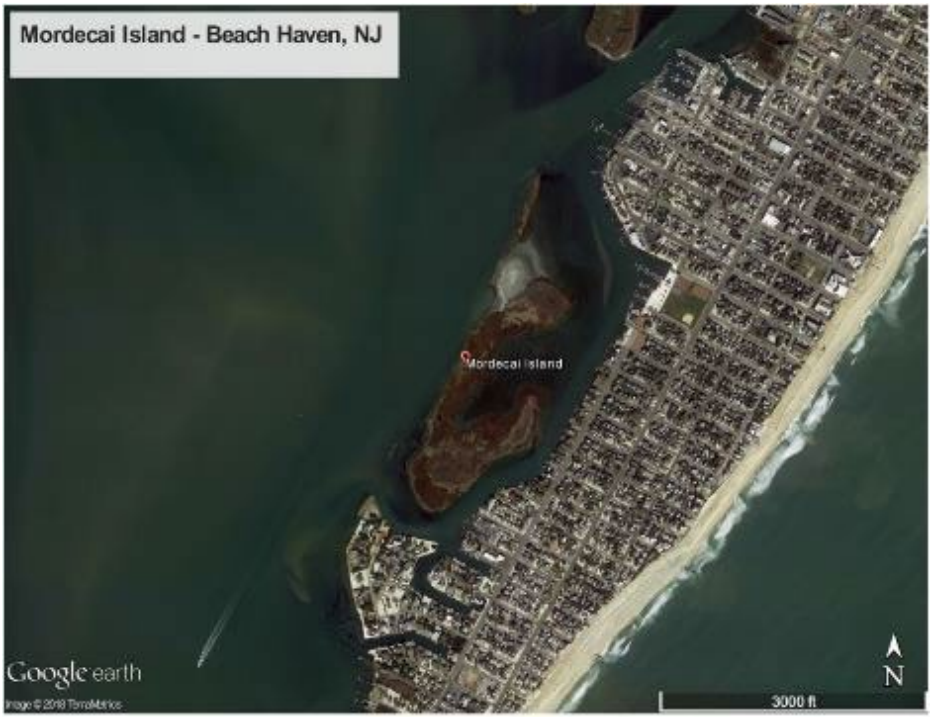
Mordecai Island
Beach Haven, New Jersey
Ecosystem Restoration
Feasibility Study and Integrated Environmental Assessment



APPENDIX B
ENVIRONMENTAL APPENDIX

U.S. Army Corps of Engineers
Philadelphia District

New Jersey Department of Environmental Protection

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Contents

CLEAN WATER ACT SECTION 404 (b)(1) EVALUATION
U.S. ARMY CORPS OF ENGINEERS

PROJECT: Mordecai Island Ecosystem Restoration

PROJECT MANAGER: Theresa Fowler Phone:

FORM COMPLETED BY: Beth Brandreth Phone:

PROJECT DESCRIPTION: The Mordecai Island Ecosystem Restoration project consists of the installation of a 3,000 LF rubble mound breakwater to an elevation of +3.6 ft. NAVD88 to protect the island from future erosion. The crest width of the trapezoidal breakwater will be 3 ft. Side slopes will be 2H:1V. The breakwater will be continuous with sill vents designed into the structure to promote intertidal flushing in order to maintain water quality. Following the installation of the rubble mound breakwater, sand obtained from maintenance dredging of the NJIWW will be placed behind the new breakwater and behind the existing MLT structures to restore approximately 11.5 acres of intertidal wetlands.

1. Review of Compliance (Section 230.10(a)-(d)).

a.	The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	| X | YES / | NO
b.	The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and 3) violate requirements of any Federally designated marine sanctuary	| X | YES / | NO
c.	The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values	| X | YES / | NO
d.	Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem	| X | YES / | NO

2. Technical Evaluation Factors (Subparts C-F).

	Signif-icant	Not Signif-icant*	N/A
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C) (Sec. 230.20-230.25).			
1) Substrate.	X		
2) Suspended particulates/turbidity.	X		
3) Water.	X		
4) Current patterns and water circulation.	X		
5) Normal water fluctuations.	X		
6) Salinity gradients.			X
b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)(Sec. 230.30-230.32).			
1) Threatened and endangered species.	X		
2) Fish, crustaceans, mollusks and other aquatic organisms in the food web.	X		
3) Other wildlife.	X		
c. Potential Impacts on Special Aquatic Sites (Subpart E)(Sec. 230.40-230.45).			
1) Sanctuaries and refuges.			X
2) Wetlands.		X	
3) Mud flats.	X		
4) Vegetated shallows.		X	
5) Coral reefs.			X
6) Riffle and pool complexes.			X
d. Potential Effects on Human Use Characteristics (Subpart F)(Sec 230.50-230.45)			
1) Municipal and private water supplies.			X
2) Recreational and commercial fisheries.			
3) Water-related recreation.	X		
4) Aesthetics.	X		
5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves.			X

3. Evaluation and Testing (Subpart G) (Sec. 230.60-230.61)

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

1)	Physical characteristics.....	X	
2)	Hydro-geography in relation to known or anticipated sources of contaminants.....		
3)	Results from previous testing of the material or similar material in the vicinity of the project ..	X	
4)	Known, significant sources of persistent pesticides from land runoff or percolation		
5)	Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)		
6)	Public records of significant introduction of contaminants from industries, municipalities, or other sources		

7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities ..... | |
8) Other sources (specify) ..... | |

List appropriate references.

Draft Environmental Assessment for Mordecai Island Ecosystem Restoration

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.

| X | |
YES NO

4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

1) Depth of water at disposal site ..... | X |
2) Current velocity, direction, and variability at the disposal site ..... | X |
3) Degree of turbulence ..... | X
4) Water column stratification ..... | X |
5) Discharge vessel speed and direction ..... | |
6) Rate of discharge ..... | |
7) Dredged material characteristics (constituents, amount, and type of material, settling velocities) ..... | X |
8) Number of discharges per unit of time ..... | |
9) Other factors affecting rates and patterns of mixing (specify) ..... | |

List appropriate references:

Draft Environmental Assessment for Mordecai Island Ecosystem Restoration

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable

| X | | |
YES NO

5. Actions To Minimize Adverse Effects (Subpart H)(Sec. 230.70-230.77).

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge. | X | |
| YES NO

List actions taken:

a. Fill will be obtained from maintenance dredging of the IWW and placed behind rubble mound structure which will minimize turbidity during placement and help to hold the sand in place.

b. Intertidal wetlands created by fill will be planted with appropriate vegetation for stabilization and habitat improvements.

c. Other turbidity reducing measures will be taken as needed during fill placement.

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

a.	Physical substrate (review sections 2a, 3, 4, and 5 above).	YES | X|	NO | |
b.	Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5).	YES | X|	NO | |
c.	Suspended particulates/turbidity (review sections 2a, 3, 4, and 5).	YES | X|	NO | |
d.	Contaminant availability (review sections 2a, 3, and 4).	YES | X|	NO | |
e.	Aquatic ecosystem structure, function and organisms(review sections 2b and c, 3, and 5)	YES | X|	NO | |
f.	Proposed disposal site (review sections 2, 4, and 5).	YES | X|	NO | |
g.	Cumulative effects on the aquatic ecosystem.	YES | X|	NO | |
h.	Secondary effects on the aquatic ecosystem.	YES | X|	NO | |

7. Findings of Compliance or non-compliance. (Sec. 230.12)

The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines ... YES | X | NO | |

ESSENTIAL FISH HABITAT CONSULTATION WORKSHEET

EFH ASSESSMENT WORKSHEET

General Project Information

Date Submitted: February 18, 2022

Project/Application Number: N/A

Project Name: Mordecai Island, Beach Haven, NJ Ecosystem Restoration

Project Sponsor/Applicant: U.S. Army Corps of Engineers

Federal Action Agency (if state agency acting as delegated): U.S. Army Corps of Engineers

Fast-41 or One Federal Decision Project: ☐ Yes ☑ No

Action Agency Contact Name: Beth Brandreth

Contact Phone: 215-656-6558 Contact Email: Mary.e.brandreth@usace.army.mil

Latitude: 39°33"30.00"N Longitude: 74°15"07.25"W

Address, City/Town, State:

Mordecai Island is located west of Long Beach Island near Beach Haven Borough

Body of Water: Barnegat Bay

Project Purpose:

To protect and restore Mordecai Island and it's associated habitat from erosion and habitat degredation.

Project Description:

Installation of a rubble mound breakwater that generally follows the 1977 Tidelands line, approximately parallel to the west side of Mordecai Island in the nearshore area to reduce island erosion. The rubble mound breakwater will extend for 3,000 linear ft. and have an average height of 7.6 ft above the bay bottom. To account for potential settlement of one foot, the initial construction is estimated to be +3.6 ft. NAVD88 (1 foot of overbuild) with a crest width of 3 feet and 2H:1V side slopes. Sill vents, at a crest elevation matching Mean Low Water (MLW), will be placed every 160 feet along the structure to allow for water flow and circulation behind the structure during the full tidal cycle. Each sill vent will be 40 feet long. Approximately 30,000 cy of sand will be obtained from normal maintenance dredging of the NJIWW and be placed behind the breakwater and on the previously filled breach area to restore lost wetlands and enhance bird nesting habitat.

Anticipated Duration of In-Water Work or Start/End Dates:

TBD. No dredging will take place from Jan 1st through May 31st.

Habitat Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[2]? ☑ Yes ☐ No

Is the project in designated HAPC[2]? ☑ Yes ☐ No

Is this coordination under FWCA only? ☐ Yes ☑ No

Total area of impact to EFH (indicate sq ft or acres): 13 acres

Total area of impact to HAPC (indicate sq ft or acres): TBD - estimated between 3 -13 acres

Current water depths: 0' to -5.0' Salinity: 19-30 ppt Water temperature range: 42 - 72° F

Sediment characteristics[3]: sand and peat mats

What habitat types are in or adjacent to the project area and will they be permanently impacted? Select all that apply. Indicate if impacts will be temporary, if site will be restored, or if permanent conversion of habitat will occur. A project may occur in overlapping habitat types.

	Habitat Type	**Total impact (sq ft/acres)**	**Impacts are temporary**	**Restored to pre-existing conditions**	**Permanent conversion of all or part of habitat**
☐	Marine				
☑	Estuarine	~13 acres	Yes	Yes	Yes
☐	Riverine (tidal)				
☐	Riverine (non-tidal)				
☑	Intertidal	~ 6 acres	Yes	Yes	Yes
☑	Subtidal	~ 7 acres	Yes	Yes	Yes
☑	Water column	~13 acres	Yes	Yes	Yes
☑	Salt marsh/ Wetland (tidal)	creation of 11.5 acres	Yes	Yes	No
☐	Wetland (non-tidal)				

[2] Use the tables on pages 7-9 to list species with designated EFH or the type of designated HAPC present.
[3] The level of detail is dependent on your project – e.g., a grain size analysis may be necessary for dredging.

	Habitat Type	Total impact (sq ft/acres)	Impacts are temporary	Restored to pre-existing conditions	Permanent conversion of all or part of habitat
☐	Rocky/hard bottom[4]:				
☑	Sand	13 acres	Yes	Yes	Yes
☐	Shellfish beds or oyster reefs				
☐	Mudflats				
☑	Submerged aquatic vegetation (SAV)[5], macroalgae, epifauna	TDB estimated between 3-13 acres	Yes	Yes	Maybe
☐	Diadromous fish (migratory or spawning habitat)				

Indicate type(s) of rocky/hard bottom habitat (pebble, cobble, boulder, bedrock outcrop/ledge) and species of SAV:

Eelgrass and macroalgae have been identified in surveys discussed in the EA.

Project Effects

Select all that apply	Project Type/Category
☐	Hatchery or Aquaculture
☐	Agriculture
☐	Forestry
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☑	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, beach renourishment, mitigation bank/ILF creation)

[4] Indicate type(s). The type(s) of rocky habitat will help you determine if the area is cod HAPC.
[5] Indicate species. Provide a copy of the SAV report and survey conducted at the site, if applicable.

Select all that apply	Project Type/Category
☐	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port)
☐	Energy development/use
☐	Water quality (e.g., TMDL, wastewater, sediment remediation)
☑	Dredging/excavation and disposal
☐	Piers, ramps, floats, and other structures
☑	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Other

Select all that apply	Potential Stressors Caused by the Activity	Select all that apply and if temporary or permanent		Habitat alterations caused by the activity
☑	Underwater noise	Temp	Perm	
☑	Water quality/turbidity/ contaminant release	☐	☑	Water depth change
☑	Vessel traffic/barge grounding	☐	☐	Tidal flow change
☐	Impingement/entrainment[6]	☐	☑	Fill
☐	Prevent fish passage/spawning	☐	☑	Habitat type conversion
☑	Benthic community disturbance	☐	☐	Other:
☑	Impacts to prey species	☐	☐	Other:

[6] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details: project impacts and mitigation

The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

Describe how the project would impact each of the habitat types selected above. Include temporary and permanent impact descriptions and direct and indirect impacts.

Approximately 13 acres of existing open water/intertidal sandy/peat bottom will be disturbed through the breakwater construction and sand placement. The project will convert approximately 2.3 acres to rocky habitat and approximately 11.5 acres to intertidal saltmarsh. Newly created wetlands will be planted with appropriate vegetation. Some SAV habitat may be temporarily impacted by sand placement but project will be protecting SAV habitat and allowing for recruitment behind the breakwater.

What specific measures will be used to avoid impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided, why not?

No dredging will take place from Jan 1st through May 31st. The majority of sand placeme

What specific measures will be used to minimize impacts?

Employing practicable BMP's such as a pipeline delivery system and not dredging from J

Is compensatory mitigation proposed? ☐ Yes ☑ No

If no, why not? If yes, describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation and monitoring plan, if applicable.

The purpose of the project is ecosystem restoration to protect Mordecai Island from future

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA-only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA document, if applicable.

EFH and HAPC designations[8]

Use the EFH mapper to determine if EFH may be present in the project area and enter all species and lifestages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present. We recommend this for larger projects to help you determine what your impacts are.

Species	**EFH is designated/mapped for:**				**Habitat present based on text description (optional)**
	EFH: eggs	**EFH: larvae**	**EFH: juvenile**	**EFH: adults/ spawning adults**	
Atlantic butterfish (Peprilus tricanthus)	☐	☐	☑	☑	☐
Black sea bass (Centropristus striata)	☐	☐	☑	☑	☐
Bluefish (Pomatomus saltatrix)	☐	☐	☑	☑	☐
Long finned inshore squid (Loligo pealei)	☑	☐	☑	☑	☐

[7] An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

[8] Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries.

Species	EFH is designated/mapped for:				Habitat present based on text description (optional)
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
Scup (Stenotomus chrysops)	☐	☐	✔	✔	☐
Spiny dogfish (Squalus acanthias)	☐	☐	✔	✔	☐
Summer flounder (Paralicthys dentatus)	☐	✔	✔	✔	✔
White hake (Urophycis tenuis)	✔	☐	☐	☐	☐
Windowpane flounder (Scopthalmus aquosus)	✔	✔	✔	✔	☐
Winter flounder (Pleuronectes americanus)	✔	✔	✔	☐	✔
Silver hake/whiting (Merluccius bilinearis)	✔	✔	☐	☐	☐
Red hake (Urophycis chuss)	✔	✔	✔	☐	☐
Monkfish (Lophius americanus)	☐	☐	☐	☐	☐
Little skate (Raja erinacea)	☐	☐	✔	✔	☐
Winter skate (Raja ocellata)	☐	☐	✔	✔	☐
Clearnose skate (Raja eglanteria)	☐	☐	✔	✔	☐
Atlantic sea herring (Clupea harengus)	☐	☐	✔	✔	☐
King mackerel (Scomberomorus cavalla)	☐	☐	☐	☐	☐
Spanish mackerel (Scomberomorus maculatus)	☐	☐	☐	☐	☐
Cobia (Rachycentron canadum)	☐	☐	☐	☐	☐
Skipjack Tuna (Katsuwonus pelamis)	☐	☐	☐	☐	☐
Yellowfin Tuna (Thunnus albacares)	☐	☐	☐	☐	☐
Sand tiger shark (Odontaspis taurus)	☐	☐	✔	☐	☐
Common thresher shark (Alopias vulpinus)	☐	☐	☐	☐	☐
Dusky shark (Charcharinus obscurus)	☐	✔	☐	☐	☐
Sandbar shark (Charcharinus plumbeus)	☐	✔	✔	✔	☐

HAPCs

Select all that are in your action area.

☑	Summer flounder: SAV[9]	☐	Alvin & Atlantis Canyons
☐	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon

[9] Summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

More information

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries on any actions they authorize, fund, or undertake that may adversely affect EFH. An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

We designed this worksheet to help you to prepare EFH assessments. It is important to remember that an adverse effect determination is a trigger to consult with us. It does not mean that a project cannot proceed as proposed, or that project modifications are necessary. It means that the effects of the proposed action on EFH must be evaluated to determine if there are ways to avoid, minimize, or offset adverse effects.

This worksheet should be used as your EFH assessment or as a guide to develop your EFH assessment. At a minimum, you should include all the information required to complete this worksheet in your EFH assessment. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. If your answers in the worksheet and supplemental information you attach do not fully evaluate the adverse effects to EFH, we may request additional information to complete the consultation.

You may need to prepare an expanded EFH assessment for more complex projects to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH assessment worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, you should include an analysis as outlined in this worksheet for an expanded EFH assessment, along with any additional necessary information. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects.
- the views of recognized experts on the habitat or the species that may be affected.
- a review of pertinent literature and related information.
- an analysis of alternatives that could avoid or minimize the adverse effects on EFH.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or threatened and endangered species.

Useful Links

National Wetland Inventory Maps
https://www.fws.gov/wetlands/
EPA's National Estuary Program (NEP)
https://www.epa.gov/nep/local-estuary-programs
Northeast Regional Ocean Council (NROC) Data Portal
https://www.northeastoceandata.org/
Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal
http://portal.midatlanticocean.org/

Resources by State

Maine
Maine Office of GIS Data Catalog
https://geolibrary-maine.opendata.arcgis.com/datasets#data
Town shellfish information including shellfish conservation area maps
https://www.maine.gov/dmr/shellfish-sanitation-management/programs/municipal/ordinances/towninfo.html
State of Maine Shellfish Sanitation and Management
https://www.maine.gov/dmr/shellfish-sanitation-management/index.html
Eelgrass maps
https://www.maine.gov/dmr/science-research/species/eelgrass/index.html
Casco Bay Estuary Partnership
https://www.cascobayestuary.org/
Maine GIS Stream Habitat Viewer
https://www.arcgis.com/home/item.html?id=5869c2d20f0b4c3a9742bdd8abef42cb

New Hampshire
NH's Statewide GIS Clearinghouse, NH GRANIT
http://www.granit.unh.edu/
NH Coastal Viewer
http://www.granit.unh.edu/nhcoastalviewer/
State of NH Shellfish Program
https://www.des.nh.gov/organization/divisions/water/wmb/shellfish/

Massachusetts
MA Shellfish Sanitation and Management Program
https://www.mass.gov/shellfish-sanitation-and-management
MassGIS Data, Including Eelgrass Maps
http://maps.massgis.state.ma.us/map_ol/oliver.php
MA DMF Recommended TOY Restrictions Document
https://www.mass.gov/files/documents/2016/08/ry/tr-47.pdf
Massachusetts Bays National Estuary Program
https://www.mass.gov/orgs/massachusetts-bays-national-estuary-program
Buzzards Bay National Estuary Program
http://buzzardsbay.org/
Massachusetts Division of Marine Fisheries

https://www.mass.gov/orgs/division-of-marine-fisheries
Massachusetts Office of Coastal Zone Management
https://www.mass.gov/orgs/massachusetts-office-of-coastal-zone-management

Rhode Island
RI Shellfish and Aquaculture
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/shellfish-aquaculture.php
RI Shellfish Management Plan
http://www.shellfishri.com/
Eelgrass Maps
http://edc.maps.arcgis.com/apps/View/index.html?appid=db52bb689c1e44259c06e11fd24895f8
RI GIS Data
http://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5
Narragansett Bay Estuary Program
http://nbep.org/
Rhode Island Division of Marine Fisheries
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/index.php
Rhode Island Coastal Resources Management Council
http://www.crmc.ri.gov/

Connecticut
CT Bureau of Aquaculture
https://www.ct.gov/doag/cwp/view.asp?a=3768&q=451508&doagNav=
CT GIS Resources
https://www.ct.gov/deep/cwp/view.asp?a=2698&q=323342&deepNav_GID=1707
Natural Shellfish Beds in CT
https://cteco.uconn.edu/viewer/index.html?viewer=aquaculture
Eelgrass Maps
https://www.fws.gov/northeast/ecologicalservices/pdf/wetlands/2012_CT_Eelgrass_Final_Report_11_26_2013.pdf
Long Island Sound Study
http://longislandsoundstudy.net/
CT GIS Resources
http://cteco.maps.arcgis.com/home/index.html
CT DEEP Office of Long Island Sound Programs and Fisheries
https://www.ct.gov/deep/site/default.asp
CT River Watershed Council
https://www.ctriver.org/

New York
Eelgrass Report
http://www.dec.ny.gov/docs/fish_marine_pdf/finalseagrassreport.pdf
Peconic Estuary Program
https://www.peconicestuary.org/
NY/NJ Harbor Estuary
https://www.hudsonriver.org/estuary-program

New York GIS Clearinghouse
https://gis.ny.gov/

New Jersey
Submerged Aquatic Vegetation Mapping
http://www.crssa.rutgers.edu/projects/sav/
Barnegat Bay Partnership
https://www.barnegatbaypartnership.org/
NJ GeoWeb
https://www.nj.gov/dep/gis/geowebsplash.htm
NJ DEP Shellfish Maps
https://www.nj.gov/dep/landuse/shellfish.html

Pennsylvania
Delaware River Management Plan
https://www.fishandboat.com/Fish/Fisheries/DelawareRiver/Documents/delaware_river_plan_exec_draft.pdf
PA DEP Coastal Resources Management Program
https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/default.aspx
PA DEP GIS Mapping Tools
https://www.dep.pa.gov/DataandTools/Pages/GIS.aspx

Delaware
Partnership for the Delaware Estuary
http://www.delawareestuary.org/
Center for Delaware Inland Bays
http://www.inlandbays.org/
Delaware FirstMap
http://delaware.maps.arcgis.com/home/index.html

Maryland
Submerged Aquatic Vegetation Mapping
http://web.vims.edu/bio/sav/
MERLIN
http://dnrweb.dnr.state.md.us/MERLIN/
Maryland Coastal Bays Program
https://mdcoastalbays.org/

Virginia
Submerged Aquatic Vegetation mapping
http://www.mrc.virginia.gov/regulations/Guidance_for_SAV_beds_and_restoration_final_approved_by_Commission_7-22-17.pdf
VDGIF Time of Year Restrictions (TOYR) and Other Guidance
https://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf

MONITORING AND ADAPTIVE MANAGEMENT PLAN

1.1 Introduction

This Monitoring and Adaptive Management Plan was prepared for the Mordecai Island Ecosystem Restoration Draft Feasibility Report/Environmental Assessment (Report). Section 2039 of Water Resource Development Act (WRDA) 2007 (as amended by Section 1161 of WRDA 2016) directs theSecretary of the Army to ensure, when conducting a feasibility study for a project (or component of a project) under the U.S. Army Corps of Engineers (USACE) ecosystem restoration mission, that the decision document include a monitoring plan to measure the success of the ecosystem restoration andto dictate the direction adaptive management should proceed, if needed. The monitoring and adaptivemanagement plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue untilsuch time as the Secretary determines that the success criteria have been met.

Section 2039 of WRDA 2007 also directs USACE to develop an adaptive management plan for all ecosystem restoration projects. The adaptive management plan must be appropriately scoped to the scale of the project. The information generated by the monitoring plan will be used by the Philadelphia District (the District) in consultation with the federal and state resources agencies and the USACE North Atlantic Division (NAD) to guide decisions on operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria.

An effective monitoring program is necessary to assess the status and trends of ecological health and biota richness and abundance on a per project basis, as well as to report on regional program success within the United States. Assessing status and trends includes both spatial and temporal variations. Gathered information under this monitoring plan will provide insights into the effectiveness of currentrestoration project and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring the success of a restoration project is not a simple task. Restored wetlands can take a long time to reach their dynamic equilibrium conditions, therefore the initial monitoring period of 5 years will be assessed as to whether the structural template has been established and if the site is on a trajectory toward ecological success. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This Monitoring and Adaptive Management Plan describes the existing habitats and monitoring methods that could be utilized to assess the project. Monitoring is necessary to determine if this structure reduces the rate of shoreline erosion and protects and enhances habitat. Monitoring will also capture the stability and growth of the restored wetlands. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of the

Mordecai Island Ecosystem Restoration project is being met.

1.2 Guidance

The following documents provide distinct USACE policy and guidance that are pertinent todeveloping this monitoring and adaptive management plan:

1. Section 1161 of WRDA 2016. Completion of Ecosystem Restoration Projects.

2. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water

   Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration

3. Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration

4. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies.

5. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects Under the EnvironmentalOperating Principles.

1.3 Project Area Description

The goal of this project is to create National Ecosystem Restoration benefits by protecting and restoring the important habitat that makes up Mordecai Island. The recommended plan for this project is described in detail in Section 6.1 of the Draft Report. The proposed plan involves the installation of a 3000 linear foot rubble mound breakwater with a 3' crest width and 2H:1V side slopes parallel to the western edge of Mordecai Island. The proposed plan also includes the restoration of approximately 11 acres of intertidal wetlands landward of the breakwater through sand placement and planting wetland vegetation. A portion of the island that was previously filled will also be raised to benefit nesting birds and diamondback terrapins.

The material for the sand placement will come from future maintenance dredging of the New Jersey Intercoastal Waterway (NJIWW) near Mordecai Island. The sand will restore the inter-tidal salt marsh system by adding lost acreages and establishing an elevational gradient that gradually transitions from open water to low marsh to high marsh. Wetland vegetation appropriate for the elevation will be planted in the intertidal zone.

2.1 Monitoring and Adaptive Management- Objectives, Strategy, and Procedures

Prior to implementation, the District along with the project Non-Federal Sponsor, NJDEP will develop a detailed monitoring plan that identifies the field variables that should be evaluated, the most appropriate field measurement methods, the recommended frequency,and duration of each field effort, the reporting requirements and schedule, and a cost estimate to implement the entire monitoring and adaptive management plan. All monitoring components will

continue to be refined as the project gets closer to implementation. This version of the monitoring plan is based on the preliminary design presented in the Mordecai Island Feasibility Report. The following sections present some of the performance criteria and potential corrective actions that would be identified in the plan.

2.2 Objectives

The purpose of this monitoring and adaptive management plan is to assess the success or failure of, the restoration. The primary project objectives are to reduce the erosion of Mordecai Island and restore lost habitat to maintain the ecological value of the island. To this end, the monitoring and adaptive management plan will focus on tracking several aspects of the project. These include: the elevation and stability of the rubble mound breakwater, the stability of the placed sand, the success of the wetland plantings, the use of the previously filled area by birds and terrapins and the status of submerged aquatic vegetation (SAVs) in the project area.

Evaluating the success of the restoration site will be based on the success of the breakwater at reducing waves and erosion, the location of the sand fill, the establishment of vegetation in the restored wetlands, and the use of the nesting area by birds and terrapins. Monitoring objectives include:

Monitoring:

- To support adaptive management of implemented projects;
- To assess and justify adaptive management expenditures;
- To minimize costs and maximize benefits of future restoration projects; and
- To determine "ecological success", document, and communicate it.

Adaptive Management:

Adaptive management measures are measures taken after a project has been completed to ensure the project features are working properly and as predicted. Since these measures are "adaptive" in nature, it is difficult to define what these measures might be prior to the issue arising. However, general concerns and examples of adaptive management processes can be identified at this stage. Adaptive management recognizes that human knowledge regarding biological and physical systems are limited and that these systems may not always respond as expected. When a restoration project is to be implemented but there is some uncertainty regarding the response of the system to particular actions, adaptive management provides a way to make changes to the project in order for the project to function as designed.

2.3 Strategy

The District will monitor the restoration area following completion of construction activities in order to evaluate the success of project, and to take corrective actions, if necessary, to ensure success.

Monitoring

Post-construction monitoring will be performed for a period of five years. An initial monitoring event will occur immediately following completion of all site restoration

activities in the form of post-construction monitoring under the construction contract. Long-term monitoring activities will be conducted annually for 5 years following completion of site restoration.

All monitoring components of the strategies will continue to be refined as the design progresses for the specific habitats restored. This monitoring plan is based on feasibility level information.

The purpose of the monitoring plan for Mordecai Island is to:

- Evaluate the placement and stability of the rubble mound breakwater and evaluate its success at reducing erosion on the island;
- Evaluate the success of the wetland restoration/creation;
- Monitor for potential spread of invasive species; and
- Develop a better understanding of wetland restoration/creation opportunities and protection needs in the study area.

Adaptive Management

Adaptive management will be implemented if specific restoration standards are not met or if it appears that actual conditions will diverge sufficiently far from the intended conditions to threaten the achievement of overall project goals. Funding for adaptive management will be included in the project cost estimates so that this option will be available in the future if needed.

The adaptive management program will consider the following conditions identified by the monitoring reports that may be limiting potential success.

- The condition/placement/stability of the rubble mound breakwater.
- Whether the vegetation species and sizes used during the initial planting were appropriate for site conditions.
- The condition/location/stability/migration of sand fill.
- Presence and density of invasive species.
- Review of restored habitat designs to identify where design may not be functioning properly to address the restoration objectives.

2.4 Monitoring and Adaptive Management Procedures

Pre-restoration monitoring protocols will seek to obtain baseline data in order to establish the existing ecological conditions of the project site. This monitoring will take place prior to the start of project implementation (during Design and Implementation Phase).

Post-restoration monitoring will begin no earlier than 1 year after all construction activities (including sand placement) are complete and continue each year for 5 years post restoration; at which point monitoring and adaptive management will be turned over to the local sponsor. The initial monitoring event will include an assessment of the restoration features and

photographic documentation of the completed restoration area to compare to those taken immediately after construction was completed.

The following are monitoring procedures that will provide the information necessary to evaluate the success of the project. Further refinement of these procedures will be completed by USACE and its sponsors prior to the pre-construction monitoring period.

2.4.1 Vegetation Monitoring

Timing and Performance Target:
Vegetation would be monitored in both the spring and fall, annually to document conditions that indicate achievement of the performance target of at least 85% coverage of planted vegetation. Additional monitoring of the upland bird nesting area will be performed to document the presence and status of invasive species (such as Phragmites) in the area. Sampling methods would include quadrat plot sampling for emergent vegetation.

Methods:
Protocol for monitoring emergent vegetation would consist of one square meter quadrat plots along random transect lines no more than 15 meters apart. At each transect, one quadrat will be randomly placed within the lowmarsh along the transect line and the existing vegetation of the plot will be monitored. Quadrats will be placed on either side (randomly chosen) within one meter of the measuring tape. Once placed, the meter mark on the upper and lower edge of each quadrat will be marked permanently with stakes and recorded on the measuring tape in meters. Plant species, plant height, stem density, flowering density, and percent cover data will be collected within each plot. A narrative description of plant health will also be collected.The exact location and side the quadrat will be placed on the transect line will be noted with GPS coordinates. This will facilitate relocating quadrats on subsequent monitoring visits. Each transect line and 1.0 m^2 quadrat will be photographed facing channel-ward at the time of vegetation monitoring. All photographs must be taken at low tide, in the same spot, and at the same height. General observations of invasive species and their location will be identified and mapped.

Adaptive Management:
If the restored site is not showing progress to meet the requirements of 85% vegetation cover, additional native vegetation would be planted to meet this goal. If, in the unlikely event, a native, sustainable ecosystem cannot be established within 2 years at the site, changes and modifications to the project site would be initiated immediately by restoration ecologists. A new monitoring plan will be redrawn by USACE to accommodate these changes and monitor the success of the alteration. In the event that significant spread of invasive species is documented, measures to control future growth and spread will be implemented.

2.4.2 SAV Monitoring

Timing and Performance Target:
Monitoring for SAVs would be conducted once annually during the growing season to document the health of any existing beds and the recruitment of new SAVs in the immediate vicinity of Mordecai Island. Sampling methods would include a combination of photo interpretation and in water surveys comparable to past studies performed in the area.

Methods:
Protocol for monitoring SAVs would involve interpretation of aerial photos and in water surveys using underwater cameras and/or snorkelers. In water surveys will consist of one square meter quadrat plots along random transect lines no more than 15 meters apart. At each transect, one quadrat will be randomly placed and percent coverage of SAV (and/or macroalgae) will be recorded. If conditions allow, stem counts will also be conducted. Species, distribution, and relative health of the SAVs will be reported. The monitoring protocols will be compatible with other SAV surveys previously conducted for ease of comparing results.

Adaptive Management:
No adaptive management protocols will be set for SAV growth since this is not a feature of the restoration project but a species that is expected to benefit from the project. Data gathered through the monitoring will help inform future restoration projects on suitable growing conditions for SAV recruitment.

2.5 Rubble Mound Breakwater Monitoring

Timing and Performance Target:
Monitoring of the rubble mound breakwater would be conducted once annually to document whether the structure meets the performance target of reducing the rate of shoreline erosion. The condition of the structure would be monitored for any potential damage or settlement. The adjacent sand fill area as well as the area directly bayward of the rubble mound breakwater would also be monitored to document any potential erosion and/or accretion. Monitoring methods would include a combination of hydrographic surveys, topographic surveys, photography, and aerial satellite imagery.

Methods:
Surveying protocol for rubble mound breakwater and sand fill monitoring would consist of hydrographic and topographic surveys conducted throughout established profile lines. These profile lines would not change from year to year so that the surveys could easily be compared to subsequent years. Profile lines would be approximately 100 feet apart and would be aligned perpendicular to the rubble mound breakwater centerline. The profile lines will start bayward of the rubble mound breakwater and extend all the way onto shore to monitor accretion/erosion throughout the entire project area. The centerline of the rubble mound structure would also be surveyed. Surveying point intervals and processing procedures would remain consistent from year to year to establish comparable data sets. Photographs of the rubble mound breakwater and sand fill would be taken at each profile line at low tide to maximize rock and sand visibility. Aerial satellite imagery would be collected from readily available online data bases.

Adaptive Management:
Adaptive management will only be required if the rubble mound breakwater is not reaching the performance target of reducing shoreline erosion. Rubble mound breakwater repairs could be required if significant damage and/or settlement are observed through monitoring. Some examples of rubble mound damage could be dislodged rocks from severe waves or slope failure from high scour rates. If damage and/or settlement is not observed yet there are measurable increases in erosion, then additional modifications may need to be made such as increasing crest height, increasing sill height, increasing crest width, reducing the length of the sills, and

placement of additional sand fill. Additional fill material may be obtained from future maintenance dredging of the NJWW. Surveys will be performed by the Operations Division of the Philadelphia District directly after placement of fill (associated costs of surveying will be a separate cost and will not be covered through monitoring and adaptive management). It is also possible that some combination of measures would be required during adaptive management.

3.0 Monitoring Responsibilities

The responsible parties for the five-year monitoring will be USACE and NJDEP. Any standards presented in this plan are to be used as guidelines for evaluation. Closer investigation will be performedby the monitoring and adaptive management team which may consist of at least one representative from the following agencies: USACE, NOAA Fisheries, USFWS, NJDEP and the Mordecai Land Trust (MLT). The Mordecai Land Trust has been actively monitoring the flora and fauna and environmental conditions at the island for many years and have provided detailed information on nesting birds and diamondback terrapins. It is anticipated that this monitoring will continue and will be used to supplement the monitoring that will be conducted by USACE.

Reporting Results:
A yearly monitoring summary report would be drafted by the USACE (or a designated representative) that briefly summarizes the data collected and determines if adaptive management is needed. A final monitoring report will be drafted that details the outcomes of the constructed restoration project. Included in each report shall be the monitoring data, photographs, a brief summary of the collected data, and a discussion of the data collected. Recommendations for adaptive management may also be included.

4.0 Estimated Cost and Duration

The Monitoring and Adaptive Management program for the Mordecai Island Ecosystem Restorationproject is scheduled to no sooner than 1 year following the completion of all construction activities. The District and the non-federal sponsor will operate this program for 5 year following construction. The project has budgeted approximately $597,788 (contingencies included) for the monitoring and adaptive management portion of this program as part of the total cost share with the non-federal sponsor (Table 1). Any monitoring or adaptive management that is conducted after the 5 years will not be part of the total project cost and will be 100% non-federal cost.

Table 1. Monitoring and Adaptive Management Cost Estimates

	Wetland Vegetation Monitoring	SAV Monitoring	Rubble Mound Breakwater Monitoring	Adaptive Management	**Grand Total**
Year 1	$ 35,680	$ 25,000	$ 40,000		$ 100,680
Year 2	$ 35,680	$ 25,000	$ 40,000		$ 100,680
Year 3	$ 35,680	$ 25,000	$ 40,000		$ 100,680
Year 4	$ 35,680	$ 25,000	$ 40,000	$ 94,388	$195,068
Year 5	$ 35,680	$ 25,000	$ 40,000		$ 100,680
Total	$ 178,400	$125,000	$ 200,000	$ 94,388	**$597,788**

CULTURAL RESOURCES CORRESPONDENCE

New Jersey Historic Preservation Office

Email Submittal Form

HPO USE ONLY	Project#:		
Date Rcvd:		Date Due:	
Assigned:			

Rev. 4/2020

Clear Form

I. REVIEW DETAILS

New Request? (●) Yes ( ) No (Prior HPO Project Number: ____)

Project / Property Name: Mordecai Island Ecosystem Restoration with NJIWW Beneficial Use of Dredged Material

Location: County: Ocean Municipality: Beach Haven Multiple: ☐

Street Address:

Block: Lot: Latitude: 39° Longitude: 74°

Review Type: *(Check all that apply)*

- ☑ Section 106: ☑ *Initiation* ☐ *Identification* ☑ *Assess Effects* ☐ *Resolve Adverse Effects* ☐ *Mitigation*
- ☐ NJ Register Project Authorization
- ☐ National Register: ☐ *Preliminary App.* ☐ *COE Request* ☐ *Draft Nom.* ☐ *Revised Draft Nom.* ☐ *Other*
- ☐ ITC Review: ☐ *Part 1* ☐ *Part 2* ☐ *Part 3* ☐ *Other*
- ☐ DEP Review: ☐ *FWW* ☐ *CAFRA* ☐ *UW/WD* ☐ *SRP* ☐ *Other*
- ☐ Technical Assistance
- ☐ Other *(Describe below)*

Description:

The USACE is conducting a feasibility study to investigate and recommend an implementable solution to the issue of sea level rise and the degradation of the salt marshes that provide habitat for economically and ecologically important fish, crab, and shellfish; nesting and foraging habitat for migratory and resident birds; and, improved water quality through de-nitrification and sediment removal. The USACE proposes to construct a rubble breakwater located approximately at the 1977 shoreline location, and to place sediments from the maintenance dredging of the New Jersey Intracoastal Waterway (NJIWW) landward of the breakwater to enhance the ecosystem of Mordecai Island.

II. CONTACT DETAILS

Name: Nicole Cooper Minnichbach, Cultural Resource Specialist and Tribal Liaison

Organization: US Army Corps of Engineers, Philadelphia District

Mailing Address: 100 Penn Square East, Wanamaker Building, 7th floor, CENAP-PL-E

City/State/Zip: Philadelphia / PA / 19107

Phone: 215-834-1065 Email: nicole.c.minnichbach@usace.army.mil

III. ATTACHMENTS

Please email this form and PDF attachments to:

NJHPO@dep.nj.gov

IMPORTANT: *There is a maximum email size limit of 25 MB to the NJHPO email account. If supporting documentation exceeds 25 MB,* ***check the box below to request a temporary OneDrive upload link.***

REQUEST UPLOAD LINK: ☐

Please refrain from submitting duplicate hard copy documentation when using this form. Some processes may require follow-up submission of hard copy originals; HPO will notify the requestor when applicable.

Check all that apply:

- ☑ Cover Letter or Transmittal Memo
- ☑ Detailed Description/Scope of Work
- ☑ Location Map
- ☐ Forms *(Nomination, NJ Register Review, ITC, etc.)*
- ☑ Site/Project Plans
- ☐ Project Specifications
- ☐ Digital Images
- ☐ Reports
- ☐ Other *(Please describe)*:

All attachments should be in PDF format.

IV. ADDITIONAL COMMENTS

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
100 PENN SQUARE EAST, 7th FLOOR WANAMAKER BUILDING
PHILADELPHIA, PENNSYLVANIA 19107-3390

June 8, 2020

Environmental Resources Branch

Ms. Katherine Marcopul, PhD
Deputy State Historic Preservation Officer
Mail Code: 501-04B
State of New Jersey
Department of Environmental Protection
Historic Preservation Office
PO Box 420
Trenton, NJ 08625-0420
kate.marcopul@dep.nj.gov

Dear Dr. Marcopul:

The U.S. Army Corps of Engineers (USACE), Philadelphia District has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The draft Environmental Assessment (EA) focuses on ecosystem restoration at Mordecai Island, Beach Haven, New Jersey. The draft EA will be provided to your office for review once it is completed.

This study was conducted under the authority of Section 1135 of the Water Resources Development Act of 1986. Under this authority the USACE may plan, design and build modifications to existing USACE projects, or areas degraded by USACE projects, to restore aquatic habitats for fish and wildlife. In the case of this study, the degraded area is Mordecai Island in New Jersey and the source of degradation is the adjacent Federal navigation channel, the New Jersey Intracoastal Waterway (NJIWW).

Mordecai Island is located near Beach Haven Borough in Barnegat Bay, Ocean County, New Jersey and, as noted above, is adjacent to the NJIWW (Figure 1). Strong tidal currents and waves that develop over a large fetch have contributed to severe shoreline erosion along Mordecai, as have boat wakes from the NJIWW. Over the past 100 years, half the island has been lost through erosion. The western edge, adjacent to the NJIWW, has receded on average between 2 – 4 feet per year, with some areas showing retreat as high as 5 feet per year. Communication with locals indicates that some recreational boaters used an island breach that occurred in the early 1980's as a cut through, contributing to further erosion of the critical habitat. The breach was subsequently filled by the USACE in 2015 and 2017. (See the lighter colored sand area between the two darker island segments in Figure 2) Additionally, since shoaling existed in the marked NJIWW channel before dredging was conducted in 2015 and 2017, but deeper water existed adjacent to the island, for many years the wakes of vessels outside the channel and closer to the island contributed to increased wave action in the vicinity of the eroding Mordecai Island shoreline.

The purpose of the feasibility study was to investigate and recommend an implementable solution to the identified problems at Mordecai Island. As sea levels continue to rise and storms become more frequent and intense, salt marshes that cannot keep pace with sea level rise will ultimately be lost, along with the ecosystem services they provide to coastal communities and the coastal economy. Furthermore, salt marshes provide habitat for economically and ecologically important fish, crabs, and shellfish; nesting and foraging habitat for migratory and resident birds; and improved water quality through de-nitrification and sediment removal. The USACE is studying several alternatives to make use of the sediments dredged from the NJIWW for ecosystem restoration at Mordecai Island.

Geo-referenced aerial photography of Mordecai Island from the years of 1977, 1995, 2002, 2007, 2012, 2015, and 2017 was obtained from various sources and digitized in order to quantify historical erosion rates on a footprint basis. The island footprint was digitized in ArcGIS for each aerial date and they were plotted against each other as shown in Figure 3. Also, a map was prepared that shows erosion and accretion areas around the perimeter of the island from the 1977 and 2017 aerials, as shown in Figure 4. It should be noted that the digitized shorelines representing the island footprint for each aerial photograph should not be considered necessarily as either the MHW or MLW line. They are just representations of the land/water interface and their locations are subject to the resolution and quality of the aerial photograph.

As Figure 4 shows, the western shoreline has retreated to the east while other parts of the island have remained relatively stable during the 40 year time period. The separate islands were conjoined in 1977, but in the early 1980's the island was breached and has been split into a "north" and "south" island ever since. The mechanical placement of sand in 2015 and 2017 in the breach area as part of the beneficial use of dredge material project was ignored for this analysis as it was not natural accretion.

The USACE narrowed its alternatives to include the placement of a rubble mound breakwater approximately parallel to the west side of Mordecai Island in the nearshore area along one of three alignments. Alignment A1 would extend for 3,000 linear feet and have an average height of 7.5 feet, Alignment B1 would extend for 2,900 linear feet and have an average height of 6.5 feet, and Alignment C1 would also be 2,900 linear feet in length and would have an average height of 6 feet (Figure 5). All three alignments are located within the 1977 tideline (Figures 3 & 4).

After some analysis and deliberation, the Project Delivery Team arrived at the Tentatively Selected Plan (TSP). The TSP would be the construction of a rubble mound breakwater along Alignment A1, and the placement of sediments dredged from the NJIWW behind the constructed breakwater. Vegetation will be planted on much of the placed sand in order to restore some of the lost acreage to the island. It is anticipated that the material obtained from future maintenance dredging of the NJIWW will also be placed in the project area in order to stabilize the ecosystem and help keep pace with sea level rise. (Figure 6).

Since the NJIWW will only be dredged to its previously authorized depth, and since the location of the rubble breakwater will be within the 1977 tideline footprint, and subsequent placement of dredged material will serve to stabilize the degraded marsh, the USACE has determined that the proposed action will have *No Effect* on historic properties eligible for or listed on the National Register of Historic Places pursuant to 36CFR800.4(d)(1).

We request your review of the proposed project and your concurrence with our *No Effect* determination. If you have any questions or comments please contact our District Cultural Resource Specialist, Nikki Minnichbach via email at Nicole.C.Minnichbach@usace.army.mil or by phone at 215-656-6556. Thank you for your participation in the Section 106 review process.

Sincerely,

Jeffrey A. Gebert

Jeff Gebert, Oceanographer
Acting Chief, Planning Division

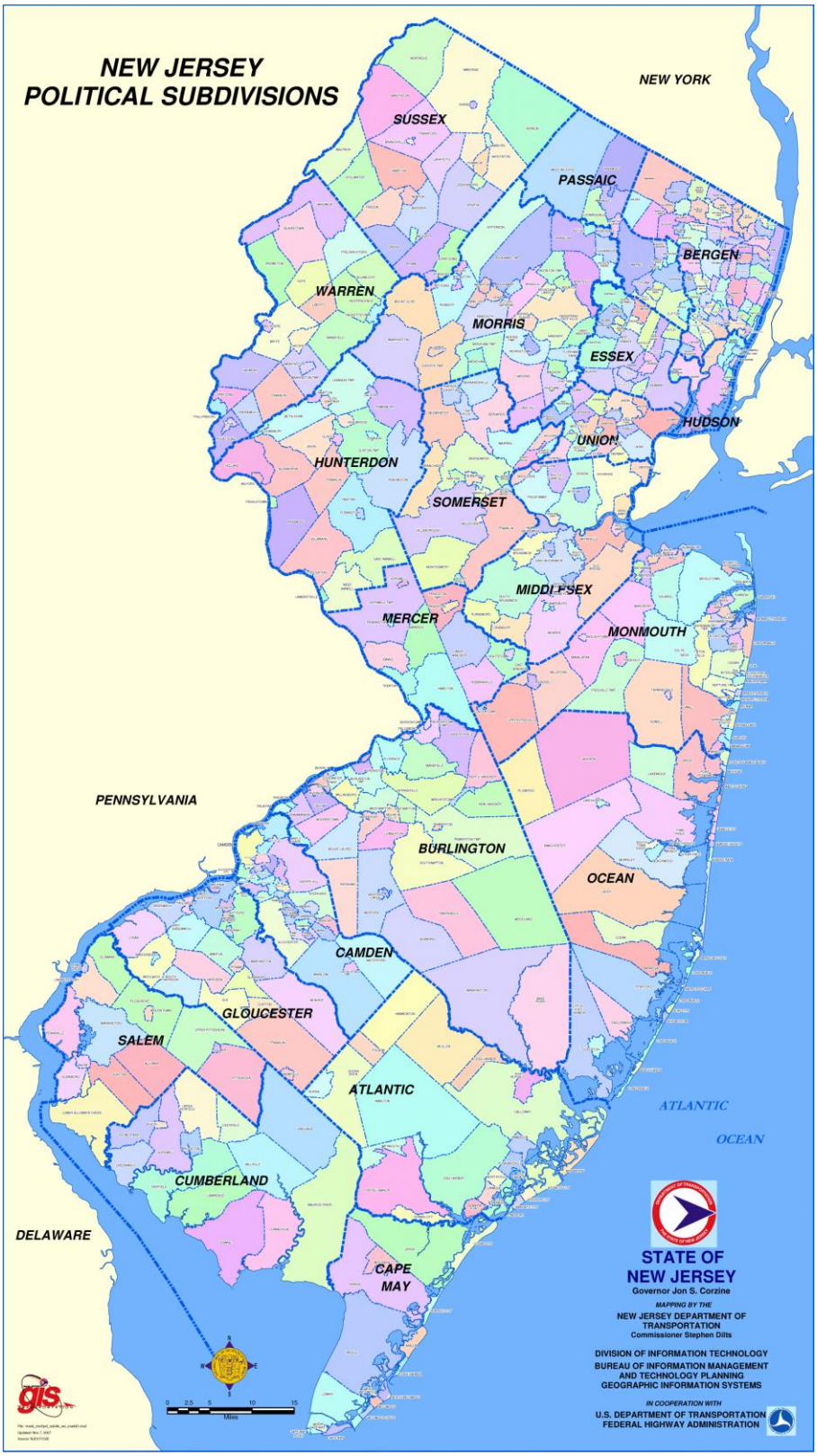

Figure 1: Location of Mordecai Island in New Jersey

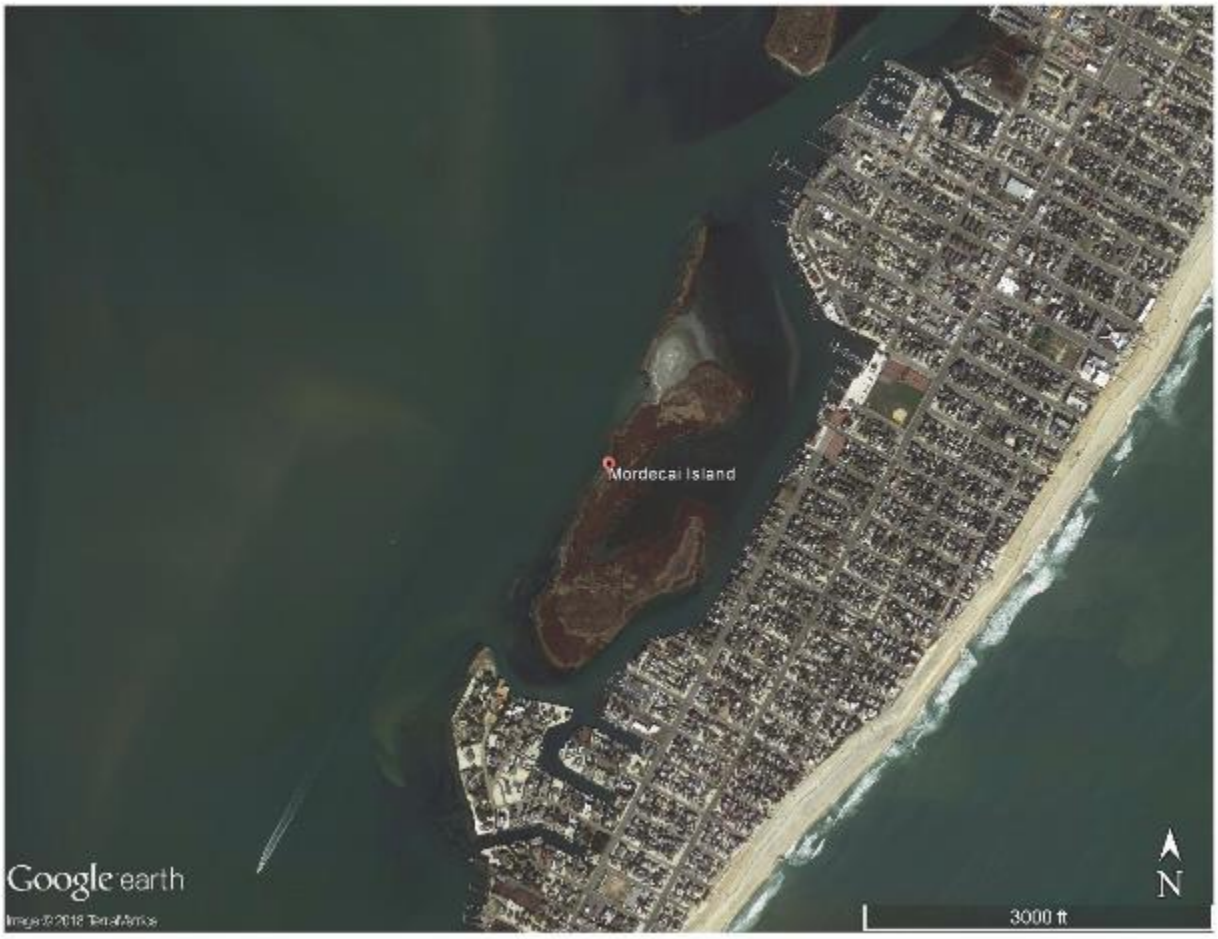

Figure 2: Mordecai Island and Surrounding Area

Figure 3: Mordecai Island 1977 Footprint vs. 2017 Footprint

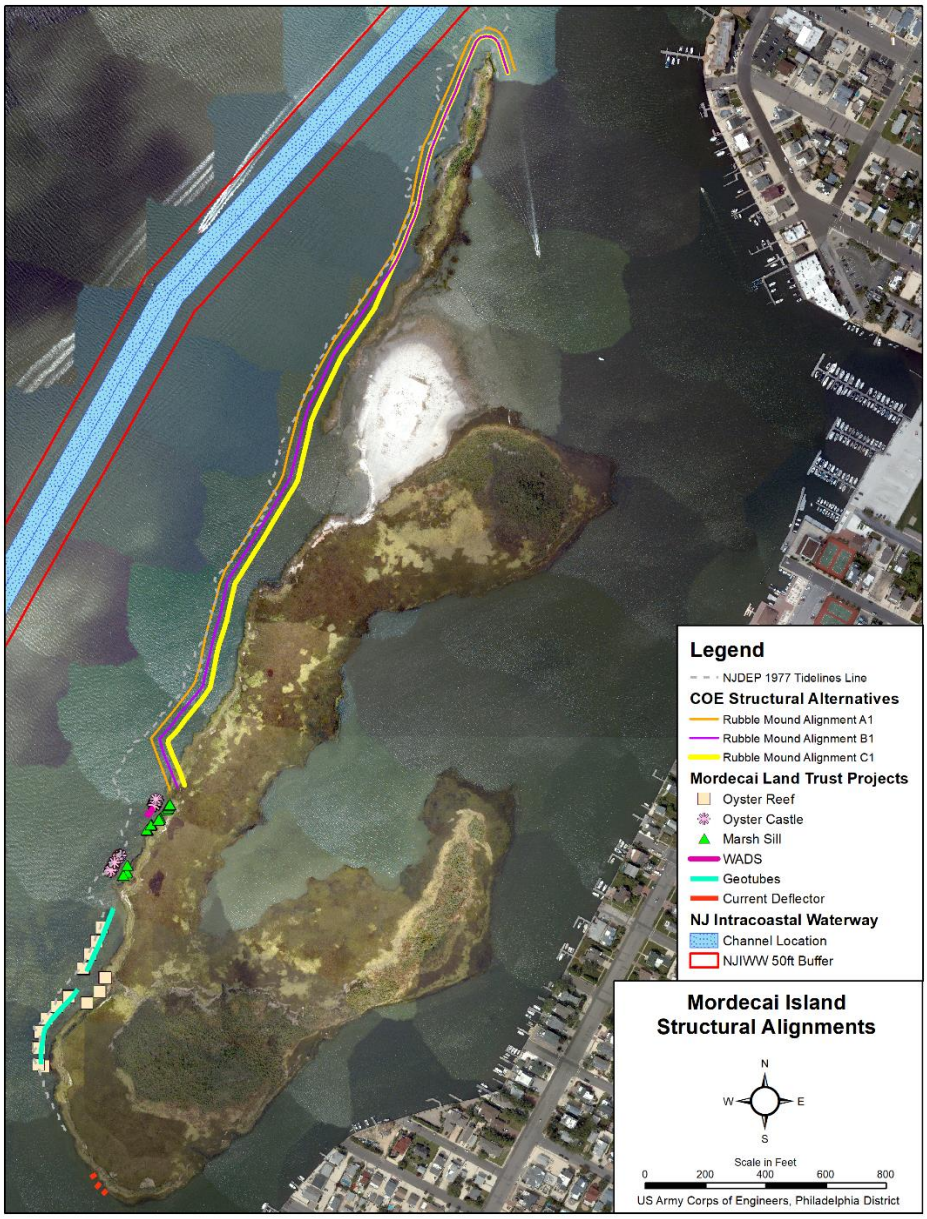

Figure 4: Plan View of Structural Alternatives

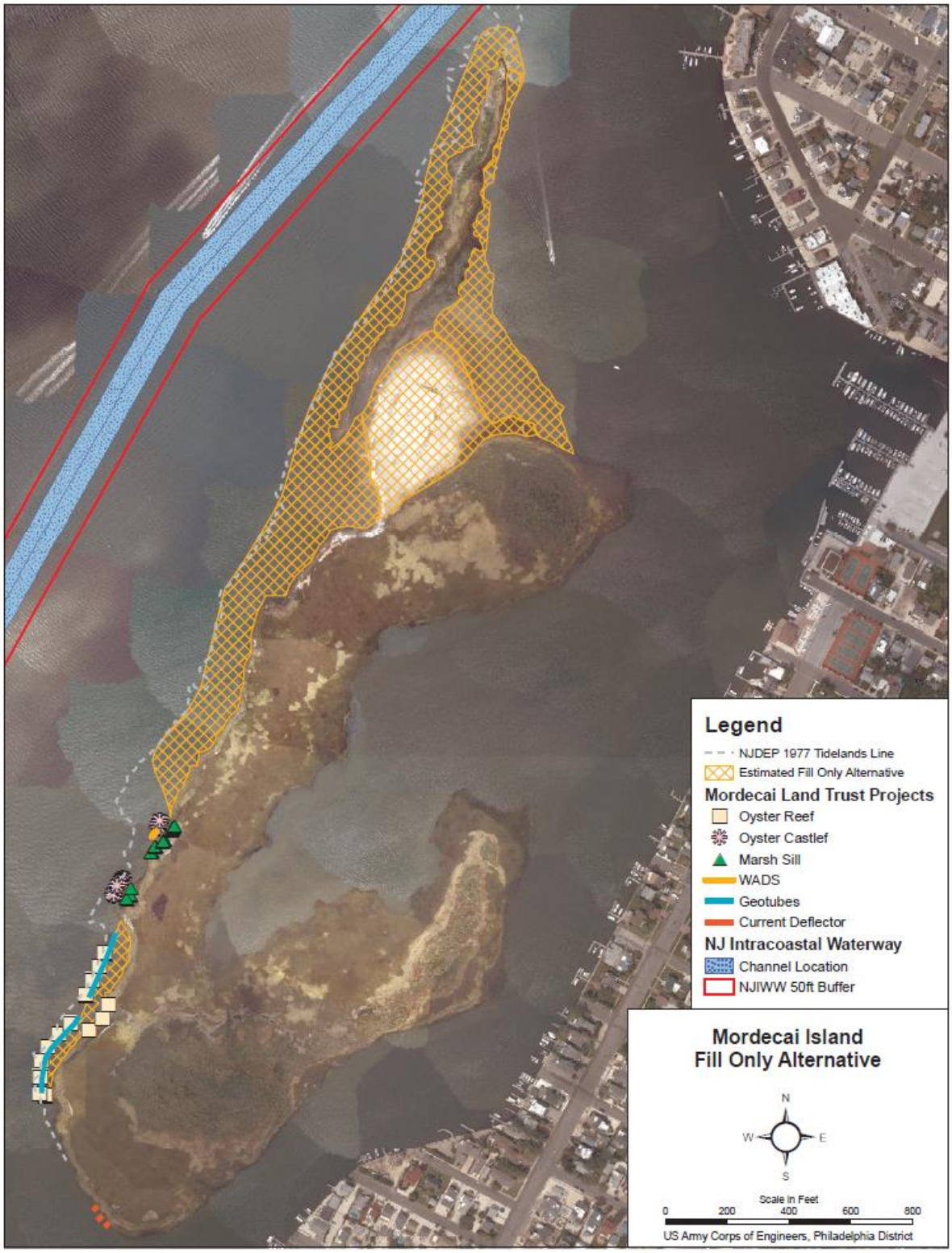

Figure 5: Proposed Location of Fill Material Deposition

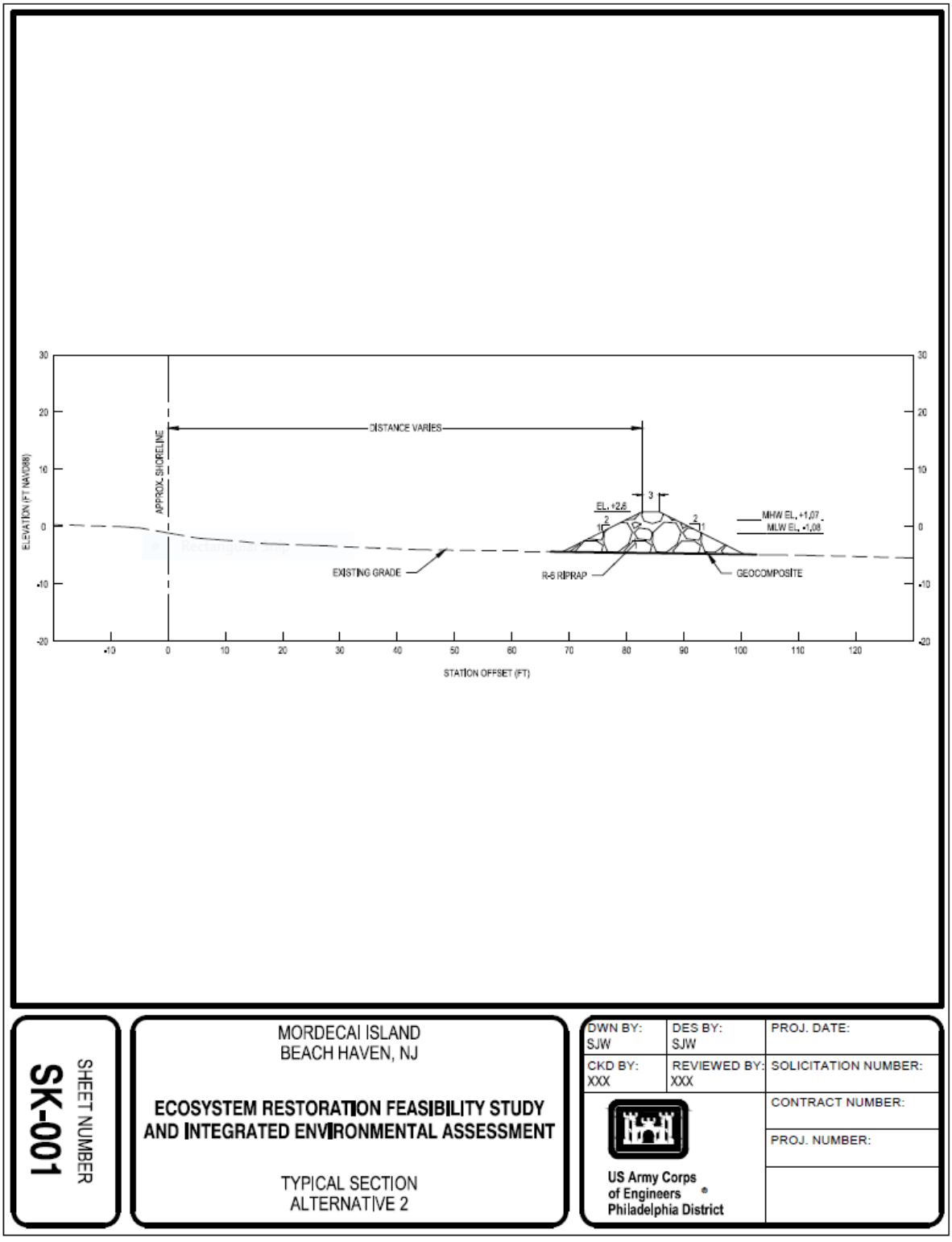

Figure 6: Typical Section Rubble Mound Breakwater

From:	Marcopul, Kate
To:	Minnichbach, Nicole C CIV USARMY CENAP (USA)
Cc:	Baratta, Meghan; West-Rosenthal, Jesse
Subject:	[Non-DoD Source] Ecosystem Restoration at Mordecai Isaland (HPO Project # 20-1254-1)
Date:	Wednesday, July 8, 2020 2:34:42 PM

This e-mail serves as the official correspondence of the New Jersey Historic Preservation Office as we switch to a temporary remote work environment in response to the ongoing novel coronavirus (COVID-19) outbreak

HPO Project # 20-1254-1

HPO-G2020-019

Dear Ms. Minnichbach:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published with amendments in the Federal Register on 6 July 2004 (69 FR 40544-40555), I am providing Consultation Comments for the following proposed undertaking:

Ocean County, Beach Haven Borough

Ecosystem Restoration at Mordecai Isaland

United States Department of Agriculture

800.4 Identification of Historic Properties

Thank you for providing the Historic Preservation Office (HPO) the opportunity to review and comment on the potential for the proposed ecosystem restoration to affect historic properties. Based upon the documentation submitted, there are no buildings, structures, sites, objects, or historic districts on or adjacent to the project location that are listed on, or that have been identified as eligible for listing in the New Jersey or National Registers of Historic Places. Although the project setting is sensitive for archaeological sites, based upon a review of information on file at the HPO, the undertaking only has a low potential to affect archaeological remains. Therefor, I concur with your finding that there will be no historic properties affected by the proposed undertaking within the area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.

Additional Comments

Thank you for providing the opportunity to review and comment on the potential for the above-referenced project to affect historic properties. Please do not hesitate to contact Jesse West-Rosenthal of my staff at Jesse.West-Rosenthal@dep.nj.gov with any questions regarding archaeology. Please reference the HPO project number 20-1254 in any future calls, emails, or written correspondence to help expedite your review and response.

Sincerely,

Katherine J. Marcopul, Ph.D., CPM
Administrator and
Deputy State Historic Preservation Officer
Historic Preservation Office
NJ Department of Environmental Protection
501 East State Street, Trenton, NJ 08625
kate.marcopul@dep.nj.gov <mailto:kate.marcopul@dep.nj.gov>
T (609) 984-0176 | F (609) 984-0578

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From:	Minnichbach, Nicole C CIV USARMY CENAP (USA)
To:	Brett Barnes (thpo@estoo.net); Darren Bonaparte; Erin Paden; Jesse Bergevin; Nathan Allison (nathan.allison@mohican-nsn.gov); Paul Lepsch (paul.lepsch@sni.org); Temple University Archaeology
Subject:	Request for Review - Mordecai Island Restoration of Habitat (UNCLASSIFIED)
Date:	Thursday, June 25, 2020 1:08:00 PM
Attachments:	Mordecai NJSHPO e106 Form.pdf Mordecai Ltr to NJSHPO Final.pdf

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CLASSIFICATION: UNCLASSIFIED

Good afternoon,

Attached are some items describing our proposed Mordecai Island restoration of aquatic habitat.

Please let me know if you have any questions or comments.

Thank you

Respectfully,

Nicole Cooper Minnichbach
Cultural Resource Specialist and Tribal Liaison
CENAP-PL-E
100 Penn Square East
Philadelphia, PA 19107
(O) 215-656-6556
(M) 215-834-1065

-----Original Message-----
From: Minnichbach, Nicole C CIV USARMY CENAP (USA)
Sent: Wednesday, June 10, 2020 10:44 AM
To: njhpo@dep.nj.gov
Cc: Brandreth, Mary E CIV USARMY CENAP (USA) <Mary.E.Brandreth@usace.army.mil>; Fowler, Theresa A CIV USARMY CENAP (US) (Theresa.A.Fowler@usace.army.mil) <Theresa.A.Fowler@usace.army.mil>
Subject: Request for Review (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Please see the attached documents for review for the Mordecai Island.

Thank you for you time to review this Section 106 documentation.

Nicole Cooper Minnichbach
Cultural Resource Specialist and Tribal Liaison CENAP-PL-E
100 Penn Square East
Philadelphia, PA 19107
(O) 215-656-6556
(M) 215-834-1065

CLASSIFICATION: UNCLASSIFIED
CLASSIFICATION: UNCLASSIFIED

The Delaware Nation
Historic Preservation Department
31064 State Highway 281
Anadarko, OK 73005
Phone (405)247-2448

July 1, 2020

To Whom It May Concern:

The Delaware Nation Historic Preservation Department received correspondence regarding the following referenced project(s).

Project(s): Mordecai Island Restoration of Habitat

Our office is committed to protecting tribal heritage, culture and religion with particular concern for archaeological sites potentially containing burials and associated funerary objects.

The Lenape people occupied the area indicated in your letter prior to European contact until their eventual removal to our present locations. According to our files, the location of the proposed project does not endanger cultural, or religious sites of interest to the Delaware Nation. **Please continue with the project as planned** keeping in mind during construction should an archaeological site or artifacts inadvertently be uncovered, all construction and ground disturbing activities should immediately be halted until the appropriate state agencies, as well as this office, are notified (within 24 hours), and a proper archaeological assessment can be made.

Please note the Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians are the only Federally Recognized Delaware/Lenape entities in the United States and consultation must be made only with designated staff of these three tribes. We appreciate your cooperation in contacting the Delaware Nation Historic Preservation Office to conduct proper Section 106 consultation. Should you have any questions, feel free to contact our offices at 405-247-2448 ext. 1403.

Erin N. Paden

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
Ph. 405-247-2448 ext. 1403
epaden@delawarenation-nsn.gov

From: Eastern Historic Preservation
To: Minnichbach, Nicole C CIV USARMY CENAP (USA)
Subject: [Non-DoD Source] Re: Request for Review - Mordecai Island Restoration of Habitat (UNCLASSIFIED)
Date: Thursday, June 25, 2020 1:11:22 PM

The Delaware Tribe of Indians has closed all tribal offices until June 29th, 2020. Due to this closure the Delaware Tribe's Historic Preservation Office's will not be open to the public and staff will be telecommuting on a limited basis. ***FOR 10 DAYS, APPROXIMATELY MAY 11TH TILL MAY 20TH OUR EMAIL SYSTEM WAS DOWN. *** During this closure we are requesting an extension to all timelines until further notice and will respond to/review projects on a priority basis. As we are working to prioritize projects, we ask that all of our preservation partners do the same. If a project is deemed to be high priority we invite you to set up a time to contact our offices by phone so that we can address the project needs appropriately. This extension and prioritizing request applies to all Historic Preservation and Cultural Resource Protection work, including ARPA, NEPA, NHPA Section 106, and NAGPRA projects. If there is an urgent issue requiring immediate attention please call Susan Bachor at 610-761-7452. Have a nice day and stay safe!

GENERAL CONFORMITY - RECORD OF NON-APPLICABILITY (RONA)

Project Name: Mordecai Island Ecosystem Restoration Project

Reference: Section 1135 of the Water Resources Development Act of 1986

Project/Action Point of Contact: Beth Brandreth, CENAP-PLE

Begin Date: September 2025

End Date: September 2027

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because:

1. An emissions estimate was completed to determine the Nitrogen Oxides (NOx) and Volatile Organic Carbon (VOC) emissions (precursors to ozone formation) associated with the construction of the Mordecai Island Ecosystem Restoration Project. Total direct and indirect emission from this project/action were calculated to generate a total of 7.2 tons of NOx and 0.3 tons of VOCs (see Appendix B of the FR/EA).

2. The project is located in Ocean County, New Jersey, which is within the Philadelphia-Wilmington-Atlantic City, PA- NJ-MD-DE nonattainment area and has the following nonattainment-related designation with respect to the National Ambient Air Quality Standards (40CFR§81.133): marginal ozone nonattainment for the 1997 8-hour ozone (oxides of nitrogen [NOx] and hydrocarbons [HC]) NAAQS.

3. The total direct and indirect emissions from this project are well below the 100 tons trigger levels for NO_x and the 50 tons trigger level for VOC (40CFR§93.153(b)(1) & (2)), as VOCs, are typically a fraction of total NOx emissions.

4. The project conforms with the General Conformity requirements (40CFR§93.153(c)(1)) and is exempted from the requirements of 40 CFR §93 Subpart B. The project/action is not considered regionally significant under 40 CFR 93.153(i).

Peter R. Blum P.E.
Chief, Planning Division

MORDECAI ISLAND CONSTRUCTION EQUIPMENT EMISSIONS ESTIMATE

	Description	Manufacturer	Model	Number of Engines	EQHours	Horse Power	Load Factor	HP-HRS	Emissions Factors g/hp-hr		Emissions (tons)	
									NOX	VOC	NOX	VOC
	Emissions Equipment Backup				**7,281.2022**							
	Selected Plan: Rubble Mound w/ 11 Acres of New Marsh											
	02. RELOCATIONS				**48.0000**							
	02 03 Cemeteries, Utilities and Structures				**48.0000**							
	EP T50GM005 TRUCK, HIGHWAY, 8,600 GVW, 4X4 (SUBURBAN)	GM GMC AND CHEVROLET	SUBURBAN 2500	1	24.0000	355	1	8520	10.33	0.54	0.09701455	0.0050714
	USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC MANUFACTURER	MISC. EQUIPMENT	0	24.0000	0						
	06. FISH AND WILDLIFE FACILITIES											
	06 03 Wildlife Facilities and Sanctuaries				**2,674.2222**							
	06 03 01 Mobilization and Demobilization				**288.0000**							
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	16.0000	900	0.5	7200	5.6	0.2	0.04444444	0.0015873
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		0	16.0000	0						
	USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	160.0000	0						
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	8.0000	900	0.5	3600	5.6	0.2	0.02222222	0.0007937
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		1	8.0000	0						
	USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	80.0000	0						
	06 03 02 Habitat and Feeding Facilities - Rubble Mound Alignment A				**2,386.2222**							
	USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	2,366.2222	0						
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	4.0000	900	0.5	1800	5.6	0.2	0.01111111	0.0003968
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		1	16.0000	0						
	10 01 Mobilization and Demobilization				**784.0000**							
	10 01 01 Mobilization				**456.0000**							
	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	24.0000	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD	MA MANITOWOC ENGINEERING CO.	999	1	24.0000	400	0.43	4128	9.5	0.2	0.04322751	0.0009101
	USR 1200 hp tug 24 hr/day rental FULL usage 1200 HP Tug rental - daily rental, FULL throttle	XX NO SPECIFIC MANUFACTURER		1	24.0000	1,200	1	28800	5.6	0.2	0.17777778	0.0063492
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		2	48.0000	900	0.5	43200	5.6	0.2	0.26666667	0.0095238
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		0	48.0000	0						
	USR spudbarge1 Spud Barge 12hr/day	XX NO SPECIFIC		0	24.0000	0						
	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	24.0000	0						
	EP H25CS027 HYDRAULIC EXCAVATOR, CRAWLER, 82,500 LBS, 2.33 CY BUCKET, 26.67' MAX DIGGING DEPTH	CS CASE CORPORATION	CX350D	1	24.0000	268	0.59	3794.88	9.5	0.2	0.03973915	0.0008366
	EP T15CA022 TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD	CA CATERPILLAR INC. (MACHINE DIVISION)	D5K2 LGP	1	24.0000	104	0.59	1472.64	9.5	0.2	0.01542116	0.0003247
	EP T45EA007 TRUCK TRAILER, LOWBOY, 50 TON, 3 AXLE , DETATCHABLE GOOSENECK (ADD TOWING TRUCK)	EA EAGER BEAVER	50GSL-3	0	72.0000	0						
	GEN T10Z6240 TRACTOR ATTACHMENT, BLADE, POWER ANGLE, HYDRAULIC, 2.53 CY (1.93 M3) CAPACITY (ADD TO 101 -135 HP (75-101 KW) DOZER, D-5)	GK GENERIC EQUIPMENT	D5 ACCUGRADE BLADE	1	24.0000	135	0.59	1911.6	9.5	0.2	0.02001786	0.0004214
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD	MA MANITOWOC ENGINEERING CO.	999	1	24.0000	400	0.43	4128	9.5	0.2	0.04322751	0.0009101
	MAP T50XX028 TRUCK, HIGHWAY, 45,000 LBS GVW, 3 AXLE, 6X4 (CHASSIS ONLY-ADD OPTIONS)	XX NO SPECIFIC MANUFACTURER	6X4 45KGVW DSL	3	72.0000	385	1	83160	10.72	0.67	0.98266667	0.0614167
	10 01 02 Demobilization				**304.0000**							
*	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	1	16.0000	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	16.0000	400	0.43	2752	9.5	0.2	0.02881834	0.0006067
	USR 1200 hp tug 24 hr/day rental FULL usage 1200 HP Tug rental - daily rental, FULL throttle	XX NO SPECIFIC MANUFACTURER		2	16.0000	1,200	1	38400	5.6	0.2	0.23703704	0.0084656
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		2	32.0000	900	0.5	28800	5.6	0.2	0.17777778	0.0063492
	US	XX NO SPECIFIC		0	32.0000	0						
	US	XX NO SPECIFIC		0	16.0000							
*	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	16.0000	0						
	EP H25CS027 HYDRAULIC EXCAVATOR, CRAWLER, 82,500 LBS, 2.33 CY BUCKET, 26.67' MAX DIGGING DEPTH	CS CASE CORPORATION	CX350D	1	16.0000	268	0.59	2529.92	9.5	0.2	0.02649277	0.0005577
	EP T15CA022 TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD	CA CATERPILLAR INC. (MACHINE DIVISION)	D5K2 LGP	1	16.0000	104	0.59	981.76	9.5	0.2	0.01028078	0.0002164
	EP T45EA007 TRUCK TRAILER, LOWBOY, 50 TON, 3 AXLE , DETATCHABLE GOOSENECK (ADD TOWING TRUCK)	EA EAGER BEAVER	50GSL-3	0	48.0000	0						
	GEN T10Z6240 TRACTOR ATTACHMENT, BLADE, POWER ANGLE, HYDRAULIC, 2.53 CY (1.93 M3) CAPACITY (ADD TO 101-135 HP (75-101 KW) DOZER, D-5)	GK GENERIC EQUIPMENT	D5 ACCUGRADE BLADE	0	16.0000	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD	MA MANITOWOC ENGINEERING CO.	999	1	16.0000	400	0.43	2752	9.5	0.2	0.02881834	0.0006067
	MAP T50XX028 TRUCK, HIGHWAY, 45,000 LBS GVW, 3 AXLE, 6X4 (CHASSIS ONLY-ADD OPTIONS)	XX NO SPECIFIC MANUFACTURER	6X4 45KGVW DSL	3	48.0000	385	1	55440	10.72	0.67	0.65511111	0.0409444
	10 01 03 Preparatory Work				**24.0000**							
	USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	24.0000	0						
	10 02 Signs				**59.3800**							
	GEN T40Z6960 TRUCK OPTIONS, FLATBED, W/40" (1M) SIDE RACKS, 8' X 12' (2.4M X 3.7M)	GK GENERIC EQUIPMENT	PVMXT-123C	0	0.9600	0						
	GEN T50Z7400 TRUCK, HIGHWAY, 26 KGVW (11.8 MT), 2 AXLE, 4X2 (CHASSIS ONLY-ADD OPTIONS)	GK GENERIC EQUIPMENT	4X2 26KGVW DSL	1	0.9600	230	1	220.8	10.72	0.67	0.0026091	0.0001631
	GEN XMEZ9120 POST DRIVER, 8" (203 MM) MAX DIA POST, 30,000 LB (13,608 KG) IMPACT (ADD 20,000-35,000 LB (9,072-15,876 KG) GVW TRUCK)	GK GENERIC EQUIPMENT	MISC. EQUIPMENT	1	0.9600	0						
	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	10.0000	0						
	EP H25CS027 HYDRAULIC EXCAVATOR, CRAWLER, 82,500 LBS, 2.33 CY BUCKET, 26.67' MAX DIGGING DEPTH	CS CASE CORPORATION	CX350D	1	2.0000	268	0.59	316.24	9.5	0.2	0.0033116	6.972E-05
	EP T15CA022 TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD ATTACHMENTS)	CA CATERPILLAR INC. (MACHINE DIVISION)	D5K2 LGP	1	2.0000	104	0.59	122.72	9.5	0.2	0.0012851	2.705E-05
	GEN T10Z6240 TRACTOR ATTACHMENT, BLADE, POWER ANGLE, HYDRAULIC, 2.53 CY (1.93 M3) CAPACITY (ADD TO 101-135 HP (75-101 KW) DOZER, D-5)	GK GENERIC EQUIPMENT	D5 ACCUGRADE BLADE	0	2.0000	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	10.0000	400	0.43	1720	9.5	0.2	0.01801146	0.0003792
	USR 900 hp tug 12 hr/day rental FULL usage 900 HP Tug rental - daily rental, FULL throttle	XX NO SPECIFIC MANUFACTURER		1	4.0000	900	1	3600	5.6	0.2	0.02222222	0.0007937
	USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	0.5000	900	0.5	225	5.6	0.2	0.00138889	4.96E-05
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		0	18.0000	0						
	USR spudbarge1 Spud Barge 12hr/day	XX NO SPECIFIC		0	8.0000	0						
	10 03 Site Work - Placement of Rubble Mound Alignment A				**3,715.6000**							
*	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	71.0500	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	71.0500	400	0.43	12220.6	9.5	0.2	0.12797145	0.0026941
	USR 900 hp tug 12 hr/day rental FULL usage 900 HP Tug rental - daily rental, FULL throttle	XX NO SPECIFIC MANUFACTURER		1	35.5250	900	1	31972.5	5.6	0.2	0.19736111	0.0070486
	USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		0	142.1000	0						
	USR spudbarge1 Spud Barge 12hr/day	XX NO SPECIFIC		0	71.0500	0						
*	EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	71.0500	0						
	EP H25CS027 HYDRAULIC EXCAVATOR, CRAWLER, 82,500 LBS, 2.33 CY BUCKET, 26.67' MAX DIGGING DEPTH	CS CASE CORPORATION	CX350D	1	71.0500	268	0.59	11234.43	9.5	0.2	0.11764445	0.0024767
	EP T15CA022 TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD ATTACHMENTS)	CA CATERPILLAR INC. (MACHINE DIVISION)	D5K2 LGP	1	71.0500	104	0.59	4359.628	9.5	0.2	0.04565307	0.0009611
	GEN T10Z6240 TRACTOR ATTACHMENT, BLADE, POWER ANGLE, HYDRAULIC, 2.53 CY (1.93 M3) CAPACITY (ADD TO 101 -135 HP (75-101 KW) DOZER, D-5)	GK GENERIC EQUIPMENT	D5 ACCUGRADE BLADE	0	71.0500	0						
	MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	71.0500	400	0.43	12220.6	9.5	0.2	0.12797145	0.0026941

		USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	17.7625	900	0.5	7993.125	5.6	0.2	0.04934028	0.0017622
		USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC MANUFACTURER		0	71.0500	0						
*		EP M10MZ011 MARINE EQUIPMENT, BOATS & LAUNCHES, TRUCKABLE WORKBOAT W/PILOT HOUSE & PUSH KNEES, INBOARD, 25.25' X 10' X 3.5'	MZ MARINE INLAND FABRICATERS	MUSTANG	1	56.0000	200	0.69	7728	5.6	0.2	0.0477037	0.0017037
		USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	56.0000	0						
*		EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	190.8500	0						
		EP H25CS027 HYDRAULIC EXCAVATOR, CRAWLER, 82,500 LBS, 2.33 CY BUCKET, 26.67' MAX DIGGING DEPTH	CS CASE CORPORATION	CX350D	1	190.8500	268	0.59	30177.2	9.5	0.2	0.31600906	0.0066528
		EP T15CA022 TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD ATTACHMENTS)	CA CATERPILLAR INC. (MACHINE DIVISION)	D5K2 LGP	1	190.8500	104	0.59	11710.56	9.5	0.2	0.12263038	0.0025817
		GEN T10Z6240 TRACTOR ATTACHMENT, BLADE, POWER ANGLE, HYDRAULIC, 2.53 CY (1.93 M3) CAPACITY (ADD TO 101 -135 HP (75-101 KW) DOZER, D-5)	GK GENERIC EQUIPMENT	D5 ACCUGRADE BLADE	0	190.8500	0						
		MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	190.8500	400	0.43	32826.2	9.5	0.2	0.34374879	0.0072368
		USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		1	47.7125	900	0.5	21470.63	5.6	0.2	0.13253472	0.0047334
		USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		0	190.8500	0						
*		EP B35HE012 BUCKET, DRAGLINE, 7.0 CY, LIGHT WEIGHT/PERFORATED	HE HENDRIX MANUFACTURING COMPANY, INC.	LS	0	190.8500	0						
		MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	MA MANITOWOC ENGINEERING CO.	999	1	190.8500	400	0.43	32826.2	9.5	0.2	0.34374879	0.0072368
		USR 900 hp tug 12 hr/day rental LESS THAN 900 HP Tug rental - 12 hr daily rental, LESS THAN FULL throttle	XX NO SPECIFIC MANUFACTURER		2	381.7000	900	0.5	343530	5.6	0.2	2.12055556	0.0757341
		USR deckbarge1 Deck Barge 12hr/day	XX NO SPECIFIC		2	381.7000	0						
		USR spudbarge1 Spud Barge 12hr/day	XX NO SPECIFIC		1	190.8500	0						
*		EP M10MZ011 MARINE EQUIPMENT, BOATS & LAUNCHES, TRUCKABLE WORKBOAT W/PILOT HOUSE & PUSH KNEES, INBOARD, 25.25' X 10' X 3.5'	MZ MARINE INLAND FABRICATERS	MUSTANG	1	120.0000	200	0.69	16560	5.6	0.2	0.10222222	0.0036508
		USR XMIXX020 SMALL TOOLS	XX NO SPECIFIC	MISC. EQUIPMENT	0	120.0000	0						
												NOx	**VOC**
											TOTAL (Tons):	**7.2**	**0.3**

Notes:
Full Throttle = 100%
Less than full throttle = 50%.