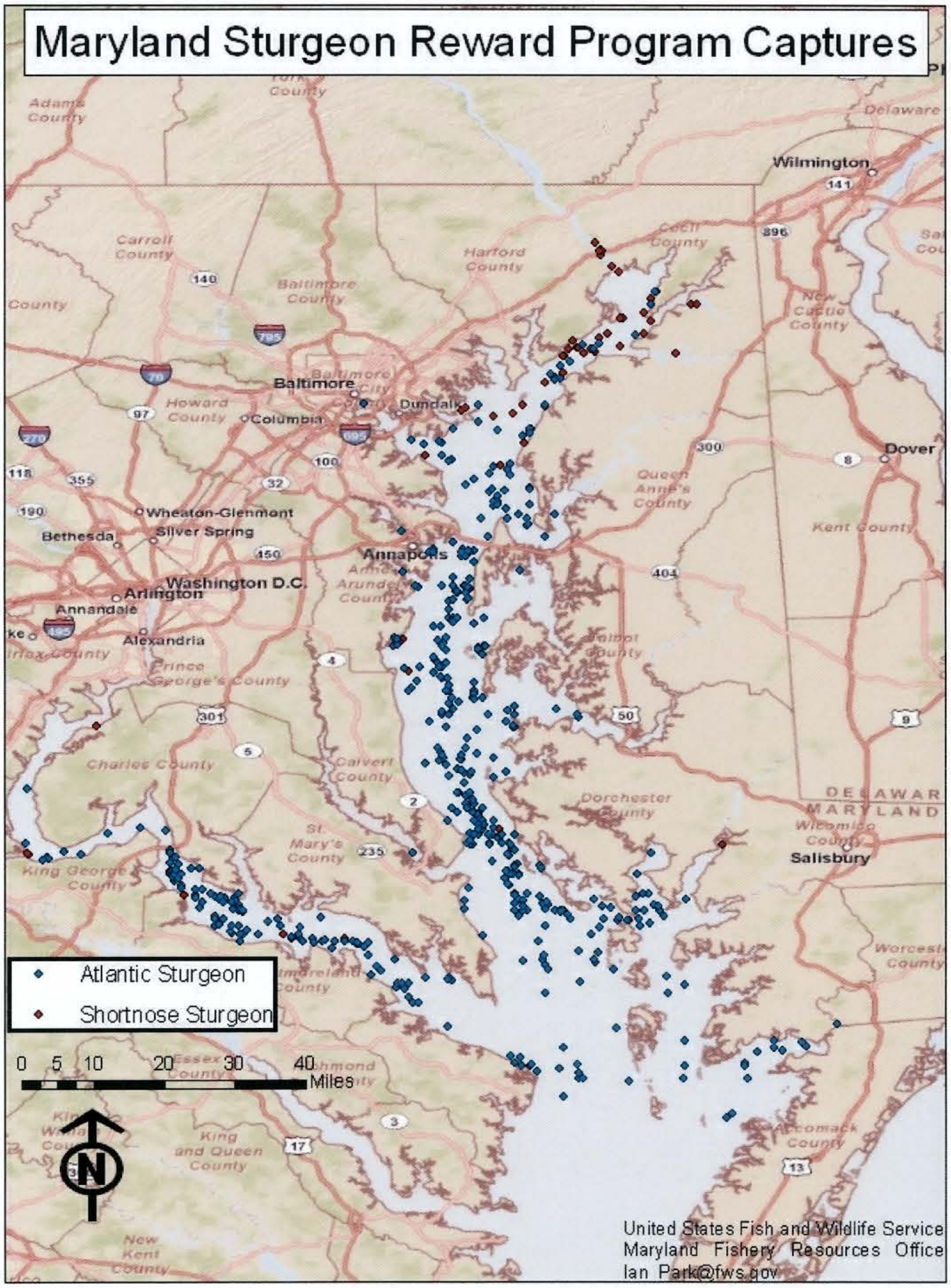


Figure 5 - Maryland Sturgeon Reward Capture Locations
Image provided by DNR.

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF
Planning Division

Mr. John Nichols
National Marine Fisheries Service
Habitat Conservation Division
410 Severn Avenue
Suite 107A
Annapolis, MD 21403

Dear Mr. Nichols:

I am writing to request your review of the Essential Fish Habitat (EFH) Assessment for the St. Jerome Creek Section 107 Small Draft Navigation Project that the Baltimore District is proposing in St. Jerome Creek, St. Mary's County, Maryland. A feasibility report with an integrated Environmental Assessment (EA) is currently being prepared.

In correspondence dated September 17, 2009, the National Marine Fisheries Service (NMFS) recommended using, for Maryland projects, the EFH Designation for the primary tributary closest to the project area, with similar salinity regime. In this case, it is the Potomac River estuary. NMFS also stated that the Maryland bay tributary designations are not accurate relative to the presence of certain federal species, based on species' ecology and salinity tolerances. For the Potomac River designation, only bluefish *(Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), and Spanish mackerel (*Scomberomorus maculatus)* for juvenile and adult life stages, and juvenile red drum (*Sciaenops ocellatus*) are expected to be in the project area of St. Jerome Creek, therefore only these four species are discussed in this EFH assessment.

The District's EFH assessment for the proposed project is enclosed. The District is requesting your concurrence that the proposed project complies with the provisions of the Magnuson-Stevens Fishery Conservation and Management Act, as amended, and as such will not have a substantial adverse effect on essential fish habitat for federally managed species. Please review the enclosed EFH assessment and provide your agency's concurrence or comments within 30 days of the date of this letter.

If you have any questions, please contact Ms. Angie Sowers at (410) 962-7440.

Sincerely,

Amy M. Guise

Amy M. Guise
Chief, Civil Project Development Branch

Enclosure

St. Jerome Creek, St. Mary's County, Maryland
Section 107 Shallow Draft Navigation Project

Essential Fish Habitat Assessment
Prepared by U.S. Army Corps of Engineers, Baltimore District
July 2011

Pursuant to Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, preparation of an Essential Fish Habitat (EFH) Assessment is necessary for the St. Jerome Creek dredging and jetty project at Deep Point and St. Jerome Points, St. Mary's County, Maryland, to address potential impacts to any areas designated as EFH. An EFH Assessment must include the following components:

1. A description of the proposed action,
2. A listing of the life stages of all species with EFH designated in the project area;
3. An analysis of the effect of the proposed action,
4. The Federal agency's opinions regarding the effects of the proposed action, and
5. Proposed mitigation, if applicable.

DESCRIPTION OF PROPOSED ACTION

The proposed St. Jerome Creek Small Navigation Project would establish two new jetty structures and straighten the course of the existing federal channel to reduce shoaling in the navigation channel. Figure 1 shows the proposed study area. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. Approximately 0.5 ac of this sand spit, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel.

The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least down drift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative as the Recommended Concept Plan for further evaluation are as follows:

- Most significant decrease in channel shoaling rate
- Longest interval between future maintenance dredging events
- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- Best potential for decreasing the shoaling in the Saint Jerome Creek section of the channel by realigning the channel straight through the inlet

- High sediment storage capacity along the up drift side of the north jetty
- Least potential for sand bypassing from the north shoreline
- Minimal down drift shoreline erosion potential
- Best protection for the existing shorelines and spits from wave induced erosion

The jetty would be constructed of timber and vinyl sheeting. TimberGuard piles would be incorporated into the design. TimberGuard piles have a treated structural wooden core that are fully encased in a tough polymer sleeve, keeping the treatment in and predators out. There are no nails, banding, or seams. The continuous polymer sleeve also reduces the dissolved oxygen level inside the pile, to prevent any destructive organisms that do get into the wood from being able to survive inside the polymer core.

Jetty construction consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile. Figure 2 depicts the proposed jetty and federal channel alignment. Figure 3 shows the batter pile/vinyl pile jetty design.

The existing navigational channel would be dredged, resulting in hydraulic dredging of approximately 1,600 feet to a depth of 7 feet mean lower low water (MLLW) and a width of 100 feet. A 400 foot spur would remain off the federal channel to the left after it passes Deep Point and continue to the existing Southern Prong channel so that passage is still available into this county channel. The spur would be dredged to 7 feet MLLW and would impact 0.05 ac. Approximately 30,000 cubic yards of material removed from the channel would be placed in an approved upland dredge disposal site that has been used for previous maintenance dredging (Figure 1).

Dredged material is expected to be mostly sand. Dewatering of the dredged material would take place in the upland placement site. The return water from this facility would outfall to Maryland waters and would meet State water quality standards in accordance with water quality certification conditions.

Water depths are less than 10 feet (MLLW) in the project area. Salinity just east of the study area in the Chesapeake Bay mainstem near Point No Point, typically varies between 7.49 and 21.76 parts per thousand (ppt). The mean range of salinity (from 1985 through 2008) is between 15 and 17 ppt (MDNR 2009). Water temperatures have been monitored just east of the Creek and range from roughly 34 degrees Fahrenheit in the winter to 80 degrees Fahrenheit in the summer months. (MDNR October 2009).

In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix following dredging. The substrate changes could potentially lead to different organisms colonizing the benthos or may be quickly covered by sand deposition. Further, the sediment substrate would be permanently converted to a jetty within the jetty footprint. This loss of bottom habitat would occur across a distance of 1,330 feet for the south jetty and 1,770 feet for the north jetty. The footprint of the south jetty above the water surface would be 8,313 square feet, and that of the north jetty would be 11,563 square feet; a 0.46 acre area. Depending on water depth, the jetties' width would vary due to driving the timber piles into the bottom at an angle. The maximum width of the jetties at their deepest point is 30 feet resulting in a maximum potential disturbance to 2.13 acres of bottom habitat.

The time of year restrictions for the hydraulic dredging activity is June 1 through September 30 and November 15 through March 1, inclusive, to protect oysters and wintering and migrating waterfowl. All construction activities would have a time of year restriction where no construction activity should be performed during the period 15 November through 1 March. The regulatory and resource agencies have stated that allowances may be made if necessary. Should an event occur that additional time is needed to finish dredging; USACE would need to make a formal request to agencies for their review.

SPECIES WITH EFH DESIGNATED IN THE PROJECT AREA

In correspondence dated September 17, 2009, the National Marine Fisheries Service (NMFS) recommended using, for Maryland projects, the EFH Designation for the primary tributary closest to the project area, with similar salinity regime. In this case, it is the Potomac River estuary. NMFS also stated that the Maryland bay tributary designations are not accurate relative to the presence of certain federal species, based on species' ecology and salinity tolerances. For the Potomac River designation, only bluefish *(Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), and Spanish mackerel (*Scomberomorus maculatus)* for juvenile and adult life stages, and juvenile red drum (*Sciaenops ocellatus*) are expected to be in the project area of St. Jerome Creek, therefore only these four species are discussed in this EFH assessment.

IMPACTS TO SPECIES WITH EFH DESIGNATED IN THE PROJECT AREA

An analysis of impacts on the species of concern and their EFH follows. The effects of the jetty construction and dredging of the existing navigational channel are evaluated.

In general, it is expected that demersal (bottom-dwelling) species (summer flounder red drum) and would be potentially more affected by the proposed activities than pelagic (water-column) species (bluefish and Spanish mackerel) since the bottom-dwellers would tend to move less during the dredging. However, the time of year that the species are in the Chesapeake Bay will need to be evaluated to determine potential impacts.

The water in the project area is very turbid. Significant increases in nutrient concentrations, such as ammonia, due to dredging activities are not expected. Nutrient levels could be minimally increased in the short-term due to release from bottom sediments as substrates are disturbed by dredging. However, after late March, project activity impacts to nutrient concentrations in the water column are expected to be negligible relative to ambient conditions in the dredging area. Since dredging is expected to occur in the fall and winter, bottom temperatures would still be relatively low (which would inhibit nutrient fluxes). Nutrient releases into the water column that could potentially occur during this period should be limited and not expected to adversely impact sensitive life stages or spawning activities.

1. BLUEFISH (*Pomatomus saltatrix*) (juvenile and adult stages)

In the NOAA/NMFS Technical Memorandum NMFS-NE-144, Essential Fish Habitat Source Document: Bluefish, *Pomatomus saltatrix*, Life History and Habitat Characteristics, juvenile bluefish are rated as abundant in the Chesapeake Bay mainstem MD/VA (i.e., lower Chesapeake). Juvenile and adult bluefish are listed as common for the Chesapeake Bay main stem within the mixing and seawater zones. This EFH assessment relies heavily on that NOAA/NMFS Technical document.

Bluefish are usually found high in the water column. In some years, large numbers of bluefish penetrate far up the Bay; in other years, bluefish schools are sparse, with larger bluefish concentrating in Virginia waters. For juveniles, all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida are considered EFH.

Juvenile and adult bluefish enter the Chesapeake Bay during spring through summer, leaving the Bay in late fall.

Adults – Bluefish are warm water migrants and do not generally occur in Mid-Atlantic estuarine waters at temperatures less than 14 to 16°C (57 to 61°F). Bluefish travel in schools of like-sized individuals and undertake seasonal migrations, moving into the Mid-Atlantic Bight during spring. Adults are uncommon north of Annapolis, and generally do not occur above the U.S. 50 bridge, except during years of greater up-Bay salt wedge encroachment. Adults are not typically bottom feeders and are strong swimmers.

Juveniles - Juveniles tend to concentrate in shoal waters. In contrast to adults, the young have a wide range of salinity tolerance and penetrate much farther up the Bay and its tributaries, where they can be found in shallow waters of very low salinity (Murdy et al., 1997). Therefore, juveniles are more common in the upper Bay above the U.S. 50 Bridge, occurring as far north as the Susquehanna Flats and the lower Elk River (Lippson 1973). Juveniles (including young of the year) begin to depart the Mid-Atlantic estuaries and move into the Atlantic Ocean in October and travel as far south as Cape Hatteras and Florida to overwinter.

Spawning - Spawning is oceanic and does not occur in the Chesapeake Bay. Bluefish spring spawning occurs during the coastal ocean migration from Florida to southern North Carolina, and summer spawning occurs further offshore in the mid-Atlantic.

Prey- Bluefish are voracious predators. Several studies have suggested that juvenile and adult bluefish would eat whatever taxa are locally abundant. They are sight feeders throughout the water column, with smaller individuals feeding on a wide variety of fishes and invertebrates, and with large bluefish feeding almost exclusively on fishes, particularly Atlantic menhaden (*Brevoortia tyrannus*), bay anchovies (*Anchoa mitchelli*), and Atlantic silversides (*Menidia menidia*). Juveniles tend to be opportunistic feeders, foraging on a wide variety of estuarine life in the pelagic zone and over a variety of bottom types (Lippson 1973). Small fish such as Menhaden that bluefish prey upon are widely dispersed across the Bay and do not depend upon the bottom. With respect to prey, there is nothing particularly unique or valuable to bluefish at the project area. Therefore, bluefish prey species should not experience adverse effects on population levels from the proposed project.

Impact on Bluefish- There are no direct impacts expected for adult and juvenile bluefish because the proposed dredging would occur in the fall, when bluefish are overwintering off of the southeastern coast of Florida. Adults are not typically bottom feeders and are strong swimmers that can easily avoid turbid conditions. No impacts are expected because there is sufficient open water habitat outside of the project area during the short construction season and turbidity impacts are expected to be local, minimal, and short-lived. As a transient species, bluefish are expected to be able to avoid any direct, minor construction impacts to water quality if construction would occur in the spring when they are likely to be in the vicinity.

No impacts to spawning, egg or larvae habitat of the bluefish are projected because spawning does not occur in the Chesapeake Bay and eggs and larvae do not occur here.

Impacts to bluefish prey are not anticipated because the young of species such as bay anchovies, menhaden, and silversides, which are found in shallow water areas, would not be in the area during the time the fall construction would occur. If dredging occurs in the spring, these species would be able to move out of the work area. If the jetty construction occurs during the warmer months, these species would be in the project area. However, these prey species are nektonic and they would move out of the area during the work. Further, bluefish have been shown to be voracious predators that would consume whatever prey is available. Therefore, the lack of selectivity shown by bluefish toward their prey should minimize any adverse affects if some prey are forced out of the area by construction activities.

Cumulative impacts: The only other ongoing activity that needs to be considered in the project area is dredging of the Southern Prong county channel. St. Mary's County dredges this channel to maintain passage as needed and as funding is available. This channel shoals approximately 0.6 feet per year. In recent years, dredging has been performed in 1991, 2006, and 2010. Dredging in 2010 was done in spots and removed 950 to 975 cy. If the federal and county channels were dredged in the same year, the impacts discussed previously to water quality, the benthos, and aquatic habitats of St. Jerome Creek could be magnified.

Cumulatively, there are not anticipated to be any significant impacts, either direct or secondary to bluefish populations within the Bay.

2. Summer flounder (*Paralichthys dentatus*) (juvenile and adult stages)

Juvenile and adult summer flounder enter the Chesapeake Bay during spring and early summer, and exit the Bay in fall (Murdy 1997). Juveniles overwinter in tidal creeks. Both adults and juveniles exhibit a marked preference for sandy bottom and/or submerged aquatic vegetation (SAV) beds, particularly areas near shorelines (Murdy 1997). The Magnuson-Stevens Act has identified SAV as a Habitat of Particular Concern for both juvenile and adult summer flounder.

The project area is located within the U.S. Geological Survey Point Lookout, MD, Quadrangle map. There is no documentation of SAV in the Point Lookout Quadrangle. Based on the 2008 SAV survey conducted by the VA Institute of Marine Science for the Maryland Coastal Bay Program, SAV does not exist in the area. In a letter dated June 30, 2009, the USFWS indicated that SAV is not known to exist in the proposed project area. Although no SAV has been documented in the area to date, potential suitable habitat may exist. In the immediate proposed project area, direct wave action from the open water of the Bay and boats, and erosion due to long shore transport may hinder the establishment of SAV habitat.

Adults - Summer flounder adults inhabit shallow coastal and estuarine waters during warmer months. Adults utilize deep channels, ridges, sandbars, and shallow water with sandy bottoms. Summer flounder inhabit the Chesapeake Bay in the summer and move offshore to depths of 120 to 600 feet of water during the fall and winter. Some summer flounder overwinter in the bay. Summer flounder are most common in the lower part of the Bay but are known to occur up to the Gunpowder River.

Juveniles- Juveniles prefer shallow waters. Newly settled juveniles usually occur in estuarine creeks in the winter (January through March). Optimal growth of juveniles occurs in salinities in the 10 to 30 ppt range. High salinity subtidal salt marsh creeks and shallow portions of the bays are the most important nursery areas.

Spawning- Summer flounder are ocean spawners. Spawning occurs during offshore migration from late summer to mid-winter. Larvae and post-larvae drift and migrate inshore, aided by prevailing water currents, and enter the bay during October through May.

Prey- Summer flounder feed mainly on fish, squids, shrimp, and crabs. The summer flounder prefers sandy substrate and is frequently seen near sandy shores, partly buried in the sand.

Impact on Summer Flounder- Adults are not usually present in the bay in the winter except for a few individuals, which may overwinter. Adults prefer sandy substrate that is present at the construction site, however, dredging is planned to occur during the fall when the adults are not likely to be in the region. If dredging should occur in the spring, these species would be able to avoid the work area. As a mobile species, summer flounder are expected to be able to avoid any direct, minor construction impacts to water quality resulting from construction. In the long term, the reduced shoaling and turbidity in the channel from the jetties should benefit summer flounder.

Approximately, 0.46 to 2.13 acres of habitat would be permanently buried by jetty construction. Approximately 30,000 cubic yards of material would be removed to dredge the federal channel to a depth of 7 feet and a width of 100 feet to provide a 1,600 foot channel, impacting 3.67 acres. In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix. The substrate changes could potentially lead to different organisms colonizing the benthos and loss of preferred sandy habitat for summer flounder. These changes could add diversity to the potential prey species of the summer flounder, but may lead to a loss of habitat for the summer flounder.

Eggs do not occur in the project area. Larvae and post-larvae may also be in the water column during the construction season and could be entrained by the dredging activities. Juveniles may be in the project area during construction as they use estuarine creeks in the winter between 10 and 30 ppt. Juveniles prefer submerged aquatic vegetation beds (SAV) and shallow water areas. Although the project area is located in a shallow water area and does have sandy bottom making it possible that juvenile summer flounder may be in the project area. However, St. Jerome Creek does not have the established SAV beds that this species prefers. It is expected that juveniles would be able to swim out of the area and find similar habitat to avoid dredging impacts.

Cumulative Impacts- An adverse impact to juvenile summer flounder and their prey species would occur from this activity as they would be displaced during construction and permanently lose 0.46 to 2.31 ac of open water habitat to jetty construction. The sandy substrate of another 3.67 acres in the federal channel may be altered by dredging. However, since they are able to utilize other habitat during construction and the jetties could diversify the habitat for these prey species, this impact would be minor.

Other activities in the project area were presented in the previous 'Bluefish-Cumulative Impacts' discussion. Cumulatively, there are not anticipated to be any long-term, significant impacts, either direct or secondary to bluefish populations within the Bay. Short-term displacement would be magnified by additional projects in the study area.

3. Spanish mackerel (*Scomberomorus maculatus*) (juvenile and adult life stages)

Spanish mackerel are most abundant from the mouth of the Chesapeake Bay region to south Florida. They prefer polyhaline regions (18-30ppt) of the lower Bay. They live for five to eight years.

Adults- Spanish mackerel are found off the Atlantic coast from the Florida Keys to New York (occasionally as far north as New England) and in the Gulf of Mexico, and prefer temperatures above 68°F. Spanish mackerel is a common visitor to the middle and lower Chesapeake Bay from spring to autumn, sometimes swimming as far north as the mouth of the Patuxent River. Spanish mackerel mostly live in near-shore, open water, moving in schools, but are sometimes found over deep grass beds and reefs, as well as in shallow estuaries. These fish winter off Florida, moving northward to North Carolina in early April and to New York in June. Spanish mackerel return to warm Florida waters later in the year, as waters cool.

Temperature and salinity appear to be the greatest factors affecting their distribution. According to Earll (1883), Spanish mackerel prefer temperatures between 21 and 27°C (70 and 81°F) and are rarely found in temperatures below 18°C (64°F). The Chesapeake Bay Program documents their range extending to 88°F. Spanish mackerel are generally found in salinities ranging from 32 - 36 ppt. Spanish mackerel spend most of their life cycle in the ocean where the environment is more stable and human impact is less severe (Atlantic States Marine Fisheries Commission, 1990).

Juveniles- Juveniles prefer shallower waters.

Spawning- Females spawn by age two, releasing between half a million and 1.5 million eggs. Larvae grow quickly, reaching lengths of 12 to 15 inches in a year. The spawning season is from April to September of each year and occurs off the North Carolina and Virginia coasts.

Prey- Spanish mackerel are mid-level pelagic carnivores, preying primarily on baitfish. They feed on a variety of fish, including herring, menhaden, sardines, mullet, needlefish, and anchovy; shrimp; crabs; and squid. Dolphins and sharks are major predators of Spanish mackerel.

Impacts- There are no direct impacts expected for adult and juvenile Spanish mackerel. Although, their range can extend to the mouth of the Patuxent River, Spanish mackerel are most abundant from the mouth of the Chesapeake Bay region to south Florida; an area that does not include the project area due to salinity and water temperature. Further, the proposed dredging would occur in the fall when Spanish mackerel are overwintering off of the coast of Florida. If found in the project area, adults and juveniles are not typically bottom feeders and are strong swimmers that can easily avoid turbid conditions and move out of the vicinity.

No impacts to spawning, egg or larvae habitat of the Spanish mackerel are anticipated because spawning does not occur in the Chesapeake Bay and eggs and larvae are not present in these waters.

Impacts to Spanish mackerel prey are not anticipated because species such as bay anchovies, menhaden, and sardines, which are found in shallow water areas, would not be in the area during the time the fall dredging would occur. If the construction occurs during the warmer months, these species would be in the project area. However, these prey species are nektonic and they would move out of the area during construction activities. In addition, the jetties could provide additional habitat for the prey species.

Cumulative Impacts- Other activities in the project area were presented in the previous 'Bluefish-Cumulative Impacts' discussion. There are not anticipated to be any significant cumulative impacts, either direct or secondary to Spanish mackerel populations within the Bay.

4. RED DRUM (*Sciaenops ocellatus*) (juvenile)

EFH for red drum includes all of the following habitats to a depth of 50 meters offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh, tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster bars and reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial bars and reefs. The area covered includes Virginia through the Florida Keys (Reagan, 1985).

Adults- Red drum are bottom-feeding fish. Adult red drums are found primarily near the Bay mouth. The project area is located near the northern limit of their Bay habitat. Adults are found in SAV beds and on mud bottoms.

Juveniles- Juveniles occur throughout Chesapeake Bay from September to November, but prefer grassy (SAV) or mud bottoms.

Spawning – Spawning is oceanic.

Prey - Red drum prey includes crabs, shrimp and fish..

Impact on Red Drum- Adults are unlikely to be present in high numbers in the project area as red drum are found primarily near the Bay mouth. The project area is located near the northern limit of their Bay habitat. If present, the projected construction period (October 1 to November 14 or March 15 to May 31) would minimally coincide with the period when red drum are prevalent in the Bay (May to November). As transient species, adult red drum would be able to avoid the disrupted area and find comparable habitat in the nearby vicinity. No impacts would occur to eggs and larvae because spawning occurs in warm ocean waters in the spring.

Juveniles prefer SAV beds or muddy bottom and shallow water in the summer. Although the project area is located in shallow water there are no established SAV beds in the area, and bottom substrates are sand. The project is proposed to take place in the fall to reduce the likelihood that individuals would be in the project area.

No negative impacts to prey are expected as the species either would not be present during fall construction or would be able to move from the area to avoid impacts. The jetties could provide habitat for red drum prey species.

Cumulative Impacts- Other activities in the project area were presented in the previous 'Bluefish-Cumulative Impacts' discussion. There are not anticipated to be any significant cumulative impacts, either direct or secondary to red drum populations within the Bay.

FEDERAL AGENCY'S OPINION ON PROJECT IMPACTS TO EFH

The proposed dredging and construction of the jetties and realignment of the federal channel is not likely to significantly affect the subject EFH species if the construction activities occur in the fall as these species largely migrate from the project area in cooler months. There are not expected to be any impacts to spawning of the subject EFH species either because the work would not be performed during the species' spawning season or spawning does not occur within the Chesapeake Bay. Turbidity levels in the project vicinity are expected to be elevated for a short time during and after the dredging event due to dredging as well as the operation of tug and barge traffic in the relatively shallow waters. The deepening of the channel and construction of the jetties would diminish the turbidity levels over the long term by decreasing shoaling rates and reducing/eliminating boat propeller scouring of the bottom.

The greatest potential impact is to juvenile summer flounder. Juvenile summer flounder and their prey may be present and would be impacted by the loss of sandy bottom habitat for the jetty construction and channel dredging. Larvae and post-larvae may also be in the water column during the construction season and could be entrained by the dredging activities. Adult summer flounder are not likely to be in the area in the fall. Spanish mackerel and red drum are least likely to be in the project area as these species is most abundant from the mouth of the Chesapeake Bay region to south Florida. Bluefish are pelagic, strong swimmers that would be able to leave the area for similar habitat. As they are voracious predators on a variety of prey, construction is not anticipated to have a significant effect on their prey.

Temporary and minor adverse effect on the EFH for bluefish, summer flounder, and red drum, as well as their prey species, would occur if construction activities occur in the spring. There would be a short-term, local increase in turbidity in the project area resulting from construction that could be sufficient to temporarily diminish phytoplankton communities. Due to entrainment, it is anticipated that there would be temporary negative impacts to the phytoplankton and during the dredging operations. A temporary loss of benthic invertebrates (prey species) would occur during construction. It is expected that there are ample invertebrates in the surrounding substrates to facilitate recolonization of the project area.

These species would be displaced during construction and permanently lose 0.46 to 2.31 acres of open water habitat to jetty construction. The dredging and realignment of the federal channel would deepen approximately 3.67 acres of sandy habitat, of which some would be converted to clay or silt/sand mix. However, impacts are anticipated to be minor since they are mobile, the habitat lost is not rare or uncommon in the project area, and the species are able to utilize other habitats during construction. In the worse case this area would be unavailable to these fish species for one season. After the work has been completed it is expected that the area would again be available to these fish species. Further, following construction, the hard substrate of the jetties could provide structure to the open water habitat.

The jetty construction may have minor adverse effect on summer flounder and red drum and their EFH since they are bottom feeders. With the construction of the jetties, there would be a loss of approximately 0.46 to 2.13 acres of bottom habitat. This would be replaced with the jetty structure. The red drum may be able to adjust to using this area to feed since they are known to feed off of rocks and pilings.

MITIGATION

The project would adhere to the time of year restriction defined by MDNR which would preclude or minimize impacts to bluefish, summer flounder, Spanish mackerel and red drum. No other mitigation measures are proposed since the proposed project would not have significant adverse effects on these species or their prey species and their EFH.

REFERENCES

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NOAA Technical Memorandum NMFS-NE-144. September 1999. Essential Fish Habitat Source Document: Bluefish, *Pomatomus saltatrix*, Life History and Habitat Characteristics. U.S. Department of Commerce, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

NOAA Technical Memorandum NMFS-NE-151. September 1999. Essential Fish Habitat Source Document: Summer Flounder, *Paralichthys dentatus*, Life History and Habitat Characteristics. U.S. Department of Commerce, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Figure 1: Study Area

Figure 2: Proposed Project

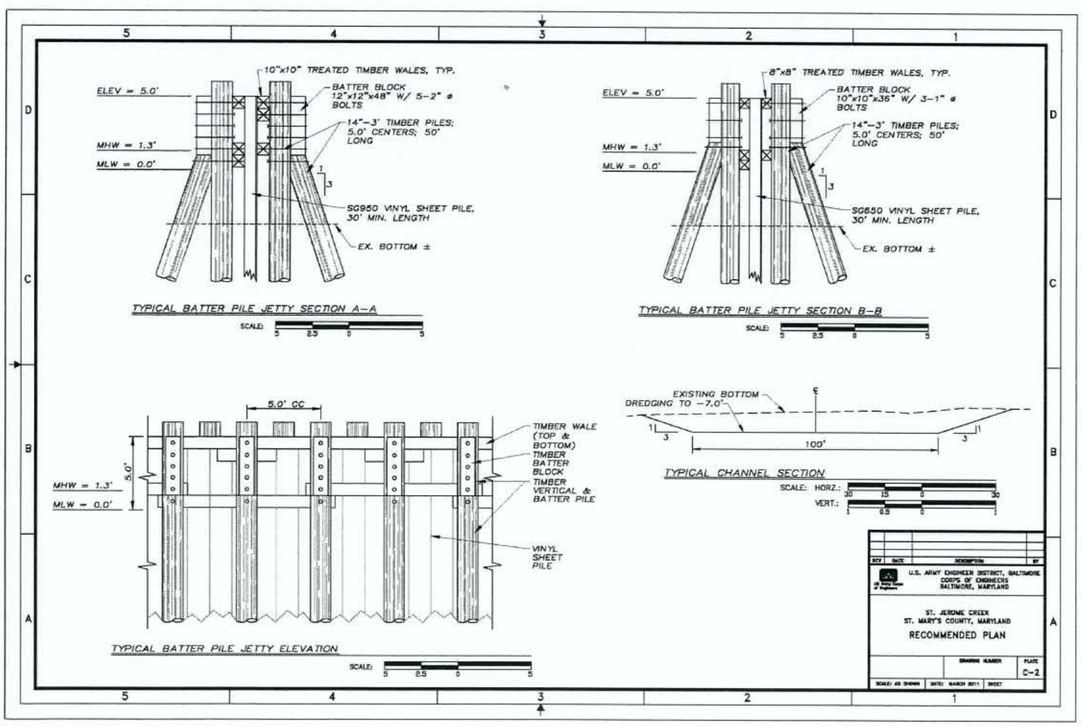

Figure 3: Batter Pile/Vinyl Sheet Pile Jetty

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

MAR - 7 2011

Amy Guise, Chief
Department of the Army
Baltimore District, Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715
Attn: Civil Project Development Branch

Re: St. Jerome Creek

Dear Ms. Guise,

This is in response to your letter dated February 25, 2011, informing NOAA's National Marine Fisheries Service (NMFS) that the U.S. Army Corps of Engineers (Corps), Baltimore District has initiated a feasibility study to examine the navigation related problems affecting St. Jerome Creek, which flows into the Chesapeake Bay. The scope of the feasibility study involved an investigation to determine the best solution for reducing the rapid rate of siltation occurring in the channel approach to St. Jerome Creek Inlet. The current recommended plan is to construct a dual batter pile/vinyl sheet pile jetty at the entrance of the St. Jerome Creek (i.e., within the Chesapeake Bay) and realign the navigation channel via hydraulic dredging (i.e., dredging would occur within the Chesapeake Bay and St. Jerome Creek). The Corps seeks technical assistance regarding whether any species listed as threatened or endangered by NMFS will be affected by the proposed project.

Sea Turtles
Four species of federally threatened or endangered sea turtles under the jurisdiction of NMFS occur seasonally in the Chesapeake Bay and as such, may also occur in St. Jerome Creek. Sea turtles are expected to be in the Chesapeake Bay in the warmer months when water temperatures are greater than 11°C, typically from mid-April through late November. The sea turtles in these waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Federally endangered green sea turtles (*Chelonia mydas*) and federally endangered leatherback sea turtles (*Dermochelys coriacea*) also occur in the Cheapeake Bay in the April – November time period.

Shortnose Sturgeon
The federally endangered shortnose sturgeon (*Acipenser brevirostrum*) is known to be present in the Chesapeake Bay, although no shortnose sturgeon have been documented within St. Jerome Creek. The current abundance of shortnose sturgeon in the Chesapeake Bay is unknown and

there is limited data available regarding distribution and no information available on shortnose sturgeon foraging and overwintering in the Chesapeake Bay. The United States Fish and Wildlife Service (USFWS) and Maryland Department of Natural Resources (MD DNR) jointly implemented a sturgeon reward program in 1996. The program was aimed at collecting data on Atlantic sturgeon incidentally caught in commercial fisheries in the Bay. In the first year of the program, two shortnose sturgeon were captured and identified. As of November 30, 2008, a total of 80 individual shortnose sturgeon have been captured in the Chesapeake Bay and its tributaries; an additional three were recaptures. Most of the shortnose sturgeon documented in the reward program have been caught in the upper Bay, from Kent Island to the mouth of the Susquehanna River and the C&D Canal; in Fishing Bay and around Hoopers Island in the middle Bay; and in the Potomac River (Skjeveland et al. 2000; Litwiler 2001; Welsh et al. 2002).

There is no available information that shortnose sturgeon spawn in Chesapeake Bay. Research on other shortnose sturgeon populations indicates that this species typically spawns just below the limit of upstream passage, often the fall line (Kynard 1997). Several Chesapeake Bay tributaries, such as the Potomac River, have habitat characteristics such as cobble/gravel substrate and areas of high flow that may be suitable for spawning. Shortnose sturgeon have been documented in the Potomac River (Kynard et al. 1997; Kynard et al. 2009), the Susquehanna River (USFWS Reward Program April 4, 1996; April 24, 1997; April 28, 1998; February 19, 1999; February 6 and 17, 2001; June 2, 2002) and near the mouth of the Rappahannock River (USFWS Reward Program May 1998); however, no spawning activity has been documented in any of these tributaries to the Chesapeake Bay.

As listed species are likely to be present in the action area of this project, a consultation, pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, may be necessary. The Corps will be responsible for determining whether the proposed action is likely to affect listed species. When project plans are complete, the Corps should submit their determination of effects, along with justification for the determination, and a request for concurrence to the attention of the Section 7 Coordinator, NMFS, Northeast Regional Office, Protected Resources Division, 55 Great Republic Drive, Gloucester, MA 01930. After reviewing this information, NMFS would then be able to conduct a consultation under section 7 of the ESA.

Technical Assistance for the proposed Chesapeake Bay DPS of Atlantic sturgeon

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus)* are known to occur in the Chesapeake Bay. In 2005, NMFS initiated a status review for Atlantic sturgeon to determine if listing as threatened or endangered under the Endangered Species Act (ESA) is warranted. The Status Review Report was completed in February 2007[1]. On October 6, 2010, NMFS published two rules proposing to list four distinct population segments (DPS) of Atlantic sturgeon as endangered (i.e., New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS as threatened (Gulf of Maine DPS) under the ESA (75 FR 61872; 75 FR 61904). The Chesapeake Bay DPS of Atlantic sturgeon includes the following: all anadromous Atlantic sturgeon whose range occurs in watersheds that drain into the Chesapeake Bay and into coastal waters from the Delaware-Maryland Border on Fenwick Island to Cape Henry, Virginia, as well as wherever these fish occur in coastal bays, estuaries, and the marine environment from the Bay of Fundy, Canada to

[1] *http://www.nero.noaa.gov/prot_res/CandidateSpeciesProgram/AtlSturgeonStatusReviewReport.pdf*

the Saint Johns River, Florida. Within this range, Atlantic sturgeon have been documented in the following rivers: James, York, Potomac, Rappahannock, Pocomoke, Choptank, Little Choptank, Patapsco, Nanticoke, Honga, and South. Additionally, Atlantic sturgeon have been documented within the Susquehanna Flats. The James River is the only known spawning river for the Chesapeake DPS, although spawning is suspected to occur in the York River.

As the listing status for this species may change, NMFS recommends updated status information is obtained from NMFS prior to the submission of any permit applications. NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on Atlantic sturgeon from any proposed project. Please note that once a species is proposed for listing, under the conference provisions of 50 CFR §402.10, federal agencies shall confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat.

Should you have any questions about these comments or about the section 7 consultation process in general, please contact Danielle Palmer at (978)282-8468 or by e-mail (Danielle.Palmer@noaa.gov).

Sincerely,

Mary Colligan

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

EC: Palmer, NMFS/NER
Nichols, NMFS/HCD

File Code: Sec 7 Tech Assist 2011-St. Jerome Creek, MD
PCTS: T/NER/2011/00706

From:	Young, Bruce - Leonardtown, MD
To:	Sowers, Angela NAB02
Subject:	RE: St. Jerome Creek
Date:	Monday, April 04, 2011 9:03:33 AM

Dear Ms. Sowers,

I concur with your assessment that no additional impacts will occur to the prime and unique soils impacted by the proposed dredge spoils disposal activity.

Please contact me if you have any additional questions.

Bruce Young
District Manager
St. Mary's Soil Conservation District
26737 Radio Station Way
Leonardtown, MD 20650
301-475-8402 ext. 3

www.stmarysscd.com <http://www.stmarysscd.com/>

From: Sowers, Angela NAB02 [mailto:Angela.Sowers@usace.army.mil]
Sent: Tuesday, March 01, 2011 9:13 AM
To: Young, Bruce - Leonardtown, MD
Subject: St. Jerome Creek

Dear Mr. Young,

The Baltimore District, U.S. Army Corps of Engineers (USACE) in partnership with St. Mary's County has initiated a feasibility study and environmental assessment (EA) to examine the navigation-related problems affecting the local users of St. Jerome's Creek. USACE currently maintains a Federal navigation channel in St. Jerome Creek. See the attached figure for the study area. The scope of this feasibility study involves a detailed investigation to determine the best solution for reducing the rapid rate of siltation occurring in the channel approach to the St Jerome Creek Inlet. The current recommended plan is to construct a dual batter pile/vinyl sheet pile jetty and realign the navigation channel to provide a better flushed system that reduces shoaling. The proposed project includes dredging of the navigation channel to the authorized depth of 7 ft.

Dredging of the current channel was originally authorized by the River and Harbors Act of 1881. Modifications to the project by the River and Harbor Act of August 26, 1937 provided for a channel 7 ft deep and 100 ft wide from deep water in the Chesapeake Bay to Airdale, then 7 ft deep and 60 ft wide to deep water in the creek, with a turning basin of the same depth, 200 ft wide and 300 ft long, opposite Airdale.

Since 2004, the material from maintenance dredging has been placed on an 11-acre site on the Orebaugh farm, approximately 550 feet south of Buzz's Marina Way. This site was previously in crop rotation for soybean production and was selected as a placement site following evaluation by a maintenance dredging EA performed by USACE in 2004. In order to contain the dredged material, a 10 – 12 ft earthen dike was constructed from material found at the placement site. The site was chosen over another site due to its size and ability to contain the projected maximum need of 60,000 cy of dredged material from one maintenance dredging event. The EA determined that the material to be placed at the site was free from contaminants and consisted of primarily sand.

The 2004 EA identified the location of both Matapeake (MmB2, fine sandy loam, 2-5% slopes moderately) and Mattapex (MuA, silt loam, 0-2% slopes) soil types at the placement site. These soils are listed as prime farmland soils. Othello soil types are also found in the dredged material placement site and are considered farmland of statewide importance (USDA NRCS, 2009). Through coordination of the 2004 EA, the St. Mary's soil conservation district determined that placement of the dredged material would have no impact to future agricultural yields of the site and was in compliance with Prime and Unique Farmlands Executive Order (CEQ Memorandum, 11 August 1980). As of the fall of 2009, the proposed dredged material placement site still contained material from the last dredge cycle (39,675 cy), which took place in 2006. Upon commencement of the proposed jetty construction, it is planned that the material currently held at the placement site would be removed to provide space for the newly dredged material. It is anticipated that the placement area would be in use for approximately one to two years for the dewatering of the dredged material. Upon the completion of this activity, the material would be hauled off-site and the placement area would be regraded. It is expected that this area would be returned to agricultural use.

The prime farmland soils located at the proposed dredged material placement area would be covered with the dredged material from the proposed work, but USACE anticipates the area would ultimately be returned to productive farmland. Although not expected, any reduction in productivity of this agricultural field area could be reversed with application of lime and fertilizer to reach the proper soil chemistry for productive farmland. Use of this site for dredged material placement would be a continuation of the current use of the site and would only extend the length of time that these soils are buried.

We are requesting your concurrence that the proposed project is in compliance with the Prime and Unique Farmlands Executive Order and would provide no further impacts to the prime and unique soils located at the site. If you have any questions, please feel free to contact me at (443) 676-4679.

Sincerely,
Angie Sowers

U.S. Army Corps of Engineers, Baltimore District
Civil Project Development Branch
Integrated Water Resource Management Specialist

Clark, Anthony A NAB02

From: Watson, Scott C NAB02
Sent: Friday, August 05, 2011 2:03 PM
To: Clark, Anthony A NAB02
Subject: FW: St. Jerome's Creek (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Tony-

Response from the MHT regarding St. Jerome's Creek, recommending survey.

Scott

-----Original Message-----
From: B Cole [mailto:BCole@mdp.state.md.us]
Sent: Friday, August 05, 2011 1:58 PM
To: Watson, Scott C NAB02
Cc: T Nowak
Subject: RE: St. Jerome's Creek (UNCLASSIFIED)

Hi Scott,

Thank you for your recent inquiry requesting our recommendations regarding whether or not underwater archeological investigations are warranted for the proposed St. Jerome's Creek project.

Trust underwater staff reviewed the information provided by the Corps. In our opinion, the area in question has a high potential for containing National Register eligible historic shipwrecks and prehistoric archaeological sites. Archaeological investigations of the new channel cut, spur channel, and the jetty footprints are warranted in order to identify whether the project areas include NR eligible archeological sites that may be impacted by the undertaking.

We have little information regarding the prehistoric sites and the earliest historic occupations of St. Jerome Creek. A number of shipwrecks could exist in the vicinity of St. Jerome's Creek including Cato and Hawk, (two ships that are important to the history of Maryland during the American Revolution that ran aground between Cedar Point and St. Jerome's Creek during 1782) and the schooners Janes A. Parsons (built 1860, lost 1918) and George W. Krebs (built 1852; lost 1909).

Thus, we recommended that the Corps complete Phase I submerged archeological investigations of the project's area of potential effects. The survey should be performed by a qualified archeologist and conducted in accordance with the Trust's "Standards and Guidelines." The level of effort should include electronic remote sensing survey employing magnetometer, high resolution side scan sonar and sub-bottom profiling systems in all areas of expected bottom disturbance. Survey transects should be spaced at intervals not to exceed 15 m (50 ft) and magnetometer sensor height should not exceed 6 m (20 ft). Please consult with the Trust prior to implementing the survey work, to ensure an appropriate level of work is completed to fulfill your project requirements.

If you have questions or need further information regarding the underwater investigations, please contact Troy Nowak, Assistant State Underwater Archaeologist, (410) 514-7668 /

TNowak@mdp.state.md.us. Although Troy is out in the field on multiple projects right now, he is checking email regularly and will get back to you as soon as he can.

Let me know if you have further questions. Have a great weekend,

Beth

Beth Cole
Administrator, Project Review & Compliance Maryland Historical Trust 100 Community Place
Crownsville, MD 21032
410-514-7631
410-987-4071 (fax)
bcole@mdp.state.md.us
http://mht.maryland.gov
Please consider the environment before printing.

-----Original Message-----
From: Watson, Scott C NAB02 [mailto:SCOTT.C.WATSON@usace.army.mil]
Sent: Thursday, July 21, 2011 10:29 AM
To: B Cole
Subject: St. Jerome's Creek (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Good morning Beth-

As you requested at our meeting here last month, I'm sending electronic copies of the St. Jerome's Creek dredging information, including the proposed plan, a map of the historic shoreline, and a bathymetric map of the project area.

We are interested in your office's opinion of the level of investigation for submerged resources you would expect for the section of new channel that has never been dredged.

I understand that this is the busy time of year for your marine folks, but if they can take a quick look at this we'd appreciate it.

Thanks,

Scott

Scott C. Watson
Cultural Resource Program Manager
U.S. Army Corps of Engineers, Baltimore District P.O. Box 1715 Baltimore, MD 21203-1715
(410) 962-9500
(410) 962-2948 (Fax)

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

OCT - 6 2011

Amy Guise, Chief
Department of the Army
Baltimore District, Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715
Attn: Planning Division

Re: St. Jerome Creek

Dear Ms. Guise,

Your letter of August 29, 2011, regarding the St. Jerome Creek Small Navigation Project, requested our concurrence with your preliminary determination that the project is not likely to adversely affect any species listed as threatened or endangered under the Endangered Species Act (ESA). Based on information provided to us on August 29, 2011, and additional information provided on September 22, 2011, and September 26, 2011, we have conducted a consultation in accordance with Section 7 of the ESA of 1973, as amended. We concur with your determination. Our supporting analysis is provided below.

Proposed Action

The proposed St. Jerome Creek Small Navigation Project proposes to undertake the following activities:

- Establish two new jetty structures at the entrance of St. Jerome Creek, Maryland: The entrance channel to St. Jerome Creek is border to the north by St. Jerome Point and to the south by Deep Point. The south jetty will connect to the shoreline approximately 200-feet south of the northern tip of Deep Point and will extend approximately 1,330-feet into the Chesapeake Bay. The north jetty will connect to the shoreline about 250-feet east of the tip of the sand pit on St. Jerome Point and will extend approximately 1,770-feet into the Chesapeake Bay. Approximately 0.5 acres of this sand pit, along 300-feet of the St. Jerome Point shoreline, will be removed for construction of the north jetty and realignment of the channel (see below).

  Jetty construction will consist of driving 30-foot length intervals of vinyl sheeting into the bottom along the proposed jetty alignments. To provide stabilization of the vinyl sheets, 14" diameter timber piles and batter piles will also be driven at 5-foot intervals on each side of the vinyl sheeting. Initially, timber batter piles, followed by vertical timber piles, will be installed along one side of the jetty. Timber batter blocks and horizontal wales will be used to secure the vertical and batter piles together. Once the timber piles have been installed on the one side of the jetty, vinyl sheeting will be driven into place and secured to the timber piles, via wales. Once the vinyl sheeting has been installed, the remaining vertical and batter timber piles, that comprise the opposite side of the jetty, will be installed.

Using barge mounted vibratory or hydraulic hammers, approximately 1,064 timber piles will be driven to support the south jetty and approximately 1,416 timber piles will be driven to support the north jetty. All pile driving activities will be undertaken from March 2nd to November 14th of any calendar year.

- Straighten the course of an existing federal channel: The federal channel proposed for straightening extends from St. Jerome Creek into the Chesapeake Bay. Approximately 1,600 feet of the channel, which will include the 0.5 acre sand pit noted above, will be dredged, via a hydraulic dredge, with approximately 30,000 cubic yards of material removed. The area will be dredged to a depth of 7-feet below the plane of mean low water and a width of 100 feet. Dredged material will be placed at an approved upland dredged disposal site. Dredging operations will not be permitted to occur from June 1st through September 30th and November 15th through March 1st of any calendar year. Maintenance dredging is projected to occur every ten years, although the amount of material to be removed per event is unknown at this time. Material will be placed at the same site.

NMFS Listed Species in the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR§402.02). For this project, the action area includes the project footprint as well as the underwater area where effects of dredging and pile installation (e.g., increase in suspended sediment, underwater noise levels) will be experienced. Analysis of pile driving activities (i.e., the type and size of the piles to be driven), indicates that effects of increased under water noise will be experienced from a 10-1,000 meter radius of the pile to be driven (Illingworth and Rodkin, Inc. and Jones and Stoke 2009). Based on analysis of hydraulic dredging activities (ACOE 1983), increased sediment levels are likely to be present for no more than 1000-feet downstream of the dredge area. As such, the action area is considered to be that area within St. Jerome Creek and the Chesapeake Bay located within a 1000-foot radius from the area to be dredged and within a 10-1,000 meter radius of the pile being driven. This area is expected to encompass all of the effects of the proposed project.

Sea Turtles

Four species of federally threatened or endangered sea turtles under the jurisdiction of NMFS occur seasonally in the Chesapeake Bay, although no sea turtles have been documented within Fishing Creek. Sea turtles are expected to be in the Chesapeake Bay in the warmer months when water temperatures are greater than 11°C, typically from mid-April through late November. The sea turtles in these waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*)[1] followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Federally endangered green sea turtles (*Chelonia mydas*) and federally endangered leatherback sea turtles (*Dermochelys coriacea*) also occur in the Cheapeake Bay in the April – November time period.

Shortnose Sturgeon
The federally endangered shortnose sturgeon (*Acipenser brevirostrum*) is known to be present in the Chesapeake Bay. The current abundance of shortnose sturgeon in the Chesapeake Bay is unknown and there is limited data available regarding distribution and no information available on shortnose sturgeon spawning, overwintering, and foraging grounds in the Chesapeake Bay; however, in regards to the latter, Niklitschek (2001) indicated via modeling that suitable habitats were very restricted during the summer months, with favorable foraging habitat limited to the tidal portions of the upper Chesapeake Bay, the Potomac River, and the James River (work referenced in Secor and Niklitschek 2002). The United States Fish and Wildlife Service and Maryland Department of Natural Resources jointly implemented a sturgeon reward program in 1996. The program was aimed at collecting data on Atlantic sturgeon incidentally caught in commercial fisheries in the Bay. In the first year of the program, two shortnose sturgeon were captured and identified. As of November 30, 2008, a total of 80 individual shortnose sturgeon have been captured in the Chesapeake Bay and its tributaries; an additional three were recaptures. Most of the shortnose sturgeon documented in the reward program have been caught in the upper Bay, from Kent Island to the mouth of the Susquehanna River and the C&D Canal; in Fishing Bay and around Hoopers Island in the middle Bay; and in the Potomac River (Skjeveland *et al.* 2000; Litwiler 2001; Welsh *et al.* 2002). These areas where shortnose sturgeon have been documented are approximately nine or more miles away from the action area and to date, the United States Fish and Wildlife Service sturgeon reward program has never documented or captured shortnose sturgeon within the action area (i.e., St. Jerome Creek and the waters surrounding the creek).

As noted above, shortnose sturgeon have not been documented in the waters within, or surrounding, St. Jerome Creek. However, based on what is known on the distribution and migration of shortnose sturgeon in the Chesapeake Bay, shortnose sturgeon may occur in the action area and therefore, be exposed to the effects of dredging and pile driving (e.g., increased turbidity, underwater noise levels).

[1] On March 16, 2010, we published a proposed rule to list two distinct population segments (DPS) of loggerhead sea turtles as threatened and seven distinct population segments of loggerhead sea turtles as endangered (75 FR 12598). On September 16, 2011, a final listing determination was made designating the Northwest Atlantic Ocean DPS, South Atlantic Ocean DPS, Southeast Indo-Pacific Ocean DPS, and the Southwest Indian Ocean DPS as threatened. The Northeast Atlantic Ocean DPS, Mediterranean Sea DPS, North Indian Ocean DPS, North Pacific Ocean DPS, and South Pacific Ocean DPS have been designated as endangered (76 FR 58868). The effective listing October 24, 2011, at which time, the species of loggerhead likely to present in the action area will go from globally listed threatened loggerhead, to the threatened Northwest Atlantic distinct population segment of loggerhead. Please note the change in status for these sea turtles will not change the effects determinations made in this letter.

Effects of the Action

Dredging

Shortnose Sturgeon

A hydraulic cutterhead (pipeline) dredge will be used for this project. Shortnose sturgeon may be vulnerable to entrainment in pipeline dredges, particularly during the winter months when individuals are less mobile and occur in aggregations in the deepest areas of the rivers or bays (e.g., channel areas with depths ranging from 10-30.0 meters (32.8-98.0 feet); Dadswell 1979; Dovel 1981; Marchette and Smiley 1982; in Dadswell *et al.* 1984) with suitable dissolved oxygen levels. Although overwintering sites have not been identified in the Chesapeake Bay, the habitat characteristics of the action area (i.e., depths less than 8 feet) are inconsistent with the depths known to be used by overwintering shortnose sturgeon and as such, sturgeon are unlikely to use the action area as an overwintering ground. Shortnose sturgeon presence within the action is also unlikely due to unsuitable foraging conditions. Although foraging shortnose sturgeon are often found in shallower water over mudflats of shellfish beds with submerged aquatic vegetation (SAV), information provided by the U.S. Army Corps of Engineers indicate that no SAV and limited sturgeon forage items (i.e., shellfish beds) are present within the action area. As such, few shortnose sturgeon are likely to use this portion of the action area as a foraging ground. Based on this information, and the fact that there have been no documented captures or occurrences of shortnose sturgeon in the action area, shortnose sturgeon are unlikely to occur in the area to be dredged. As such, we have determined that the interaction between a shortnose sturgeon and a hydraulic dredge is discountable.

Sea Turtles

Sea turtles are not known to be vulnerable to entrainment in cutterhead dredges, presumably because they are able to avoid the relatively small intake and low intake velocity. In addition, based on studies done on sea turtle occurrence, behavior, and movements (i.e., Morreale and Standora (1990)), the habitat characteristics of the action area (i.e., depths less than 8 feet) are inconsistent with the preferred habitats of foraging sea turtles (i.e., depths between 16-49 feet). As such, it is unlikely that sea turtle species will occur in the action area where dredging will occur. However, even if transient sea turtles were present, no sea turtles are likely to be injured or killed as a result of dredging operations. Based on this information, we have determined that the likelihood of an interaction between a sea turtle and a hydraulic dredge is discountable.

Pile driving

The installation of piles via pile driving can produce underwater sound pressure waves that can affect aquatic species. The proposed project will involve the installation of vinyl sheathing and timber piles; however, as it is currently unknown whether a vibratory or impact hammer will be used to install the timber and vinyl sheathing, both methods will be analyzed. Currently, there is no information available on the underwater noise levels produced by the driving of vinyl sheathing; however, of the known underwater noise levels produced by the driving of various materials, timber is closest in material composition to vinyl sheathing that could be used as a best estimate of potential underwater noise produced by the driving of vinyl sheathing (pers. comm., Kyle Baker, NMFS/SER; March 5, 2010). As such, the assessment of underwater noise levels produced by the driving of timber piles will serve as a reference of underwater noise levels produced by the driving of vinyl sheathing. Based on the available literature (i.e., Illingworth and Rodkin, Inc. and Jones and Stoke, 2009), the table below (Table 1) describes the estimated underwater noise levels produced by the driving of vinyl and timber piles. The estimated underwater noise levels are taken from a distance of 10 meters from the pile being driven.

Table 1. Estimated underwater noise levels produced by the driving of vinyl sheathing and timber piles

Type Pile	Hammer Type	Estimated Noise Level ($dB_{RMS}{}^2$)	Estimated Noise Level ($dB_{SEL}{}^2$)
Timber/vinyl	Impact	170	160
Timber/vinyl	Vibratory[4]	160	150

(2) Root Mean Square (RMS) pressure is the square root of the time average of the squared pressure. The reference in water is usually dB re: 1 μPa. Current thresholds for determining impacts to sea turtles typically center around RMS.

(3) Sound Exposure Level (SEL) is defined as that level which, lasting for one second, has the same acoustic energy as the transient and is expressed as dB re: $1\mu Pa^2 \cdot sec$. Current thresholds for determining impacts to fish typically center around SEL.

(4) Vibratory hammers produce underwater noise levels that are approximately 10-20 dB re: 1μPa lower than those produced by a impact hammer (Laughlin 2005).

The levels provided in Table 1 are dependent not only on the pile and hammer characteristics, but also on the geometry and boundaries of the surrounding underwater and benthic environment. As the distance from the source increases, underwater sound levels produced by pile driving are known to dissipate rapidly. Using data from Illingworth and Rodkin, Inc. and Jones and Stoke (2009) underwater noise levels produced from the driving of timber piles/vinyl sheathing will attenuate 10 dB every 10 meters. These values are based on a conservative literature estimate of attenuation rates for the driving of timber piles (Illingworth and Rodkin, Inc. and Jones and Stoke 2009).

Sea Turtles

The hearing capabilities of sea turtles are poorly known and there is little available information on the effects of noise on sea turtles. Some studies have demonstrated that sea turtles have fairly limited capacity to detect sound, although all results are based on a limited number of individuals and must be interpreted cautiously. Most recently, McCauley (2000) noted that decibel levels of 166 dB re 1μPa were required before any behavioral reaction (e.g., increased swimming speed) was observed, and decibel levels above 175 dB re 1uPa elicited avoidance behavior of sea turtles. Based on this and the best available information, NMFS believes any underwater noise levels at or above 166 dB has the potential to adversely affect sea turtles (e.g., injury, temporary threshold shifts). As noted above, sound levels may be as high as 170 $dB_{RMS\text{-}impact}$ (160 $dB_{RMS\text{-}vibratory}$) within 10 meters of the timber pile or vinyl sheathing being driven. However, based on the attenuation rates, noise levels during the installation of timber piles or vinyl sheathing will be lower than 166 dB at a distance beyond approximately 20 meters from the timber pile or vinyl sheathing being driven with an impact hammer, and at a distance beyond approximately 10 meters from the timber piles or vinyl sheathing being driven with a vibratory hammer. As noted above, the habitat characteristics of the action area (i.e., depths of 8 feet or less), including the area within 10 meters of the timber pile or vinyl sheathing being driven with a vibratory hammer or within 20 meters of the timber pile or vinyl sheathing being driven within an impact hammer, are inconsistent with the preferred habitats of sea turtles (i.e., depths ranging from 16-49 feet) and as such, sea turtles are unlikely to occur within the action area where pile driving will occur and therefore, within 0-20 meters of the timber pile or vinyl sheathing being driven with a impact hammer or within 0-10 meters of the timber pile or vinyl sheathing being driven with a vibratory hammer. Based on this and the best available information, the noise effects of pile driving on sea turtles are discountable.

Shortnose Sturgeon

Pile driving affects fish through underwater noise and pressure which can cause effects to hearing and air containing organs, such as the swim bladder. Effects to fish can range from temporary avoidance of an area to death due to injury of internal organs. The type and size of pile, type of installation method (i.e., vibratory vs. hammer), type and size of fish (smaller fish are more often impacted), and distance from the sound source (i.e., sound dissipates over distance so noise levels are greater closer to the source) all contribute to the likelihood of effects to an individual fish. The available literature on effects of pile driving on aquatic species is difficult to summarize due to inconsistent methods of measuring underwater sound, the diversity of pile driving methods and receiving substrates, and the differing tolerances of aquatic species to underwater noise. Generally, however, the larger the pile and the closer a fish is to the pile, the greater the likelihood of effects.

Popper et al. (2006) have proposed a set of criteria for injury to fish exposed to pile driving. They propose that pile strikes which result in a sound exposure level (SEL) of 187 dB re 1 μPa as measured 10 meters from the source are expected to produce injuries to fish. As different fish species demonstrate differing sensitivities to sound levels and there is little information on the effects of underwater noise on shortnose sturgeon, it is difficult to determine whether this criterion is appropriate for shortnose sturgeon. While no studies have been conducted on the effects of pile driving on shortnose sturgeon, two studies have been conducted on the effects of blasting on this species. Both activities produce sound waves that would act similarly in the water column, making effects comparable. Moser (1999) studied the effects of rock blasting in Wilmington Harbor on caged hatchery reared shortnose sturgeon. A study done in the Cooper River, South Carolina, by Collins and Post (2001) tested the use of blasting caps to possibly repel shortnose sturgeon from a blasting site. These studies indicate that mortality of shortnose sturgeon only occurred when recorded sound levels were 234 dB. At sound levels between 196-229 dB, some shortnose sturgeon were temporarily stunned. These studies suggest that, consistent with the recommendations by Popper et al. 2006, exposure of shortnose sturgeon to sound levels below 187dB is unlikely to result in effects to this species. Sound levels within the proposed project site (i.e., a maximum of 160 $dB_{SEL\text{-}impact}$ (150 $dB_{SEL\text{-}vibratory}$) within 10 meters of the timber pile or vinyl sheathing being driven) are below the range that could negatively affect shortnose sturgeon. Based on this information, NMFS is able to conclude that the effects of pile driving on shortnose sturgeon are insignificant and discountable.

Effects to Benthic Resources: Dredging and Jetty Construction

Dredging and the construction of two jetties (i.e. pile driving) can cause effects on sea turtles and shortnose sturgeon by reducing prey species through the alteration of the existing biotic assemblages and habitat, as well as, removing potential prey species during dredging and pile driving operations. Green sea turtles forage on sea grasses; however, based on available information, SAV does not exist within the portion of the action area where dredging or jetty installation will occur. As such, no effects to the forage base for green sea turtles will occur. Kemp's ridley and loggerhead sea turtles typically feed on crabs, other crustaceans, and mollusks. As most sea turtle prey items are mobile and adjacent areas will be undisturbed, recolonization by at least some prey items (crabs, other crustaceans) is expected to be rapid. In addition, as noted above, the habitat characteristics of the action area (i.e., depths less than 8 feet) are inconsistent with the depths known to be used by foraging sea turtles (i.e., 16-49 feet) and as such, sea turtles are unlikely to occur within the portion of the action area where dredging and jetty installation will occur. Based on this information, dredging and the installation of jetties within the Chesapeake Bay is not likely to disrupt normal feeding behaviors for sea turtles and is not likely to remove critical amounts of prey resources from the action area and is not likely to alter the habitat in any way that prevents sea turtles from using the action area as a migratory pathway. Based on this information, the effects of dredging and jetty installation within St. Jerome Creek and the Chesapeake Bay on sea turtle migration and foraging are expected to be insignificant and discountable.

As noted above, the habitat characteristics of the action area are also sub-optimal for shortnose sturgeon foraging (i.e., no SAV or shellfish beds). As such, shortnose sturgeon are not likely to use the action area as a foraging ground and therefore, the alteration of the habitat as a result of dredging and jetty installation is not likely to remove critical amounts of prey resources from the action area for shortnose sturgeon. Additionally, dredging and the installation of jetties within the Chesapeake Bay is not likely to alter the habitat in any way that prevents shortnose sturgeon from using the action area as a migratory pathway to other areas of the Bay that are more suitable for foraging and therefore, there would not be any disruption of essential behaviors such as migrating or foraging. Based on this information, and the fact that shortnose sturgeon have not been documented within the action area, the effects of dredging and jetty installation within St. Jerome Creek and the Chesapeake Bay on shortnose sturgeon migration and foraging are expected to be insignificant and discountable.

Water Quality Effects of Dredging and Pile Driving

Dredging and the installation of piles will disturb shoreline sediments and may cause a temporary increase in suspended sediment in the nearshore area. Turbidity levels associated with pile driving are expected to be only slightly elevated above background levels (average range of 10.0 – 120.0 mg/L (ACOE 2007; Anchor Environmental 2003), while the turbidity plume associated with a typical hydraulic dredge extends approximately 1000 feet (ACOE 1983) with turbidity levels associated with these sediment plumes typically range from 11.5 to 282.0 mg/L with the highest levels detected adjacent to the cutterhead and concentrations decreasing with greater distance from the dredge (ACOE 2007; Anchor Environmental 2003).

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580.0 mg/L to 700,000.0 mg/L depending on species. Studies with striped bass adults showed that pre-spawners did not avoid concentrations of 954.0 to 1,920.0 mg/L to reach spawning sites (Summerfelt and Moiser 1976 and Combs 1979 in Burton 1993). While there have been no directed studies on the effects of total suspended solids (TSS) on shortnose sturgeon, shortnose sturgeon juveniles and adults are often documented in turbid water, and Dadswell (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters. As such, shortnose sturgeon are assumed to be as least as tolerant to suspended sediment as other estuarine fish such as striped bass. The TSS levels expected for pile driving (10.0 – 120.0 mg/L) and dredging (11.5 to 282.0 mg/L) are below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in Burton 1993) and benthic communities (390.0 mg/L (EPA 1986)). Based on this information, the effect of suspended sediment resulting from dredging and pile driving activities on shortnose sturgeon will be insignificant.

No information is available on the effects of TSS on juvenile and adult sea turtles. Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). TSS is most likely to affect sea turtles if a plume causes a barrier to normal behaviors or if sediment settles on the bottom affecting sea turtle prey. As sea turtles are highly mobile they are likely to be able to avoid any sediment plume and any effect on sea turtle movements is likely to be insignificant. Additionally, as noted above, The TSS levels expected for pile driving (10.0 – 120.0 mg/L) and dredging (11.5 to 282.0 mg/L) are below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in Burton 1993) and benthic communities (390.0 mg/L (EPA 1986)). Based on this information, the effect of suspended sediment resulting from dredging and pile driving activities on sea turtles will be insignificant.

Other Project Activities

The presence of barges and work occurring on these barges will not affect sea turtles or shortnose sturgeon as it will not cause any changes in their behavior or otherwise affect any individuals. No other effects from the construction components of the proposed project will affect any listed species.

Maintenance Dredging Effects

Maintenance dredging is projected to be needed every ten years. As the effects on sea turtles and shortnose sturgeon of maintenance dredging will be the same as those of the initial dredge cycle described above, the effects on sea turtles and shortnose sturgeon of additional (maintenance) dredging cycles will also be insignificant or discountable.

Conclusion

Based on the analysis that any effects to listed sea turtles and shortnose sturgeon will be insignificant or discountable, as noted above, we are able to concur that the St. Jerome Creek

Small Navigation Project, proposed by the U.S. Army Corps of Engineers, is not likely to adversely affect any listed species under NMFS jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action.

Technical Assistance for Proposed Species
On October 6, 2010, NMFS published two proposed rules to list five distinct population segments (DPS) of Atlantic sturgeon under the ESA. NMFS is proposing to list four DPSs as endangered (New York Bight, Chesapeake Bay, Carolina and South Atlantic) and one DPS of Atlantic sturgeon as threatened (Gulf of Maine DPS) (75 FR 61872; 75 FR 61904). As you know, once a species is proposed for listing, as either endangered or threatened, the conference provisions of the ESA may apply (see ESA section 7(a)(4) and 50 CFR 402.10). As stated at 50 CFR 402.10, "Federal agencies are required to confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat."

We have reviewed the proposed action in order to provide guidance to you as to whether a conference is required in this case. Atlantic sturgeon are known to occur in the Chesapeake Bay. The United States Fish and Wildlife Service sturgeon reward program and tagging database have never documented or captured Atlantic sturgeon within the action area (i.e., waters within, and surrounding, St. Jerome Creek); however, based on what is known on the distribution and migration of Atlantic sturgeon in the Chesapeake Bay, Atlantic sturgeon may occur in the action area and therefore, be exposed to the effects of dredging and jetty installation (i.e., pile driving). The distribution of Atlantic sturgeon is strongly associated with prey availability. Atlantic sturgeon are most likely to occur in shallow waters, such as those found in the action area, if suitable forage (e.g., benthic invertebrates such as mollusks and crustaceans) and appropriate habitat conditions are present (e.g., in areas of SAV). However, given the lack of suitable sturgeon foraging items (i.e., no SAV, limited benthic invertebrates) Atlantic sturgeon are unlikely to occur in the action area and therefore, within the immediate vicinity of dredging operations. As such, an interaction between an Atlantic sturgeon and the dredge bucket is unlikely. Additionally, with a lack of suitable foraging items, dredging and the installation of jetties will not remove critical amounts of prey resources from the action area, and therefore is not likely to affect the foraging ability of Atlantic sturgeon. Dredging and pile driving operations also are not likely to alter the habitat in any way that prevents Atlantic sturgeon from using the action area as a migratory pathway to other areas of the Bay that are more suitable for foraging and therefore, there would not be any disruption of essential behaviors such as migrating or foraging. In addition, underwater noise levels produced from the driving of timber piles and vinyl sheathing (i.e., a maximum of 160 $dB_{SEL\text{-}impact}$ (150 $dB_{SEL\text{-}vibratory}$) within 10 meters of the pile or sheathing being driven) will be below levels believed to cause adverse effects to Atlantic sturgeon (i.e., 187 dB re 1 μPa as measured 10 meters from the source (Popper *et al.* 2006)). Also, as any effects to the benthic environment (e.g., suspended sediment) will be minor and temporary, effects to Atlantic sturgeon resulting from dredging and pile driving operations are also unlikely. Based on the best available information, effects to Atlantic sturgeon from the proposed action are unlikely to occur. As all effects of the proposed action are likely to be insignificant and discountable and the proposed action is not likely to result in the injury, mortality, or reduction in the reproduction, numbers, and distribution of any Atlantic sturgeon, the action is not likely to appreciably reduce the survival and recovery of any DPS of Atlantic sturgeon and therefore it is not reasonable to anticipate that this action would be likely to jeopardize the continued existence of any DPS of Atlantic sturgeon. As such, we conclude that a conference is not required at this time for Atlantic sturgeon. Should project plans change, we recommend that you discuss the potential need for a conference with us.

Should you have any questions about this correspondence please contact Danielle Palmer at (978) 282-8468 or by e-mail (Danielle.Palmer@Noaa.gov).

Sincerely,

Patricia A. Kurkul

Patricia A. Kurkul
Regional Administrator

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Ec: Nichols, NMFS/HCD
Palmer, NMFS/PRD
Sowers, ACOE/Baltimore

File Code: Sec 7 ACOE Baltimore- St. Jerome Creek
PCTS: I/NER/2011/04878
H:\H2.0\personal\Danielle Palmer\Section 7\Informal Consultation\2011\ACOE-St. Jerome Creek, MD

From:	John Nichols
To:	Sowers, Angela NAB02
Subject:	Re: St. Jerome Creek EFH Assessment (UNCLASSIFIED)
Date:	Thursday, March 01, 2012 5:53:19 PM

Angie:
I knew that this project involved dredging the federal channel, and jetties at the mouth of the creek. However, I did not expect vinyl jetties. Habitat wise, they provide nothing of value to fish. However, they do displace less of a footprint of existing sand bottom, important to bottom foragers like summer flounder.

In conclusion, there should be minimal impacts on EFH, and we have no objections to this proposal.

On Thu, Mar 1, 2012 at 8:24 AM, Sowers, Angela NAB02 <Angela.Sowers@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Hi John,

Attached is the EFH Letter we sent for St. Jerome Creek as well as the assessment. As requested, please provide a response by March 15.

Thanks,
Angie

-----Original Message-----
From: John Nichols [mailto:john.nichols@noaa.gov]

Sent: Tuesday, February 28, 2012 11:39 AM
To: Sowers, Angela NAB02
Subject: Re: St. Jerome Creek EFH Assessment (UNCLASSIFIED)

I will need a resend. Thanks.

On Tue, Feb 28, 2012 at 7:46 AM, Sowers, Angela NAB02 <Angela.Sowers@usace.army.mil> wrote:

Sure. Do you still have the EFH assessment or do you need me to resend?

Angie Sowers, Ph.D.
U.S. Army Corps of Engineers

Planning Division, Baltimore
Integrated Water Resource Management Specialist
443.676.4679
Message sent via my BlackBerry Wireless Device

From: John Nichols [mailto:john.nichols@noaa.gov]
Sent: Monday, February 27, 2012 01:13 PM

To: Sowers, Angela NAB02
Subject: Re: St. Jerome Creek EFH Assessment (UNCLASSIFIED)

Angie:

I responded to a resource/scoping inquiry associated with proposed dredging and/or jetties in St. Jerome's Creek some time ago, but do not remember responding to an EFH assessment. Do I get a second try?

On Tue, Feb 21, 2012 at 10:47 AM, Sowers, Angela NAB02 <Angela.Sowers@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Hi John,

We sent NMFS an EFH Assessment for St. Jerome Creek on August 25, 2011. I wanted to follow up with you as we have not received a response.

Thanks,
Angie

Angie Sowers, Ph.D.
U.S. Army Corps of Engineers
Baltimore District- Planning Division
Civil Project Development Branch
Integrated Water Resources Management Specialist
10 S. Howard St.
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Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

From:	George_Ruddy@fws.gov
To:	Sowers, Angela NAB02
Cc:	Bob_Zepp@fws.gov
Subject:	RE: St. Jerome Creek (UNCLASSIFIED)
Date:	Thursday, May 10, 2012 3:03:53 PM
Attachments:	St Jerome jetty.pdf

Angie: According to my file, on Nov 3, 2010, I received from you a narrative description of the batter pile/vinyl sheet pile jetty concept and a figure depicting a representative cross section of the jetty structure. I am attaching them for your clarification. I don't have any related transmittal correspondence. Until now, I was unaware of the impact to the spit from the channel realignment. However, it does not really matter because in our opinion all these project actions are considered to be improvements to an existing Federal navigation channel. Therefore the work is still covered under the Sec 6(a)(2) exception to the limitations on Federal expenditures under the Coastal Barrier Resources Act (CBRA).

George Ruddy
USFWS
410-573-4528
(See attached file: St Jerome jetty.pdf)
Inactive hide details for "Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

05/10/2012 09:20 AM

To

"George_Ruddy@fws.gov" <George_Ruddy@fws.gov>

cc

Subject

RE: St. Jerome Creek (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hi George,

In trying to finalize our draft report for the St Jerome Creek Section 107 Project, I am compiling all of our agency correspondence. In doing so, I have identified that I am missing documentation of providing you information on which you based your Nov 5 decision that the project modifications to a batter pile/vinyl sheet pile jetty still qualified as an exception for the CBRA. I think I provided you the details on the project modification by email, but possibly by letter. By chance, do you think you still have that correspondence? If so, could you forward it to me? Your response to the email is below.

I have attached the information and map that I think would have been provided to you. I have been asked to confirm that you were aware of the 0.5 acre impact to the spit when you made your Nov 5 decision.

Sorry for the inconvenience but thank you in advance,
Angie

-----Original Message-----
From: George_Ruddy@fws.gov [mailto:George_Ruddy@fws.gov]
Sent: Friday, November 05, 2010 8:02 AM
To: Sowers, Angela NAB02
Cc: Clark, Anthony A NAB02; Bob_Zepp@fws.gov
Subject: Re: St. Jerome's Creek

Angie: It is our opinion that that the revised project design concept, a batter pile/vinyl sheet pile jetty, continues to qualify as an exception to the limitation on Federal expenditures under section 6(a)(2) of the Coastal Barrier Resources Act (CBRA). I refer you to our letter of December 16, 2009, to Ms. Guise of your office which provided the formal response to your request for consultation under the CBRA. Thank you for keeping us informed about the progress of this study.

George Ruddy
U.S. Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
410-573-4528
Inactive hide details for "Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

"Sowers, Angela NAB02" <Angela.Sowers@usace.army.mil>

11/04/2010 03:34 PM

To

<George_Ruddy@fws.gov>

cc

"Clark, Anthony A NAB02" <Anthony.A.Clark@usace.army.mil>

Subject

St. Jerome's Creek

Hi George,

We will have an updated schedule to you this month. There are still a few things getting worked out. In the mean time, would you mind providing us an email that documents your conclusion that the new jetty being considered is included in the exemption that we currently have?

Thanks,
Angie

Angie Sowers, Ph.D.
U.S. Army Corps of Engineers
Baltimore District- Planning Division
Civil Project Development Branch
Integrated Water Resources Management Specialist

10 S. Howard St.
Rm 11700-E
Baltimore, MD 21201

angela.sowers@usace.army.mil
(410)962-7440

Classification: UNCLASSIFIED
Caveats: NONE

[attachment "Coastal Barriers - Ruddy_2010.doc_2012.doc" deleted by George Ruddy/CBFO/R5/FWS/DOI]

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF

Planning Division

SEP 25 2012

Mr. John W. Fowler
Executive Director
Advisory Council on Historic Preservation
Old Post Office Building, Suite 803
1100 Pennsylvania Avenue, N.W.
Washington, D.C. 20004

Dear Mr. Fowler:

The purpose of this letter is to invite the Advisory Council on Historic Preservation to participate in the development and execution of a Programmatic Agreement (PA) to consider future potential effects to historic properties resulting from a U.S. Army Corps of Engineers, Baltimore District (Baltimore District) proposed navigation project. The proposed project involves construction of a jetty (or jetties) and excavation of a new navigation channel across the mouth of St. Jerome Creek, along the western shore of the Chesapeake Bay in St. Mary's County, Maryland. The work is being conducted through our statutory authority under the Continuing Authorities Program, Section 107 of the Rivers and Harbors Act of 1960, as amended, 33 U.S.C. §577. The project will address the littoral sand drift that frequently shoals the existing channel, which seriously impacts vessel movement and restricts the ability of local watermen, recreational boaters, charter boat operators, and others to enter and exit the waterway during periods of low tide, resulting in loss of productive fishing time and damage to vessels. The proposed project is an undertaking subject to the provisions of Section 106 of the National Historic Preservation Act of 1966, 16 U.S.C. §470f, and its implementing regulations found at 36 CFR §800.

The Baltimore District has consulted with the Maryland State Historic Preservation Office (Maryland SHPO), and has conducted a preliminary and limited review of the project's area of potential effect (APE). Both the Baltimore District and the Maryland SHPO agree that some or all of the APE has a high potential to contain historic properties, particularly submerged archaeological resources such as shipwrecks, in areas that have never been subject to prior cultural resources investigations. The Baltimore District and the Maryland SHPO further agree that additional investigations are warranted to identify potential historic properties that may be located in the APE.

The Baltimore District is preparing a feasibility study for the project, and that study must be approved by the U.S. Army Corps of Engineers, North Atlantic Division, to receive additional project funding to complete the Section 106 review and advancement of the study to the Design and Implementation phase. In order for the feasibility report to be approved, however, U.S. Army Corps of Engineers policy requires that all Section 106 compliance be completed. Therefore, pursuant to 36 CFR §800.14(b)(1)(ii), the purpose of this PA is to establish the procedures that the Baltimore District will follow to comply with the requirements of 36 CFR §800.4 through 800.13 for the project, subsequent to its approval. The PA will include identification of historic properties in the project's APE, evaluation of the effect of the undertaking on historic properties, and resolution of adverse effects, if applicable.

Execution of the PA will allow the Baltimore District to complete the Section 106 process and satisfy applicable Federal historic preservation laws, while allowing U.S. Army Corps of Engineers higher authority to approve the feasibility report and advance the project to the next phase, including funding to implement the provisions of the PA. A copy of the draft PA is enclosed for your information. This draft PA was developed by the Baltimore District and the Maryland SHPO.

We request the Advisory Council on Historic Preservation to notify us within 15 days of receipt of this letter of its desire to participate in the development and execution of this PA to consider effects of the Baltimore District's project on historic properties. Please contact Mr. Scott C. Watson, of this office, at (410) 962-9500 if you have any questions.

Sincerely,

Amy M. Guise

Amy M. Guise
Chief, Planning Division

Enclosure

Copy Furnished (w/o enclosure):

Ms. Elizabeth Cole, Maryland State Historic Preservation Office

Martin O'Malley
Governor

Anthony G. Brown
Lt. Governor

Margaret G. McHale
Chair

Ren Serey
Executive Director

STATE OF MARYLAND
CRITICAL AREA COMMISSION
CHESAPEAKE AND ATLANTIC COASTAL BAYS
1804 West Street, Suite 100, Annapolis, Maryland 21401
(410) 260-3460 Fax: (410) 974-5338
www.dnr.state.md.us/criticalarea/

September 27, 2013

Ms. Angie Sowers
Baltimore District – Planning Division
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Re: Draft Feasibility Report/Integrated Environmental Assessment
St. Jerome Creek Section 107 Small Draft Navigation Project

Dear Ms. Sowers:

Thank you for submitting the above referenced report for review and comment. The purpose of the report is to identify the preferred solution to maintain the St. Jerome's Creek federal navigation channel. The proposed selected alternative would consist of the construction of two jetties that will connect to two small spits of fastland. The project will be constructed from the water. Additionally, dredge materials from the channel will be placed at an existing dredge material containment facility.

As proposed, the project is consistent with the Critical Area law and Criteria. Therefore, we concur that the project is consistent with the Maryland Coastal Zone Management Program. Thank you for the opportunity for review and comment. Please contact me at (410) 260-3475 if you have any questions.

Sincerely,

Kate Charbonneau

Kate Charbonneau
Regional Program Chief

cc: Mr. Elder Ghigiarelli, Maryland Department of the Environment

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

October 21, 2013

Colonel J. Richard Jordan, III
District Engineer
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Attn: Angela Sowers

Re: St. Jerome Creek Section 107 Navigation project

Dear Colonel Jordan:

Enclosed is our Fish and Wildlife Coordination Act Report on the St. Jerome Creek Section 107 Project. Before we can support the project we believe that the environmental analysis needs to include a more rigorous evaluation of the effect of the project on the creek's circulation and flushing. If there are any questions, please contact George Ruddy of my staff at 410-573-4528.

Sincerely,

G. Parks

Genevieve LaRouche
Supervisor

cc: Roland Limpert, MD DNR, Annapolis, MD
Christopher Boelker, NMFS, Gloucester, MA

Preserving America's Heritage

October 29, 2013

Ms. Amy M. Guise
Chief, Planning Division
Baltimore District, Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Ref: Proposed Construction of Jetties and Navigation Channel Realignment at St. Jerome Creek St. Mary's County, Maryland

Dear Ms. Guise:

The Advisory Council on Historic Preservation (ACHP) recently received your notification regarding the development of a Programmatic Agreement (PA) for the referenced project. Based upon the information you provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of our regulations, "Protection of Historic Properties" (36 CFR Part 800) does not apply to this undertaking. Accordingly, we do not believe that our participation in the consultation to resolve adverse effects is needed. However, if we receive a request for participation from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or another party, we may reconsider this decision. Additionally, should circumstances change, and you determine that our participation is needed to conclude the consultation process, please notify us.

Pursuant to 36 CFR 800.6(b)(1)(iv), you will need to file the final PA, developed in consultation with the Maryland State Historic Preservation Officer (SHPO) and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the Agreement and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

If you have any questions or require further assistance, please contact Tom McCulloch at 202-606-8554, or via email at tmcculloch@achp.gov.

Sincerely,

Raymond V. Wallace

Raymond V. Wallace
Historic Preservation Technician
Office of Federal Agency Programs

From:	Guy, Chris
To:	Sowers, Angela NAB
Subject:	[EXTERNAL] Re: St. Jerome creek- Fish and Wildlife Coordination
Date:	Tuesday, June 24, 2014 4:28:35 PM

Based on the information provided in the webinar earlier tody, the Service is satisfied that the Corps of Engineers has done their due diligence on this issue. If you have any additional concerns or questions regarding the St. Jerome's Creek Section 107 project, please contact me.

Thank You.

Christopher P. Guy
US Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis MD 21401
410-573-4529 Office
410-320-8847 Cell
chris_guy@fws.gov

Chesapeake Bay Field Office e-newsletter at http://chesapeakebay.fws.gov

On Tue, Jun 24, 2014 at 3:19 PM, Sowers, Angela NAB <Angela.Sowers@usace.army.mil> wrote:

Hi Chris,
This email is specific to our St. Jerome Creek Section 107 Project. USACE has further investigated tidal circulation and flushing in St. Jerome Creek in response to issues raised in the Fish and Wildlife Coordination Act Report provided by your office on October 21, 2013. Today via webinar we presented to you our findings from further modeling investigations and conversations with MDE. We are requesting concurrence from you that we have adequately investigated the concern raised by FWS on the impacts of the project on tidal flushing and that the existing information suggests that the project will have negligible impacts on flushing and circulation. Your concurrence would fulfill coordination for this project for the Fish and Wildlife Coordination Act.

Thank you,
Angie

Sent from my BlackBerry 10 smartphone.

PROGRAMMATIC AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT; AND THE MARYLAND STATE HISTORIC PRESERVATION OFFICE REGARDING THE PROPOSED CONSTRUCTION OF JETTIES AND NAVIGATION CHANNEL REALIGNMENT AT ST. JEROME CREEK, ST. MARY'S COUNTY, MARYLAND

Preamble

WHEREAS, the U. S. Army Corps of Engineers (hereinafter "USACE"), maintains a Federal navigation channel in St. Jerome Creek, which is located along the western shore of the Chesapeake Bay between St. Jerome Neck and Fresh Pond in St. Mary's County, Maryland; and

WHEREAS, the USACE, through its statutory authority under the Continuing Authorities Program, Section 107 of the Rivers and Harbors Act of 1960, as amended, 33 U.S.C. §577, is proposing to construct a jetty or jetties and dredge a new navigation channel across the mouth of St. Jerome Creek (hereinafter "Project"), as depicted on the map attached hereto as Exhibit A; and

WHEREAS, the proposed Project is being considered to address the littoral drift from the shore that frequently shoals the existing channel, which seriously impacts vessel movement and restricts the ability of local watermen, recreational boaters, charter boat operators, and others to enter and exit the waterway during periods of low tide, resulting in loss of productive fishing time and damage to vessels; and

WHEREAS, the USACE is completing a Feasibility Study to determine whether the proposed Project is economically feasible and environmentally acceptable; and

WHEREAS, the proposed Project will involve construction of a jetty or jetties designed to trap sediment to keep the channel clear and reduce the need for dredging from a two-year cycle to a ten-year cycle and restore vessel utilization of the existing channel; and

WHRERAS, the proposed Project may involve the excavation of a new, realigned channel within the inlet of St. Jerome Creek that would be more hydraulically efficient than the existing channel and decrease the shoaling in St. Jerome Creek, providing the longest interval between future maintenance dredging events; and

WHEREAS, implementation of the proposed Project will involve some level of disturbance to upland and submerged lands through construction of the jetties and dredging activities in areas that have not been dredged in the past; and

WHEREAS, the USACE has determined that implementation of the proposed Project constitutes an 'undertaking' pursuant to the provisions of Section 106 of the National Historic Preservation Act of 1966,16 U.S.C. §470f, and its implementing regulations found at 36 CFR §800; and

WHEREAS, the Feasibility Study must be approved by USACE higher authority prior to the negotiation of a Project Partnership Agreement between the USACE and St. Mary's County, receipt of additional project funding, and advancement of the Project to the Design and Implementation phase; and

WHEREAS, pursuant to 36 CFR §800.14(b)(1)(ii), the purpose of this Programmatic Agreement (hereinafter "PA") is to establish the procedures that the USACE will follow to comply with the requirements of 36 CFR §800.4 through 800.13 for the Project, including identification of historic properties in the Project's Area of Potential Effect (hereinafter "APE"), evaluation of the effect of the undertaking on historic properties, and resolution of adverse effects, if applicable, thereby completing the Section 106 process and satisfying applicable State and Federal historic preservation laws, and allowing the USACE to approve the Feasibility Report and advance the Project to the next phase; and

WHEREAS, the PA will satisfy the USACEs' responsibilities for compliance with P.L. 101 377, 16 U.S.C. §470g-4 – g-8; and

WHEREAS, the USACE is consulting with the Maryland Historical Trust, which is the Maryland State Historic Preservation Office ("MD SHPO") pursuant to 36 CFR §800; and

WHEREAS, the USACE, in consultation with the MD SHPO, has established the undertaking's APE, as defined at 36 CFR §800.16(d), to be the footprint of all upland and submerged activities related to constructing the jetties, the footprint of all dredging activities taking place in areas that have not been dredged in the past, and the location of any associated ancillary activities, to encompass the geographic areas within which the undertaking may directly or indirectly cause alterations, including visual effects, in the character or use of historic properties; and

WHEREAS, the USACE, in consultation with the MD SHPO has conducted a preliminary and limited review of the APE and has determined that some or all of the APE has a high potential to contain historic properties, particularly submerged archaeological resources such as shipwrecks, in areas that have never been subject to prior cultural resources investigations; and

WHEREAS, the Advisory Council on Historic Preservation (Council) was invited to participate in the development of the PA in accordance with 36 CFR Part 800, but by letter dated October 29, 2013, declined to participate in the development of the PA; and

WHEREAS, in accordance with 36 CFR §800.6(b)(1)(iv), the USACE will submit this PA, along with the appropriate documentation specified in 36 CFR §800.11(f), to the Advisory Council on Historic Preservation (hereinafter "Council") prior to approving the undertaking in order to meet the requirements of Section 106 and 36 CFR §800;

NOW, THEREFORE, the USACE and the MD SHPO agree that the Project shall be administered in accordance with the following stipulations to satisfy the USACEs' Section 106 responsibility.

Stipulations

The USACE shall ensure that the following measures are carried out prior to implementation of the Project:

A. Cultural Resource Investigations

1. Phase I-level Archaeological Investigation

   Prior to the start of the Phase I-level investigation, the USACE and the MD SHPO shall review any additions, subtractions, or other changes to the Project subsequent to the execution of this PA, and consult on the need to modify or change the PA accordingly, to ensure that identification investigations are implemented as necessary and appropriate to identify any historic properties that may be impacted by the proposed Project or ancillary activity.

   A Phase I- level submerged archaeological investigation will be conducted in the Project's APE. The investigation will be performed by a qualified professional archaeologist (See, Administrative Condition A, "Personnel Qualifications"). The Phase I investigation shall be designed to identify resources potentially eligible for inclusion in the National Register that may be affected by the Project.

   Prior to the start of the Phase I archaeological investigation, the USACE shall prepare a scope of work for the investigation, in consultation with the MD SHPO. The MD SHPO will be provided with a draft copy of the scope of work for review and comment, prior to its implementation.

   The Phase I archaeological investigation shall be performed in accordance with the Maryland Historical Trust's *Standards and Guidelines for Archaeological Investigations in Maryland* (Shaffer and Cole 1994). For underwater survey, the Phase I-level investigation shall employ electronic remote sensing devices including magnetometer, high-resolution side scan sonar, and sub-bottom profiler in all areas of expected substrate disturbance to identify contacts, anomalies, features, objects, and/or locations with potential to represent or contain historic properties. Survey transect intervals shall be spaced at intervals not to exceed 15m (50 feet). Magnetometer sensor height shall not exceed 6m (20 feet). Additional electronic remote sensing and inspections by diving archaeologists shall be conducted as necessary to determine if contacts, anomalies, features, objects, and/or locations represent properties that may be eligible for the National Register of Historic Places.

2. Disposition of Artifacts

   Artifacts discovered during archaeological investigations related to the Project shall remain the Property of the State of Maryland, save and except Department of

Defense (DoD) vessels and ordinance, which shall remain property of the Federal Government. The USACE shall ensure that all materials and records resulting from historic properties investigations conducted within the project area will be curated in accordance with MD SHPO "Standards and Guidelines for Archaeological Investigations in Maryland".

3. Reports

All investigations performed pursuant to this PA shall conclude with written reports. The USACE shall submit a draft of each report to the MD SHPO for review and comment and shall ensure that the comments of the MD SHPO are addressed in each final report. The USACE shall provide two copies of each final report to the MD SHPO, including an electronic copy of the final report in the form of a PDF file generated directly from the original Word document to the MD SHPO.

If the MD SHPO does not provide comments on the reports within thirty (30) calendar days of receipt, the USACE may assume MD SHPO acceptance of the reports.

4. No Historic Properties Affected Determination

The USACE shall consult with the MD SHPO regarding the results of the Phase I investigation. Should the USACE and the MD SHPO agree that the results of the Phase I investigation show that no archaeological resources are located in the Project's APE, or that archaeological resources are in the APE but will not be affected by the Project, or that archaeological resources are in the APE but are not historic properties in accordance with the definition provided at 36 CFR §800.16(l)(1), no additional cultural resource investigations will be undertaken, and the Section 106 review will be complete.

B. Evaluation of Potential Historic Properties

If potential historic properties are identified in the APE after completion of the survey efforts in described in Stipulation A-1, and the USACE determines that it is infeasible to avoid impacting such historic properties but intends to continue with the proposed Project, the USACE, in consultation with the MD SHPO and in accordance with the Performance Standards in Stipulation VI of this MOA and *Standards and Guidelines for Archaeological Investigations in Maryland* (Shaffer and Cole 1994), will evaluate each of the identified resources for their eligibility for listing in the National Register by applying the National Register criteria for evaluation (36 CFR §60.4 [a-d]), and in accordance with 36 CFR §800.4 (c). The USACE will ensure that National Register eligibility evaluations are completed for such historic properties, which shall include documentary research, field investigation, analyses, and reporting.

The USACE shall provide the results of any such evaluation studies to the MD SHPO for review, comment, and formal determinations of eligibility.
If the MD SHPO does not provide comments within thirty (30) calendar days of receipt, the USACE may assume MD SHPO acceptance of the results.

C. Treatment of Historic Properties

Should any property eligible for inclusion in the National Register be identified under Stipulations A and B, the USACE shall make a reasonable and good-faith effort to avoid adversely affecting the resources by relocating or modifying the proposed action. If the USACE intends to continue with the proposed Project and if adverse effects are unavoidable, the USACE and the MD SHPO shall consult in accordance with 36 CFR §800.6 to develop and implement appropriate treatment options to resolve adverse effects in accordance with *Standards and Guidelines for Archaeological Investigations in Maryland* (Shaffer and Cole 1994), including avoidance, minimization, or mitigation of adverse effects. The USACE will ensure that appropriate plans to involve the public and identify interested parties are developed and implemented, in consultation with the MD SHPO.

The USACE shall ensure that any resulting treatment options are accomplished in accordance with the relevant performance standards in Administrative Condition A.

D. Late Discoveries

If unanticipated discoveries of archaeological sites or other potential historic properties are encountered during implementation of the Project, the USACE shall, in accordance with 36 CFR §800.6(c)(6), consult with the MD SHPO. The USACE shall notify MD SHPO within 48 hours of the discovery and protect the discovery by minimizing, to the maximum extent possible, all work in the area of the discovery until it can be inspected by a qualified archaeologist (see Administrative Condition A, "Personnel Qualifications") to determine its parameters. Work may then continue in the project area outside of those parameters and the USACE in consultation with MD SHPO shall assess the NRHP eligibility of the discovery. If the discovery is determined to possess those qualities of significance identified in the National Register criteria, then the USACE will ensure that appropriate measures are implemented pursuant to the terms of this PA in accordance with Stipulation C above.

Administrative Conditions

A. Personnel Qualifications.

The USACE shall ensure that all work carried out by the Government pursuant to this Programmatic Agreement is carried out by or under the direct supervision of a person or persons meeting, at a minimum, the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44738-9), and that all historic preservation work is carried out by or under the direct supervision of an archaeologist meeting, at a minimum, the *Secretary of the Interior's Professional Qualifications Standards for* Archaeologist *Professionals* (48 FR 44738-9).

The MD SHPO may monitor activities carried out pursuant to this Programmatic Agreement, and the Council may review such activities if so requested. The Governement will cooperate with the Council and the MD SHPO in carrying out their responsibilities.

B. Review of Implementation

If Stipulations A through C above have not been implemented within five years from the date of this PA, the parties to this agreement shall review the PA to determine whether revisions are needed. If revisions are needed the parties to this agreement will consult in accordance with 36 CFR §800 to make such revisions.

C. Termination

This PA will continue in full force and effect until the completion of the proposed Project, or January 1, 2020, whichever occurs first. If the USACE decides not to implement the proposed Project, subsequent to the execution of this PA, all of the USACEs' obligations hereunder shall automatically and immediately terminate.

D Early Termination

Any signatory or concurring party to this PA may terminate it prior to the time established in Paragraph C above, by providing written notice to the other parties thirty (30) days prior to termination, provided that the parties will consult during and prior to termination to seek agreement on amendments or other actions that would avoid early termination. In the event of early termination, the USACE will comply with 36 CFR §800.4 through §800.6 with regard to individual undertakings covered by this PA.

E. Amendment

Any party to this PA may request that it be amended, whereupon the parties will consult in accordance with 36 CFR §800.13 to consider such amendment. No amendment to this PA is effective unless it is in writing and executed and dated by all signatory parties hereto.

F. Dispute Resolution.

Should any party to this PA object in writing to the USACE regarding any actions carried out or proposed with respect to the USACEs' Section 106 responsibilities or implementation of this PA, the USACE, the Council, and the MD SHPO shall consult to resolve the objection. If, after initiating such consultation, the USACE and the MD SHPO determine that the objection cannot be resolved through consultation, the USACE shall forward all documentation relevant to the objection to the Council, including the USACE's proposed response to the objection. Within 30 days after receipt of all pertinent documentation, the Council shall exercise one of the following options in accordance with 36 CFR §800.7:

1) Advise the USACE that the Council concurs in the USACE's proposed response to the objection, whereupon the USACE shall respond to the objection accordingly;

2) Provide the USACE with recommendations, which the USACE, in consultation with the MD SHPO, shall take into account in reaching a final decision regarding its response to the objection; or

3) Notify the USACE that the objection will be referred for comment pursuant to 36 CFR §800.7, and proceed to refer the objection and comment. The resulting comment shall be taken into account by the USACE in accordance with 36 CFR §800.7(c)(4).

Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the USACE may assume the Council's concurrence in its proposed response to the objection.

The USACE shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the USACEs' responsibility to carry out all actions under this PA that are not the subjects of the objection shall remain unchanged.

G. Failure to Comply with Terms.

In the event that the USACE does not carry out the terms of this PA, the USACE will comply with 36 CFR §800.4 thorough §800.6 with regard to undertakings covered by this PA.

H. Notice to Parties.

All written notice provided for in this PA shall be sent by certified mail as follows:

U.S. Army Corps of Engineers
Mr. Scott C. Watson
10 South Howard Street
Baltimore, MD 21203-1750

Maryland Historical Trust
Ms. Elizabeth Cole
Administrator
Project Review and Compliance
100 Community Place
Crownsville, MD 21032

Execution and implementation of this PA evidences that the USACE has afforded the Council a reasonable opportunity to comment on the proposed Project and that the USACE has taken into account the effects of the proposed Project on historic properties. Execution and implementation of this PA evidences that the USACE has satisfied its responsibilities under Section 106 of the National Historic Preservation Act.

≈

SIGNATORY PARTIES:

UNITED STATES ARMY CORPS OF ENGINEERS

By: ______________________ Date: 5 NOV 13

J. Richard Jordan, III
Colonel, Corps of Engineers
District Engineer

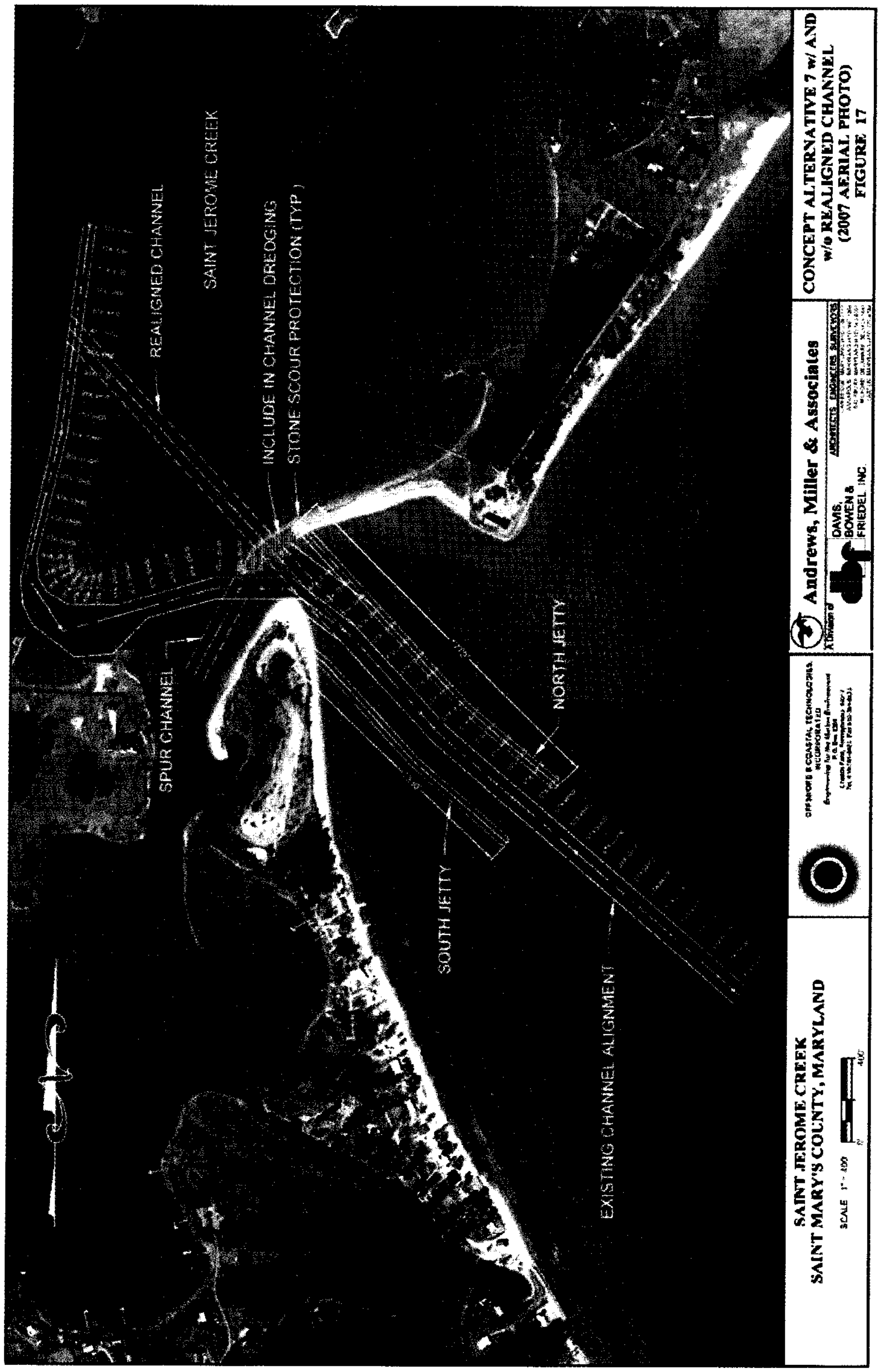
MARYLAND HISTORICAL TRUST

By: ______________________ Date: 1/17/2014

J. Rodney Little
Director, Maryland Historical Trust
and State Historic Preservation Officer

Exhibit A

St. Jerome Creek Proposed Project



APPENDIX F

SECTION 404(b)1 EVALUATION

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

ST. JEROME CREEK SMALL NAVIGATION PROJECT
ST. MARY'S COUNTY, MARYLAND
June 2012

I. Project Description

A. Location

The St. Jerome Creek Small Navigation Project is located at the mouth of St. Jerome Creek and its confluence with the Chesapeake Bay (Figure 1). The area is shown on the Point Lookout, Maryland U.S.G.S. 7.5’ quadrangle topographic map, and National Ocean Service Chart No. 12233. The site lies at -076.34° longitude and 38.12° latitude.

B. General Description

The proposed St. Jerome Creek Small Navigation Project would establish two new jetty structures and straighten the course of the existing federal channel to reduce shoaling in the navigation channel. Figure 1 shows the proposed study area. Each jetty would extend approximately 40 feet inland from MHW. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. Approximately 0.5 ac of this sand spit, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel.

The jetty would be constructed of timber and vinyl sheeting. TimberGuard piles would be incorporated into the design. TimberGuard piles have a treated structural wooden core that are fully encased in a tough polymer sleeve, keeping the treatment in and predators out. There are no nails, banding, or seams. The continuous polymer sleeve also reduces the dissolved oxygen level inside the pile, to prevent any destructive organisms that do get into the wood from being able to survive inside the polymer core.

Jetty construction consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft intervals on each side of the vinyl sheet pile. Figure 2 depicts the proposed jetty and federal channel alignment. Figure 3 shows the batter pile/vinyl pile jetty design.

The existing navigational channel would be hydraulically dredged, approximately 1,600 feet to a depth of 7 feet mean lower low water (MLLW) and a width of 100 feet. The footprint of the federal channel to be dredged is 3.67 acres plus a spur (0.05 ac) to connect the federal to the county channel. The 400 foot spur would remain off the federal channel to the left after it passes Deep Point and continue to the existing Southern Prong channel so that passage is still available into this county channel. The spur would be dredged to 7 feet MLLW and would impact an additional 0.05 ac. Approximately 30,000 cubic yards of material removed from the channel and the spur would be placed in an approved upland dredge disposal site that has been used for previous maintenance dredging (Figure 1).

C. Purpose

The project is proposed for the purpose of improving navigation in the St. Jerome Creek. The channel begins to shoal below the authorized depth about two years after dredging and seriously impacts vessel movements within five years. This restricts the ability of local watermen, recreational boaters, charter boat operators, and others to exit and enter the waterways during periods of low tide. Such delays result in loss of productive fishing time. Also, damages to recreational vessels have been directly linked to the shoaling problem.

D. General Description of Discharge Material

1. Characteristics of Fill Material. The following materials would be used to construct the batter pile/vinyl sheet pile jetty system: ten and fourteen foot long treated timber wales (8”x8” and 10”x10”), 50 foot long timber piles with TimberGuard, timber batter block (8”x8” and 12”x12”), and 30 foot long vinyl sheet piles. TimberGuard piles have a treated structural wooden core that are fully encased in a tough polymer sleeve, keeping the treatment in and predators out. There are no nails, banding, or seams. The continuous polymer sleeve also reduces the dissolved oxygen level inside the pile, to prevent any destructive organisms that do get into the wood from being able to survive inside the polymer core.

   Dredged material will be conveyed to the placement site by hydraulic pipeline. The dredged material is expected to be approximately 70 percent water and 30 percent sediment. Dredged material would be largely sand, but would also include some clay, silt, and silty sand.

2. Fill Material Quantities. Table 1 contains the total materials that would be used to construct the batter pile/jetties.

3. Source of Material. The timber and vinyl sheets for construction of the jetties would be provided by the contractor.

E. Description of the Proposed Discharge Sites

The jetty construction location extends across the mouth of the St. Jerome Creek, a tidal river, with a hard, sandy bottom, and into the Chesapeake Bay. Water depths are less than 10 feet MLLW, and as shallow as 2 feet MLLW within the federal channel prior to the project. A chartered natural oyster bar (NOB 31-2) is located approximately 600 yards southeast of the eastern terminus of the federal channel. NOB 31-2 includes parts of the Butler and Butler Addition 1 bars. These bars are in the public fishery and shown in Figure 4. The remaining oyster bars within St. Jerome Creek are considered to be ‘riparian’, a designation for areas where the creek is less than 100 yards wide at the mouth. As a result of the ‘riparian’ designation, the ownership of the shellfish on the bottom belongs to the riparian property owners. As such, there are likely to be additional productive shellfish beds surrounding the creek, adjacent to the water

Table 1. Material Quantities to Construct Batter Pile/Jetty System

	north jetty- 1,370 feet	north jetty- 400 feet	south jetty- 1,330 feet	TOTAL
vinyl sheeting- 30' lengths	27,414	8,004	26,613	62,031
8"x8" wale- 10' lengths	14,604		14,178	28,782
8"x8" wale- 14' lengths	20,446		19,849	40,295
14"-3’ diameter timber piling- 50' lengths w/TimberGuard	54,800	16,000	53,200	124,000
8"x8" timber batter block- 3' lengths	8,763		8,507	17,270
10"x10" wale- 10' lengths		6,664		6,664
10''x10'' wale- 14' lengths		9,330		9,330
12"x12" timber batter block- 4' lengths		7,680		7,680

(personal communication with Louis Wright of MDNR on July 29, 2009), that are not well documented.

Lippson and Lippson (1997) identify St. Jerome Creek and the shoreline outside the Creek as soft shell clam habitat. Baker and Man (1991) document that St. Jerome Creek is within the optimal habitat range for soft shell clams. Old charts represent the area as clam habitat, but populations do shift around and there is no population or harvest data available for the area. Soft shell clams are typically eradicated from soft substrates such as mud by predators (Baker and Mann 1991). Project areas with firmer substrates, such as sand or sand mixes could support soft shell clams.

Blue crab (*Callinectes sapidus*) occurs in the study area and supports a substantial commercial and recreational fishery in the area.

The jetties would tie into the shorelines of St. Jerome Point and Deep Point. These areas are currently sandy shorelines, whose position has continued to change over the course of time.

F. Description of Dredging and Placement Method

The dredging will be conducted hydraulically with the material placed in an upland disposal area. Dredged material will be transported from the channel to the placement site using a pipeline. It is planned that the jetty construction would occur from the water using barges and cranes. It is expected that a temporary construction area approximately 2,000 square feet would be needed on land at each jetty site.

II. Factual Determinations

A. Physical and Substrate Determinations

1. Substrate elevation and slope. The shoreline area is mostly flat with some undulation resulting from the currents in the area. Water depths are mostly less than 10 feet MLLW, but are typically between 5 and 10 feet MLLW. There are two deeper areas, with depths of approximately 12 feet MLLW. Slopes are typically mild.

2. Sediment Type. The sediment in the project area consists of mainly fine and coarse grained sands. At the bottom of the depths planned to be dredged, there is some clay, silt, and silty sand.

3. Dredged Fill Material Movement. Minimal erosion is expected at the site following the construction of the jetties due to the very gentle slopes. The jetties would be monitored for settlement as it was identified that foundation materials are soft.

4. Other Effects. None expected.

5. Actions Taken to Minimize Impacts. Monitoring will be performed to evaluate whether jetties have moved following construction.

B. Water Circulation, Fluctuation, and Salinity Determinations

1. Water Quality.

(a) *Salinity* - No change expected in existing tidal waters.

(b) *Chemistry* - No long-term change expected. The water in the project area is very turbid. Significant increases in nutrient concentrations, such as ammonia, due to dredging activities are not expected. Nutrient levels could be minimally increased in the short-term due to release from bottom sediments as substrates are disturbed by dredging.

(c) *Clarity* – St. Jerome Creek is a turbid creek with high sedimentation rates. A minor and temporary reduction of water clarity is expected in immediate area during construction at the dredged and placement site due to increased turbidity. The turbidity produced would be of short duration and would contribute little sediment to the natural ebb and flow of sediments in the area. Fine sand may be carried with the currents but is expected to fall out within 100 feet. As the material has a high percentage of sand, turbidity increases would be minor and temporary. Following construction, a rapid return to pre-project clarity is expected with possible minor improvement due to adequate depths at the navigation channel.

(d) *Color* - Minor and temporary change expected during construction due to minor increase in turbidity. No long-term impact expected; potential for minor improvement.

(e) *Odor* - No change expected.

(f) *Taste* - Not applicable.

(g) *Dissolved Gas Levels* - No change expected.

(h) *Nutrients* - No long-term change expected. The water in the project area is very turbid. Significant increases in nutrient concentrations, such as ammonia, due to dredging activities are not expected. Nutrient levels could be minimally increased in the short-term due to release from bottom sediments as substrates are disturbed by dredging.

(i) *Eutrophication* - Not long-term change expected. Significant increases in nutrient concentrations, such as ammonia, due to dredging activities are not expected. Nutrient levels could be minimally increased in the short-term due to release as substrates are disturbed by dredging.

(j) *Temperature* - No change expected.

2. <u>Current Patterns and Circulation.</u>

(a) *Current Patterns and Flow* - Alterations are expected to the tidal waters adjacent to the jetty site as the presence of the jetties would change current patterns and flows in the near vicinity. No adverse environmental impacts are expected. Current modeling that focused on evaluating shoaling rates within the federal and county channel suggest little to no change in tidal circulation within the creek, but these models were not designed to specifically look at circulation within the creek. Detailed project design efforts in the next planning stage will further evaluate the impacts on circulation and flushing within St. Jerome Creek.

(b) *Velocity* - Minor changes expected around the jetty area. After construction, the jetty would slow water down; at its tip velocity may increase.

(c) *Stratification* - No change expected.

(d) *Hydrologic Regime* - No change expected.

3. Normal Water Level Fluctuations. No change expected. The tidal range would remain the same.

4. Salinity Gradients. No change expected.

5. Actions That Will Be Taken to Minimize Impacts. The use of hydraulic dredging is expected to minimize the resuspension of dredged material into the water column. Site conditions are expected to limit the use of turbidity curtains as channel velocities and offshore fetches are too extreme for their use. Turbidity curtains could potentially be used at the interface of the northerly jetty into the sand peninsula to minimize the resuspension of sediment into the water column during dredging and placement activities. Any sandy substrates disturbed by dredging area expected to settle out of the water column in the near vicinity of the dredging. Following project completion, the channel should have increased capability to self-scour. This will permit future dredging to be required less frequently and therefore, minimize the frequency of dredging impacts.

C. Suspended Particulate/Turbidity Determinations

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Placement Site. Minor and temporary impacts to water quality are expected during construction because of increased turbidity. As the material is mostly sand, it will settle quickly and any turbidity is expected to be brief. Also, this area has a relatively large volume of sand in suspension on a regular basis.

2. Effects (degree and duration) on Chemical and Physical Properties of the Water Column.

(a) *Light Penetration* - Minor, temporary, and localized reduction in light penetration due to turbidity would occur during construction in waters adjacent to the project site. No change is expected after construction. Any turbidity created by these actions is expected to be generally within the range of natural turbidity levels.

(b) *Dissolved Oxygen*. Minor, temporary, and localized reduction in dissolved oxygen in conjunction with elevated turbidity levels may occur during construction. Following construction, a rapid return to pre-project conditions is expected.

(c) *Toxic Metals and Organics*. No toxic metals or organics are expected to be released into the water column.

(d) *Pathogens*. No pathogens are expected to be released into the water column.

(e) *Aesthetics*. A temporary and minor reduction in aesthetic value within the project area is expected to occur because of minor turbidity during construction. Following construction, a rapid return to pre-project conditions is expected.

(f) *Temperature*. No change expected.

3. Actions Taken to Minimize Impacts. The use of hydraulic dredging is expected to minimize the resuspension of dredged material into the water column. An appropriate time of year restriction has been set by the resource agencies to protect aquatic resources in the area. No dredge work can be done from June 1 through September 30 or from November 15 through March 1. Site conditions are expected to limit the use of turbidity curtains as channel velocities and offshore fetches are too extreme for their use. Turbidity curtains could potentially be used at the interface of the northerly jetty into the sand peninsula to minimize the resuspension of sediment into the water column during dredging and placement activities. But their use would be limited elsewhere. Any sandy substrates disturbed by dredging area is expected to settle out of the water column in the near vicinity of the dredging.

D. Contaminant Determinations

There is no evidence that hazardous or toxic contaminants exist in the vicinity of the project area. The 2004 EA identified no hazardous waste sites. Based upon a review of the U.S. Environmental Protection Agency (USEPA) records [Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), Resource Conservation and Recovery Act Information System (RCRAInfo), National Priorities List (NPL), and Toxic Release Information System (TRIS)] there are no known sources for hazardous, toxic and radioactive wastes in the proposed project area (USEPA 2009), but there are three seafood industry-related businesses in the St. Jerome vicinity that have been issued surface water permits.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton. Due to entrainment, it is anticipated that there will be temporary negative impacts to the phytoplankton and zooplankton during the dredging operations. Any phytoplankton and zooplankton entrained in the sediment slurry that is removed by dredging would be lost to the Bay system and removed from the food web. Local depressions of macrozooplankton, phytoplankton, and photosensitive zooplankton may occur, but would be short in duration and to species that are common throughout the mid-Bay region. The majority of the plankton occurring at the site would be comparable to plankton that is widely dispersed and abundant over a broad region of the Chesapeake Bay. The impacts would be localized and not significant in the long-term. In the short term, the turbidity associated with dredging and construction is likely to suppress light penetration into the water column and could locally depress the phytoplankton community. However, the area currently is very turbid so this may limit the negative impacts on plankton resources. No significant adverse impacts are expected to any particular species as a result of the minor and local increase in turbidity. Following construction, planktonic organisms would return to the work area.

2. Effects on Benthos. . Jetty construction operations would result in a permanent loss of benthic habitat of 0.46 ac in the jetty footprint and the destruction of any plankton or benthic organisms (including clams) that were entrained with the dredged sediment. Dredging would immediately impact and deepen to 7 feet MLLW 3.72 ac (3.67 ac in federal channel and 0.05

ac in spur). This impact would be moderate and short-term because it is expected that the benthos would be recolonized. Some substrates would be converted from sand to clay, silt, or silty sand which may lead to colonization by different species.

The jetty footprint was calculated by measuring horizontally from the outside of one batter block to the next at the top of the jetty. The footprint of the south jetty would be 8,313 square feet (using 6.25 feet in width), and that of the north jetty would be 11,563 square feet (using 7 feet in width). However, due to the slope of the piles, the width of the jetty structure under the seafloor will be wider than the part that is visible above the waterline.

An indirect effect of the project would be the attraction of benthic organisms and fish that require or prefer hard substrate to the jetties. This would enhance a different group of organisms than what had been present in the channel area, but would provide some compensation for the lost benthic habitat.

(a) *Primary Production, Photosynthesis* - Minor, temporary, and localized reduction in photosynthesis and primary production due to turbidity impacts to phytoplankton may occur during dredging and jetty construction. Following construction, a rapid return to pre-project conditions is expected.

(b) *Suspension/Filter Feeders* - Minor, temporary, and localized impacts to suspension feeders (such as jellyfish) and to filter feeders (such as oysters, clams) in the area may occur due to increases in turbidity created by construction activities. Although steps are taken to reduce impacts to oysters, reefs within St. Jerome Creek could be impacted by increased sedimentation as a result of dredging activities. The mouth of St. Jerome Creek at the Chesapeake Bay is a highly turbid environment with wind driven currents commonly churning up sands in the area. Following construction, a rapid return to pre-project conditions is expected. Some organisms may be physically removed from the area by the hydraulic dredging.

(c) *Sight Feeders* - Minor, temporary, and localized impacts due to turbidity may occur during construction. Following construction, a rapid return to ambient conditions is expected. In addition, some organisms may be physically removed from the area by the hydraulic dredging. Mobile organisms are expected to be able to leave the area upon commencement of construction to avoid impacts.

3. <u>Effects on Nekton.</u> The dredging of material on the channel bottom at the proposed project site is anticipated to temporarily affect the distribution of nektonic organisms.
Nekton are expected to be able to exit the project area during construction to avoid impact and then return to the area upon completion of the project.

4. <u>Effects on Aquatic Food Web.</u> Dredging and construction activities associated with the jetty placement would temporarily disrupt the aquatic food web, by loss of nekton, phytoplankton, and benthic fauna, but pre-construction conditions are expected to return following the completion of construction.

5. Effects on Special Aquatic Sites.

(a) *Sanctuaries and Refuges* - The project will have no significant impact to sanctuaries or refuges within the proposed project or surrounding area.

(b) *Wetlands* - The USFWS NWI mapping shows the presence of estuarine and marine (unconsolidated sand) unvegetated wetlands on St. Jerome and Deep Point. Vegetated wetlands exist on the interior of St. Jerome Creek. Minimal to no impacts are expected to existing vegetated wetlands, except for a small fringe wetland where the pipeline will cross. However, 0.5 ac of unconsolidated sand beach would be removed to provide for the new alignment of the Federal channel. Modeling of St. Jerome Creek indicates that the project area is receiving sediment from both the north and south. Additional wetland creation may occur over time if substrates accumulate in areas newly protected by the jetties.

Placement of the pipeline during hydraulic pumping is likely to result in minor local, direct, short-term impacts on existing wetland vegetation. This impact, the result of the placement of the pipeline crossing the small wetland area in order to transfer dredged material from the dredge rig to the placement site, is unavoidable. It is anticipated that no permanent harm to wetland areas will result from the Proposed Action, and that vegetation temporarily covered or impacted by the pipe will regrow to current densities over the next one or two growing seasons.

(c) *Tidal flats* - There will be a minor permanent impact to tidal flats from the jetty construction. Approximately 0.5 ac of the sand spit at the tip of St. Jerome Point, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel. The project will have no significant impact to tidal flats. Projected sediment (likely sand) deposition behind the jetties would create new fastland that could take the form of sandy beach, tidal flats, or wetlands.

(d) *Vegetated Shallows* - The project would have no significant impact to vegetated shallows. Deposition in the areas behind the jetties would alter the current habitat permanently and could potentially lead to a loss of shallow water habitat, but these areas do not currently contain submerged aquatic vegetation.

6. Rare, Threatened and Endangered Species. No rare, threatened or endangered species would be adversely affected by this project. Based on correspondence from both the USFWS and MD DNR, which indicated no records for any federal or state listed rare, threatened or endangered species, no impacts to such resources are expected (AppendixE). NMFS has indicated that endangered species they manage, the shortnose sturgeon and various breeds of endangered sea turtles may be present in the project area. Ongoing monitoring efforts have identified that is very unlikely that shortnose sturgeon would be in the project area. No impacts are anticipated to shortnose sturgeon.

Sea turtles are transient to the Chesapeake Bay and the project vicinity. Kemp's ridley and loggerhead turtles are the most frequent visitors to the Chesapeake Bay. Leatherback sea turtles typically continue migrating north past the Chesapeake Bay and prefer nesting on the high wave energy beaches of the eastern seaboard. No nesting by sea turtle species has yet been recorded in the Chesapeake Bay (Evans et al. 1997).

Although direct monitoring was not performed as part of the feasibility study, a small number of dead sea turtle strandings have been reported in the vicinity in the past five years with one being in the direct project area. No data on live strandings is available. Sea turtles are migratory individuals that are seasonal transients to the project area. During cooler weather months when construction would occur, sea turtles are unlikely to be present. No negative impacts are expected to sea turtles.

Atlantic sturgeon could be present in the project area, but monitoring suggests that they are not common. Due to the unlikelihood of their presence, no negative impacts are expected to Atlantic sturgeon.

7. <u>Other Wildlife</u>. Detrimental impacts to other wildlife are expected to be temporary and insignificant. Some disturbance to terrestrial wildlife may also occur due to construction activities; however these effects are temporary, not significant and would not be expected to limit their growth or population size. It is likely that the current sand beaches may be enlarged in the areas behind the jetties, but the potential exists for wetlands to develop. Time of year restrictions would be implemented to protect oyster bars, and wintering and migratory waterfowl. If any deposition does reach oyster bars in the vicinity, it could lead to a loss in production from that bar. Any bars that are heavily sedimented over may take years to recover or need to be cleaned of sediment to return the health of the bar.

8. <u>Actions to Minimize Impact</u>. The use of hydraulic dredging is expected to minimize the resuspension of dredged material into the water column. Turbidity curtains could potentially be used at the interface of the northerly jetty into the sand peninsula to minimize the resuspension of sediment into the water column during dredging and placement activities, but their use is limited elsewhere. Time of year restrictions would be implemented to protect oyster bars and waterfowl.

F. Proposed Disposal Site Determinations

1. <u>Mixing Zone Determination</u>. Not applicable.

2. <u>Determination of Compliance with Applicable Water Quality Standards.</u> Construction activities would be conducted in accordance with all applicable State water quality standards.

3. <u>Potential Effects on Human Use Characteristics.</u>

(a) *Municipal and Private Water Supply* - Not applicable.

(b) *Recreational and Commercial Fisheries* - Minor temporary impacts are expected to occur to the commercial and recreational fishery during the dredging of the St. Jerome Creek. The construction of the jetties is not expected to impact pound netting activities outside the mouth of St. Jerome Creek as these are further offshore than the jetties would extend. No information is available to evaluate potential impacts to gillnetting use in the vicinity. The Circle C Oyster Ranch could be impacted by increased turbidity and sediment from the proposed project. Previous county dredging has been reported to have disrupted the operations at the Circle C Oyster Ranch and caused a significant loss of income.

Those using the federal channel (for fishing or recreation) would need to become familiar with the new channel alignment, but over the long-term the realignment is not expected to cause any negative benefits. Conversely, the primary positive effect is that the Proposed Action provides safe and economical navigation for all boat traffic in and out of the St. Jerome Creek federal navigation channel between St. Jerome Creek and the middle Chesapeake Bay. The dredging of the federal navigation channel helps to support the area's economy by allowing a full range of commercial and recreational watercraft to enter the Bay.

(c) *Water Related Recreation* - Recreational boaters using the St. Jerome Creek would be able to safely navigate through the mouth of the river upon completion of the project. Construction of the proposed project, including dredging and placement is anticipated to take approximately 7 months to complete and would not take place during the summer season when recreational use is highest. The dredging and construction operations may temporarily require the redirection of any boat traffic around the area. Boaters may experience some delays during this time. It is anticipated that a beneficial impact to recreation would occur once the construction is completed and access to the St. Jerome Creek is restored.

(d) *Aesthetics* - Construction of the project would alter the natural aesthetics at the mouth of St. Jerome Creek. This impact would be permanent. The proposed jetties would be constructed to a height of +5 ft MLLW. The south jetty would connect to the shoreline about 100 feet south of the northern tip of Deep Point and would have a length of 2,040 feet. The north jetty would connect at the tip of Saint Jerome Point and would have a length of 1,100 feet. This is expected to be a minor impact to the Bay-wide viewshed. The impact would be more significant to the landowners and users adjacent to the project, but is not anticipated to block any of the viewshed. No additional impacts to aesthetics are expected at the dredged material placement site since the current use of the site is being continued. There would also be a temporary and minor reduction in aesthetic value within the area of dredging due to construction activities.

(e) *Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves* – Land formations at the mouth of St. Jerome Creek are included in the Coastal Barrier Resources System. Coastal barriers are unique land forms that provide protection for diverse aquatic habitats and serve as the mainland's first line of defense against the impacts of severe coastal storms and erosion. These areas are subject to federal funding prohibitions, as specified in the Coastal Barriers Resource Act, to discourage development or modifications to coastal barriers. Federal monies can be spent within the CBRS for certain exempted activities, after consultation with the USFWS. Consultation with USFWS (email dated November 5, 2010) indicates that the project qualifies for exemption, since the purpose of the proposed project is to maintain an existing federal navigation channel.

III. Finding of Compliance

A. Adaptation of the Section 404(b)(1) Guidelines to This Evaluation.

No adaptations of the Guidelines were made relative to this Evaluation

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem.

Dredging and jetty construction are water dependent by nature and require either excavation of supra-tidal sites to intertidal elevations or filling into open water habitat. In this case, the proposed action was configured to minimize detrimental environmental impacts and maximize benefits to a specific, local navigation channel.

C. Compliance with Applicable State Water Quality Standards

The proposed dredging and placement of material, jetty construction, and associated activities would be in compliance with Maryland water quality standards.

D. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act

The proposed fill material is not anticipated to violate the Toxic Effluent Standard of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973

Consultation with NMFS regarding project impacts to shortnose sturgeon, Atlantic sturgeon, and sea turtles is ongoing. It is not expected that the project would have an impact to these species. It is expected that the proposed project would be in compliance with the Endangered Species Act of 1973.

F. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

No marine sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the study area.

G. Evaluation of Extent of Degradation of Waters of the United States

The proposed channel and jetty construction project would not result in significant, adverse impacts on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. Negative impacts including a disruption of business and economic losses have been identified to the oyster aquaculture operation within St. Jerome Creek. The life stages of aquatic life and wildlife would not be significantly adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project components. It is anticipated that a beneficial impact to recreation would occur once the construction is completed and access to the St. Jerome Creek is restored.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

Material dredged from the site would be removed to an upland disposal area.

I. Determination of Cumulative Effects on the Aquatic Ecosystem

The impacts of the proposed action must be weighed to determine whether the additive effects of these actions will result in a significant cumulative impact on the natural and human environment of the area.

The only other activity that needs to be considered in the project area is dredging of the Southern Prong county channel. St. Mary's County dredges this channel to maintain passage as needed and as funding is available. This channel shoals approximately 0.5 ft per year. In recent years, dredging has been performed in 1982, 1991, 2006, and 2010. Dredging in 2010 was done in spots and removed 950 to 975 cy. If the Federal and county channels were dredged in the same year, the impacts discussed previously to water quality, the benthos, and aquatic habitats of St. Jerome Creek could be slightly increased.

Further, this project would stabilize a dynamic shoreline and inlet. Shoreline stabilization occurs throughout the Bay and cumulatively results in a hardened shoreline that provides reduced habitat and has a reduced ability to enable the Chesapeake Bay to adapt to sea-level rise and climate change. This project would contribute to the greater than 1,000 miles of bay shoreline that is already hardened in Maryland. In some places, a stable inlet has led to increased development of the area. There is no way to forecast whether this would occur in St. Jerome Creek, but the potential for increased development should be recognized.

J. Determinations of Secondary Effects on the Aquatic Ecosystem

Indirect effects resulting from the project have been discussed previously in this analysis under each category. No significant secondary impacts are expected from the proposed project.

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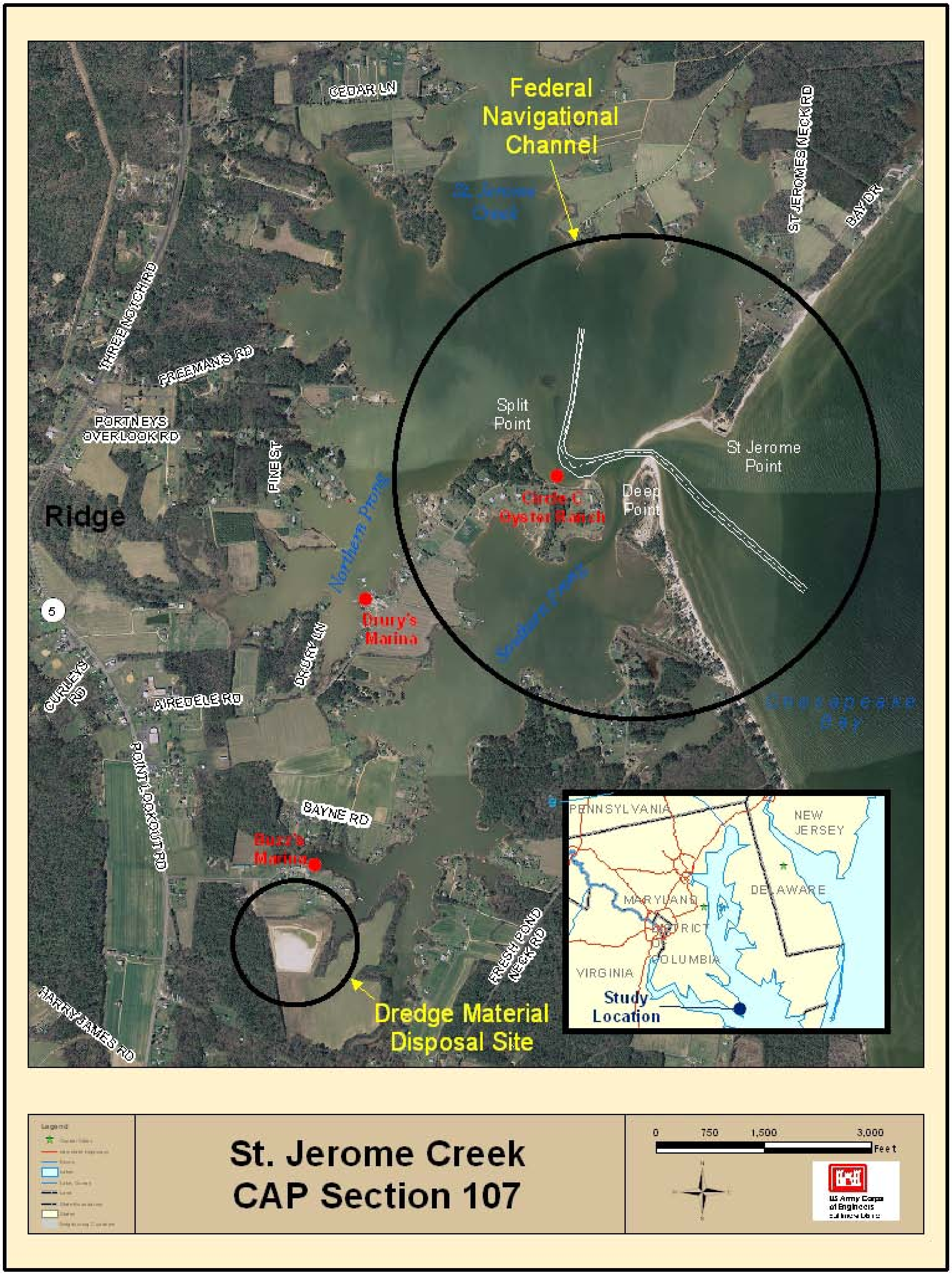

Figure 1: Study Area

Figure 2: Proposed Project

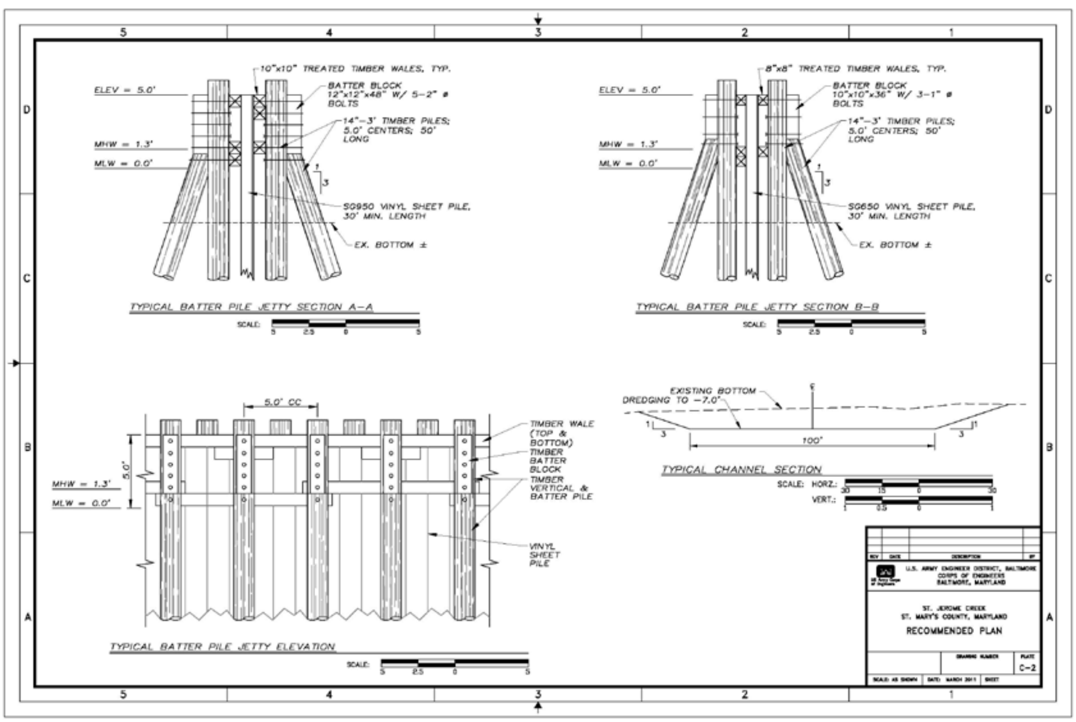

Figure 3: Batter Pile/Vinyl Sheet Pile Jetty

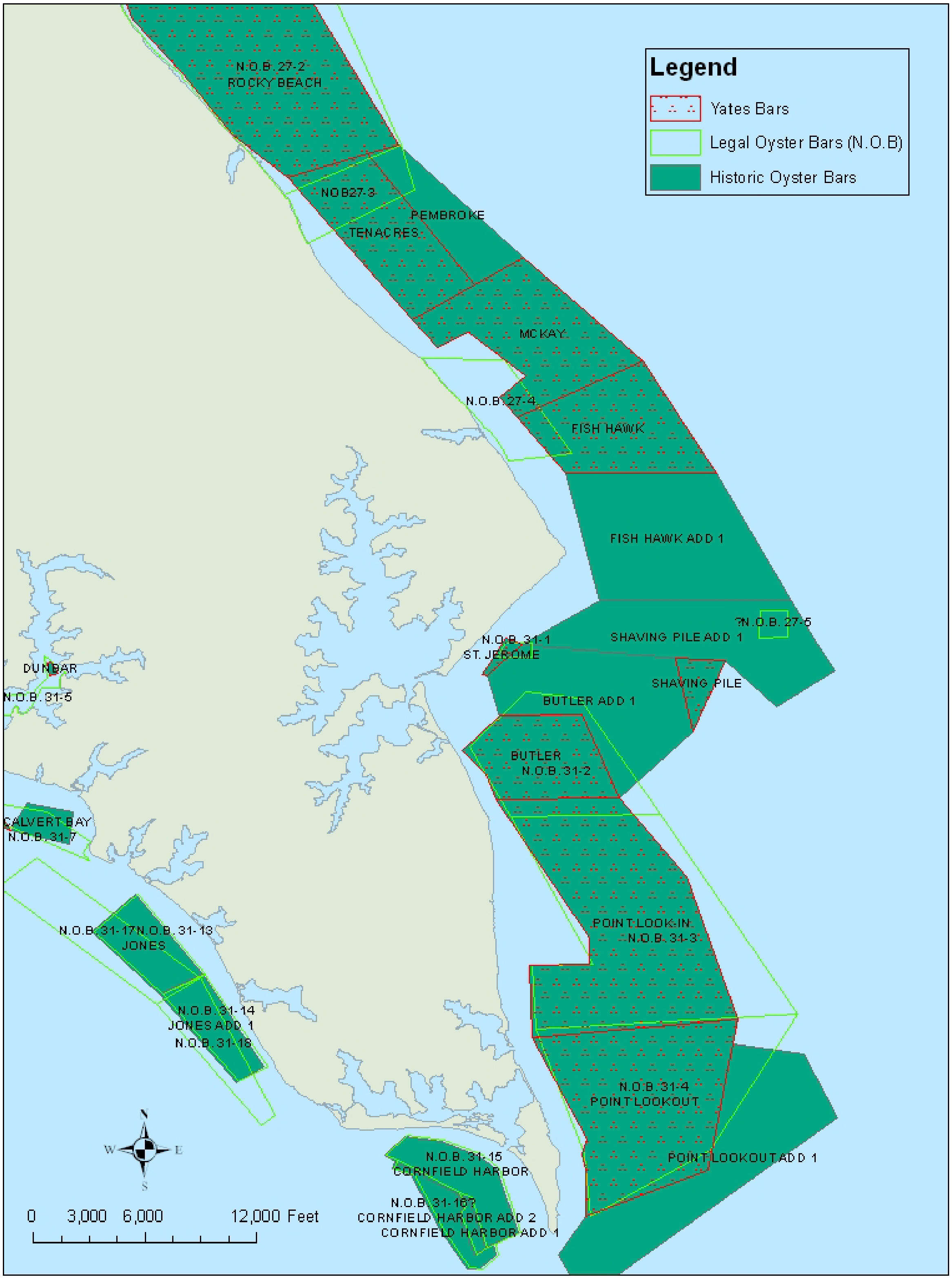

Figure 4: Oyster Bars in the Vicinity of St. Jerome Creek

APPENDIX G

ESSENTIAL FISH HABITAT ASSESSMENT

St. Jerome Creek, St. Mary's County, Maryland
Section 107 Shallow Draft Navigation Project

Essential Fish Habitat Assessment
Prepared by U.S. Army Corps of Engineers, Baltimore District
July 2011

Pursuant to Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, preparation of an Essential Fish Habitat (EFH) Assessment is necessary for the St. Jerome Creek dredging and jetty project at Deep Point and St. Jerome Points, St. Mary's County, Maryland, to address potential impacts to any areas designated as EFH. An EFH Assessment must include the following components:

1. A description of the proposed action,
2. A listing of the life stages of all species with EFH designated in the project area;
3. An analysis of the effect of the proposed action,
4. The Federal agency's opinions regarding the effects of the proposed action, and
5. Proposed mitigation, if applicable.

DESCRIPTION OF PROPOSED ACTION

The proposed St. Jerome Creek Small Navigation Project would establish two new jetty structures and straighten the course of the existing federal channel to reduce shoaling in the navigation channel. Figure 1 shows the proposed study area. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. Approximately 0.5 ac of this sand spit, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel.

The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least down drift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative as the Recommended Concept Plan for further evaluation are as follows:

- Most significant decrease in channel shoaling rate
- Longest interval between future maintenance dredging events
- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- Best potential for decreasing the shoaling in the Saint Jerome Creek section of the channel by realigning the channel straight through the inlet

- High sediment storage capacity along the up drift side of the north jetty
- Least potential for sand bypassing from the north shoreline
- Minimal down drift shoreline erosion potential
- Best protection for the existing shorelines and spits from wave induced erosion

The jetty would be constructed of timber and vinyl sheeting. TimberGuard piles would be incorporated into the design. TimberGuard piles have a treated structural wooden core that are fully encased in a tough polymer sleeve, keeping the treatment in and predators out. There are no nails, banding, or seams. The continuous polymer sleeve also reduces the dissolved oxygen level inside the pile, to prevent any destructive organisms that do get into the wood from being able to survive inside the polymer core.

Jetty construction consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile. Figure 2 depicts the proposed jetty and federal channel alignment. Figure 3 shows the batter pile/vinyl pile jetty design.

The existing navigational channel would be hydraulically dredged, resulting in hydraulic dredging of approximately 1,600 feet to a depth of 7 feet mean lower low water (MLLW) and a width of 100 feet. The footprint of the federal channel to be dredged is 3.67 acres. A 400 foot spur would remain off the federal channel to the left after it passes Deep Point and continue to the existing Southern Prong channel so that passage is still available into this county channel. The spur would be dredged to 7 feet MLLW and would impact 0.05 ac. Approximately 30,000 cubic yards of material removed from the channel would be placed in an approved upland dredge disposal site that has been used for previous maintenance dredging (Figure 1).

Dredged material is expected to be mostly sand. Dewatering of the dredged material would take place in the upland placement site. The return water from this facility would outfall to Maryland waters and would meet State water quality standards in accordance with water quality certification conditions.

Water depths are less than 10 feet (MLLW) in the project area. Salinity just east of the study area in the Chesapeake Bay mainstem near Point No Point, typically varies between 7.49 and 21.76 parts per thousand (ppt). The mean range of salinity (from 1985 through 2008) is between 15 and 17 ppt (MDNR 2009). Water temperatures have been monitored just east of the Creek and range from roughly 34 degrees Fahrenheit in the winter to 80 degrees Fahrenheit in the summer months. (MDNR October 2009).

In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix following dredging. The substrate changes could potentially lead to different organisms colonizing the benthos or may be quickly covered by sand deposition. Further, the sediment substrate would be permanently converted to a jetty within the jetty footprint. This loss of bottom habitat would occur across a distance of 1,330 feet for the south jetty and 1,770 feet for the north jetty. The footprint of the south jetty above the water surface would be 8,313 square feet, and that of the north jetty would be 11,563 square feet; a 0.46 acre area. Depending on water depth, the jetties' width would vary due to driving the timber piles into the bottom at an angle. The maximum width of the jetties at their deepest point is 30 feet resulting in a maximum potential disturbance to 2.13 acres of bottom habitat.

The time of year restrictions for the hydraulic dredging activity is June 1 through September 30 and November 15 through March 1, inclusive, to protect oysters and wintering and migrating waterfowl. All construction activities would have a time of year restriction where no construction activity should be performed during the period 15 November through 1 March. The regulatory and resource agencies have stated that allowances may be made if necessary. Should an event occur that additional time is needed to finish dredging; USACE would need to make a formal request to agencies for their review.

SPECIES WITH EFH DESIGNATED IN THE PROJECT AREA

In correspondence dated September 17, 2009, the National Marine Fisheries Service (NMFS) recommended using, for Maryland projects, the EFH Designation for the primary tributary closest to the project area, with similar salinity regime. In this case, it is the Potomac River estuary. NMFS also stated that the Maryland bay tributary designations are not accurate relative to the presence of certain federal species, based on species' ecology and salinity tolerances. For the Potomac River designation, only bluefish *(Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), and Spanish mackerel (*Scomberomorus maculatus)* for juvenile and adult life stages, and juvenile red drum (*Sciaenops ocellatus*) are expected to be in the project area of St. Jerome Creek, therefore only these four species are discussed in this EFH assessment.

IMPACTS TO SPECIES WITH EFH DESIGNATED IN THE PROJECT AREA

An analysis of impacts on the species of concern and their EFH follows. The effects of the jetty construction and dredging of the existing navigational channel are evaluated.

In general, it is expected that demersal (bottom-dwelling) species (summer flounder red drum) and would be potentially more affected by the proposed activities than pelagic (water-column) species (bluefish and Spanish mackerel) since the bottom-dwellers would tend to move less during the dredging. However, the time of year that the species are in the Chesapeake Bay will need to be evaluated to determine potential impacts.

The water in the project area is very turbid. Significant increases in nutrient concentrations, such as ammonia, due to dredging activities are not expected. Nutrient levels could be minimally increased in the short-term due to release from bottom sediments as substrates are disturbed by dredging. The use of hydraulic dredging is expected to minimize the resuspension of dredged material into the water column. After late March, project activity impacts to nutrient concentrations in the water column are expected to be negligible relative to ambient conditions in the dredging area. Since dredging is expected to occur in the fall and winter, bottom temperatures would still be relatively low (which would inhibit nutrient fluxes). Nutrient releases into the water column that could potentially occur during this period should be limited and not expected to adversely impact sensitive life stages or spawning activities.

1. BLUEFISH (*Pomatomus saltatrix*) (juvenile and adult stages)

In the NOAA/NMFS Technical Memorandum NMFS-NE-144, Essential Fish Habitat Source Document: Bluefish, *Pomatomus saltatrix*, Life History and Habitat Characteristics, juvenile bluefish are rated as abundant in the Chesapeake Bay mainstem MD/VA (i.e., lower Chesapeake). Juvenile and adult bluefish are listed as common for the Chesapeake Bay main stem within the mixing and seawater zones. This EFH assessment relies heavily on that NOAA/NMFS Technical document.

Bluefish are usually found high in the water column. In some years, large numbers of bluefish penetrate far up the Bay; in other years, bluefish schools are sparse, with larger bluefish concentrating in Virginia waters. For juveniles, all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida are considered EFH.

Juvenile and adult bluefish enter the Chesapeake Bay during spring through summer, leaving the Bay in late fall.

Adults – Bluefish are warm water migrants and do not generally occur in Mid-Atlantic estuarine waters at temperatures less than 14 to 16°C (57 to 61°F). Bluefish travel in schools of like-sized individuals and undertake seasonal migrations, moving into the Mid-Atlantic Bight during spring. Adults are uncommon north of Annapolis, and generally do not occur above the U.S. 50 bridge, except during years of greater up-Bay salt wedge encroachment. Adults are not typically bottom feeders and are strong swimmers.

Juveniles - Juveniles tend to concentrate in shoal waters. In contrast to adults, the young have a wide range of salinity tolerance and penetrate much farther up the Bay and its tributaries, where they can be found in shallow waters of very low salinity (Murdy et al., 1997). Therefore, juveniles are more common in the upper Bay above the U.S. 50 Bridge, occurring as far north as the Susquehanna Flats and the lower Elk River (Lippson 1973). Juveniles (including young of the year) begin to depart the Mid-Atlantic estuaries and move into the Atlantic Ocean in October and travel as far south as Cape Hatteras and Florida to overwinter.

Spawning - Spawning is oceanic and does not occur in the Chesapeake Bay. Bluefish spring spawning occurs during the coastal ocean migration from Florida to southern North Carolina, and summer spawning occurs further offshore in the mid-Atlantic.

Prey- Bluefish are voracious predators. Several studies have suggested that juvenile and adult bluefish would eat whatever taxa are locally abundant. They are sight feeders throughout the water column, with smaller individuals feeding on a wide variety of fishes and invertebrates, and with large bluefish feeding almost exclusively on fishes, particularly Atlantic menhaden (*Brevoortia tyrannus*), bay anchovies (*Anchoa mitchelli*), and Atlantic silversides (*Menidia menidia*). Juveniles tend to be opportunistic feeders, foraging on a wide variety of estuarine life in the pelagic zone and over a variety of bottom types (Lippson 1973). Small fish such as Menhaden that bluefish prey upon are widely dispersed across the Bay and do not depend upon the bottom. With respect to prey, there is nothing particularly unique or valuable to bluefish at the project area. Therefore, bluefish prey species should not experience adverse effects on population levels from the proposed project.

Impact on Bluefish- There are no direct impacts expected for adult and juvenile bluefish because the proposed dredging would occur in the fall, when bluefish are overwintering off of the southeastern coast of Florida**.** Adults are not typically bottom feeders and are strong swimmers that can easily avoid turbid conditions. No impacts are expected because there is sufficient open water habitat outside of the project area during the short construction season and turbidity impacts are expected to be local, minimal, and short-lived. As a transient species, bluefish are expected to be able to avoid any direct, minor construction impacts to water quality if construction would occur in the spring when they are likely to be in the vicinity.

No impacts to spawning, egg or larvae habitat of the bluefish are projected because spawning does not occur in the Chesapeake Bay and eggs and larvae do not occur here.

Impacts to bluefish prey are not anticipated because the young of species such as bay anchovies, menhaden, and silversides, which are found in shallow water areas, would not be in the area during the time the fall construction would occur. If dredging occurs in the spring, these species would be able to move out of the work area. If the jetty construction occurs during the warmer months, these species would be in the project area. However, these prey species are nektonic and they would move out of the area during the work. Further, bluefish have been shown to be voracious predators that would consume whatever prey is available. Therefore, the lack of selectivity shown by bluefish toward their prey should minimize any adverse affects if some prey are forced out of the area by construction activities.

Cumulative impacts: The only other ongoing activity that needs to be considered in the project area is dredging of the Southern Prong county channel. St. Mary's County dredges this channel to maintain passage as needed and as funding is available. This channel shoals approximately 0.6 feet per year. In recent years, dredging has been performed in 1991, 2006, and 2010. Dredging in 2010 was done in spots and removed

950 to 975 cy. If the federal and county channels were dredged in the same year, the impacts discussed previously to water quality, the benthos, and aquatic habitats of St. Jerome Creek could be magnified.

Cumulatively, there are not anticipated to be any significant impacts, either direct or secondary to bluefish populations within the Bay.

2. Summer flounder (*Paralichthys dentatus*) (juvenile and adult stages)

Juvenile and adult summer flounder enter the Chesapeake Bay during spring and early summer, and exit the Bay in fall (Murdy 1997). Juveniles overwinter in tidal creeks. Both adults and juveniles exhibit a marked preference for sandy bottom and/or submerged aquatic vegetation (SAV) beds, particularly areas near shorelines (Murdy 1997). The Magnuson-Stevens Act has identified SAV as a Habitat of Particular Concern for both juvenile and adult summer flounder.

The project area is located within the U.S. Geological Survey Point Lookout, MD, Quadrangle map. There is no documentation of SAV in the Point Lookout Quadrangle. Based on the 2008 SAV survey conducted by the VA Institute of Marine Science for the Maryland Coastal Bay Program, SAV does not exist in the area. In a letter dated June 30, 2009, the USFWS indicated that SAV is not known to exist in the proposed project area. Although no SAV has been documented in the area to date, potential suitable habitat may exist. In the immediate proposed project area, direct wave action from the open water of the Bay and boats, and erosion due to long shore transport may hinder the establishment of SAV habitat.

Adults - Summer flounder adults inhabit shallow coastal and estuarine waters during warmer months. Adults utilize deep channels, ridges, sandbars, and shallow water with sandy bottoms. Summer flounder inhabit the Chesapeake Bay in the summer and move offshore to depths of 120 to 600 feet of water during the fall and winter. Some summer flounder overwinter in the bay. Summer flounder are most common in the lower part of the Bay but are known to occur up to the Gunpowder River.

Juveniles- Juveniles prefer shallow waters. Newly settled juveniles usually occur in estuarine creeks in the winter (January through March). Optimal growth of juveniles occurs in salinities in the 10 to 30 ppt range. High salinity subtidal salt marsh creeks and shallow portions of the bays are the most important nursery areas.

Spawning- Summer flounder are ocean spawners. Spawning occurs during offshore migration from late summer to mid-winter. Larvae and post-larvae drift and migrate inshore, aided by prevailing water currents, and enter the bay during October through May.

Prey- Summer flounder feed mainly on fish, squids, shrimp, and crabs. The summer flounder prefers sandy substrate and is frequently seen near sandy shores, partly buried in the sand.

Impact on Summer Flounder- Adults are not usually present in the bay in the winter except for a few individuals, which may overwinter. Adults prefer sandy substrate that is present at the construction site, however, dredging is planned to occur during the fall when the adults are not likely to be in the region. If dredging should occur in the spring, these species would be able to avoid the work area. As a mobile species, summer flounder are expected to be able to avoid any direct, minor construction impacts to water quality resulting from construction. In the long term, the reduced shoaling and turbidity in the channel from the jetties should benefit summer flounder.

Approximately, 0.46 to 2.13 acres of habitat would be permanently buried by jetty construction. Approximately 30,000 cubic yards of material would be removed to dredge the federal channel to a depth of 7 feet and a width of 100 feet to provide a 1,600 foot channel, impacting 3.67 acres. In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix. The substrate changes could potentially lead to different organisms colonizing the benthos and loss of preferred sandy habitat for summer flounder. These changes could add diversity to the potential prey species of the summer flounder, but may lead to a loss of habitat for the summer flounder.

Eggs do not occur in the project area. Larvae and post-larvae may also be in the water column during the construction season and could be entrained by the dredging activities. Juveniles may be in the project area during construction as they use estuarine creeks in the winter between 10 and 30 ppt. Juveniles prefer submerged aquatic vegetation beds (SAV) and shallow water areas. Although the project area is located in a shallow water area and does have sandy bottom making it possible that juvenile summer flounder may be in the project area. However, St. Jerome Creek does not have the established SAV beds that this species prefers. It is expected that juveniles would be able to swim out of the area and find similar habitat to avoid dredging impacts.

Cumulative Impacts- An adverse impact to juvenile summer flounder and their prey species would occur from this activity as they would be displaced during construction and permanently lose 0.46 to 2.31 ac of open water habitat to jetty construction. The sandy substrate of another 3.67 acres in the federal channel may be altered by dredging. However, since they are able to utilize other habitat during construction and the jetties could diversify the habitat for these prey species, this impact would be minor.

Other activities in the project area were presented in the previous ‘Bluefish-Cumulative Impacts’ discussion. Cumulatively, there are not anticipated to be any long-term, significant impacts, either direct or secondary to bluefish populations within the Bay. Short-term displacement would be magnified by additional projects in the study area.

3. Spanish mackerel (*Scomberomorus maculatus)* (juvenile and adult life stages)

Spanish mackerel are most abundant from the mouth of the Chesapeake Bay region to south Florida. They prefer polyhaline regions (18-30ppt) of the lower Bay. They live for five to eight years.

Adults- Spanish mackerel are found off the Atlantic coast from the Florida Keys to New York (occasionally as far north as New England) and in the Gulf of Mexico, and prefer temperatures above 68°F. Spanish mackerel is a common visitor to the middle and lower Chesapeake Bay from spring to autumn, sometimes swimming as far north as the mouth of the Patuxent River. Spanish mackerel mostly live in near-shore, open water, moving in schools, but are sometimes found over deep grass beds and reefs, as well as in shallow estuaries. These fish winter off Florida, moving northward to North Carolina in early April and to New York in June. Spanish mackerel return to warm Florida waters later in the year, as waters cool.

Temperature and salinity appear to be the greatest factors affecting their distribution. According to Earll (1883), Spanish mackerel prefer temperatures between 21 and 27°C (70 and 81°F) and are rarely found in temperatures below 18°C (64°F). The Chesapeake Bay Program documents their range extending to 88°F. Spanish mackerel are generally found in salinities ranging from 32 - 36 ppt. Spanish mackerel spend most of their life cycle in the ocean where the environment is more stable and human impact is less severe (Atlantic States Marine Fisheries Commission, 1990).

Juveniles- Juveniles prefer shallower waters.

Spawning- Females spawn by age two, releasing between half a million and 1.5 million eggs. Larvae grow quickly, reaching lengths of 12 to 15 inches in a year. The spawning season is from April to September of each year and occurs off the North Carolina and Virginia coasts.

Prey- Spanish mackerel are mid-level pelagic carnivores, preying primarily on baitfish. They feed on a variety of fish, including herring, menhaden, sardines, mullet, needlefish, and anchovy; shrimp; crabs; and squid. Dolphins and sharks are major predators of Spanish mackerel.

Impacts- There are no direct impacts expected for adult and juvenile Spanish mackerel. Although, their range can extend to the mouth of the Patuxent River, Spanish mackerel are most abundant from the mouth of the Chesapeake Bay region to south Florida; an area that does not include the project area due to salinity and water temperature. Further, the proposed dredging would occur in the fall when Spanish mackerel are overwintering off of the coast of Florida. If found in the project area, adults and juveniles are not typically bottom feeders and are strong swimmers that can easily avoid turbid conditions and move out of the vicinity.

No impacts to spawning, egg or larvae habitat of the Spanish mackerel are anticipated because spawning does not occur in the Chesapeake Bay and eggs and larvae are not present in these waters.

Impacts to Spanish mackerel prey are not anticipated because species such as bay anchovies, menhaden, and sardines, which are found in shallow water areas, would not be in the area during the time the fall dredging would occur. If the construction occurs during the warmer months, these species would be in the project area. However, these prey species are nektonic and they would move out of the area during construction activities. In addition, the jetties could provide additional habitat for the prey species.

Cumulative Impacts- Other activities in the project area were presented in the previous 'Bluefish-Cumulative Impacts' discussion. There are not anticipated to be any significant cumulative impacts, either direct or secondary to Spanish mackerel populations within the Bay.

4. RED DRUM (*Sciaenops ocellatus*) (juvenile)

EFH for red drum includes all of the following habitats to a depth of 50 meters offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh, tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster bars and reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial bars and reefs. The area covered includes Virginia through the Florida Keys (Reagan, 1985).

Adults- Red drum are bottom-feeding fish. Adult red drums are found primarily near the Bay mouth. The project area is located near the northern limit of their Bay habitat. Adults are found in SAV beds and on mud bottoms.

Juveniles- Juveniles occur throughout Chesapeake Bay from September to November, but prefer grassy (SAV) or mud bottoms.

Spawning – Spawning is oceanic.

Prey - Red drum prey includes crabs, shrimp and fish..

Impact on Red Drum- Adults are unlikely to be present in high numbers in the project area as red drum are found primarily near the Bay mouth. The project area is located near the northern limit of their Bay habitat. If present, the projected construction period (October 1 to November 14 or March 15 to May 31) would minimally coincide with the period when red drum are prevalent in the Bay (May to November). As transient species, adult red drum would be able to avoid the disrupted area and find comparable habitat in the nearby vicinity. No impacts would occur to eggs and larvae because spawning occurs in warm ocean waters in the spring.

Juveniles prefer SAV beds or muddy bottom and shallow water in the summer. Although the project area is located in shallow water there are no established SAV beds in the area, and bottom substrates are sand. The project is proposed to take place in the fall to reduce the likelihood that individuals would be in the project area.

No negative impacts to prey are expected as the species either would not be present during fall construction or would be able to move from the area to avoid impacts. The jetties could provide habitat for red drum prey species.

Cumulative Impacts- Other activities in the project area were presented in the previous ‘Bluefish-Cumulative Impacts’ discussion. There are not anticipated to be any significant cumulative impacts, either direct or secondary to red drum populations within the Bay.

FEDERAL AGENCY’S OPINION ON PROJECT IMPACTS TO EFH

The proposed dredging and construction of the jetties and realignment of the federal channel is not likely to significantly affect the subject EFH species if the construction activities occur in the fall as these species largely migrate from the project area in cooler months. There are not expected to be any impacts to spawning of the subject EFH species either because the work would not be performed during the species’ spawning season or spawning does not occur within the Chesapeake Bay. Turbidity levels in the project vicinity are expected to be elevated for a short time during and after the dredging event due to dredging as well as the operation of tug and barge traffic in the relatively shallow waters. The deepening of the channel and construction of the jetties would diminish the turbidity levels over the long term by decreasing shoaling rates and reducing/eliminating boat propeller scouring of the bottom.

The greatest potential impact is to juvenile summer flounder. Juvenile summer flounder and their prey may be present and would be impacted by the loss of sandy bottom habitat for the jetty construction and channel dredging. Larvae and post-larvae may also be in the water column during the construction season and could be entrained by the dredging activities. Adult summer flounder are not likely to be in the area in the fall. Spanish mackerel and red drum are least likely to be in the project area as these species is most abundant from the mouth of the Chesapeake Bay region to south Florida. Bluefish are pelagic, strong swimmers that would be able to leave the area for similar habitat. As they are voracious predators on a variety of prey, construction is not anticipated to have a significant effect on their prey.

Temporary and minor adverse effect on the EFH for bluefish, summer flounder, and red drum, as well as their prey species, would occur if construction activities occur in the spring. There would be a short-term, local increase in turbidity in the project area resulting from construction that could be sufficient to temporarily diminish phytoplankton communities. Due to entrainment, it is anticipated that there would be temporary negative impacts to the phytoplankton and during the dredging operations. A temporary loss of benthic invertebrates (prey species) would occur during construction. It is expected that there are ample invertebrates in the surrounding substrates to facilitate recolonization of the project area.

These species would be displaced during construction and permanently lose 0.46 to 2.31 acres of open water habitat to jetty construction. The dredging and realignment of the federal channel would deepen approximately 3.67 acres of sandy habitat, of which some would be converted to clay or silt/sand mix. However, impacts are anticipated to be minor since they are mobile, the habitat lost is not rare or uncommon in the project area, and the species are able to utilize other habitats during construction. In the worse case this area would be unavailable to these fish species for one season. After the work has been completed it is expected that the area would again be available to these fish species. Further, following construction, the hard substrate of the jetties could provide structure to the open water habitat.

The jetty construction may have minor adverse effect on summer flounder and red drum and their EFH since they are bottom feeders. With the construction of the jetties, there would be a loss of approximately 0.46 to 2.13 acres of bottom habitat. This would be replaced with the jetty structure. The red drum may be able to adjust to using this area to feed since they are known to feed off of rocks and pilings.

MITIGATION

The project would adhere to the time of year restriction defined by MDNR which would preclude or minimize impacts to bluefish, summer flounder, Spanish mackerel and red drum. No other mitigation measures are proposed since the proposed project would not have significant adverse effects on these species or their prey species and their EFH.

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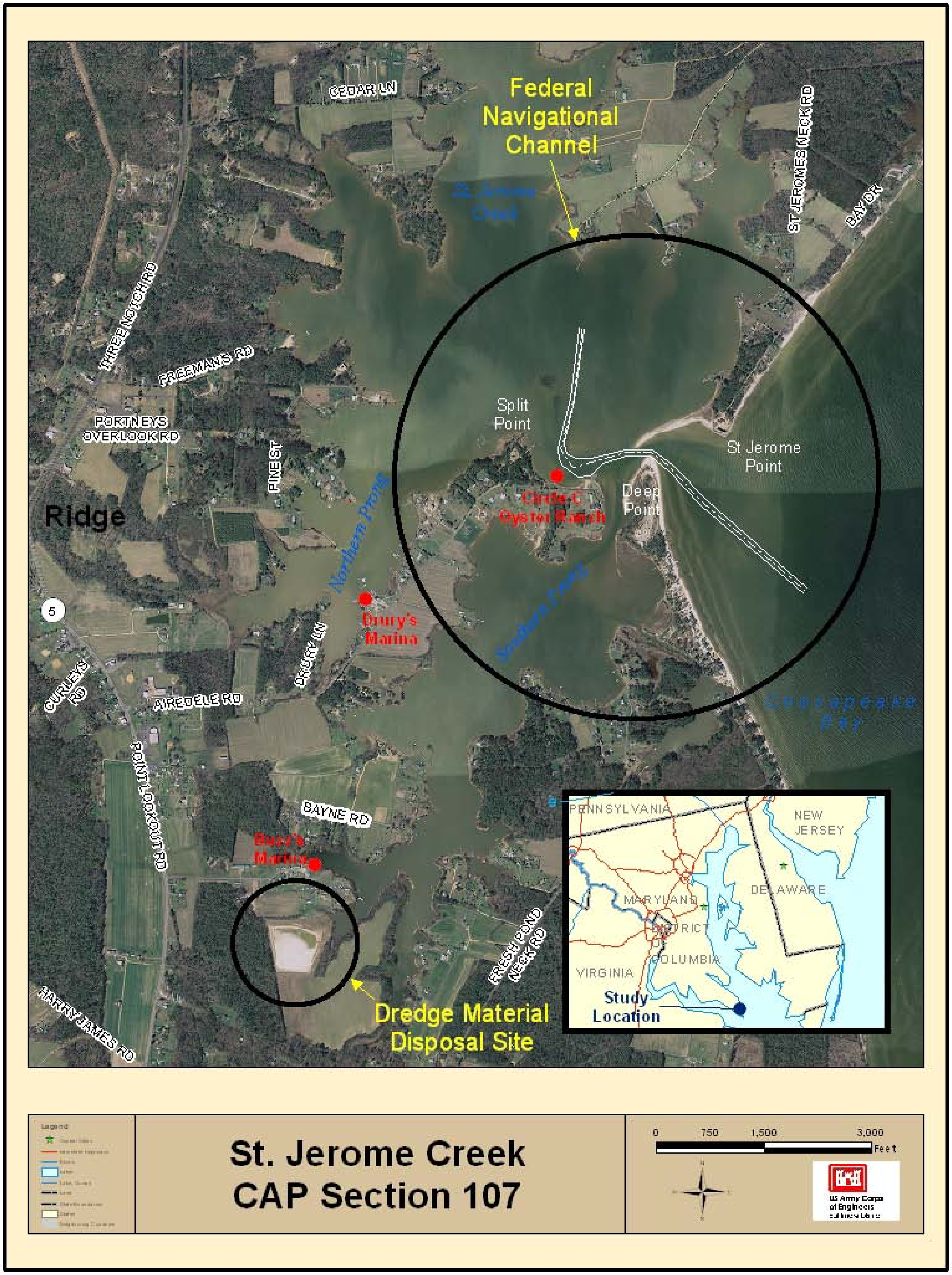


Figure 1: Study Area

Figure 2: Proposed Project

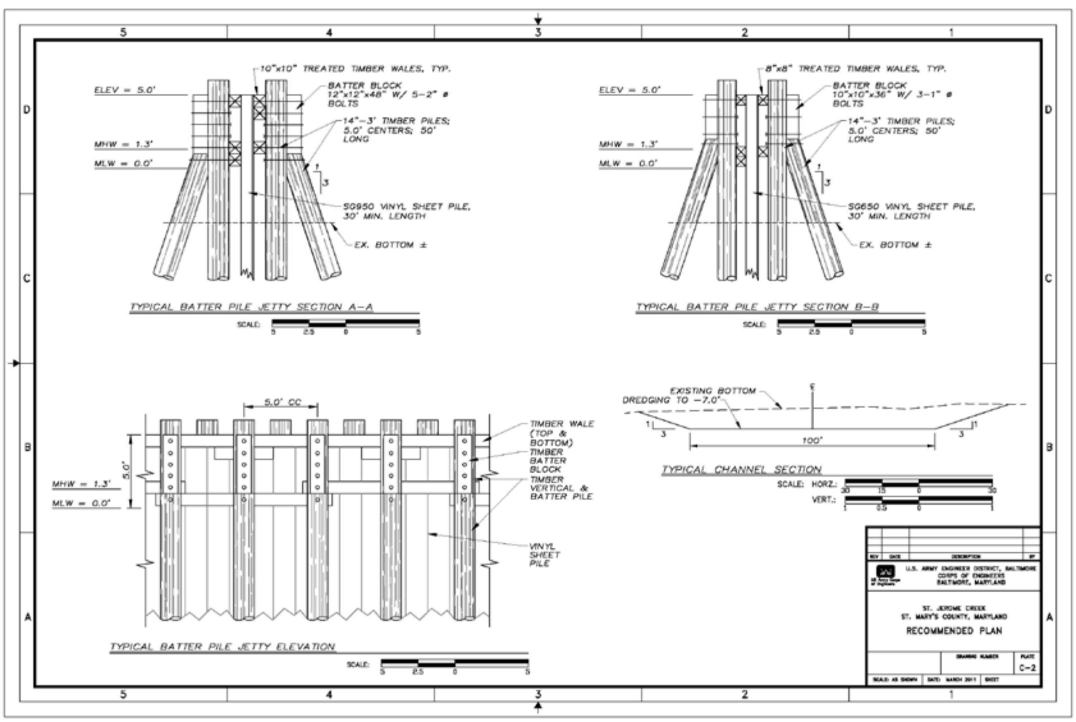


Figure 3: Batter Pile/Vinyl Sheet Pile Jetty

APPENDIX H

ENDANGERED SPECIES ACT – SECTION 7 CONSULTATION

St. Jerome Creek
Section 107 Shallow Draft Navigation Project
St. Mary's County, Maryland

Endangered Species Act- Section 7 Consultation
August 2011

Prepared By U.S. Army Corps of Engineers

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 et. seq.) requires every Federal agency, in consultation with and with the assistance of the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In pursuant with Section 7(a)(2), the following information is provided to NMFS and USFWS in order to initiate Section 7(a)(2) consultation. This assessment includes:

1. A description of the proposed action;
2. A listing of the species of concern;
3. An analysis of the effects of the proposed action; and,
4. The Federal agency's opinions regarding the effects of the proposed action.

1. DESCRIPTION OF PROPOSED ACTION

The proposed St. Jerome Creek Small Navigation Project would establish two new jetty structures and straighten the course of the existing federal channel to reduce shoaling in the navigation channel. Figure 1 shows the proposed study area. The south jetty would connect to the shoreline about 200 feet south of the northern tip of Deep Point and would have a length of 1,330 feet. The north jetty would connect about 250 east of the tip of the sand spit and would have a length of 1,770 feet. Approximately 0.5 ac of this sand pit, along 300 feet of shoreline, would be removed for construction of the north jetty and realignment of the channel.

The objective of the jetties would be to trap the longshore transport and prevent it from entering the channel area. These jetties would probably have the least downdrift impacts along the Deep Point and Saint Jerome Point shorelines. The landward terminus of the north jetty will require stabilization along the sand spit shoreline to prevent the jetty from being flanked. The proposed crest elevation of the jetties would be + 5 feet MLLW.

The general parameters considered which resulted in the selection of this alternative as the Recommended Concept Plan for further evaluation are as follows:

- Most significant decrease in channel shoaling rate
- Longest interval between future maintenance dredging events

- Significantly increased tidal current velocities in the inlet (particularly ebb currents) with the configuration of the north and south jetties
- Best potential for decreasing the shoaling in the Saint Jerome Creek section of the channel by realigning the channel straight through the inlet
- High sediment storage capacity along the updrift side of the north jetty
- Least potential for sand bypassing from the north shoreline
- Minimal downdrift shoreline erosion potential
- Best protection for the existing shorelines and spits from wave induced erosion

Jetty construction consists of driving 30 ft. lengths of vinyl sheet pile into the bottom along the proposed jetty alignments. The sheet pile would have a top elevation of +5.0 ft. MLLW. The elevation of the bottom of the sheet pile would be about - 25 ft. MLLW. To provide initial stabilization of the sheet pile, 50 ft. long treated timber piles would be driven at 5 ft. intervals on each side of the vinyl sheet pile and attached to the sheet pile with 8 in. x 8 in. treated timber wales. The stabilization of the sheet pile would be completed by driving 50 ft. long by 14"-3' diameter treated timber batter piles at 5 ft. intervals on each side of the vinyl sheet pile. Figure 2 depicts the proposed jetty and federal channel alignment. Figure 3 shows the batter pile/vinyl pile jetty design.

The existing navigational channel would be dredged, resulting in hydraulic dredging of approximately 1,600 feet to a depth of 7 feet mean lower low water (MLLW) and a width of 100 feet. Approximately 30,000 cubic yards of material removed from the channel would be placed in an approved upland dredge disposal site that has been used for previous maintenance dredging (Figure 1).

Water depths are less than 10 feet (MLLW) in the project area. Salinity just east of the study area in the Chesapeake Bay Mainstem near Point No Point, typically varies between 7.49 and 21.76 parts per thousand (ppt). The mean range of salinity (from 1985 through 2008) is between 15 and 17 ppt (MDNR 2009). Water temperatures have been monitored just east of the Creek and range from roughly 34 degrees Fahrenheit in the winter to 80 degrees Fahrenheit in the summer months. (MDNR 2009).

In most places, the bottom substrate would not be changed, and would remain sand. In other locations, the bottom substrate would be changed to clay or a silt/sand mix following dredging. The substrate changes could potentially lead to different organisms colonizing the benthos or may be quickly covered by sand deposition. Further, the sediment substrate would be permanently converted to a jetty within the jetty footprint. This loss of bottom habitat would occur across a distance of 1,330 feet for the south jetty and 1,770 feet for the north jetty. The footprint of the south jetty above the water surface would be 8,313 square feet, and that of the north jetty would be 11,563 square feet; a 0.46 acre area. Depending on water depth, the jetties' width would vary due to driving the timber piles into the bottom at an angle. The maximum width of the jetties at their deepest point is 30 feet resulting in a maximum potential disturbance to 2.13 acres of bottom habitat.

The time of year restriction for the hydraulic dredging activity is June 1 through September 30 and November 15 through March 1, inclusive, to protect oysters and wintering and migrating

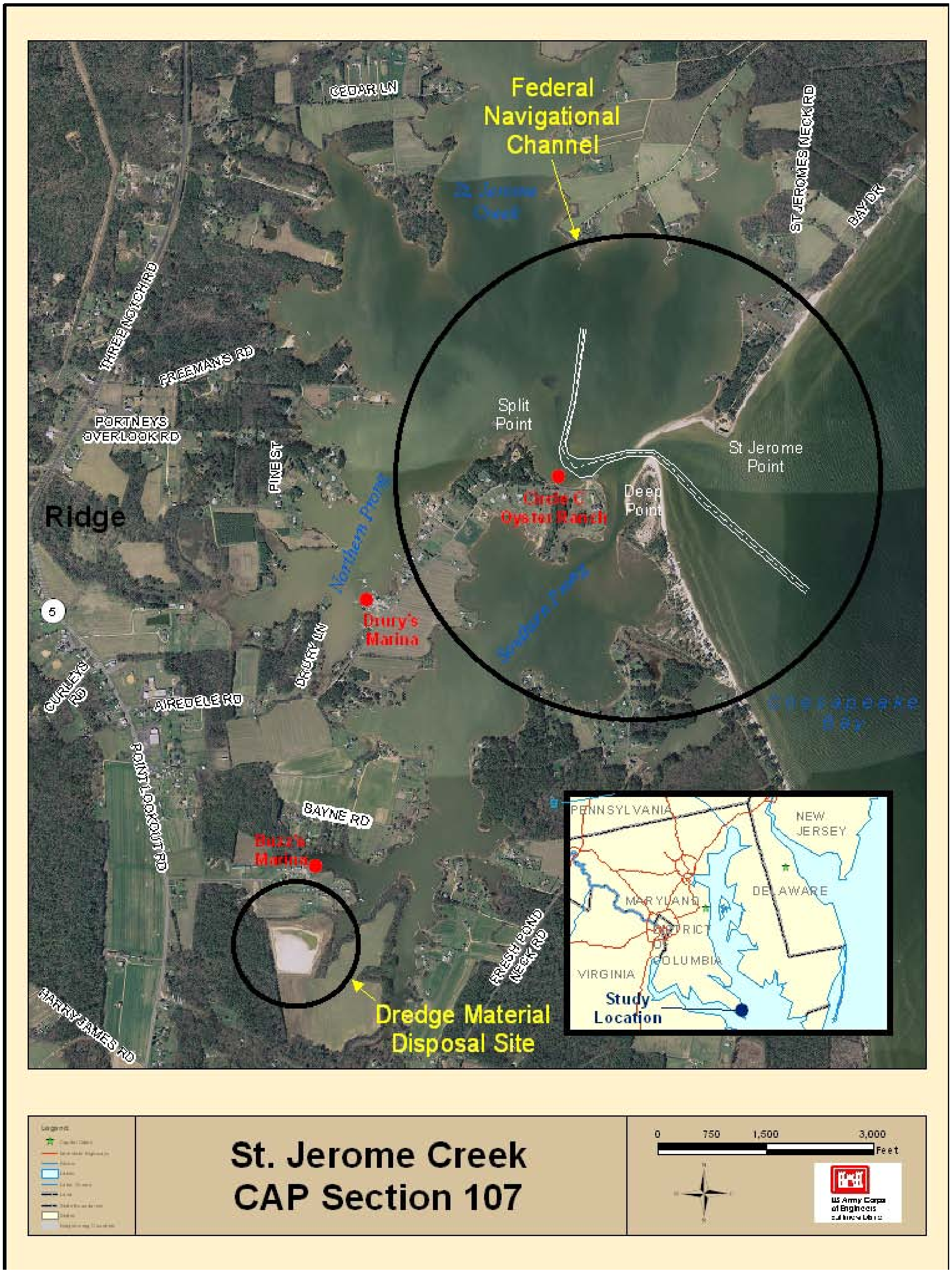


Figure 1: Study Area

Figure 2: Proposed Project

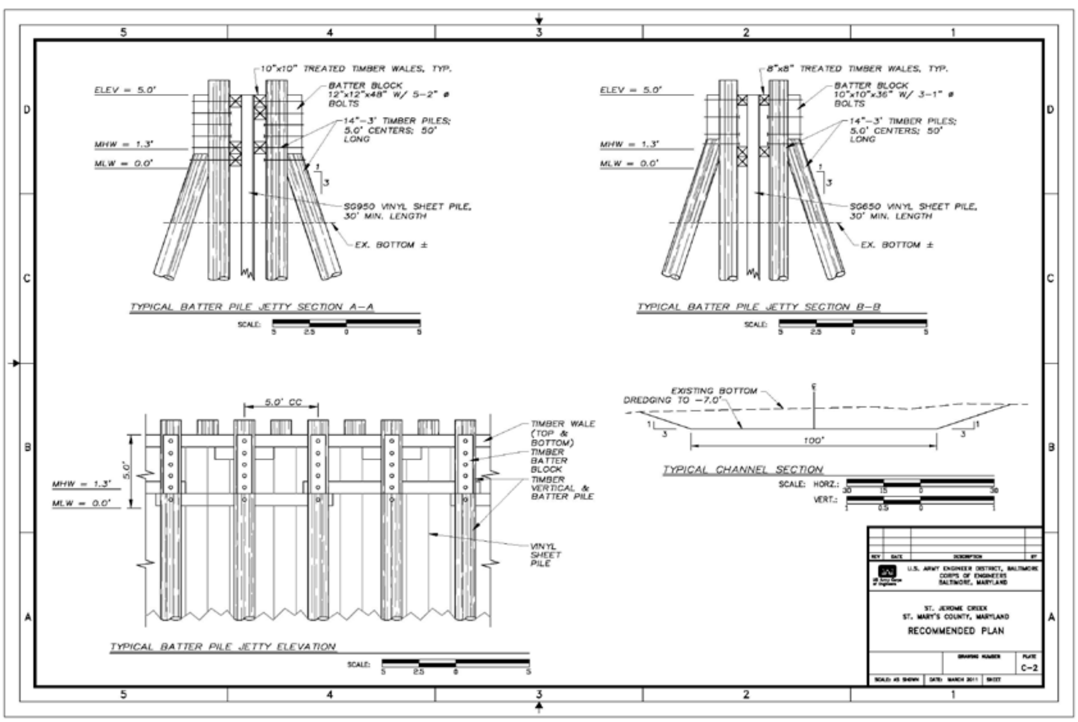


Figure 3: Batter Pile/Vinyl Sheet Pile Jetty

waterfowl. All construction activities would have a time of year restriction where no construction activity should be performed during the period 15 November through 1 March. The regulatory and resource agencies have stated that allowances may be made if necessary. Should an event occur that additional time is needed to finish dredging; USACE would need to make a formal request to agencies for their review.

2. SPECIES OF CONCERN

The National Marine Fisheries Service (NMFS) has indicated that four species of federally threatened and endangered sea turtles may be found in the project area as well as the federally endangered shortnose sturgeon (*Acipenser brevirostrum*). The sea turtles potentially found in the project area are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Federally endangered green sea turtles (*Chelonia mydas*) and federally endangered leatherback sea turtles (*Dermochelys coriacea*) also occur seasonally in the Chesapeake Bay. Figure 4 shows the location of dead sea turtle strandings in the project area in the past 5 years.

Shortnose sturgeon are most prevalent in the upper Chesapeake Bay and within the Potomac River. There is no data to suggest their presence in the project area and none have been documented within St. Jerome Creek. However, there are occasional get reports of shortnose sturgeon near the mouth of the Potomac River, which is adjacent to the project area. Of the 99 shortnose sturgeon reports, four were found at the mouth of the Potomac River site.

Atlantic sturgeon are found throughout the tidal waters of the Chesapeake Bay. There have been 1,664 documented wild Atlantic sturgeon reports and 562 hatchery-origin Atlantic sturgeon reports since 1996. Some of these reports are multiple recaptures of individual fish. Although no wild Atlantic sturgeon have been reported from the mouth of St. Jerome's Creek, there was one hatchery fish reported from that area in 1997 (hatchery fish are not displayed on Figure 5) that was caught in a pound net. Therefore, it is possible that Atlantic sturgeon could be present near the mouth of St. Jerome's Creek. However, it is likely that they are uncommon in the area. The pound net sites are frequently fished every year and if sturgeon were common there would be more reports. The project area does not produce many reward program capture reports.

NMFS is currently reviewing whether Atlantic sturgeon (*Acipenser oxyrinchhus*) should be listed as threatened or endangered under the ESA. On October 6, 2010, NMFS published two rules proposing to list four distinct population segments (DPS) of Atlantic sturgeon as endangered, including one for the Chesapeake Bay. St. Jerome Creek lies within the Atlantic sturgeon's habitat range, but the species has not been documented in the project area (Figure 5).

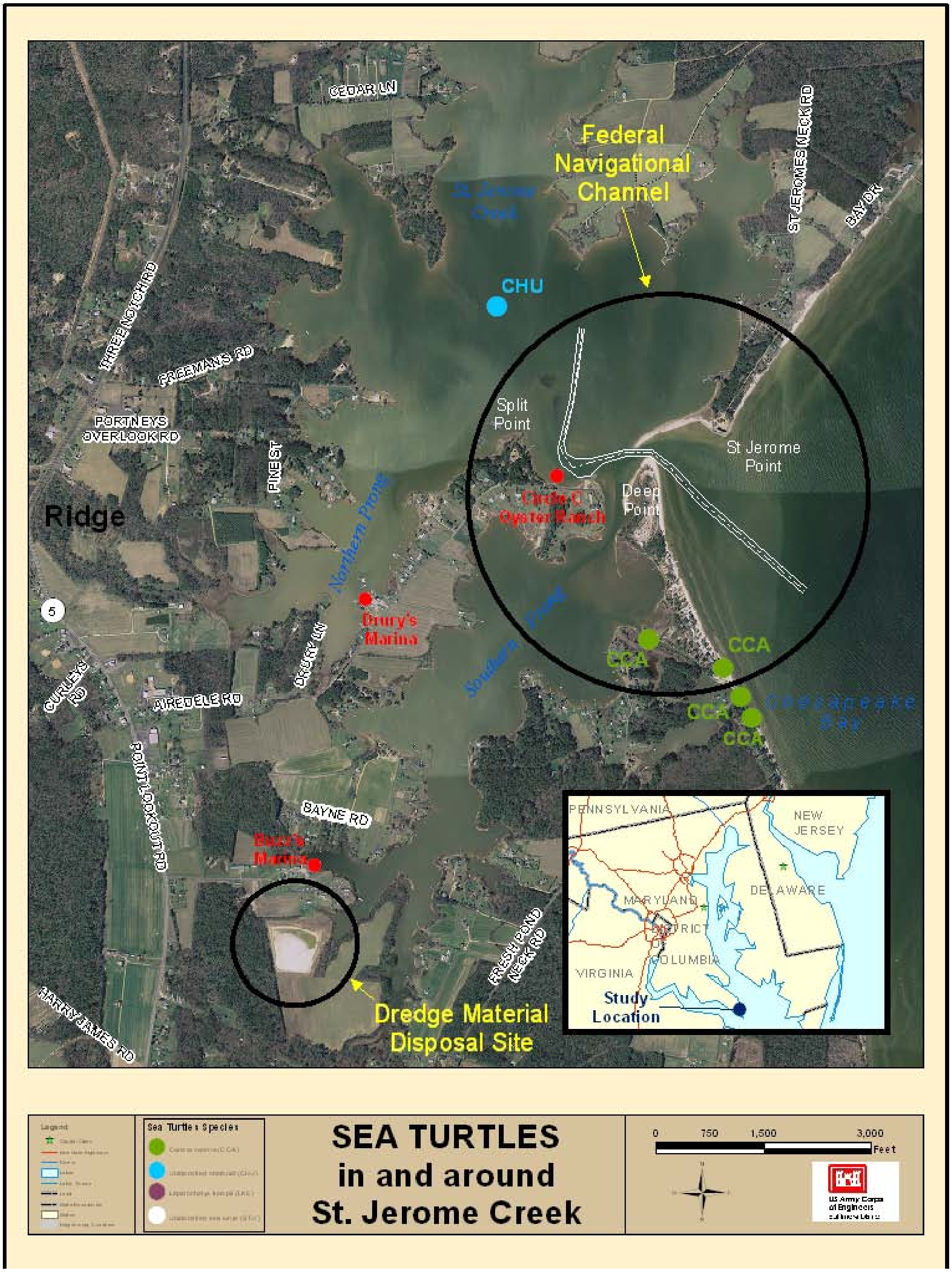


Figure 4 – Sea Turtles

3. AN ANALYSIS OF THE EFFECTS OF THE PROPOSED PROJECT

Ongoing monitoring efforts have identified that is very unlikely that shortnose sturgeon would be in the project area. No impacts are anticipated to shortnose sturgeon.

Sea turtles are transient to the Chesapeake Bay and the project vicinity. Kemp's ridley and loggerhead turtles are the most frequent visitors to the Chesapeake Bay. Leatherback sea turtles typically continue migrating north past the Chesapeake Bay and prefer nesting on the high wave energy beaches of the eastern seaboard. No nesting by sea turtle species has yet been recorded in the Chesapeake Bay (Evans et al. 1997).

Although direct monitoring was not performed as part of the feasibility study, a small number of dead sea turtle strandings have been reported in the vicinity in the past five years with one being in the direct project area. No data on live strandings is available. Sea turtles are migratory individuals that are seasonal transients to the project area. During cooler weather months when construction would occur, sea turtles are unlikely to be present. No negative impacts are expected to sea turtles.

Atlantic sturgeon could be present in the project area, but monitoring suggests that they are not common. Due to the unlikelihood of their presence, no negative impacts are expected to Atlantic sturgeon.

4. THE FEDERAL AGENCY'S OPINION REGARDING THE EFFECTS OF THE PROPOSED ACTION

The shortnose sturgeon and various breeds of endangered sea turtles may be present in the project area. Ongoing monitoring efforts have identified that is very unlikely that shortnose sturgeon would be in the project area. Therefore, no impacts are anticipated to shortnose sturgeon.

Sea turtles are transient to the Chesapeake Bay and the project vicinity. Kemp's ridley and loggerhead turtles are the most frequent visitors to the Chesapeake Bay. Leatherback sea turtles typically continue migrating north past the Chesapeake Bay and prefer nesting on the high wave energy beaches of the eastern seaboard. No nesting by sea turtle species has yet been recorded in the Chesapeake Bay (Evans et al. 1997).

Although direct monitoring was not performed as part of the feasibility study, a small number of dead sea turtle strandings have been reported in the vicinity in the past five years with one being in the direct project area. No data on live strandings is available. Sea turtles are migratory individuals that are seasonal transients to the project area. During cooler weather months when construction would occur, sea turtles are unlikely to be present. No negative impacts are expected to sea turtles.

Atlantic sturgeon could be present in the project area, but monitoring suggests that they are not common. Due to the unlikelihood of their presence, no negative impacts are expected to Atlantic sturgeon.

Correspondence from both the USFWS and MDNR, indicated that neither agency had any Federal or state listed rare, threatened or endangered species, respectfully. Therefore, no impacts are expected to these resources.

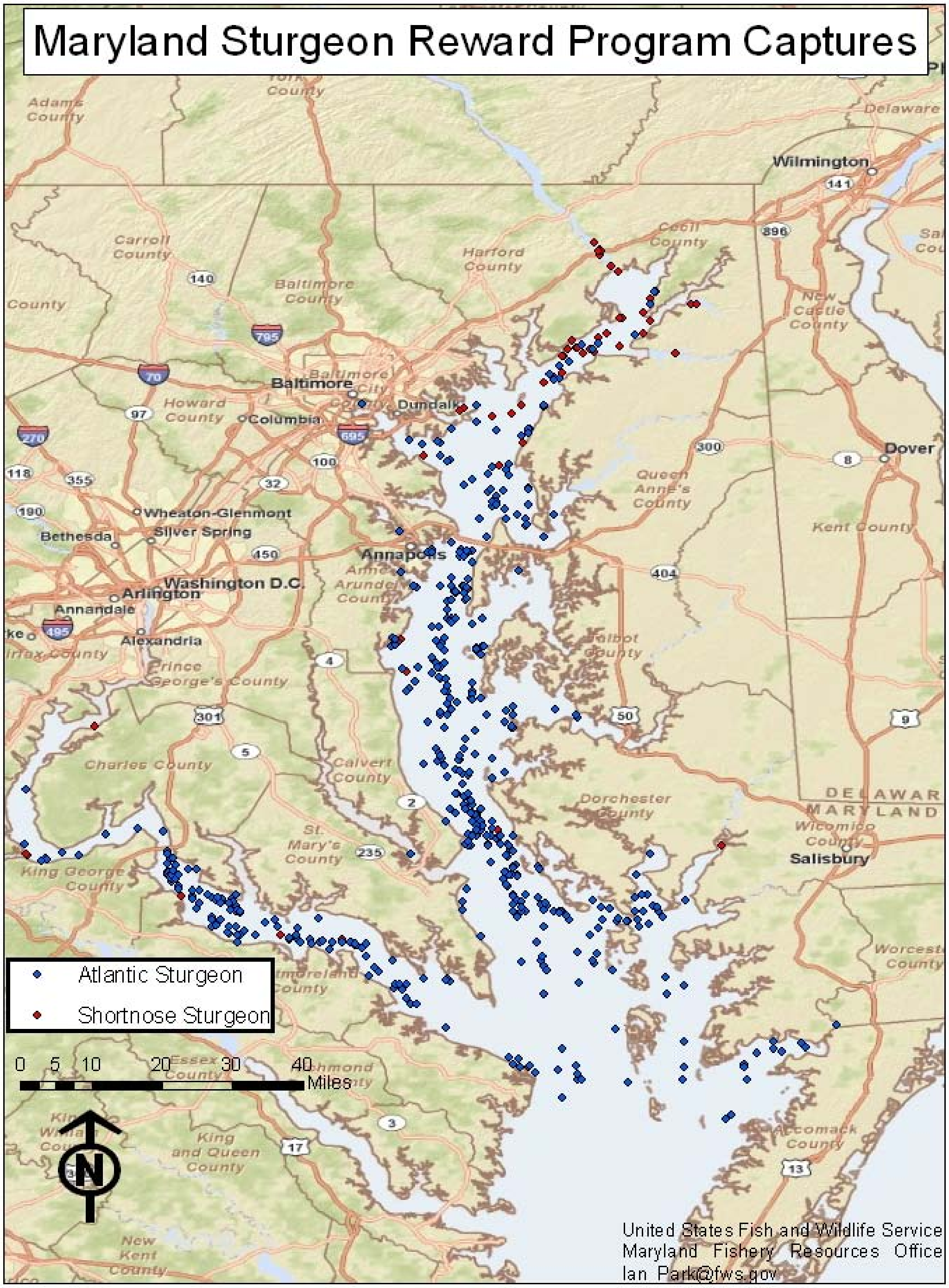


Figure 5 - Maryland Sturgeon Reward Capture Locations
Image provided by DNR.

APPENDIX I

SEA LEVEL RISE CONSIDERATIONS

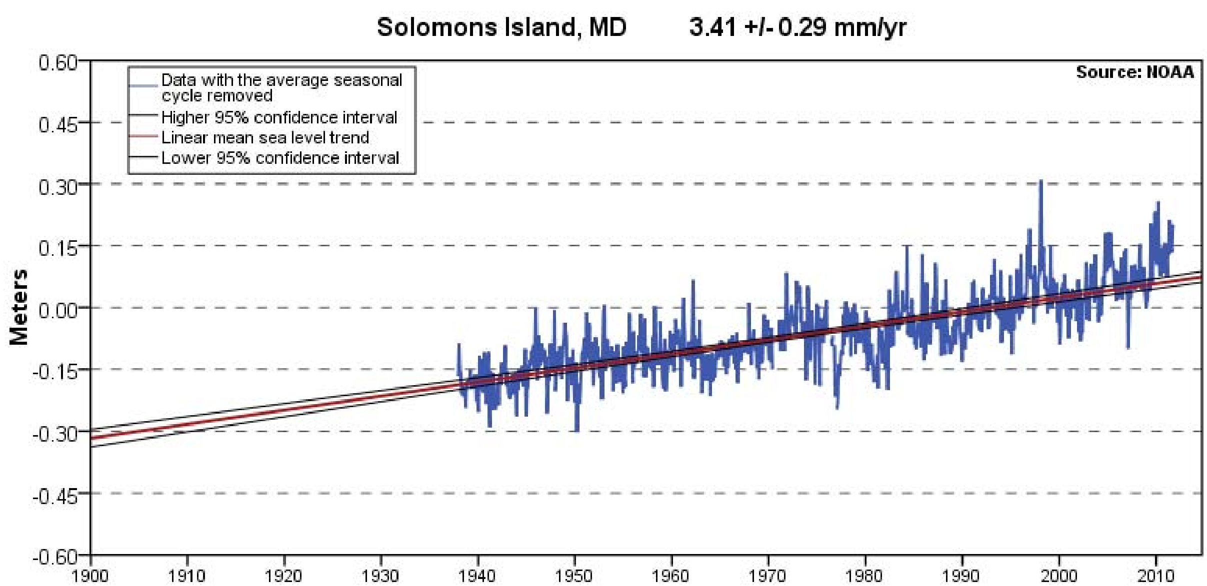
SEA LEVEL RISE CONSIDERATIONS

Introductory Remarks: In addition to a large number of publications by various research, government and non-government agencies, USACE and EPA have issued specific reports, and NOAA offers a web-based database, all cited as part of the References listed at the end of this section.

While it is not considered within the scope of this project to discuss the details of the variety of information and design guidelines provided by these documents, two interesting charts that were extracted from the NOAA's web-based data for Solomons Island, Maryland, are presented here in view of the proximity of Solomons Island to the St. Jerome Creek project area (approximately 24 miles).

Figure 1 shows one of these charts referring to the sea level rise trend developed for the Solomons Island station provided directly by NOAA. The 70-years of data available for Solomons Island provides there has been an increase of 0.783 ft which refers to an average rate of 0.011 ft/year (= 3.41 mm/year.)

Figure 1: Mean Sea Level Trend
8577330 Solomons Island, Maryland



The mean sea level trend is 3.41 millimeters/year with a 95% confidence interval of +/- 0.29 mm/yr based on monthly mean sea level data from 1937 to 2006 which is equivalent to a change of 1.12 feet in 100 years.

Derived based on this average rate, the sea level rise values would be 0.28 ft, 0.56 ft, and 1.13 ft, respectively, for the standard project design periods of 25-years, 50-years and 100-years.

Figures 2 and 3 below, on the other hand, provide the inter-annual variation of the water levels measured in Solomons Island, for the entire record, and since 1980, respectively.

Figure 2: Interannual variation
8577330 Solomons Island, Maryland

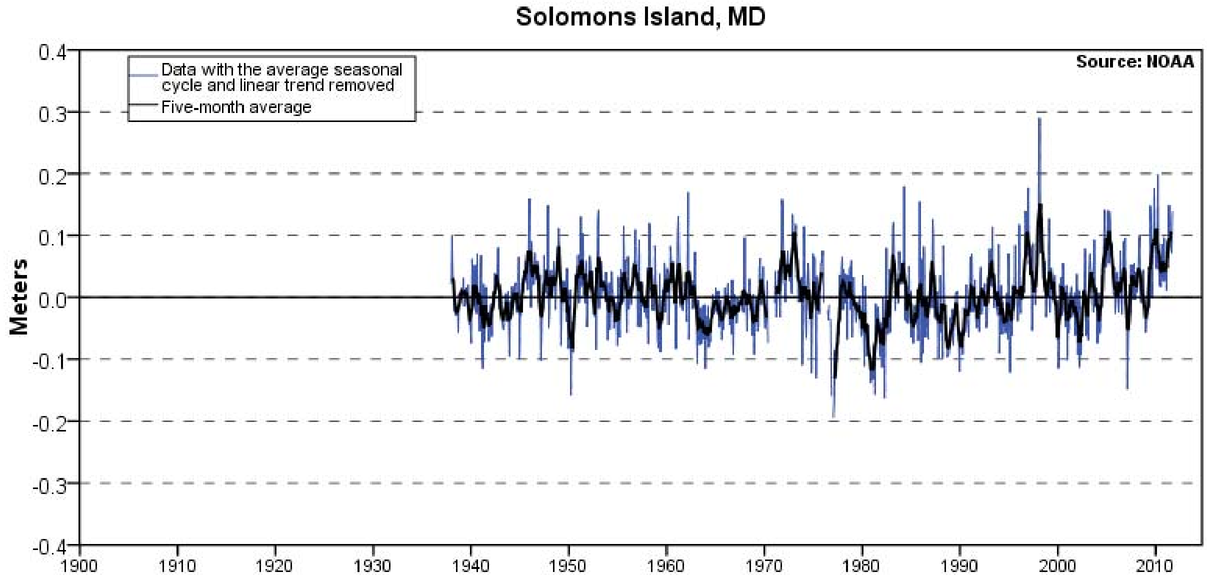
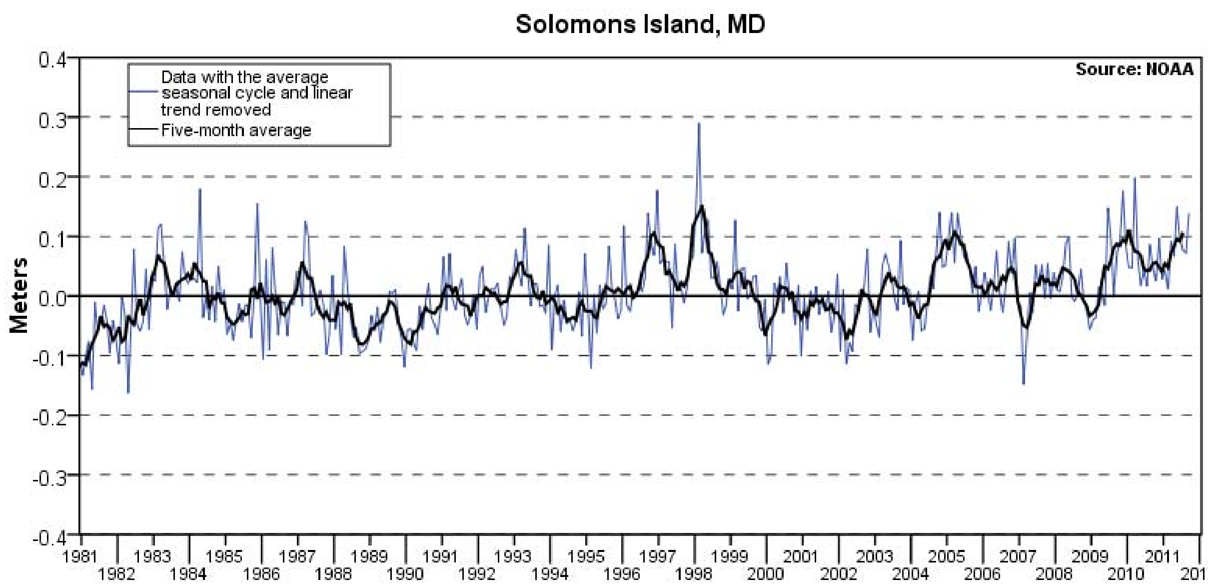


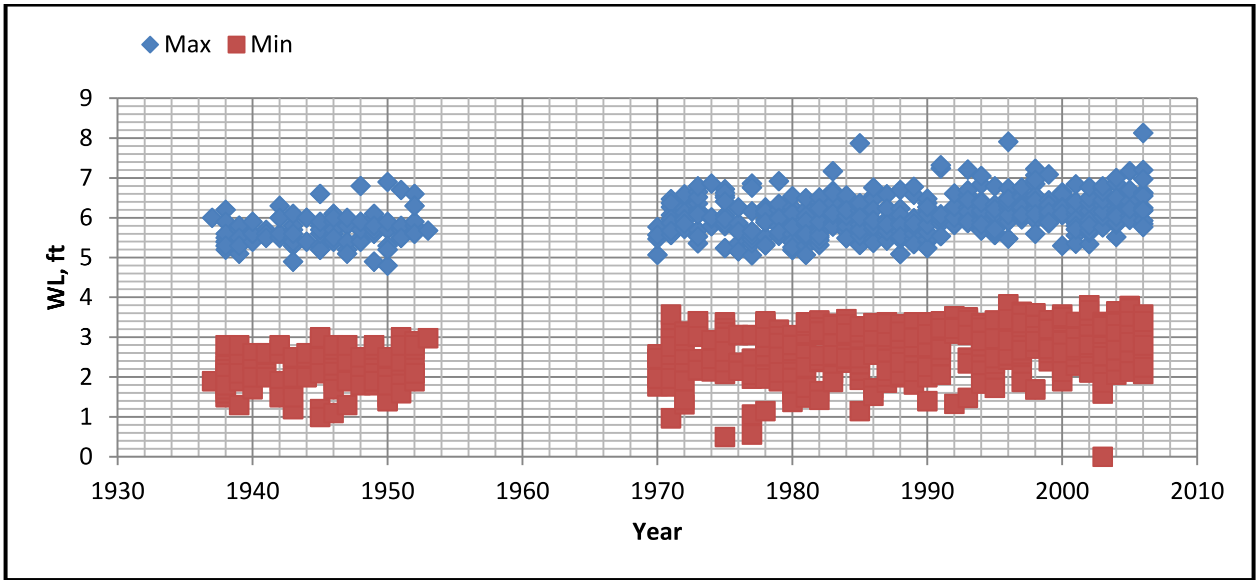
Figure 3: Interannual variation since 1980
8577330 Solomons Island, Maryland



Still based on the NOAA data, the variations of the maximum and minimum monthly extreme water surface elevations were extracted and Figure 4 was produced. This plot shows that while the maximum and the minimum monthly extreme water levels are about 6.5 and 3 ft, respectively, the apparent average variation of the data is no less than 2 ft, and 2.5 ft for the two sets of extreme values data.

It may also be noted that there are several observations referred to as “outliers” being observed both on the high and low sides particularly recently. It is also interesting to note that a clear, “increasing” trend cannot be discerned for either of these monthly extreme water level values.

Figure 4: 8577330 Solomons Island, Maryland
Historic Data Monthly Max-Min Extreme WL



Re: http://tidesandcurrents.noaa.gov

USACE Criteria: In regards to "Estimating Future Change in Local MSL", USACE Engineering Circular, EC 1165-2-211 provides the following guidance:

a. In USACE activities, analysts shall consider what effect changing relative sea-level rates could have on design alternatives, economic and environmental evaluation, and risk. The analysis shall include, as a minimum, a low rate which shall be based on an extrapolation of the historical tide gauge rate, and intermediate and high rates, which include future acceleration of GMSL. The analysis may also include additional intermediate rates, if the project team desires. The sensitivity of each design alternative to the various rates of sea-level change shall be considered. Designs should be formulated using currently accepted design criteria.…

b. Since the 1987 NRC study on sea-level change was completed, the IPCC has produced four editions of its projections for future climate change and GMSL rise. The NRC study and the IPCC Third and Fourth Assessment Reports, dated 2001 and 2007, are useful in estimating future changes in local MSL (see http://www.ipcc.ch/).

c. The 1987 NRC report reviews data on relative sea-level changes and the resulting effect on engineering structures and coastal wetlands. Despite its age, the information and guidance presented in this study, in terms of considering how different types of projects may be affected by sea-level change, are useful and should be considered by USACE planners and engineers throughout the project life-cycle of studies and projects…

d. Subsequent to the IPCC AR4 Report of 2007, there have been several peer-reviewed articles presenting current eustatic sea-level rise estimates ranging from 1.7 ± 0.2 and 1.9 ± 0.4mm/yr (Church and White, 2011) to 3.2 ± 0.4 mm/yr (Merrifield et al., 2009). The latter estimate is based upon tide station and satellite data in the approximate period from 1990 through 2009. The methodology used for developing satellite and tide gauge MSL estimates are not completely independent, since satellite observations rely upon selected tide gauge data to calibrate and de-bias the satellite data (Leuliette et al., 2004). Moreover, for short observation periods (2003 to 2007) there are unexplained long-term systematic errors in at least one of the observing systems (Willis et al., 2008).). Houston and Dean (2011) examined records of 57 tide stations of the PSMSL with record duration lengths of 60 to 156 years and concluded that there was no acceleration of global sea level rise in the 20th century, consistent with Douglas (1992). Regardless of the observing system used, the premise here is that at least 40 years of data are required to establish a robust sea-level trend.

e. Because the methodology described in this EC uses a scenario-based approach, it may be useful to consider an upper bound on 21st century eustatic sea-level rise. Several peer reviewed publications have proposed maximum estimates of GMSL rise by year 2100. Although the authors use different physical bases to arrive at the estimates, none of them proposes a 21st century GMSL rise greater than 2 meters. Figure B-10 illustrates the minimum and maximum GMSL change expected by year 2100, along with author or publication. Based upon these bodies of research, it seems reasonable that a credible upper-bound for 21st century GMSL rise would be about 2 meters. This by no means suggests that 21st century GMSL rise cannot exceed 2 meters, but a maximum of 2 meters is reasonable at this time.

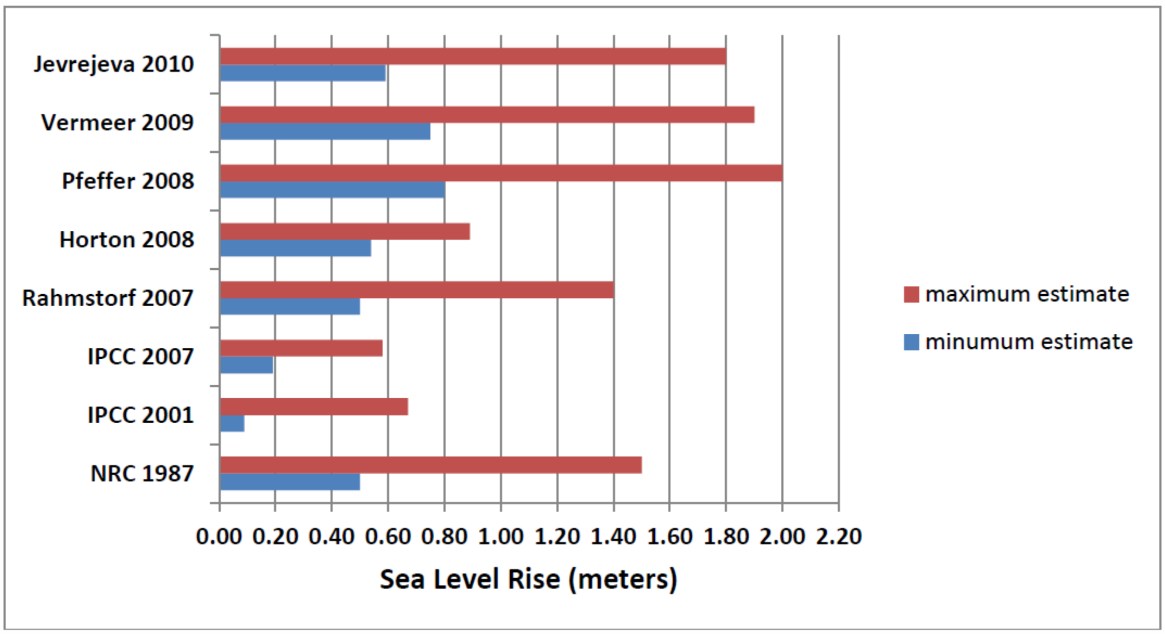


Figure 5: Comparison of maximum and minimum estimates of global SLR by year 2100.

f. The 1987 NRC report recommended that feasibility studies for coastal projects consider the high probability of accelerating GMSL rise and provided three different scenarios. The 1987 NRC described these three scenarios using the following equation:

$$E(t) = 0.0012t + bt^2 \qquad (1)$$

in which t represents years, starting in 1986, b is a constant, and $E(t)$ is the eustatic sea level change, in meters, as a function of t. The NRC committee recommended "projections be updated approximately every decade to incorporate additional data." At the time the NRC report was prepared, the estimate of global mean sea-level change was approximately 1.2 mm/year. Using the current estimate of 1.7 mm/year for GMSL change, as presented by the IPCC (IPCC 2007), results in this equation being modified to be:

$$E(t) = 0.0017t + bt^2 \qquad (2)$$

(1) The three scenarios proposed by the NRC result in global eustatic sea-level rise values, by the year 2100, of 0.5 meters, 1.0 meters, and 1.5 meters. Adjusting the equation to include the historic GMSL change rate of 1.7 mm/year and the start date of 1992 (which corresponds to the midpoint of the current National Tidal Datum Epoch of 1983-2001), instead of 1986 (the start date for equation 1), results in updated values for the variable b being equal to 2.71E-5 for modified NRC Curve I, 7.00E-5 for modified NRC Curve II, and 1.13E-4 for modified NRC Curve III. The three GMSL rise scenarios updated from NRC (1987) are depicted in Figure 6.

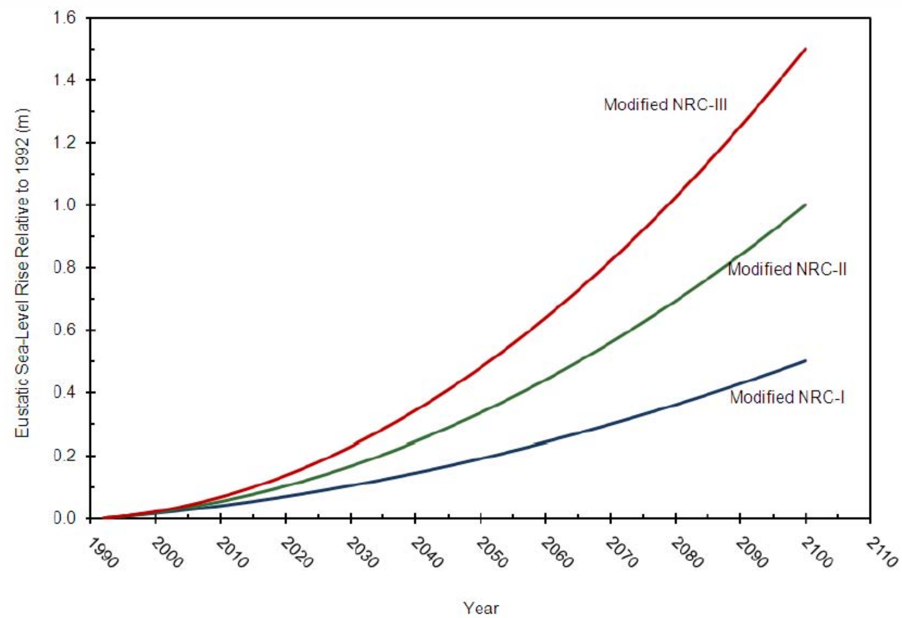


Figure 6: Scenarios for GMSL Rise (based on updates to NRC 1987 equation).

(2) Manipulating equation (2) to account for the fact that it was developed for eustatic sea level rise starting in 1992, while projects will actually be constructed at some date after 1992,results in equation (3):

$$E(t_2) - E(t_1) = 0.0017(t_2 - t_1) + b(t_2^2 - t_1^2) \qquad (3)$$

where t_1 is the time between the project's construction date and 1992 and t_2 is the time between a future date at which one wants an estimate for sea-level change and 1992 (or $t_2 = t_1$ + number of years after construction) (Knuuti, 2002). For example, if a designer wants to know the projected eustatic sea-level rise at the end of a project's period of analysis, and the project is to have a fifty year life and is to be constructed in 2013, $t_1 = 2013 - 1992 = 21$ and $t_2 = 2063 - 1992 = 71$.

***<u>Application to this Project</u>*:**

<u>Calculations based on Current Global MSL Rates</u>:

Assuming that the construction for the current project will start in 2014, and considering a project life of 50 years, the following can be derived:

t_0 =1992 = Beginning ear for the NRC data
T_1 =2014 = Current (Construction) Year for the Project
T_2 =2064 = Year for the End of the Project Design Period

$t_1 = T_1 - t_0$ = 2014-1992 = 22 years, and
$t_2 = T_2 - t_0$ = 2064-192 = 72 years

Hence, Eq. (3) yields: $E(72) – E(22) = 0.0017 (72\text{-}22) + b(72^2\text{-}22^2) = \underline{0.085 + 4{,}700\ b}$

Using the current global MSL rates calculated based on the b values specified for the low, medium and high NRC scenarios, the following respective sea level rise estimates are obtained;

NRC-I (b=0.0000236) => E(50-yrs) = 0.1959 m = 0.643 ft MSL = 1.24 ft MLW
NRC-II (b=0.0000620) => E(50-yrs) = 0.3764 m = 1.234 ft MSL = 1.83 ft MLW
NRC-III (b=0.0001005) => E(50-yrs) = 0.5574 m = 1.828 ft MSL = 2.42 ft MLW

Calculations based on the Solomons Island MSL Rate:

For the same project construction start date of 2014 and design period of 50 years, if the current Solomons Island MSL rate of 3.41 mm/yr is used,

Eq. (3) yields: $E(72) - E(22) = 0.00341 (72\text{-}22) + b(72^2\text{-}22^2) = \underline{0.1705 + 4{,}700\ b}$

and for the three NRC scenarios, the following respective sea level rise estimates are obtained:

NRC-I (b=0.0000236) => E(50-yrs) = 0.2814 m = 0.923 ft MSL = 1.52 ft MLW
NRC-II (b=0.0000620) => E(50-yrs) = 0.4619 m = 1.515 ft MSL = 2.11 ft MLW
NRC-III (b=0.0001005) => E(50-yrs) = 0.6428 m = 2.108 ft MSL = 2.71 ft MLW

Thus, if the current Solomons Island MSL rate is used, the reference mean sea water level affecting the project site from the Chesapeake Bay side during the 50-year project life would be expected to rise by a minimum of 1.52 ft and as high as 2.71 ft above the current Mean Sea Level.

Calculations considering Local MSL and Regional Vertical Land Movement Rates:

Another decision parameter considered in the Mean Sea Level evaluations is the answer to the question as to whether the regional mean sea level is different from the global (eustatic) mean sea level trend of 1.7 mm/year [USACE Circular EC 1165-2-211, Appendix C, Step 9].

If the answer to this question is affirmative, the follow-up question is whether it is possible to identify a vertically stable geologic platform within the same region as the project site.

As depicted in Figure 7, there are several regional stations for which the following MSL rate data are available:

Annapolis Rate	=	3.44 mm/yr
Solomons Rate	=	3.41 mm/yr
Cambridge Rate	=	3.46 mm/yr
Baltimore Rate	=	3.08 mm/yr
Washington Rate	=	3.16 mm/yr

Based on these rates, a reasonable estimate for the local MSL rate for the St. Jerome Creek site may be derived averaging the nearby Annapolis and Solomons Island MSL rates:

=> St Jerome Creek MSL rate = *3.425 mm/yr* (average of Annapolis & Solomons MSL rates)

SEA LEVELS ONLINE

Figure 7: MSL Data Summary at Regional Stations[Source: NOAA- Sea Level Online]

A regional MSL trend may be calculated by averaging the rates at all five regional stations:

=> Regional Average MSL rate = 3.314 *mm/yr* (average of Annapolis, Solomons, Cambridge, Baltimore & Washington MSL rates)

These evaluations indicate that the MSL rates for the five regional stations are fairly close to each other, implying a stable geologic formation in the region, and yielding an estimated local rate of vertical land movement of (3.425 - 3.314=) 0.111 mm/year.

Again for the same project construction start date of 2014 and design period of 50 years, if the regional average MSL rate of 3.314 mm/yr is used,

$$\text{Eq. (3) yields: } E(72) - E(22) = 0.003314\,(72\text{-}22) + b(72^2\text{-}22^2) = \underline{0.1657 + 4{,}700\ b}$$

and for the three NRC scenarios, the following respective sea level rise estimates are obtained:

NRC-I (b=0.0000236) => E(50-yrs) = 0.2766 m = 0.907 ft MSL = 1.51 ft MLW
NRC-II (b=0.0000620) => E(50-yrs) = 0.4571 m = 1.499 ft MSL = 2.10 ft MLW
NRC-III (b=0.0001005) => E(50-yrs) = 0.6381 m = 2.093 ft MSL = 2.69 ft MLW

Thus, if the average regional MSL rate is used, the referenced mean sea water level affecting the project site from the Chesapeake Bay side during the 50-year project life would be expected to rise by at least 1.51 ft and as high as 2.69 ft above the current Mean Sea Level.

Conclusion: Whether it is the minimum 0.64 ft or the maximum of 2.71 ft rise in the MSL anticipated to occur within the next 50 years, it will be a significant rise in the water level, particularly when compared with the current tide range of MHW-MLW = 1.1 ft.

Adjustments to the batter pile vinyl sheet pile jetties may need to be considered in the Design phase for the depths that the batter piles need to be driven and top elevation of the vinyl sheet piles as the sea level rises during the 50 year project life.

References:

EP A, Climate Change Science Program (CCSP) Synthesis and Assessment Product 4.1:Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region, Washington, D.C., 2009.
http://www.climatescience.gov/Library/sap/sap4-1 /final-report/default.htm

USACE, Planning Guidance Notebook, ER 1105-2-1 00, 22 APR 2000.
http://140.194.76.129/publications/engregs/er1105-2-100/toc.htm

USACE, Circular, EC 1165-2-211, 1 October 2011.
http://planning.usace.army.mil/toolbox/library/ECs/EC11652212Nov2011.pdf

USACE, Comprehensive Evaluation of Project Datum: Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection, and Navigation Projects. EC 1110-2-6065
http://140.194.76.l29/publications/eng-circulars/ec1110-2-6065/toc.htm

NOAA, Tides and Currents, Sea Level Trends, current web site.
http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

APPENDIX J

VALUE ENGINEERING

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MD 21203-1715

REPLY TO
ATTENTION OF:

CENAB-EN

MEMORANDUM FOR Value Engineer, Baltimore District, ATTN: CENAB-EN/ Carrie A. Ozgar, 10 South Howard Street, Baltimore, MD 21201

SUBJECT: Value Engineering Study Memo for PN 118572, St Jerome Creek, St. Mary's County, Maryland, Continuing Authorities Program – Section 107, Shallow Draft Navigation Project

1. References:

   a. Engineer Regulation 11-1-321, Army Programs, Value Engineering (VE), 01 January 2011.

   b. FY 10 Value Management/Engineering (VM/E) Execution Guidance, 11 January 2010.

   c. PN 118572, St Jerome Creek, St. Mary's County, Maryland, Continuing Authorities Program – Section 107, Shallow Draft Navigation Project, Feasibility Report and Integrated Environmental Assessment.

2. According to the requirements set forth by ER 11-1-321, all projects, programs, and procurements greater than $1 million shall have an appropriate VE study or an approved waiver. I am requesting to move the VE study to be done very early in the Preconstruction Engineering and Design (PED) phase.

3. The construction cost of the subject project is $9.7 million. Summary of the project is as follows:

   a. Construction of two batter pile/vinyl sheet pile jetties held in place by vinyl covered piles at the entrance to St. Jerome Creek.

   b. The south jetty would be approximately 1,330 feet in length and connect to the shoreline about 200 feet south of the northern tip of Deep Point.

   c. The north jetty would be approximately 1,770 feet in length and connect about 250 feet east of the tip of the sand spit of St. Jerome Point.

   d. The existing entrance channel will be realigned; however, a Federally maintained spur will remain to the west after it passes Deep Point and continue to the existing Southern Prong channel so that passage is still available.

4. Due to the Feasibility Cost Sharing Agreement (FCSA) being signed in September 2008 which did not include a scope and cost estimate for VE, the design of the project being

completed to 65%, a Draft Feasibility Report that is scheduled to be submitted to North Atlantic Division (NAD) in April and the uncertainty of future CAP Section 107 budgets, the Baltimore District respectfully requests a Value Engineering Study to be moved into the PED phase and initiated early on when funds are available.

5. The Point of Contact for this action is the Project Manager, Tony Clark who may be reached at (410) 962-3413 or anthony.a.clark@usace.army.mil.

Amy M. Guise
Amy M. Guise
Chief, Civil Project Development Branch

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MD 21203-1715

REPLY TO
ATTENTION OF:

CENAB-VE 22 May 2012

MEMORANDUM FOR Chief, Civil Project Development Branch, Baltimore District, ATTN: CENAB-PL-P/ Amy Guise, 10 South Howard Street, Baltimore, MD 21201

SUBJECT: Value Engineering Study Requirement for PN 118572, St Jerome Creek, St. Mary's County, Maryland, Continuing Authorities Program – Section 107, Shallow Draft Navigation Project

1. References:

a. Engineer Regulation 11-1-321, Army Programs, Value Engineering (VE), 01 January 2011.

b. OMB Circular A-131, Value Engineering, 21 May 1993.

c. Value Engineering Study Memo for PN 118572, St Jerome Creek, St. Mary's County, Maryland, Continuing Authorities Program – Section 107, Shallow Draft Navigation Project

2. According to the requirements set forth by ER 11-1-321, all projects, programs, and procurements greater than $1 million shall have an appropriate VE study or an approved waiver.

3. According to the requirements set forth by OMB A-131, federal agencies shall use VE as a management tool, where appropriate. In addition, federal agencies shall identify programs/projects with the most potential to yield savings from the application of VE techniques.

4. It has been noted that the Feasibility Cost Sharing Agreement (FSCA), which was signed in 2008, did not include the scope and cost estimate for VE. Given the current project schedule and uncertainty for future CAP Section 107 future budget, I concur with the plan to move VE into the PED phase as long as it is initiated early. On future projects, the FSCA should take into consideration the VE requirement and a budget estimate should be included.

5. The Point of Contact for this action is the Value Engineering Officer, Carrie Ozgar, who may be reached at 410-962-4408 or carrie.a.ozgar@usace.army.mil

Encl
VE Study Memo PN 118572

CARRIE A. OZGAR, PE, AVS
Value Engineering Officer

APPENDIX K

AGENCY TECHNICAL REVIEW COMMENTS

ATTACHMENT 1: TEAM ROSTERS

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ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECSION DOCUMENTS

COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the draft feasibility report and integrated environmental assessment for *St. Jerome Creek, St. Mary's County, Maryland*, Section *107 Small Navigation* project. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks[sm].

SIGNATURE ______________ 6/6/2012
Jeffery Strahan Date
Review Management Office Rep. / ATR Team Leader
CENAO-WR-PR

SIGNATURE ______________ 8/1/2012
Anthony Clark Date
Project Manager (Baltimore District)
CENAB-PL-P

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: NONE

As noted above, all concerns resulting from the ATR of the project have been fully resolved.

SIGNATURE ______________ 8/1/2012
Harvey Johnson Date
Chief, Civil Works Branch
Engineering Division (Baltimore District)
CENAB-EN-W

SIGNATURE ______________ 8/1/12
Amy Guise Date
Chief, Civil Project Development Branch
Planning Division (Baltimore District)
CENAB-PL-P

Comment Report: All Comments
Project: St Jerome Creek, MD
Review: Agency Technical Review (ATR)
Displaying 141 comments for the criteria specified in this report.

Id	Discipline	Section/Figure	Page Number	Line Number
4147621	Real Estate	Section 17 Attitudes of Landowners	Page 5	line 3

The sentence stating that "it will likely be supported by the landowners directly involved." is a statement of opinion. A more definitive statement may be "there is no known opposition to the project from landowners."

Submitted By: Belinda Estabrook (9126525667). Submitted On: 24-Aug-11

1-0 Evaluation **Concurred**
Concur, REP page 5 line 3 will be changed to "There is no known opposition to the project from landowners."

Submitted By: Anthony Clark (410-962-3413) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Belinda Estabrook (9126525667) Submitted On: 21-Oct-11

Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
4147676	Other	Main Report Section 7.2	Page 7-2	n/a

This section has a LERRD cost of $8,580. This cost is not consistent with the cost in the Real Estate Appendix.

Submitted By: Belinda Estabrook (9126525667). Submitted On: 24-Aug-11

1-0 Evaluation **Concurred**
Changes made. $146,080 is the cost consistent with the cost in the Real Estate Appendix

Submitted By: Anthony Clark (410-962-3413) Submitted On: 14-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Belinda Estabrook (9126525667) Submitted On: 21-Oct-11

Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
4157230	Planning - Plan Formulation	n/a'	Cover	n/a

Please add date of report to the cover

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Date added.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4157249	Planning - Plan Formulation	n/a'	FONSI	n/a

At the end of the first paragraph, or beginning of the second, add a sentence to briefly say what the problem is - shoaling impeded watermen, causes damage and requires frequnet dredging. Also, more fully state what Section 107 is. The readers of the FONSI may not be up on that.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Text added to the FONSI

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157262	Planning - Plan Formulation	n/a'	FONSI	n/a

4th paragraph - define MHT before using the acronym.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
MHT has been defined.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157286	Planning - Plan Formulation	n/a'	Executive Summary	First Paragraph, 4th sentence

This sentence makes it sound like there is not real problem. Shoaling begins in 2 years and after 5 years we are at less than the 7 foot controlling depth. In the report we say that after 5 years we are at about 4 feet. So, what we should say is that the controlling depth is less than 7 feet after 2 years (don't say below, since that could imply deeper than 7 feet) and after 5 years it is at 4 feet or less.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Open Comment**
The sentence now reads: "Within five years of the maintenance dredging, the controlling depth in the channel is 2 ft. or less than the authorized channel depth (7 ft.)." Not sure what this means? Is the controlling depth 2 feet? or is it just less than 7? Why don't we move the text about the authorized depth of 7 feet to the previous sentence. Then in this sentence we'll just say that the contolling depth is typically about 2 feet.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

1-2 Backcheck Recommendation **Open Comment**
Changes made to account for Backcheck comment.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 17-Apr-12

1-3 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4157296	Planning - Plan Formulation	n/a'	Executive Summary	Second Paragraph, 1st sentence

Don't call it the St Jerome project yet, call it the recommended alternative from this analysis.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157309	Planning - Plan Formulation	n/a'	Executive Summary and FONSI	n/a

We probably need a figure to see what's going on. We mention the names of points and whatnot, but if you read the document from the beginning, you don't even know what the Creek looks like. As some enviro people if we typically have a figure with the FONSI, but we should definitely have one with the executive summary - or at least cite where it can be found in the report.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Added study location figure to the Executive Summary. Talked with ENV people and they stated that they have never added figures with the FONSI.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157316	Planning - Plan Formulation	n/a'	Executive Summary	n/a

In the 4th paragraph we refer to a "dredge material placement site." Please do a global to make sure we always refer to "dredged material."

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Global search conducted. Changes made were necessary.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157341	Planning - Plan Formulation	Section 1	1-1	4th sentence

We mention the controlling depth being below 7 feet. I know what you mean, but to say something is below implies lower. Say the the depth is less than 7 feet, or that the controlling depth is shallower, or something like that.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157345	Planning - Plan Formulation	Section 1-1	1-1	1st sentence

Change "which" to "that". Which is preceded by a comma, that isn't.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157350	Planning - Plan Formulation	Section 1-3	1-1	last sentence

You mention the controlling depths along the channel. I assume that is current controlling depth? When was the survey done and when was it lasat dredged? Say something like, "In (year) the project was maintained to its authorized depth of 7 feet plus 2 feet of allowable overdepth. Based on a survey done in XXXX, the controlling depths in the channel ranged from XX to XX." That will help show how fast it shoals. Also, you show a very shallow controlling depth of 1.83 feet - not the 4 you discussed before.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**

Survey done in 2009. Last dredged in 2006. Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157392	Planning - Plan Formulation	Section 1-5	1-4	first sentence, last paragraph of section

We reference "proposed impacts". We don't want to propose impacts. Say that we evaluated the anticipated impacts of the proposed alternatives.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**

Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157394	Planning - Plan Formulation	Section 2	n/a	n/a

I did not review Section 2 as it is outside my expertise.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**

Understood.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4157399	Planning - Plan Formulation	General	n/a	n/a

I think many of your figures would look better if they were outlined. May be good to add if possible.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made where possible.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157422	Planning - Plan Formulation	Section 3-2	3-2	n/a

First line of the second full paragraph on the page. Briefly state what the GENESIS model is. Could be as simple as a phrase that says "a hydraulic sediment model used to design the recommended plan (see Appendix X)" Just real quick - is this a model we used? Where is more discussion on it, etc?

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157431	Planning - Plan Formulation	Section 3.2.1	3-3	n/a

Second sentence. Change "economy" to "economic well-being"

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes Made

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4157445	Planning - Plan Formulation	Section 3.2.2	3-3	n/a

In this paragraph we talk about the economic loss attributable to a change in controlling depth from 7 feet to 2 feet in five years. Previously in this report we've said 3 or 4 times that the 5-year controlling depth is 4 feet including a few sentences earlier. This seems very contradictory and seems to imply that the economics was not done correctly. However, in Section 1-3 we clearly show a controlling depth of less than 2 feet. Since the project was last maintained in 2006, if the survey from which the depths reported in Section 1-3 came can be dated and shown to be 5 years old or less, then we have proof that 2 feet is a better estimate than 4 feet. Maybe the other areas in the text need to be strengthened.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 30-Aug-11

1-0 Evaluation **Concurred**
Changes made to controlling depth of 2 ft or less in applicable text areas. The survey was from 2009.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12
Current Comment Status: **Comment Closed**

4161776	Planning - Plan Formulation	3.2.2.4	3-7	n/a

Please check if this is an appropriate assumption for fuel use. Seems that a trip to another harbor would not require an extra 12 hours at low speed, nor would a boat sit idling while waiting on the tide. Seems to me that they would cut the engine and drop anchor. If this is standard econ process, then fine, but it sounds strange.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**
This was questioned in the PDT review. However, this seems to be standard econ process. The text has already been refined to include more language than the previous review period.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4161794	Planning - Plan Formulation	3.2.2.6	3-7	n/a

We state here that the channel will continue to be dredged every 5 years to maintain the channel to its proper depth, but we just talked about how the channel is not at its proper depth almost immediately after dredging. So we need to restate this. Is it actually dredged every 5 years? Did we choose 5 years for the purposes of our analysis? Do we think it's a reasonable assumption going forward? Please rephrase.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**
Changes made to Section 3.2.2.6.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4161803	Planning - Plan Formulation	4	4-1	n/a

In the introductory paragraph to the Section, we say that we hope to protect from shoaling in the "proposed" St Jerome channel. Actually, the channel is already there, so remove the word "proposed" and rephrase the sentence to read properly. If we ultimately decide the recommend a modified channel, that's fine but (1) it's still the same channel, just adjusted and (2) we don't want to appear as though we've prejudged a solution. The report must read like a story and the reader should read about our analyses and recommendations as they came about.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

Revised 01-Sep-11.

1-0 Evaluation **Concurred**
Changes made to paragraph.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4161809	Planning - Plan Formulation	4-1	4-1	n/a

Fix justification problem in the first line of the paragraph.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**
Change made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4161903	Planning - Plan Formulation	4-3.7	4-6	n/a

The description of Alternative 5 doesn't include the segmented breakwaters shown in Figure 6.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**
Changes made. Added description to include segmented breakwaters shown in Figure 6.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 10-Apr-12

Current Comment Status: **Comment Closed**

4161909	Planning - Plan Formulation	General Section 4.3	n/a	n/a

For a few of the alternative descriptions, we mention downdrift impacts, but we don't say what that means. I assume we're talking sand starvation. Please clarify that.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**

Clarified in Executive Summary and Section 4.3 starting with Alternative 1.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4161977	Planning - Plan Formulation	4.4.4	4-12	n/a

Why is this alternative called 7A? Please note that this is a new alternative that was added in later on as the PDT discussed which preliminary plans to take forward. Spell out specifically that the jetties are similar to 7 (are they) but that they go out at an angle to offer a straight shot down the existing channel. This is part of the story telling thing - show how the thinking of the group progressed.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**

Information added to Alternative 7A description.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 12-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4161984	Planning - Plan Formulation	4.4	n/a	n/a

We need some sort of statement about why the other options were dropped. it could be very simple, like "alternatives with no northern jetty were dropped due to concerns of shoaling by littoral drfit from the north." Or, "Alternatives x, y, and z were dropped because the proposed jetties made them too expensive and didn't add significant benefits." Something like that. We need to let the reader in on our thinking. Sometimes it takes a lot of words to rule out an option, sometimes it's real easy.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 01-Sep-11

1-0 Evaluation **Concurred**
Changes made in section 4.3.2 thru 4.3.11 and in section 4.4

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4167932	Planning - Plan Formulation	4.5.1.5	4-15	n/a

Third sentence under Figure 4.14. Again we make reference to the 5-year maintenance schedule and how that allows for unrestricted navigation. That isn't the case, as our econ shows. Does it change the analysis at al to jsut say that a 5-year cycle is the assumed existing condition, or something like that? Even that isn't true given the realities of funding.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 06-Sep-11

1-0 Evaluation **Concurred**
Changes made to first sentence under Figure 4.14.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4167937	Planning - Plan Formulation	4.5.1.5	4-15	n/a

Paragraph under Figure 4.14. We state here that a 5-year cycle gets us to a controlling depth of -4 feet. Earlier we talk about -2 feet controlling depth. If the -4 was used for the analysis, why? Why not -2? If we assumed this to be conservative and not overstate benefits, or something like that, we should say so.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 06-Sep-11

1-0 Evaluation **Concurred**
Changes made to first sentence under Figure 4.14

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4169600	Planning - Plan Formulation	5.1	5-1	n/a

We say that we have determined the best solution, but then we talk about the recommended plan. What do we mean by various plans when it sounds like we already choose one? You shoudl give a short explanation of the variables that were looked at to come up with a plan.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 07-Sep-11

1-0 Evaluation **Concurred**
Changes made to Section 5.1.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4169612	Planning - Plan Formulation	5.1.2	5-3	n/a

Say that the plans consist of variations to Alternative 7, blah, blah, blah,

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 07-Sep-11

1-0 Evaluation **Concurred**
Changes made in Section 5.1.2

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4169622	Planning - Plan Formulation	5.1.2, first sentence second paragraph	5-3	n/a

Change from "shown in Figure 5-1, has the south jetty" to "shown in Figure 5-1, includes a jetty to the south...". Then change "and connect" to "connected"

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 07-Sep-11

1-0 Evaluation **Concurred**
Changes made

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4169639	Planning - Plan Formulation	5.1.3, third paragraph (and 5.1.2)	5-6	n/a

When you discuss the difference among the three options, break that sentence up. It goes on forever. Also, when you first introduce the idea of three options for the piles in section 5.1.2, mention that they have different initial construction and maintenance costs. Say no more then, but just bring up that fact so that we understand the different plans that will be discussed.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 07-Sep-11

1-0 Evaluation **Concurred**
Changes made in 5.1.2 and 5.1.3

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4169666	Planning - Plan Formulation	5.1.3, third paragraph	5-6	n/a

You mention that the cost differential for Option 3 requires the sponsor to pay the difference. You didn't yet talk about the total cost of the project. Earlier in this section you should reference the table and talk about the $7 million cap and how the sponsor must pay the difference.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 07-Sep-11

1-0 Evaluation **Concurred**
Changes made in first and third paragraph of 5.1.3

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171147	Planning - Plan Formulation	5.2.1	n/a	n/a

Just mention that the with-project costs include dredging every 10 years as calculated previously.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171153	Planning - Plan Formulation	5.2.2	n/a	n/a

first paragraph of section. You already introduced Table 5-3. Then you mention IDC, which isn't shown until Table 5-5. Try to clean up such that we know what table we're talking about.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made in 5.2.2

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171221	Planning - Plan Formulation	5.3	5-10	n/a

Have we defined MHWL before?

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made. MHWL was not defined before. In section 2.5.10, MHWL is now defined for the first time.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4171223	Planning - Plan Formulation	6	n/a	n/a

As with Section 2, I didn't read 6. It is for our NEPA reviewer.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Understood

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4171242	Planning - Plan Formulation	5	n/a	n/a

Somewhere in section 5, we sbould have a discussion of the dredged material placement site. Where is it? How much is going there? How will it be done (piped, trucked, etc). As I said, I didn't read section 6, but there needs to be a discussion of the site in there too from a NEPA standpoint.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
It is discussed in Section 5.1.2.2 Excavation and Placement. There is also discussion of the placement site throughout Section 6.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12
Current Comment Status: **Comment Closed**

4171256	Planning - Plan Formulation	Table 7-1	7-2	n/a

This table is a tough one - figuring out Nav cost-share always is. However, at the bottom we show costs of $7 M federal (which is the limit, so that's correct), but then the non-Fed 10% is shown as $700k. 10% of $7 M is $700k, but that's not the question. Besides, a 90/10 split should be $7M/$778k. Table needs to be scrubbed. The feas costs are part of the total and count against the $7M, but only design and implementation is 90/10/10. I will supply my best stab at the table. Also we show the 10% payback as being on the entire cost. I suppose that is correct, but I'm not sure I've dealt with that before. We may want to seek guidance.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

Revised 08-Sep-11.

1-0 Evaluation **Concurred**
Changes made to table.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171292	Planning - Plan Formulation	7.2	7-2	n/a

Based on my new figuring, this paragraph should say that the non-fed share is $3,099,080 plus the 10% pay-back. What you have now actually includes the feasibility costs, which are not construction costs and have already been paid.

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171294	Planning - Plan Formulation	7.3	7-2	n/a

Implementation schedule needs to be updated

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4171316	Planning - Plan Formulation	9	9-1	n/a

Fix the cost numbers at the bottom of the page to match the new Table 7-1

Submitted By: Daniel Bierly (410-962-6139). Submitted On: 08-Sep-11

1-0 Evaluation **Concurred**
Changes made.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Daniel Bierly (410-962-6139) Submitted On: 17-Apr-12

Current Comment Status: **Comment Closed**

4174011	Environmental	1st Para	FONSI	n/a

State that there's existing Federal channel there

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Concur.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4174022	Biology-Ecology	2.5.2 and 6.5.3	n/a	n/a

Concern: What type of containment does the placement site have, if any? The site appears to be a temporary dewatering station for dredged sands prior to trucking off-site but it is unknown if the material is contained. Basis for concern: if uncontained, what is the chance of the material becoming displaced during a storm event and impacting nearby aquatic resources? Significance: moderate Recommend brief description of containment area to include how the placed material is contained

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**

The material is contained at the placement site by dikes that were constructed during the last dredging in 2006. The site still holds the material from that dredging event. Text will be added to the document to clarify this issue.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11

Current Comment Status: **Comment Closed**

4174030	Environmental	2.5.2 and 6.5.3	n/a	n/a

Concern: The dredged material appears to be of high quality. Is there opportunity to use the material locally in a beneficial manner? Or is the trucking to off-site localities a utilization of the matieral beneficially off-site? Basis of concern: Potential for beneficial use of dredged material Significance: low Recommend adding a statement the fate of the material trucked off-site, if possible.

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**

The use or re-use of the dredged material is a sponsor decision. At this time, it is undetermined how the sponsor plans to use this resource.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11

Current Comment Status: **Comment Closed**

4174038	Environmental	3rd Para, Line 5	FONSI	n/a

While effects may be minor, affects associated with long-term presence of jetties themselves are essentially permanent. Clarify that water quality impacts temporary & minor, other physical effects minor & permanent

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Concur. Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4174040	Environmental	2.5.6	n/a	n/a

Concern: It was stated that sedimentation rates/Secchi depth readings were taken. But no data was provided, though it was noted that the readings were "typical." Basis of concern: Although the reader can assume, based on text on fish and wildlife, that the local area supports aquatic and avian life, no data on these aspects of water quality were provided though they appear to be available. Significance: low Suggest adding a brief summation of this information.

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Data is limited- one 6-week study in the Fall, but a brief summary of data was added. Data is Secchi depths, not sedimentation rates. Text was clarified.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11

Current Comment Status: **Comment Closed**

4174061	Environmental	4th Para, Line 5	FONSI	n/a

FONSI needs to state what might happen if we find cultural/historic resources of significance - what mitigation measures might be employed?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Changes made in 5th para, line 5. Text added: If historic properties are located in the project area they should be avoided if it is possible to do so and still having a viable project. If avoidance is not feasible, mitigation measures could range from doing nothing (not likely, but possible), to recordation, research, excavation, some combination thereof, or "alternate" forms of mitigation, such as preserving a resource elsewhere.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 15-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4174067	Biology-Ecology	2.5.7.1	n/a	n/a

Concern: Please clarify NOB 31-2. It seems fairly close to the project area and, based on the map, large in size. Oyster density appears to be fairly low on the NOB 31-2 but some oyster fishing takes place in it. Basis for concern: oysters are at critically low levels in MD waters (bay wide really). Negative impacts should be avoided if at all possible. Significance: moderate Recommendation: Adding a sentence or two about the specific distance of NOB 31-2 from the project site as well as its size. The proposed project may increase rates of water flow in a corner of the NOB from looking at the hydaulic data, this could be of some benefit to the NOB.

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Size of NOB 31-2 and 31-3 as well as distance to project was added.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11
Current Comment Status: **Comment Closed**

4174073	Environmental	1st Para, Line 4	Executive Summary	n/a

State existing Federal channel

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4174082	Environmental	1st or 2nd Para	Executive Summary	n/a

Briefly summarize plan formulation and alternatives considered

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Non-concurred**
Team does not view It necessary to add this detail to Executive Summary. Working to keep Executive Summary brief and focused.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Need only be a sentence, but not important.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4174090	Environmental	5th Para	Executive Summary	n/a

State what potential implications of Phase I work might be. Redesign? Need to implement studies or mitigation measures?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**
Changes made. Text added: The Phase I investigation is geared to determining the presence or absence of potential historic properties in the project area. If such potential historic properties are identified, various scenarios are possible, including redesign to avoid the property, additional investigations to determine the historic significance of the property, and potential recordation or excavation of the property.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 15-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4174095	Biology-Ecology	6.5.7.3	n/a	n/a

Concern: Loss of benthic habitat/displacement due to proposed project. While it is agreed that the project will impact the benthic community as described, the structure may provide some opportunity for sessile invertebrates to attach, which could be a small positive benefit to the benthos. Basis for concern: Hard structure of any sort can provide at least some compensatory habitat for a different suite of benthic life than that displaced by placement of the structure and is worth mention. Significance: low Recommend: adding a statement regarding these benefits. While they are limited, they are worth mention.

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**

Concur. Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11

Current Comment Status: **Comment Closed**

4174101	Environmental	Sections 2 and 6	Table of Contents	n/a

Structure puzzling. Section 2.2 title implies that physical environmental topics should be covered here, but some of that stuff is actually in Section 2.5. Why not combine these into one subsection?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**

Section 2 will be reorganized. All physical environmental topics all under 2.2 with corresponding changes in Section 6. 'Biological Resources' and 'Other Environmental Considerations' added as sections.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4174107	Biology-Ecology	6.5.7.8	n/a	n/a

Concern: Sturgeons - a map was provided showing the records of sturgeons in MD waters of the Bay. Was there an associated timeline of these records? I believe this map was derived from Welsh et al. 2002 "Distribution and Movement of Shortnose Sturgeon in the Chesapeake Bay" Estuaries 25(1):101-104. This paper may provide a timeline for these sturgeon records Basis of concern: it may help better illustrate the rarity of the sturgeon in the local region if this data could be provided, which may aid in the consultation with NMFS on sturgeon related issues. Significance: moderate

Recommend consulting the Welsh paper and adding the timeline if possible. Also consider providing this paper to NMFS during the consultation process, it may help.

Submitted By: david schulte (757-201-7007). Submitted On: 09-Sep-11

1-0 Evaluation **Concurred**

The information was provided by DNR but does start in 1996 so is the same data. Information was added to better describe the time frame. Added a citation for a 10 yr review of the taggin program by USFWS dated 2007.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: david schulte (757-201-7007) Submitted On: 03-Oct-11

Current Comment Status: **Comment Closed**

4175664	Environmental	1.6	1-4	n/a

Add background about previous placement sites, volume typically dredged, material type dredged, dredging method

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

There is some additional information available in the 2004 EA. This will be added- placement site in 1991; dredging method in 2006. Information in Sec 1.3, 2.2.6, and 4.12.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175666	Environmental	2.1	2-1	n/a

"placement site still contained" is strange statement. Implies that site is only temporary storage site and material is regularly removed from here after placement. Does St Mary's County regularly remove the material? If this is the case, should be explained in Section 1.6.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised to clarify that the 'material is still contained'. This material will need to be removed prior to the proposed dredging.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175668 Environmental 2.2.2 2-1 n/a

Delete "but form in a relatively thin veneer over the crystalline basement rock in the study area" Coastal Plain deposits here likely hundreds of feet thick. Crystalline basement rock irrelevant.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175669 Environmental 2.2.2 2-2 n/a

Add mention of tidal wetland soils in waterway

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Wetland (hydric) soils were added to wetlands mapped. Discussion added to Soils section.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175671 Environmental 2.2.3 2-2 n/a

Add "into the mouth of St Jerome's Creek" after "to the north and south"

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Concur. Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175672	Environmental	2.2.4	2-4	n/a

Salinity paragraph confusing. Should state salinity range 15 to 17 ppt during the year, from a low of about 7.5 in winter/spring to a high of about 22 ppt in summer/fall.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175673	Environmental	2.3	2-4	n/a

2nd sentence incorrect (?). Implies shoaling a new problem/worsening trend. Instead, it's a recurrent problem because we don't dredge frequently enough to prevent it.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175674	Environmental	2.3.1	2-4	n/a

Make sure Figure 1, or some other figure, shows locations of Ridge and Dameron, and reference that figure.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Ridge is on Figure 1. Dameron will be added, as well as a reference to that figure.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175681	Environmental	2.3.3	2-5	n/a

Move text "The economic benefits of an improved ..." to plan formulation or impacts section. Section 2 should cover existing conditions; these statements don't refer to that.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be revised. Identical text already in 6.3.3 so text deleted.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175683	Environmental	2.3.4.1	2-6	n/a

Add sentence clarifying that Table 2-3 includes information on businesses outside of St. Jerome's Creek.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Requested text will be inserted.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175687	Environmental	2.3.5	2-7	n/a

Clarify why maintenance dredging only done once every 10 to 15 years if actually needed more frequently. Funding inadequate? Low priority for funding?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Yes, frequency of maintenance dredging is driven by available funding and funding has not been available for more frequent dredging. A sentence was added to Sec 2.2.6 (Sediment) to address this.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175690	Environmental	2.3.6	2-8	n/a

Add sentence on recreational use of St Jerome's Creek. Information supplied deals with county as a whole. Representative of St Jerome's Creek?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
No specific information available for only St. Jerome Creek. A sentence was added to this section that state's that recreation within St. Jerome Creek is largely water-dependent activities, predominantly boating and fishing; and that the county information provided is representative of St. Jerome Creek.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175691	Environmental	2.4.1	2-8	n/a

Reference figure showing roads discussed.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Sentence about Rt 301, I-95, and I-495 deleted. Not needed. Rt 235 and Rt 5 are shown on Fig 1-1.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175692	Environmental	2.4.1	2-8	n/a

State whether or not any airports in St. Mary's County or adjacent counties.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be added. There are 10 local airports within St. Mary's County.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175693	Environmental	2.4.2	2-9	n/a

Delete "No utilities are located in the St Jerome's Creek area" if electric or gas lines are present as paragraph above indicates. If they're "off the grid," then don't delete.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be revised to state that 'No utilities are located within St. Jerome Creek where the project would be constructed.'

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175694	Environmental	2.5.2	2-9	n/a

Add word "Shoreline" before "within the proposed ..." to clarify that that's what you're referring to.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175695	Environmental	2.5.2	2-9	n/a

Move paragraph and sentences "A geotechnical investigation...depth)." to sediments Section 2.2.3

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

Revised 12-Sep-11.

1-0 Evaluation **Concurred**
Concur. Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175696	Environmental	2.5.2	2-10	n/a

Paragraph "Following the completion..." should be subdivided such that existing conditions information is presented here, while plan formulation is discussed in plan formulatin section.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
This paragraph deleted. Already in plan form section.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175699 Environmental 2.5.6 2-11 n/a

Double-check: high sedimentation rates or high suspended sediments? If former, should move to Sect 2.2.3. Text implies suspended sediments. If topic is sedimentation rate to bottom that should instead be included in Sect 2.2.3

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
High suspended sediments. Study measured Secchi depth and used this data to indicate high sedimentation rates, but for our purposes only Secchi depth data will be presented as an indicator of high suspended sediments. Discussion kept in water quality section.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175701 Environmental 2.5.7.1 2-12 n/a

Last sentence, modify to state that plankton levels typical of eutrophic waters assumed to exist.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175703 Environmental 2.5.7.2 2-12 n/a

Text in this section predominantly covers commercial fisheries. Should move information covering commercial aspects to Sect 2.5.7.4.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Commercial fisheries information will be moved to Sect 2.5.7.4.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175704	Environmental	2.5.7.3	2-12	n/a

Should use scientific names for all or none. Is a hodepodge. Okay to not use them for birds though if using AOU standardized common name.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Scientific names will be added for all.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175705	Environmental	2.5.7.3	2-12	n/a

Add introductory sentence to EFH paragraph, something like: "St Jerome's Creek and Chesapeake Bay are designated as EFH by NMFS for several fish species."

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175710 Environmental 2.5.7.5 2-15 n/a

If wetlands lie in proposed jetty areas, should provide some additional text on what these are and include map in main text

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

NWI map will be added to text and wetland resources in project area will be further described.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175715 Environmental 2.5.7.6 2-15 n/a

Clarify whether SAV has occurred there over period of VIMS records (1986 onward) or even older records. Statement "Although no SAV has ever been documented ..." implies this, but also sounds like it might refer to more recent period of time

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

The VIMS data from 1971 through the present identified SAV in only one year, 1985. There were some small, low density plots in northeast St. Jerome Creek. Text will be clarified.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175728 Environmental 2.5.7.8 2-16 n/a

Any evidence that any of the stranded dead sea turtles died as consequence of dredging? If information available, state identified causes of death (boat collisions, fishing gear entanglements, etc.)

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
No information is available regarding cause of death.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175734 Environmental 2.5.10 2-20 n/a

Move last two sentences of last paragraph of this subsection to environmental compliance, does not belong in existing conditions.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175737 Environmental 2.5.11 2-20 n/a

Move "There are three seagood ..." sentence to water quality, Section 2.5.6. Also, state whether these are permitted dischargers.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

Revised 12-Sep-11.

1-0 Evaluation **Non-concurred**
The EPA website does not provide any additional information. In fact, the permits are expired for all the sites. The most recent expired in 2005 and the others in 1987 and 1991. I will revise text to state that facilities are shown in database, but permits have expired. This information belongs here under HTRW as they were NPDES permits.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Open Comment**
While presumably some HTRW materials could be included in an NPDES-permitted discharge (http://cfpub.epa.gov/npdes/faqs.cfm?program_id=45#108), I don't think consideration of these NPDES permits or the discharges belongs in HTRW section. In the HTRW section we deal exclusively w/HTR stuff, and don't consider wastewater.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

1-2 Backcheck Recommendation **Open Comment**
added for Angela Sowers: The following text was moved from Section 2.6.4 Hazardous, Toxic, and Radioactive Waste to Section 2.2.11 Water Quality. There are three seafood industry-related businesses in the vicinity of St. Jerome Creek that had surface water permits that are now expired. The most recent expired in 2005 and the other two expired in 1987 and 1991.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 25-Apr-12

1-3 Backcheck Recommendation **Close Comment**
Good.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 25-Apr-12
Current Comment Status: **Comment Closed**

4175740	Environmental	2.5.12	2-20	n/a

Way too much text on noise, move first 5 paragraphs to annex or delete entirely unless there's good reason to include this (i.e., substantial noise concerns).

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Section will be reduced.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175743	Environmental	4.1	4-1	n/a

Second paragraph, delete "objectives" after "environment," replace with "laws/policies"

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175744 Environmental 4.3 4-2 n/a

Present alternative of increasing dredging frequency

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Changes made. Section 4.3.2 Increased Maintenance added

Submitted By: Anthony Clark (410-962-3413) Submitted On: 19-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175745 Environmental 5.1.1.2 5-3 n/a

No previous information provided previously on shortage of placement sites. This should be included in plan formulation/alternatives formulation section.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Changes made. Text added to Section 4.3

Submitted By: Anthony Clark (410-962-3413) Submitted On: 19-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175748 Environmental 5.1.1.2 5-3 n/a

Need to acknowledge that project would cause loss of one of few remaining natural inlets with dynamic shoals along Chesapeake Western Shore,

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175750	Environmental	All	6-1 to 6-15	n/a

Check w/Amy whether she'd like each topic divided into "direct" and "indirect" impacts subtopics. She's required this on recent reviews.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Per Amy Guise, both direct and indirect impacts will be discussed, but they do not need to be in specific subsections.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175754	Environmental	6.1	6-1	n/a

Paragraph 2, "still contained" - revise as per previous comment

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175758	Environmental	6.2.3	6-1	n/a

Move discussion on turbidity to water quality impacts

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175769	Environmental	6.2.3	6-2	n/a

Move sentence "The substrate changes could potentially lead to ..." to biological resources or benthos subsection.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175773	Environmental	6.2.3, Para starting w/ "Based on ..."	6-2	n/a

Add reference to figure 6-1 and 6-2 and state range of modeled shallowing/deepening here or in bathymetry subsection.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Information requested will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Open Comment**
I couldn't located figure numbers. Please add if not done.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

1-2 Backcheck Recommendation **Open Comment**
added for Angela Sowers: Projected erosion/deposition values pulled from Figures 6.1 and 6.2 (color coded legend provides values) and added to discussion. Text revised to: Figure 6.1 depicts the erosion and deposition projected from northeast waves. Projected erosion and deposition ranges from -0.75 m to 0.75 m, respectively. Figure 6.2 depicts the erosion and deposition projected from southeast waves. Throughout the study area, projected erosion and deposition ranges from -0.75 m to 1.0 m, respectively. The NE waves cause more extreme erosion, whereas SE waves lead to more extreme deposition. Within the NOB's, there are a few small areas of slight deposition (less than 0.5 m) from NE waves, but these appear to be largely offset by erosional forces (0 to -0.5 m) from SE waves. Erosion is not expected to be a negative impact on the oyster bars and would likely help maintain a sediment free surface on the NOBs.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 25-Apr-12

1-3 Backcheck Recommendation **Close Comment**
ok

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 25-Apr-12

Current Comment Status: **Comment Closed**

4175774	Environmental	6.2.3, last para	6-2	n/a

Move "If the effluent ..." to water quality subsection

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175781	Environmental	6.3.4	6-3	n/a

"seasonal" impacts meaning unclear. Since you've already said "short-term," probably unnecessary

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised. "seasonal" will be deleted.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175787	Environmental	6.2.4	6-2	n/a

Here or elsewhere as best fits, need to include text to meet requirements of EC 1165-2-211

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Requirements of EC 1165-2-212 have been added in Section 2.8, 6.8 and Appendix J.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 19-Jan-12

1-1 Backcheck Recommendation **Open Comment**
Text on p. 2-24 should not state which scenario we believe in. Instead, just provide range of estimated rise rates. Deal with which rate to formulate for in plan formulation sections. Suggest revising 2nd paragraph to something like below, with an additional revision need noted for which I don't provide any suggested text: USACE, per EC 1165-2-212, is required to consider a continuation of the historic rate of sea level rise, as well as forecast accelerated sea-level rise at intermediate and high global rates developed by the National Research Council. The global forecasts are adjusted as necessary to consider additional factors that affect the rate of sea-level rise locally. The accelerated rates would increase future sea levels over what continuation of historic rates would produce. A continuation of the historic trend for the 50-year period of analysis would produce a sea level 0.56 foot higher in St Jerome Creek in 2064 than it is at present. Accelerated rise rates would result in an increase in a sea level of xx by 2064. (NOTE: ONLY PRESENT 2 ADDITIONAL RATES. HISTORIC IS LOW, YOU ONLY NEED INTERMEDIATE AND HIGH). For Section 6.8, we're not supposed to select the most likely SL rise scenario, but instead to consider SL rise at all 3 rates and how this would affect alternative performance. We need to select a robust alternative.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

1-2 Backcheck Recommendation **Open Comment**
Changes made in text on p. 2-24 and in Section 6.8. Also language added in the executive summary and in Section 9 concerning Sea Level Change as discussed.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 19-Apr-12

1-3 Backcheck Recommendation **Close Comment**
ok

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 25-Apr-12

Current Comment Status: **Comment Closed**

4175791 Environmental 6.5.1 6-5 n/a

Add text that natural inlet would be altered to stabilized inlet. Beaches, shoals, and channel will no longer be naturally dynamic.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175793 Environmental 6.5.2 6-5 n/a

Soil at jetty tie-ins would presumably be graded/excavated and reworked in at the site (i.e., not trucked off).

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised to clarify.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175795 Environmental 6.5.6 6-6 n/a

Flushing increased, no change, or decreased? Address explicitly.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Completed modeling focused on evaluating shoaling rates within the federal and county channel and suggest little to no change in tidal circulation within the creek, but these models were not designed to specifically look at circulation within the creek. Detailed project design efforts in the next planning stage will further evaluate the impacts on circulation and flushing within St. Jerome Creek.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Open Comment**

Paragraph needs to provide a conclusion for now, but also cover future modeling and implications of this. If we think risk of water quality impairment is high, we would need to add text to FONSI and Executive Summary acknowledging this. Based on what you provide though, I don't think that's necessary. Instead, I suggest replacing above with something like below: Completed modeling focused on evaluating shoaling rates within the federal and county channel and suggest little to no change in tidal circulation within the creek. Although these models were not designed to specifically look at circulation within the creek, because tidal circulation would likely be maintained at present levels, no long-term impact to water quality via reduced flushing or impaired circulation would be expected. Detailed project design efforts in the next planning stage will further evaluate the impacts on circulation and flushing within St. Jerome Creek. USACE would utilize this information in its application to MDE for Water Quality Certification. In the event potential detrimental impacts to water quality were identified, USACE would likely be required to modify project design to reduce these effects.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

1-2 Backcheck Recommendation **Open Comment**

added for Angela Sowers Revised text as suggested. (current Sec 6.2.11) Completed modeling focused on evaluating shoaling rates within the federal and county channel and suggest little to no change in tidal circulation within the creek. Although these models were not designed to specifically look at circulation within the creek, because tidal circulation would likely be maintained at present levels, no long-term impact to water quality via reduced flushing or impaired circulation would be expected. Detailed project design efforts in the next planning stage will further evaluate the impacts on circulation and flushing within St. Jerome Creek. USACE would utilize this information in its application to MDE for Water Quality Certification. In the event that potential detrimental impacts to water quality were identified, USACE would likely be required to modify project design to reduce these effects.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 25-Apr-12

1-3 Backcheck Recommendation **Close Comment**
ok

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 25-Apr-12
Current Comment Status: **Comment Closed**

4175815	Environmental	6.5.7.2	6-7	n/a

Add that hydraulic dredging also typically has winter time restriction to protect oysters during quiescence.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Language will be added to state that oysters would also benefit from the winter time restrictions.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175817	Environmental	6.5.7.5	6-9	n/a

Wetlands might develop on protected interior of sandbars/shoals, but probably not on any wave-exposed areas

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Wetland section needs to be revised. Latest NWI map does show 'estuarine and marine wetlands' on tips of both shorelines at mouth of St. Jerome that would be impacted by jetty construction. Although, wetlands exist on wave-exposed shoreline, it is likely they existed there prior to exposure. Text will be clarified.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175824	Environmental	6.5.7.8	6-10	n/a

Sea turtles could be present April - Nov. Possible any work could occur then?

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

It is possible, but work outside the TOY restrictions would first need to be coordinated with the resource agencies.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Open Comment**

Neither Section 2.5.9 nor Appendix H provides sufficient information on time of year of turtle occurrence to validate "no effect." Add text to one or both of these locations noting their occurrence as function of water temperature, then provide approximate range of dates when those temperatures are/aren't met. For ocean at Ocean City, water temperatures are warm enough (somewhere in 50sF) for sea turtles to be present from about April 1 through November 30. I suspect Bay's would differ by a few days thisaway or thataway, but haven't determined it nor looked it up. Additionally, would be appropriate to add TOY to 6.5.9: "All construction activities would have a time of year restriction where no construction activity should be performed during the period 15 November through 1 March."

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

1-2 Backcheck Recommendation **Open Comment**

added for Angela Sowers: Text will be revised as suggested.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 25-Apr-12

1-3 Backcheck Recommendation **Close Comment**

Going on faith.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 25-Apr-12

Current Comment Status: **Comment Closed**

4175827	Environmental	6.5.14	6-12	n/a

Add change in aesthetic character from natural to stabilized inlet with jetties.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175830 Environmental 6.5.15 6-12 n/a
State "no effects on children anticipated"

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175833 Environmental 6.6 6-12 n/a
Section fails to cover what implications of finding substantial cultural/historic resources might be. Potential mitigation measures under various scenarios should be presented.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Changes made. Text added: If historic properties are located in the project area, they could be avoided. If avoidance is not feasible, mitigation measures could range from doing nothing (not likely, but possible), to recordation, research, excavation, or some combination thereof.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 15-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175843 Environmental 6.7 6-12 to 6-15 n/a

Substantial portion of this is NOT cumulative impacts. Table 6-1 would be great in Executive Summary, but is not cumulative. Paragraphs beginning "Temporary reductions..." and "Dredging and construction..." do not belong here. The paragraphs do appear to contain areas, quantities, etc., not presented in earlier subsections. In that event, move those pieces of information there.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Table 6-1 is not meant to be specific to cumulative impacts and will be moved up to an earlier position in Section 6. The cumulative impacts section will be revised to remove language that does not belong into appropriate sections.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175846	Environmental	6.7	6-12 to 6-15	n/a

Last paragraph on p. 6-15 does cover cumulative impacts. Additional cumulative impact topic is increased shoreline hardening which will contribute to 1,000 miles of bay shoreline now hardened in Md., and loss of dynamic natural inlet contributing to trend towards fixing inlets in place. Also, any risk of inducing development? Address whether yay or nay.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Additional language will be added to discuss hardening shoreline and loss of dynamic natural inlet. There is no way to determine if project will induce development, but possibility will be recognized in impacts section.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175859	Environmental	8.1 and 8.2	8-1	n/a

These subsections would read better if collapesed into one and titled "Public and Agency Coordination." As written, there is NO actual public involvement presented in 8.1, and 8.2 first sentence provides adequate summary of what coordination is supposed to be such that the 2 paragraphs of 8.1 could be deleted - except for sentence "The major source..." which is useful.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Section will be revised as suggested.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175863	Environmental	8.2	8-1 to 8-4	n/a

Chronology usually presented in annex or appendix. Need only present summary of important points in main body of report. Suggest moving there.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

A summary paragraph will be added. Chronology will be moved to appendix.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175866	Environmental	23 July 2009	8-2	n/a

Letter from MDDNR but USFWS request included. Double-check, confusing

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be corrected. 'USFWS' should be 'MDNR'

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175875	Environmental	15 Dec 2009	8-2	n/a

Confusing - coordination with USFWS regarding DNR regulation. Did comparable coordination occur with DNR regarding TOY? Add that if not in here. Also, statement that dredging is typically exempt only partly applicable - other construction activities wouldn't necessarily be exempt.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be corrected. 'USFWS' should be 'DNR'. Text will clearly state that no all proposed activities would be exempt.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175876	Environmental	8.3	8-4	n/a

What are potential implications? Cover possible mitigation scenarios.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Changes made. Text added: The Phase I survey would require funding and time. If historic properties are located in the project area, they could be avoided. If avoidance is not feasible, mitigation measures could range from doing nothing (not likely, but possible), to recordation, research, excavation, or some combination thereof.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 15-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175880	Environmental	Last sentence	9-2	n/a

What are potential implications of unresolved cultural/historic stuff? State concisely.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Changes made. Text added: The Phase I survey would require funding and time. If historic properties are located in the project area, they could be avoided. If avoidance is not feasible, mitigation measures could range from doing nothing (not likely, but possible), to recordation, research, excavation, or some combination thereof.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 15-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175881 Environmental EOs, Memos, 10-1 n/a

Add Chesapeake Bay EO

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175887 Environmental n/a' 10-1 n/a

Add explanation of what "pending" means to Level of Compliance explanations at bottom

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**

Definition will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175888 Environmental n/a' 10-1 n/a

Somewhere in document should state that USACE has determined project is consistent with Md coastal laws and policies and is thus consistent with CZMA.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
A section was added to Sec 2 and 6 to address 'Coastal Zone Management'.

Submitted By: angela sowers (410-962-7440) Submitted On: 20-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175925	Environmental	Appndx F	n/a	n/a

404b1 should focus on aquatic impacts, upland disposal site impacts not of interest other than to demonstrate non-aquatic placement site

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Discussion of upland disposal site impacts will be removed.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175929	Environmental	Appndx F, (A. Physical and Substrate Determinations), 5. Actions Taken to Minimize Impacts	4	n/a

Move this information to " C. Suspended Particulate/Turbidity Determinations" on p. 6

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

Revised 12-Sep-11.

1-0 Evaluation **Concurred**
Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175931	Environmental	Appndx F, (2. Current Patterns and Circulation), 5. Actions That Will Be Taken to Minimize Impacts	5	n/a

Information presented irrelevant to topic. Instead, if no impact expected, no minimization measures needed or appropriate. (For example, would be somewhat self-scouring compared to existing conditions, plus future dredging would occur but at lower frequency).

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

Revised 12-Sep-11.

1-0 Evaluation **Concurred**
Time of year language will be removed. The actions proposed are the minimize impacts to changes in water quality as well as circulation so discussion of turbidity curtains kept. Further language will be added regarding projections that new channel will be self-scouring.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175934	Environmental	Appndx F, 2. Effects on Benthos	8	n/a

Somewhere in here, add that structure would provide exotic substrate for fouling organisms

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

Revised 12-Sep-11.

1-0 Evaluation **Concurred**
Text will be added.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175936	Environmental	Appndx F, 5. Effects on Special Aquatic Sites, (b) Wetland	p. 9	n/a

Wetlands can develop on new intertidal substrate in protected settings (i.e., minimal wave energy or tidal scour). Exterior of new sand deposits probably exposed to bay wave energy, poor wetland development sites.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4175937	Environmental	Appndx F, 6. Rare, Threatened and Endangered Species	p. 9	n/a

Atlantic sturgeon not mentioned.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Non-concurred**
Atlantic sturgeon are mentioned in the last paragraph of this section on page 10.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4175941	Environmental	Appndx F	p. 12	n/a

Cumulatives Effects not presented other than for South Prong County Channel. Most of this is summary information, delete or put in summary at beginning perhaps (?). Add contributing to shoreline hardening, loss of natural inlet and associated habitats.

Submitted By: Christopher Spaur (410-962-6134). Submitted On: 12-Sep-11

1-0 Evaluation **Concurred**
Text will be revised as suggested.

Submitted By: angela sowers (410-962-7440) Submitted On: 13-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Christopher Spaur (410-962-6134) Submitted On: 18-Apr-12
Current Comment Status: **Comment Closed**

4180082	Geotechnical	n/a'	n/a	n/a

Appendix C-3 – Geotechnical Analysis – Please provide a geotechnical engineering report to accompany boring logs. Report should include a characterization of the subsurface conditions, and soil parameters and engineering properties to be used in the geotechnical analysis (settlement analysis of the rock jetty and analysis the sheet pile/battered pile structure). Report should include conclusions and geotechnical recommendations. Recommend including a soil/geologic profile along the channel which displays soil strata, ground elevations and water levels.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **Non-concurred**
Response: The decision was made after drilling was completed to hold off on any testing or geotechnical engineering analysis/report due to the extremely soft material encountered and the issues with construction of a stone jetty on this foundation. It was decided that additional drilling would be accomplished in the next phase of the project to evaluate the foundation conditions and complete the design of the sheet pile/battered pile jetties.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 14-Oct-11

1-1 Backcheck Recommendation **Close Comment**
Suggest removing geotechnical Scope of Work from Appendix. Also suggest adding statement that a detail investingation and analysis is forthcoming

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12
Current Comment Status: **Comment Closed**

4180085 Geotechnical n/a' n/a n/a

Appendix C-3 – Geotechnical Analysis. Boring logs should include elevations of soil strata.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **Concurred**
Response: Elevations of soil strata can be added to the boring logs.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12
Current Comment Status: **Comment Closed**

4180087 Geotechnical n/a' n/a n/a

Appendix C-3 - Geotechnical Analysis – includes Geotechnical Scope of Work only. Need a report to accompany boring logs not just a scope. Also, scope indicates soil laboratory tests would be performed. However no laboratory test results are included. Please include.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**
Response: The decision was made after drilling was completed to hold off on any testing or geotechnical engineering analysis/report due to the extremely soft material encountered and the issues with construction of a stone jetty on this foundation. It was decided that additional drilling would be accomplished in the next phase of the project to evaluate the foundation conditions and complete the design of the sheet pile/battered pile jetties.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**
Suggest removing Geotechnical Scope of Work from Appendix. Add statement that additional investigation and analysis will be required for the next phase of study.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12
Current Comment Status: **Comment Closed**

4180089	Geotechnical	n/a'	n/a	n/a

Section 2.5.2 Soils - please describe how the grab samples where obtain. Some of the logs indicate SPT. Were the samples obtained from driving a split spoon? Comment also applies to section 4.8 Geotechnical Investigation

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **Concurred**

Response: The samples obtained by the Baltimore Corps field personnel were obtained by driving a split spoon. Added in Section 2.2.6 and 4.8

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180091	Geotechnical	n/a'	n/a	n/a

Section 4.9.1 Batter Pile/Vinyl Sheet Pile Jetty. Last sentence indicates a 50 ft long by a 14"-3' diameter. Diameter is usually measured in inches. A 3.0 foot diameter timber pile would be difficult to locate. Please explain. Comment also applies to figure 14-7 and figure 5-2

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**

Response: The 14"-3' diameter designation indicates a pile that is 14" in diameter at a point 3' from the end. This designation is commonly used on plans for timber pile construction projects.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

although commonly used on plans for construction, I would suggest clarifying in the feasibility report.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180094	Geotechnical	n/a'	n/a	n/a

Section 4.10 Selection of Jetty Alternative. – need to include engineering analysis and calculations on the design of jetty. The design of the system needs to consider the lateral forces. This should show the loading conditions – wind, wave, possible boat forces, and sediment build up that will eventually be placed against wall. A determination of the proper embedment depth of the piles considering the loading on the sheet pile wall shall be made. A factor of safety for the wall system should be determined. Please state assumptions and document references to support calculations.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**

Response: Final engineering analysis and design of the sheet pile/battered pile jetties will be completed during the next phase of the project after the additional drilling and laboratory testing are completed. A geotechnical engineering report will be completed detailing the design of the structures.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180095	Geotechnical	n/a'	n/a	n/a

Section 4.10 Selection of Jetty Alternative. The last paragraph mentions the cross sections and states they "will have a 12"x12"x48" and 10"x10"x36" batter piles, respectively." Please check. I believe these are the dimensions of the batter blocks and misstated as written.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **Concurred**

Response: Concur. This paragraph will be corrected.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180100	Geotechnical	n/a'	n/a	n/a

Section 4.10 Selection of Jetty Alternative. Some of the boring logs which extend maximum 41.5 feet show very low blow counts or even weight of hammer (B3) for the full depth. Assuming the piles will be above the mudline by approximately 10 feet, and then only 40 feet will be embedded in the soils. Based on some of these borings, the recommended pile depth may not be sufficient to support the lateral loads. Please provide analysis on the embedment depth and the appropriate factor of safety for the wall system. Borings need to be deeper and longer piles may be needed. This may preclude the use of timber piles. Steel H or pipe piles may need to be considered. This factor will obviously increase costs. Please explain.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**

Response: Final engineering analysis and design of the sheet pile/battered pile jetties will be completed during the next phase of the project after the additional drilling and laboratory testing are completed. It is anticipated that the additional borings will be deeper than the initial borings. This analysis may determine that concrete or steel piles may be required. A geotechnical engineering report will be completed detailing the design of the structures.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Although the plan is to perform further investigations and evaluations at the next phase, I would suggest discussing this in the feasbility report. There may be some additional costs for the deeper piles and a different pile type which the feasibilty report should note.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180102	Geotechnical	n/a'	n/a	n/a

Report mentions that 30,000 cy of material will need to be dredged from channel. Has the existing dredge material disposal site been evaluated to consider the placement of the new material? Are the existing dikes suitable to contain the material?

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**

Response: The existing dredge material disposal site (provided by the local sponsor) is currently full and will be excavated to provide the capacity for the new material. Preliminary investigation indicates that the existing dikes will be suitable to contain the material. This will be confirmed during the next phase of the project.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180111	Geotechnical	n/a'	n/a	n/a

Section 2.5.2 Soils – last paragraph states an evaluation of the foundation conditions was conducted. The results of the evaluation and any analysis performed should be discussed in a geotechnical engineering report. Comment also applies to section 4.8 Geotechnical Investigation.

Submitted By: Raymond Dridge (757-201-7086). Submitted On: 14-Sep-11

1-0 Evaluation **For Information Only**

Response: The decision was made after drilling was completed to hold off on any testing or geotechnical engineering analysis/report due to the extremely soft material encountered and the issues with construction of a stone jetty on this foundation. It was decided that additional drilling would be accomplished in the next phase of the project to evaluate the foundation conditions and complete the design of the sheet pile/battered pile jetties.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Suggest indicating this in the feasiblity report

Submitted By: Raymond Dridge (757-201-7086) Submitted On: 04-May-12

Current Comment Status: **Comment Closed**

4180284	Hydraulics	1.1.1 Water Levels	Append. C. page C-1	n/a

Some discussion on sea level rise is needed per EC-1165-2-211

Submitted By: Mark Hudgins (). Submitted On: 14-Sep-11

1-0 Evaluation **Concurred**

Requirements of EC 1165-2-212 have been added in Section 2.8, 6.8 and Appendix J.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 19-Jan-12

1-1 Backcheck Recommendation **Close Comment**

thanks

Submitted By: Mark Hudgins () Submitted On: 18-Apr-12

Current Comment Status: **Comment Closed**

4180286	Hydraulics	figures 14-34	Append. C.	n/a

Could not read legends on figures

Submitted By: Mark Hudgins (). Submitted On: 14-Sep-11

1-0 Evaluation **Concurred**

Response: Concur. These legends will be made legible.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 26-Sep-11

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Mark Hudgins () Submitted On: 19-Oct-11

Current Comment Status: **Comment Closed**

4193257	Planning - Plan Formulation	n/a'	n/a	n/a

Concern: Alternatives are screened out of consideration without any explanation as to why. Basis: Alternatives generally are going to be screened out because they do not meet the goals, objectives or criteria of the planning effort. Significance: High. The analysis lacks transparency as to why some alternatives were carried forward and others were not. Action: Recommend including why the alternatives were screened out. If there is no reason, they should be carried forward in the analysis.

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

In section 4.3 - Key issues to be considered have been added to each alternative. In Section 4.4 further explanation was added as to why some alternatives were carried forward and others were not.

Submitted By: Anthony Clark (410-962-3413) Submitted On: 14-Oct-11

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 26-Apr-12

Current Comment Status: **Comment Closed**

4193485	Planning - Plan Formulation	n/a'	n/a	n/a

Concern: Section 3.2.1 states that "Shoaling is projected to decrease the controlling depth in the channel to -4 ft within 5 years of maintenance dredging, requiring a shortened dredge cycle to maintain minimal channel depths for navigation." The economic analysis uses a controlling depth of -2 within 5 years. Basis: The economic analysis and the statement of the problem should be based on the same considerations. Significance: High. Proper identification of the conditions affects the calculated benefits. Action: Determine the proper shoaling rate to use in the analysis.

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

The economic analysis has been changed to -4 FT within 10 years for the with-project condition. The controlling depth of -2 FT is still used in the without-project condition to calculate delays in the channel for economic purposes. The major portion of the channel is at -4 FT depth or greater and represents a more accurate assumption for calculating sediment transport, dredge quantities, and engineering specifications. However, it only takes one area of shoaling to force vessels to maneuver outside the designated channel or wait for a higher tide to provide adequate depth for safe passage. Because the latest survey shows mid-channel depth at 2 FT MLLW, that is the controlling depth used to estimate tidal delays.

Submitted By: Denise Kammerer-Cody (978 318-8105) Submitted On: 11-Jan-12

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed.

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 24-Apr-12

Current Comment Status: **Comment Closed**

4193718	Economics	n/a'	n/a	n/a

Concern: The economic analysis utilizes lost wages as a proxy for increases in costs due to relocating to another port with a greater travel distance to the fishing grounds. There is no evidence provided that lost wages would be equivalent to the increase in costs due to greater travel distances. Basis: ER 1105-2-100 states in paragraph E-11 and E-12 states that changes in net income are to be used for calcuation of NED Benefits. Significance: High. The metrics used to measure NED benefits for changes in travel distance do not appear to meet regulation. Action: Provide a basis for the lost wages to be used a proxy for increases in travel distance or recalculate the benefits utilizing changes in net income as the basis for the benefits.

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

The use of lost wages as a proxy for relocation costs has been removed. The actual labor costs for traveling from the closest harbor of sufficient depth to the traditional fishing grounds is now calculated by multiplying the hourly rate times the additional travel hours times the number of crew per vessel.

Submitted By: Denise Kammerer-Cody (978 318-8105) Submitted On: 11-Jan-12

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed.

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 24-Apr-12

Current Comment Status: **Comment Closed**

4193938	Planning - Plan Formulation	n/a'	n/a	n/a

Concern: Section 4.5.1.5 Predicted Shoaling Rates and Controlling Depths, states that "The procedure to develop this estimate assumes that under existing without project conditions, the navigation channel shoals to a controlling depth of -4.0 feet MLLW or less in five years. To maintain unrestricted navigation in the channel, dredging would be required every five years." This is the same information used to determine the recommended plan but it does not reconcile with the economic analysis which states that shoaling begins immediately and vessels are shoaled in after 5 years. Basis: The economic analysis should be utilizing the same operating and physical assumptions used in plan formulaton. Significance: High. The differences stated here could result in the recommendation of the wrong plan. Action: This data should be reconciled and reanalyzed or the differences corrected.

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

Same response as for Comment ID: 4193485 - The economic analysis has been changed to -4 FT within 10 years for the with-project condition. The controlling depth of -2 FT is still used in the without-project condition to calculate delays in the channel for economic purposes. The major portion of the channel is at -4 FT depth or greater and represents a more accurate assumption for calculating sediment transport, dredge quantities, and engineering specifications. However, it only takes one area of shoaling to force vessels to maneuver outside the designated channel or wait for a higher tide to provide adequate depth for safe passage. Because the latest survey shows mid-channel depth at 2 FT MLLW, that is the controlling depth used to estimate tidal delays.

Submitted By: Denise Kammerer-Cody (978 318-8105) Submitted On: 11-Jan-12

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed.

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 24-Apr-12

Current Comment Status: **Comment Closed**

4193980	Planning - Plan Formulation	n/a'	n/a	n/a

Concern: There is no evidence provided that the incremental benefits provided by the recommended plan, greater ability to reduce shoaling rates in the channel, are justified or that the recommended plan is the NED plan. Basis: No comparison of costs or benefits among the alternatives was conducted to determine the plan that best maximizes net remaining benefits. The current analysis of the recommended plan is an evaluation of differing construction methods and techniques for one alternative. Significance: High. Action: Evaluate the alternatives for the benefits they provide and the costs they incur to determine that the recommended plan is the NED Plan

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

Information and Comparison of costs & benefits among the alternatives has been added in section 4.3.13, 4.4.5, and 4.6

Submitted By: Anthony Clark (410-962-3413) Submitted On: 24-Jan-12

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed.

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 24-Apr-12

Current Comment Status: **Comment Closed**

4194015	Economics	n/a'	n/a	n/a

Concern: The economic analysis utilizes additional fuel consumption as a proxy for increases in costs due to relocating to another port with a greater travel distance to the fishing grounds. There is no evidence provided thatadditional fuel consumption would be equivalent to the increase in costs due to greater travel distances. Basis: ER 1105-2-100 states in paragraph E-11 and E-12 states that changes in net income are to be used for calcuation of NED Benefits. In determining net income, the vessel operating costs would include fuel consumption as part of the calculation. Significance: High. The metrics used to measure NED benefits for changes in travel distance do not appear to meet regulation. Action: Provide a basis for the additional fuel consumption to be used a proxy for increases in travel distance or recalculate the benefits utilizing changes in net income as the basis for the benefits.

Submitted By: Jeffery Strahan (757-201-7195). Submitted On: 22-Sep-11

1-0 Evaluation **Concurred**

The use of additional fuel costs as a proxy for relocation costs has been removed. The actual fuel costs for traveling from the closest harbor of sufficient depth to the traditional fishing grounds is now calculated by multiplying the increased distance times the fuel consumption rate times the price per gallon of fuel.

Submitted By: Denise Kammerer-Cody (978 318-8105) Submitted On: 11-Jan-12

1-1 Backcheck Recommendation **Close Comment**

I have reviewed the response and it addresses my concerns - comment is closed.

Submitted By: Jeffery Strahan (757-201-7195) Submitted On: 24-Apr-12

Current Comment Status: **Comment Closed**

APPENDIX L

FISH AND WILDLIFE COORDINATION ACT REPORT

Fish and Wildlife Coordination Act Report

on

St. Jerome Creek Section 107 Navigation project

Prepared by:
George Ruddy
Fish and Wildlife Biologist

Under supervision of:
Genevieve LaRouche, Supervisor
Chesapeake Bay Field Office
U.S. Fish and Wildlife Service

October 21, 2013

INTRODUCTION

This constitutes the report of the U.S. Fish and Wildlife Service (Service) on the St. Jerome Creek, Section 107 Navigation Project, St, Mary's County, Maryland. It is submitted in accordance with Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat 401, as amended; 16 U.S.C. et seq.) and Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1513 et seq.). It is based on the project information presented in the Draft Feasibility Report and Integrated Environmental Assessment dated August 2012. A Service biologist participated in an onsite inspection of the project area with Corps personnel on November 25, 2009.

PROJECT DESCRIPTION

The primary goal of the project is to reduce the rapid shoaling that occurs in the federal channel located at the entrance to St. Jerome Creek. The channel has an authorized depth of 7 feet, but shoaling typically reduces the controlling depth to 2 feet or less within 5 years after maintenance dredging is performed. The recommended plan (figure 1) has two basic components. The first involves the construction of two batter pile/vinyl sheet pile jetties at the entrance to St. Jerome Creek. The south jetty would be approximately 1,330 feet in length and attach to the shoreline approximately 250 feet south of the tip of Deep Point. The north jetty would be approximately 1,770 feet in length and would attach to the sand spit off St. Jerome Point approximately 250 feet from the tip. The jetties would reduce the amount of the sediment that enters the channel as it is naturally transported along the shoreline.

The second part of the project involves realigning a portion of the interior channel so that a large bend would be replaced by shorter cutoff section. Approximately 0.5 acre at the tip of the St. Jerome Point sand spit would be removed to permit the channel to come straight thru the creek mouth. By making the channel more hydraulically efficient, the modified alignment is expected to further reduce the potential for shoaling. The channel realignment will require dredging approximately 30,000 cubic yards of material which would be deposited in a previously used diked upland disposal site.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

St Jerome Creek is located within the mesohaline zone of Chesapeake Bay. The salinity in this area typically varies between 7 and 22 parts per thousand. The creek receives relatively little freshwater discharge. The mean tidal range is 1.3 feet. The natural creek depths are generally 6 feet or less MLLW (figure 3). The federal entrance channel has an authorized depth of 7 feet MLLW. However, shoaling is a significant problem and the feasibility report notes that the controlling depth is typically reduced to about 2 feet within 5 years after maintenance dredging. Because of funding limitations, maintenance dredging has historically only been conducted about once every 10 years. The major shoaling areas are reported to be: 1) in the back creek area near where the channel bends; 2) just seaward of the entrance; and 3) the offshore end where the channel crosses a sand bypass bar. The constricted entrance between Deep Point and the St. Jerome Point sand spit is subjected to high current and bottom scouring so it remains deeper than the 7-foot authorized depth.

The narrowness of the mouth (approximately 200 feet) in relation to the Creek's surface water area (over 1,000 acres) is an indication of weak circulation and flushing. The creek has several branches and coves that may also hinder the tidal and wind driven circulation. While the central portion of the creek near the mouth has water quality sufficient to permit shellfish harvesting (based on the Maryland Department of the Environment bacteria standards), the water quality in the branches and coves is impaired and shellfish harvesting there is prohibited (figure 2).

The annual Chesapeake Bay aerial surveys routinely do not identify any beds of submerged aquatic vegetation in St. Jerome Creek. The creek's vegetated tidal wetlands are mostly small areas of fringe and pocket marshes. Two charted natural oyster bars (N.O.B. 31-2 and N.O.B. 31-1) are located in Chesapeake Bay approximately 1,300 yards from the mouth of the creek. The fish community is composed of the typical mesohaline assemblages, but there is substantial seasonal variation with diversity reaching a maximum in late summer and early fall. Many of the species are marine migrants that enter the area at various times and life stages. This group includes many species with commercial or recreational value. Because of its low freshwater discharge St. Jerome Creek does not support any significant anadromous fish spawning. Commercial fishing activity using pound nets and anchor gill nets occurs in the neighboring Bay region. The catch includes: striped bass, menhaden, sea trout, bluefish, spot, and croaker. The area also supports commercial and recreational fishing for blue crab. The Maryland Department of Natural Resources (DNR) has identified the lower portion of St. Jerome Creek and the adjacent near shore zone of Chesapeake Bay as "historic waterfowl concentration area", which indicates relatively high use by migrating and wintering waterfowl.

The shoreline at Deep Point where the south jetty would be connected is a sand beach. The landward area was previously used as a disposal site for sandy material dredged from the channel. It currently exhibits secondary growth by a mix of species including loblolly pine, black locust, black cherry, eastern redcedar, American holly, bayberry, smooth sumac, groundsel bush, and phragmites. The shoreline where the north jetty would attach is near the end of a long sand spit arising from St. Jerome Point. The sand spit is sparsely vegetated at the end near the channel and is likely to be overtopped by high tides.

Future without the Project

The shorelines at the mouth of St. Jerome Creek are rather dynamic spits of land that are constantly being affected by wave erosion and deposition processes. The net littoral drift is toward the channel from both shorelines. The shoreline morphology can be affected by sea level rise, extreme storms, and potential implementation of shoreline stabilization measures on the updrift areas. There will need to be continued periodic dredging to maintain the navigation channels. Finding suitable disposal sites for the dredged material could become a challenge in the future.

Federally Listed Endangered and Threatened Species

Except for occasional transient individuals, no federally proposed or listed endangered or threatened species under our jurisdiction are known to exist within the project impact area. Therefore, no Biological Assessment or further Section 7 Consultation pursuant to the Endangered Species Act of 1973 is required with the U.S. Fish and Wildlife Service. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered. The National Marine Fisheries Service has indicated that six federally listed species under their jurisdiction may transit the project area on an occasional basis. They include four species of sea turtles (loggerhead, Kemp's ridley, green, and leatherback) and two species of sturgeon (shortnose and Atlantic). No impacts to these species are expected.

Consultation under the Coastal Barrier Resources Act

The project area is included within Unit MD-45 of the Coastal Barrier Resources System (CBRS). The CBRS consists of largely undeveloped coastal barrier islands and spits established originally under the Coastal Barrier Resources Act in 1982 and subsequently expanded under the Coastal Barrier Improvement Act in 1990. These acts place restrictions on Federal expenditures for projects affecting CBRS units. Previous consultation with the Corps (letter dated December 16, 2009, signed by Leopoldo Miranda) concluded that that the proposed project qualifies for an exception under section 6(a)(2) because it is considered to be an improvement to an existing federal navigation channel.

BIOLOGICAL EFFECTS OF THE PROJECT

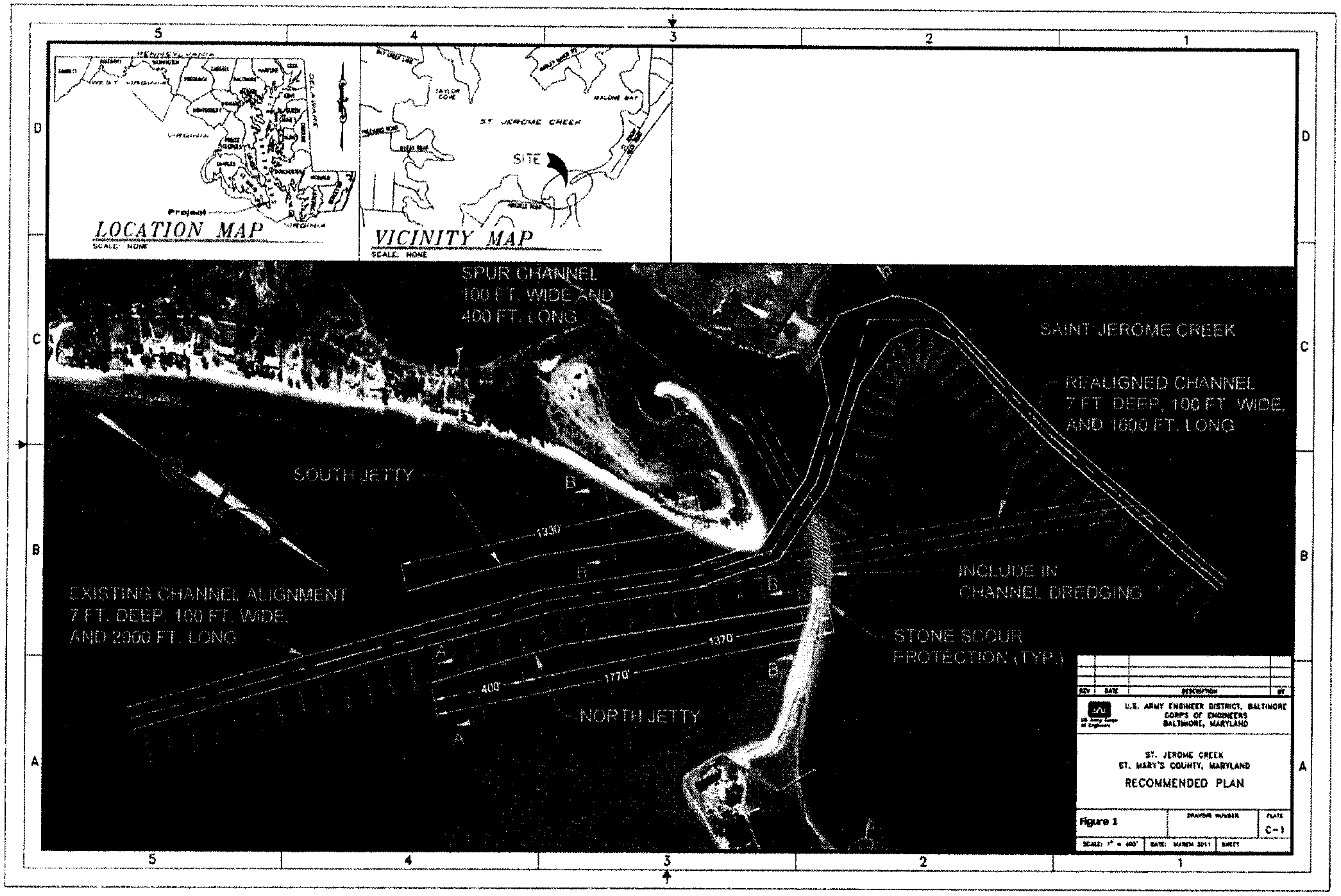
The jetties will stabilize the inlet to St. Jerome Creek and reduce the rate of shoaling in the channel by approximately 52 percent according to the Corps' modeling. This will reduce the need for maintenance dredging and the ecological disturbance associated with dredging and disposal of the dredged material. Sand will accumulate on the south side of the south jetty and on the north side of the north jetty. Since the net littoral transport is toward the inlet from both the south and north directions, there should not be any substantial sand starvation effects on the adjacent shorelines. The dredging associated with the channel realignment will cause a temporary disruption to the bottom dwelling organisms but recolonization is expected. No significant impacts are expected to occur from the disposal of the dredged material since a previously utilized upland disposal site would be used. The dredging would produce an increase in the level of suspended sediment, but the effect should be limited due to the expected sandy composition of the material and the planned use of a hydraulic dredge. The project plan would adhere to a restriction recommended by the DNR that no dredging occurs from June 1 through September 30 to minimize potential effects on oysters. While the dredging is not expected to have any substantial effect on the offshore natural oyster bars, there are oyster aquaculture operations within the creek that could be adversely affected by increased levels of suspended sediment. The plan also would follow a recommendation by the DNR that no construction (either dredging or jetty construction) should take place during the period of November 15 to March 1 in order to avoid disturbance to wintering/migrating waterfowl.

One issue of particular concern to us is the long-term effect of the project on the creek's water quality which is related to its effect on the degree of flushing. The creek currently appears to have relatively weak flushing and high fecal coliform levels. As a result, shellfish harvesting is restricted (i.e., prohibited) within most of the less well flushed areas (Southern Prong, Northern Prong, Taylor Cove, Malone Bay, and upper St. Jerome Creek proper; see figure 2). The central area of the main creek, which is open to harvesting, sustains significant commercial oyster aquaculture operations. In recent years the State of Maryland has been making a substantial effort to encourage oyster aquaculture. In addition to the economic benefit, oyster aquaculture offers ecological benefits such as water column filtration, removal of excess nutrients (nitrogen and phosphorus), habitat enhancement, and a viable alternative to reduce the pressure on the wild fishery. We understand that one of the companies with an operation in the creek (Chesapeake Fresh Oyster Company) recently submitted an application to expand their operation. If the project were to cause a reduction in the flushing, the restricted area could expand and have important negative consequences for oyster aquaculture in St. Jerome Creek. Other aspects of the creek's ecology could also be adversely affected by reduced flushing.

The project would significantly modify the circulation at the mouth of the creek, but the effect on the creek's flushing is unclear. The jetties have the potential to reduce flushing by attenuating current energy, especially wind driven currents, and reducing mixing of creek and Bay waters. The project feasibility report notes that the modeling studies that were conducted to evaluate shoaling rates "suggest little to no change in tidal circulation within the creek." However, the report also notes that the models were not designed to specifically look at circulation within the creek, and states that this issue will be evaluated further during the next planning stage when the detailed project design would be developed.

CONCLUSIONS

The Corps is estimating that the project will produce a 52 percent reduction in the rate of channel shoaling. This will have the beneficial effect of reducing the need for maintenance dredging and the accompanying environmental disturbance that it entails. Unfortunately, the effect of the project on the flushing of St. Jerome Creek is unclear at this point. This aspect is particularly important because: 1) large areas of the creek are already experiencing symptoms of low flushing; and 2) there are substantial commercial oyster aquaculture operations which could be impacted if flushing was further reduced. We do not agree with the decision to defer investigation of this issue until the next planning stage when detailed plans are developed. Typically, this late stage of project planning does not involve review outside of the Corps. We believe that this information is important enough that it should be part of the NEPA analysis conducted during the feasibility study phase. The Service would also need to see the results of the circulation study before we can fully support this project. If there are any questions, please contact George Ruddy at (410) 573-4528.


LOCATION MAP
SCALE: NONE
VICINITY MAP
SCALE: NONE
ST. JEROME CREEK
SITE
SPUR CHANNEL
100 FT. WIDE AND
400 FT. LONG
SAINT JEROME CREEK
REALIGNED CHANNEL
7 FT. DEEP, 100 FT. WIDE,
AND 1600 FT. LONG
SOUTH JETTY
INCLUDE IN
CHANNEL DREDGING
EXISTING CHANNEL ALIGNMENT
7 FT. DEEP, 100 FT. WIDE,
AND 2900 FT. LONG
STONE SCOUR
PROTECTION (TYP.)
NORTH JETTY
1330'
1370'
1770'
400'
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
ST. JEROME CREEK
ST. MARY'S COUNTY, MARYLAND
RECOMMENDED PLAN
Figure 1
C-1

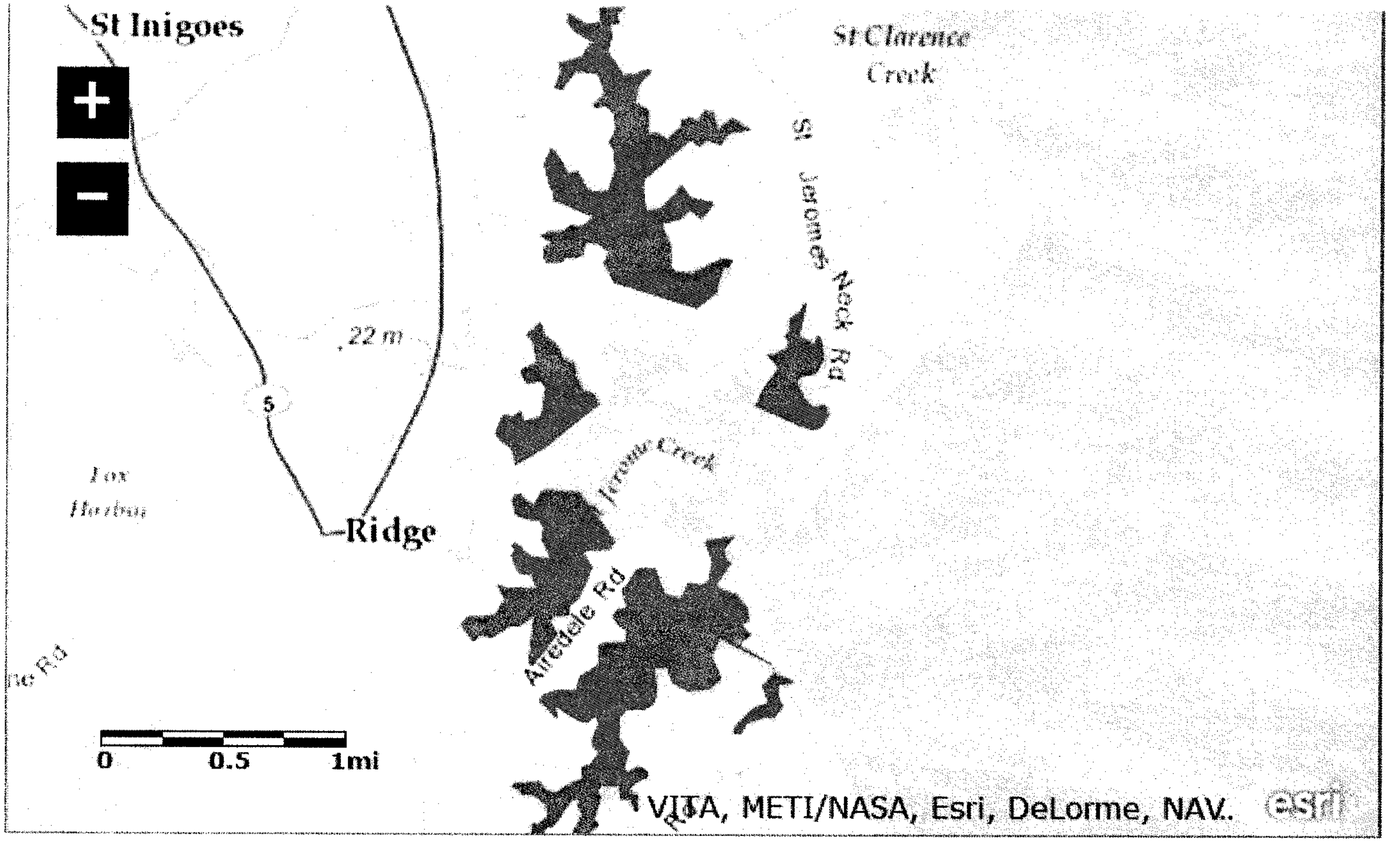
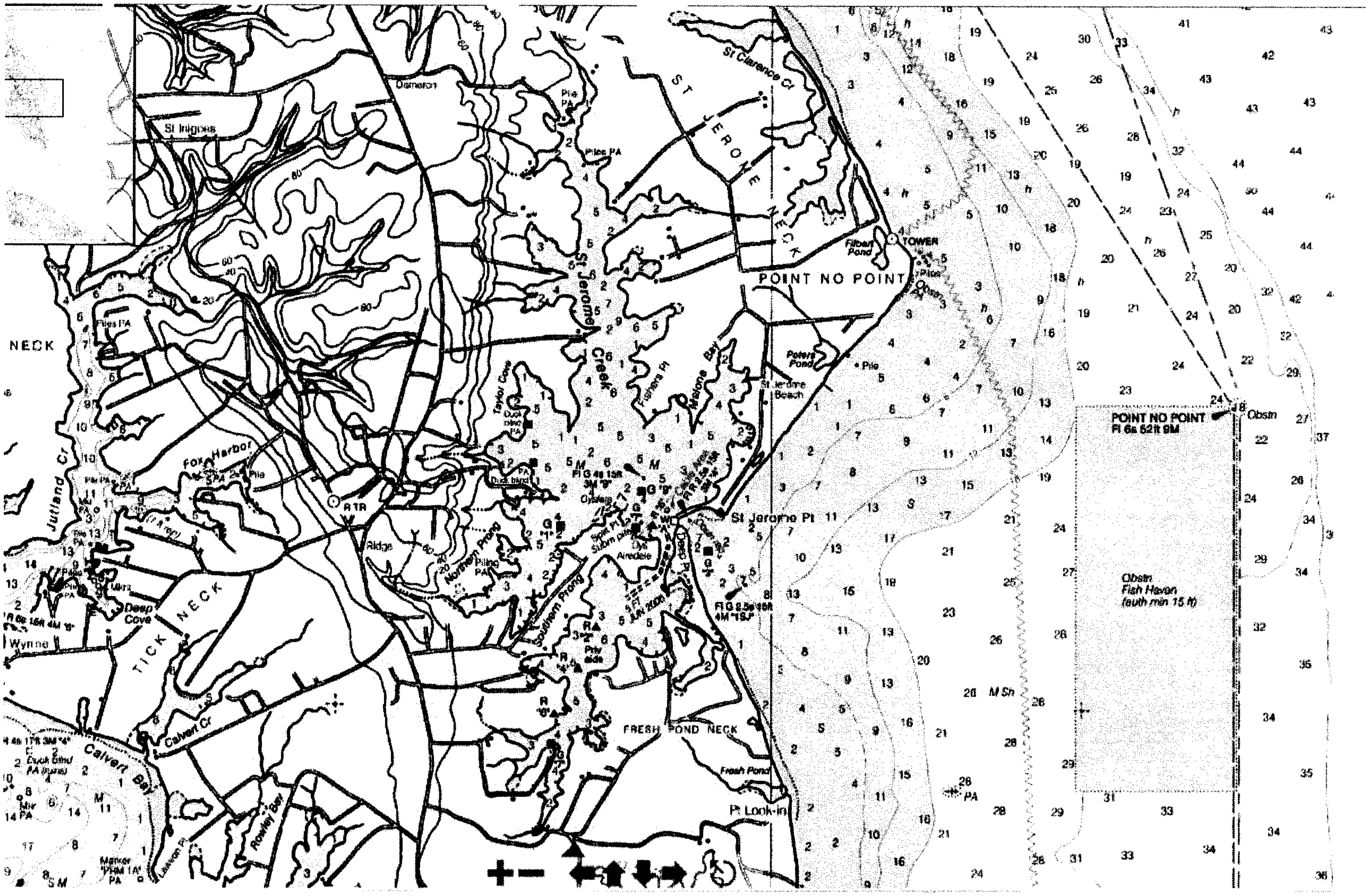


Figure 2. Restricted shellfish waters in St. Jerome Creek (Source Maryland Department of the Environment, current as of August 26, 2013).

Figure 3. St. Jerome Creek navigation chart.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

October 21, 2013

Colonel J. Richard Jordan, III
District Engineer
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Attn: Angela Sowers

Re: St. Jerome Creek Section 107 Navigation project

Dear Colonel Jordan:

Enclosed is our Fish and Wildlife Coordination Act Report on the St. Jerome Creek Section 107 Project. Before we can support the project we believe that the environmental analysis needs to include a more rigorous evaluation of the effect of the project on the creek's circulation and flushing. If there are any questions, please contact George Ruddy of my staff at 410-573-4528.

Sincerely,

G. Parks

Genevieve LaRouche
Supervisor

cc: Roland Limpert, MD DNR, Annapolis, MD
Christopher Boelker, NMFS, Gloucester, MA

From:	Guy, Chris
To:	Sowers, Angela NAB
Subject:	[EXTERNAL] Re: St. Jerome creek- Fish and Wildlife Coordination
Date:	Tuesday, June 24, 2014 4:28:35 PM

Based on the information provided in the webinar earlier tody, the Service is satisfied that the Corps of Engineers has done their due diligence on this issue. If you have any additional concerns or questions regarding the St. Jerome's Creek Section 107 project, please contact me.

Thank You.

Christopher P. Guy
US Fish and Wildlife Service
Chesapeake Bay Field Office
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Annapolis MD 21401
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chris_guy@fws.gov

Chesapeake Bay Field Office e-newsletter at http://chesapeakebay.fws.gov

On Tue, Jun 24, 2014 at 3:19 PM, Sowers, Angela NAB <Angela.Sowers@usace.army.mil> wrote:

Hi Chris,

This email is specific to our St. Jerome Creek Section 107 Project. USACE has further investigated tidal circulation and flushing in St. Jerome Creek in response to issues raised in the Fish and Wildlife Coordination Act Report provided by your office on October 21, 2013. Today via webinar we presented to you our findings from further modeling investigations and conversations with MDE. We are requesting concurrence from you that we have adequately investigated the concern raised by FWS on the impacts of the project on tidal flushing and that the existing information suggests that the project will have negligible impacts on flushing and circulation. Your concurrence would fulfill coordination for this project for the Fish and Wildlife Coordination Act.

Thank you,
Angie

Sent from my BlackBerry 10 smartphone.