Delaware Department of Natural Resources and Environmental Control
Delaware Coastal Management Program

Initial Review: _____
Updated On: _____
Complete: _____
Official Use Only

# Coastal Zone Management Act Federal Consistency Form

This document provides the Delaware Coastal Management Program (DCMP) with a Federal Consistency Determination or Certification for activities regulated under the Coastal Zone Management Act of 1972, as amended, and NOAA's Federal Consistency Regulations, 15 C.F.R. Part 930. Federal agencies and other applicants for federal consistency are not required to use this form; it is provided to applicants to facilitate the submission of a Consistency Determination or Consistency Certification. In addition, federal agencies and applicants are only required to provide the information required by NOAA's Federal Consistency Regulations.

| **Project/Activity Name:** | Murderkill Salt Marsh Hydrological Modification |
|---|---|

## I. Federal Agency or Non-Federal Applicant Contact Information:

Contact Name/Title: Brian Marsh/Team Lead

Federal Agency Contractor Name (if applicable): _____

Federal Agency: USFWS Delaware Bay Coastal Program
(either the federal agency proposing an action or the federal agency issuing a federal license/permit or financial assistance to a non-federal applicant)

Mailing Address: Delaware Bay Coastal Program, 2591 Whitehall Neck Road, Smyrna, DE 19977

City: Smyrna State: DE Zip Code: 19977

E-mail: [redacted] Telephone #: [redacted]

## II. Federal Consistency Category:

- (●) Federal Activity or Development Project (15 C.F.R. Part 930, Subpart C)
- ( ) Outer Continental Shelf Activity (15 C.F.R. Part 930, Subpart E)
- ( ) Federal Financial Assistance (15 C.F.R. Part 930, Subpart F)
- ( ) Federal License or Permit Activity (15 C.F.R. Part 930, Subpart D)
- ( ) Federal License or Permit Activity which occurs wholly in another state (interstate consistency activities identified in DCMP's Policy document)

## III. Detailed Project Description (attach additional sheets if necessary):

See included project narrative and plans. We propose to improve salt marsh hydrology by enhancing tidal ebb and flow during normal tidal cycles over a 58-acre area at the Hall Tract of the State-owned Milford Neck Wildlife Area in Kent County, Delaware. We propose to do this by installing 1,651 ft of runnels which are shallow channels connecting low areas of the salt marsh to tidal channels. Runnels will be installed by hand. The footprint of the runnels will be a maximum of 1,651 square ft. Material (up to a maximum of 62 cyd/3,325 square ft) removed by creating the runnels will be used beneficially at the marsh by being placed in relatively low areas where vegetation has died or become stressed due to unnatural persistent saturation or inundation created by the history of the site being ditched and low elevation pockets forming between ditches.

**IV. General Analysis of Coastal Effects** (attach additional sheets if necessary):

The effects of the project will be beneficial to salt marsh and to coastal resilience. We propose making the area more resilient by reducing inundation rates which will lead to revegetation and increased health of existing vegetation which in turn will increase biological and sediment accretion that will help decrease degradation and help the marsh keep pace with sea level rise. Improved vegetation will increase overall productivity of the area and provide better habitat for avian nesters, forage fish, and other groups of species.

**V. Detailed Analysis of Consistency with DCMP Enforceable Policies** (attach additional sheets if necessary)**:**

**Policy 5.1: Wetlands Management**

The project will restore, preserve, and protect the functions of these wetlands by reducing current degradation from high inundation and saturation rates that have reduced vegetation health and has led to areas starting to convert to mudflat. Restoring hydrology will halt some of the wetland degradation, stabilize the salt marsh platform, improve habitat, increase biological accretion (underground accretion) that is critical for elevation gains needed to keep up with SLR, as well as increase the likelihood that suspended sediments accrete.

**Policy 5.2: Beach Management**

Not applicable

**Policy 5.3: Coastal Waters Management** (includes wells, water supply, and stormwater management. Attach additional sheets if necessary)

The project will restore, preserve, and protect intertidal salt marsh. Without this project, we are concerned that the area will continue to lose vegetated marsh, continue to have marsh platform breaking down and becoming unconsolidated sediment, continue to not gain elevation due to lost biological accretion (underground) and normal sediment accretion and therefore have relative elevation losses, continue to lose habitat to salt marsh species, and to become more destabilized. Eventually, these areas could transition mostly to low marsh vegetation or bare sediment vulnerable to erosive forces of the Murderkill River.

**Policy 5.4: Subaqueous Land and Coastal Strip Management**

The project will restore and protect the natural environment of salt marsh. The project will not have an adverse effect on economics, aesthetics, or neighboring land uses.

**Policy 5.5: Public Lands Management**

The project occurs on State public land being part of the Milford Neck Wildlife Area. The project will not alter the use or potential use of the land and will not create a requirement for added land management. Access will not be changed through the project. The project will help with the Delaware Division of Fish and Wildlife's land management by helping to maintain the salt marsh.

**Policy 5.6: Natural Lands Management**

The project will help with the Delaware Division of Fish and Wildlife's land management goals for the area by helping to maintain the salt marsh present at the site. We have coordinated with Delaware Division of Fish and Wildlife since the project's inception.

**Policy 5.7: Flood Hazard Areas Management**

The project does not involve actions that may affect state or local flood hazard areas management.

**Policy 5.8: Port of Wilmington**

Not applicable

**Policy 5.9: Woodlands and Agricultural Lands Management**

Not applicable

**Policy 5.10: Historic and Cultural Areas Management**

The project area is of interest to the State and Tribes for cultural resources. Both have expressed concern that creating new channels, even shallow runnels, could expose pre-contact cultural resources. Therefore, following input from DE SHPO (see included letter), we will have SOI certified archaeological monitoring of the site during runneling, which is the only activity proposed at this site. We our coordinating with the Tribes to ensure they can have Tribal Monitors on site throughout the work.

**Policy 5.11: Living Resources**

The project will benefit living resources by slowing or halting the degradation of the salt marsh, restoring vegetation, restoring resilience, and restoring habitat. The project design will prevent adverse impacts to resources by limiting the number of runnels to what we believe is the minimum needed to help the site, implementation will take place outside of the growing season, equipment use will be minimized and only involve low ground pressure equipment, and the project will not allow the loss of unconsolidated sediment from the system. The project will benefit a variety of wildlife such as nesting clapper rail.

**Policy 5.12 Mineral Resources Management**

Not applicable

**Policy 5.13: State Owned Coastal Recreation and Conservation**

The project will not change coastal recreation of the area which is hard to access by foot and unlikely to be accessed by boat. The area is salt marsh and limited to only passive recreation or hunting, neither of which will be changed by the work or access to either be changed. The project goal is conservation of salt marsh and has been developed in coordination with the Delaware Division of Fish and Wildlife that owns and manages the property.

**Policy 5.14: Public Trust Doctrine**

The project does not increase limits on public access or use of the sites. The project will help maintain the area as salt marsh for the benefit of the public.

**Policy 5.15: Energy Facilities**

Not applicable

**Policy 5.16: Public Investment**

The project does not necessitate State public investment. The project proponent is a federal agency with NGO partners. All work will be done by hand through USFWS and their partners and through USFWS funding.

**Policy 5.17: Recreation and Tourism**

The project area is not easily accessible to the public other than potentially hunting or passive recreation such as bird watching. The project will help maintain the natural salt marsh cover of the area and the recreation and ecotourism it could offer.

**Policy 5.18: National Defense and Aerospace Facilities**

Not applicable

**Policy 5.19: Transportation Facilities**

Not applicable

**Policy 5.20: Air Quality Management**

Not applicable

**Policy 5.21: Water Supply Management**

Not applicable

**Policy 5.22: Waste Disposal Management**

Not applicable

**Policy 5.23: Development**

Not applicable

**Policy 5.24: Pollution Prevention**

Not applicable

**Policy 5.25: Coastal Management Coordination**

This project has potential value for elsewhere in the State on and off State lands for showing how subtle hydrological restoration may improve coastal resources. We welcome coordination on this project amongst agencies interested in coastal resource conservation and preservation.

**VI. JPP and RAS Review** (Check all that apply)**:**

Has the project been reviewed in a monthly Joint Permit Processing and/or Regulatory Advisory Service meeting?

☒ JPP ☐ RAS ☒ None

*If yes, provide the date of the meeting(s): On 6/20/24 we had a meeting on a separate but very similar project at Cedar Creek that we are now applying for as well. This and other projects were discussed at

**VII. Statement of Certification/Determination and Signature** (Check one and sign below):

☒ **FEDERAL AGENCY CONSISTENCY DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity is consistent to the maximum extent practicable with the enforceable policies of the Delaware Coastal Management Program.

OR

☐ **FEDERAL AGENCY NEGATIVE DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity will not have any reasonably foreseeable effects on Delaware's coastal uses or resources (Negative Determination) and is therefore consistent with the enforceable policies of the Delaware Coastal Management Program.

OR

☐ **NON-FEDERAL APPLICANT'S CONSISTENCY CERTIFICATION.** Based upon the information, data, and analysis included herein, the non-federal applicant for a federal license or permit, or state or local government agency applying for federal funding, listed in (I) above, finds that this proposed activity complies with the enforceable policies of the Delaware Coastal Management Program and will be conducted in a manner consistent with such program.

| | | | |
|---|---|---|---|
| Signature: | BRIAN MARSH Digitally signed by BRIAN MARSH Date: 2026.11.05 08:34:03 -05'00' | | |
| Printed Name: | | Date: | |

Pursuant to 15 C.F.R. Part 930, the Delaware Coastal Management Program must provide its concurrence with or objection to this consistency determination or consistency certification in accordance with the deadlines listed below. Concurrence will be presumed if the state's response is not received within the allowable timeframe.

**Federal Consistency Review Deadlines:**

| | |
|---|---|
| Federal Activity or Development Project<br>(15 C.F.R. Part 930, Subpart C) | 60 days with option to extend an additional 15 days or stay review (15 C.F.R. § 930.41) |
| Federal License or Permit<br>(15 C.F.R. Part 930, Subpart D) | Six months, with a status letter at three months. The six month review period can be stayed by mutual agreement. (15 C.F.R. § 930.63) |
| Outer Continental Shelf Activity<br>(15 C.F.R. Part 930, Subpart E) | Six months, with a status letter at three months. If three month status letter not issued, then concurrence presumed. The six month review period can be stayed by mutual agreement. (15 C.F.R. § 930.78) |
| Federal Financial Assistance to State or Local Governments<br>(15 C.F.R. Part 930, Subpart F) | State Clearinghouse schedule |

**OFFICIAL USE ONLY:**

| | | |
|---|---|---|
| Reviewed By: | Fed Con ID: | Date Received: |
| Public notice dates: to | Comments Received: ☐ NO ☐ YES *[attach comments]* | |
| Decision type:<br>*(objections or conditions attach details)* | Decision Date: | |

# PROJECT NARRATIVE

## Project title: Murderkill Salt Marsh Hydrological Modification

## PROJECT PARTNERS

Delaware Division of Fish and Wildlife (landowner), U.S. Fish and Wildlife Service Delaware Bay Coastal Program, Ducks Unlimited, and Partnership for the Delaware Estuary

## PROJECT LOCATION

Hall Tract, Milford Neck Wildlife Area, Kent County, Delaware. The site is a 58-acre area of salt marsh south of the community of Bowers Beach, Delaware and north of the Murderkill River.

Project center is at approximately 39.046 N -75.4000 E.

Parcel Number: 8-00-12300-01-2025-00001

## PROJECT GOAL

Make the area more resilient by reducing inundation rates which will lead to revegetation and increased health of existing vegetation which in turn will increase biological and sediment accretion that will help decrease degradation and help the marsh keep pace with sea level rise. Improved vegetation will increase overall productivity of the area and provide better habitat for avian nesters, forage fish, and other groups of species.

## SITE CONDITION AND HISTORY

In 2022, we identified the approximately 260 acres of salt marsh of the Hall Tract as having potential for salt marsh restoration. In 2023, we selected a 58-acre portion along the Murderkill River to assess for appropriate restoration designs by primarily looking at hydrology and elevation but also examining the avian, plant, and nekton communities from 2023 to 2025. We selected this portion of the site because of ponded water on the marsh platform during low tides, indications of stressed vegetation, areas where vegetation has converted to bare sediment, and the presence of shallow ponding that is likely to expand.

All work proposed for this project is on State-owned land. We still may assess and pursue restoration of other areas of the tract's 260 acres of salt marsh as future separate actions.

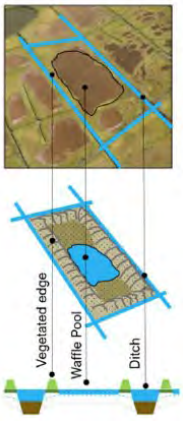
The Murderkill site lies along the Murderkill River and close to the mouth of the river. The site receives sediment from both up and especially downstream tidal flows. The entire project area is salt marsh and surrounded by additional salt marsh or the Murderkill River. The platform across the site is mostly intact and mostly walkable although bisected by remanent ditches that have become effective tidal channels with a tidal range of approximately 2.2 ft.

The area was ditched extensively in the 1930s by the Civilian Conservation Corps. The ditches may have been cleaned out or expanded sometime in the mid-20$^{th}$ century. An aerial image from 1968 that is at the end of this narrative clearly shows the layout of ditches.

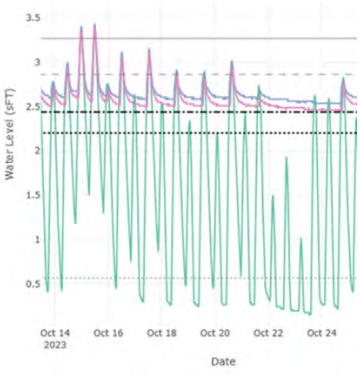
Vegetation across most of the site is short form *Spartina alterniflora* (syn *Sporobolus alterniflorus* or smooth cordgrass) with a few small patches of *Spartina patens* (syn *Sporobolus pumilus*, salt meadow cordgrass, or salt hay) and *Distichlis spicata* (saltgrass). The site has likely been gradually converting from high marsh to low marsh. Maps at the end of this narrative from Coxe (2012) show the decrease of high marsh from 1937 to 2007 and we now see little of the high marsh left that was still present in 2007.

The Murderkill site has sediment accretion and marsh degradation in a pattern often seen on ditched marshes. The marsh platform should be less inundated and saturated than it is based on tidal datums we calculated from water level data from the site. Our assessment indicates water remains on the surface due to three main reasons. First, the site has likely become flatter due to the history of ditching causing a loss of the subtle gradients that allow an unaltered marsh to drain despite having few channels. Second, high tides can flood the marsh but do not completely ebb from the marsh during each tidal cycle because pockets of platform have lower elevations than the edges of ditches. The edges of channels in a salt marsh often have subtle microberms along them because sediment in tidal water drops out in these areas before getting onto the marsh platform. Microberms are enhanced in a salt marsh that has been ditched because the ditches increase the channel density which decreases tidal energy and causes the sediment to be less likely to be pushed further onto the marsh platform. Third, as marsh in between channels becomes more saturated or inundated throughout the tidal cycle, vegetation health decreases causing a reduction in belowground growth (i.e., biological accretion) that is particularly important in Mid-Atlantic salt marsh for gaining elevation. As the marsh between ditches loses accretion abilities, the elevation deficit relative to the ditch edges gets increased causing more ponding, further vegetation stress or loss, further relative negative accretion compared to the ditch edges, and so on as shown in the below diagram from Smith et al. (2021). Our assessment data provide evidence of the degraded condition on the marsh.

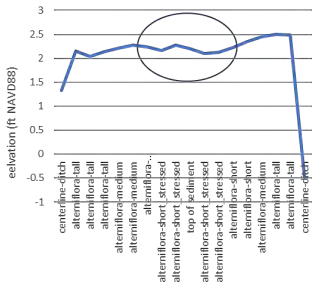
*Diagram from Smith et al. 2021 showing pool formation due to elevation deficits between ditches compared next to ditches.*

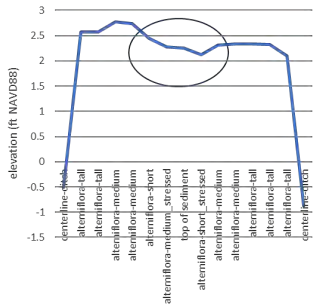



We had Hobo water level loggers in place at the site from August through December 2023. Two were placed on the surface and one in a ditch that has converted to a large functional tidal channel. A map at the end of the narrative shows where the loggers were located. The graph below shows the water logger data from a representative example of time. The blue (Murder_surface_1 logger) and pink (Murder_surface_2) lines show the surface water levels in contrast to the platform elevation where the loggers are located (dashed lines) and of the tidal channel water level data in green. The higher tides in the channel show water levels that can access the platform but the surface water slowly drops and usually at least some is still on the surface by the next high tide. The fact that the channel water levels are sometimes not high enough to access the platform at all show the platform is still relatively high and should not be so persistently inundated as we find it. This can be addressed by runnels, shallow hand dug channels that enhance the connection between the platform and the existing channels.




Biobenchmark points were recorded across the site. These are points where both the elevation and type of vegetation cover are recorded. Biobenchmarks are not taken at random points but instead are taken at representative areas of the particular type of cover and usually where at least two square contiguous meters around the point are predominantly that kind of cover. The relatively low elevation spots between the ditches can be seen by plotting the data. For example, the two graphs below show profiles of transects shown in the corresponding maps where runnels are proposed. Digging runnels will connect these lower areas of marsh with the neighboring channels.








The below table shows tidal datums we calculated from the water level data of the project area compared to the elevation of the water level loggers on the surface and their calculated current inundation rates. The inundation rates are close to 100% despite the loggers being at elevations (2.20 and 2.41 ft) close to the corresponding mean high water of the nearby channel (2.59 ft). The site is a good candidate for hydrological restoration because this elevation capital (i.e., positive relief relative to the tideshed and local tidal datums) provides evidence that runnels will be effective.

| | MLW | MTL | MHW | logger elev | inundation* |
|---|---|---|---|---|---|
| Murder_channel_1 | 0.42 | 1.51 | 2.59 | - | - |
| Murder_surface_1 | 2.57 | 2.64 | 2.71 | 2.20 | 100% |
| Murder_surface_2 | 2.49 | 2.59 | 2.68 | 2.41 | 97% |

*Percent of 15 minute intervals that the logger collected data showing inundation

The below table shows inundation rates calculated from water levels in one of the channels that would likely occur on the marsh platform near the site's channels if runnels were created. The table suggests the locations of the two surface water level loggers should be inundated approximately 40% or less which is a good inundation rate for healthy *S. alterniflora* but instead these areas have bare sediment and nearly 100% inundation because the lack of drainage that runnels could improve.

| elev ft | % inundated |
|---|---|
| 3.25 | 3.11 |
| 3 | 7.39 |
| 2.75 | 17.12 |
| 2.5 | 33.85 |
| 2.25 | 40.47 |
| 2 | 44.94 |
| 1.75 | 48.44 |
| 1.5 | 50.19 |

# PROPOSED PLAN

We propose approximately 1,651 linear ft of runnels at this site to help the hydrology and allow the vegetation to improve which will increase resilience and habitat value. The intent is mostly to reestablish healthy *S. alterniflora* but the few remaining high marsh patches in the project area will benefit as well.

The runnels will be shallow channels cut through marsh platform where there is typically not evidence of previous ditches or natural channels. The runnels connect existing negative relief to regain tidal influence and may or may not be to the invert elevation or below of the area they target for increased drainage. Runnels restore more effective tidal influence on the flood and especially ebb tides and reduce platform inundation rates.

We plan an estimated thirteen sections of runnel. The depth of runnels will vary but average approximately 0.6 ft below the surrounding platform elevation and will not be deeper than 1 foot. The width of runnels will also vary but the average will be approximately 10 inches or less and will not be wider than 1 foot. We expect the amount of material to be removed during runnel creation to be at most 61 cyd. The actual volume will likely be considerable less. The volume of 61 cyd assumes all widths and depths are at a maximum and the runnels have vertical sides instead of slightly sloping sides.

The runnels will be hand dug. Although the site has relatively firm platform to allow low ground pressure equipment to be used in some area, our planned width and depth of the runnels is too narrow and shallow for equipment to be effectively used and some of the ditches that are now tidal creeks are too wide and deep for some kinds of equipment to reasonably cross.

Without runnels, the most likely trajectory for the salt marsh at this site is for the ponding to continue and expand into surrounding stressed vegetation and expand vertically as peat breaks down and converts to unconsolidated sediment. As pools develop deeper unconsolidated bottoms, the relative elevation capital of the platform will be lost and there would be no way to regain the vegetated marsh surface without some very costly intervention to regain elevation such as beneficial use of dredged material. Once the marsh became degraded enough, there then would be a chance of the Murderkill River eroding into the area with a worst-case scenario of the marsh being lost. Without intervention, the best-case but unlikely scenario to take place throughout the site would be the ponding areas create their own natural runnels to reconnect to the tidal channels.

## Habitat Mounds

Material removed from creating runnels will be placed into habitat mounds. Mounds will be placed mostly in low unvegetated areas on the marsh platform and close to where the material will be removed

from. Material will be shoveled directly from the runnel area to the mound areas or conveyed a short distance using a hand-pulled marsh sled. Mounds will be approximately 0.5 ft high. We will gently press the mounds flat so they create a surface for *S. patens* or other vegetation to grow, so they do not have small pockets that will produce mosquitoes, and so that high uneven areas are avoided that would quickly break down (i.e., oxidize). The maximum of 61 cyd of material removed from runneling will mostly be saturated peat that will quickly be reduced in volume due to dewatering, settling, and breaking down.

Mound locations are depicted on the plans as approximate. Exact locations will be determined at the time of placement based on marsh condition. The diameter of the mounds will vary based on the amount of material being removed in the immediate area. Mound sizes will vary but average approximately 25 $ft^2$ in extent and contain approximately 0.46 cyd. Based on a maximum of 61 cyd of material removed, we expect the total number of mounds may be up to approximately 133 and cover up 3,325 $ft^2$ for permitting but these are the maximums and the actual will likely be well under this. Based on our recent experience creating runnels at Prime Hook National Wildlife Refuge in Delaware, we expect much less material than estimated.

### Timeline

All work will be done outside of the growing and nesting season approximately in March 2027. All runnels will likely be implemented during one scheduled effort to the degree resources allow. The project will likely take two to three days.

### Minimizing impacts to the marsh

Impacts to the salt marsh will be minimized. The proposed plan involves doing only a limited amount of runneling to minimize disturbance and to ensure the desired changes happen without unintended effects on the marsh. Construction will take place outside of the growing season and nesting season. Most of the marsh platform at the Murderkill project area is still firm and can be walked on with little threat of compaction. We will use established paths, single entry points to the site, and walk on planks across the softest areas to further reduce disturbance. We do not propose using equipment. The work can be done more efficiently and effectively at a lower cost by hand than with equipment. The plan minimizes sediment redistribution or sediment loss because we will keep the runnels shallow and most of the runnels will be dug into peat rather than unconsolidated sediment.

## MAINTENANCE AND ADAPTIVE MANAGEMENT PLAN

We do not expect extensive maintenance but do think the project will have greater success with some occasional maintenance by hand to remove mobilized sediment that has accreted in constriction points in runnels and potentially to remove new *S. alterniflora* re/growth (vertically or horizontally) in these areas where it causes restrictions.

As tidal influence is restored, the flows in the reopened channels may alter channel size to fit the flow in them. This will be natural and expected leading to a new and more stable state closer to equilibrium for the project area.

## MONITORING

The five variables listed below will demonstrate success for the project. One through three will begin to happen within one tidal cycle of implementation and can be measured by continuing to have water level loggers in approximately the current locations at least during the growing season. Four and five will begin to be seen after one growing season but will likely take three growing seasons. Four and five will be monitored with the least disturbance and cost by observing the areal extent of vegetation as evidenced by

ground and drone imagery from set x, y, and z coordinates during low tides at the end of the growing season for at least 3 years.

1) Reduced water levels on the marsh soon after implementation.
2) Reduced inundation rates of water on the marsh soon after implementation.
3) Increased agreement between the tidal patterns on the marsh surface and channel network.
4) Reduced loss in vegetation from horizontal expansion of pools and bare areas.
5) Return of vegetation and increased vegetation density that are currently bare sediment or mostly bare sediment.

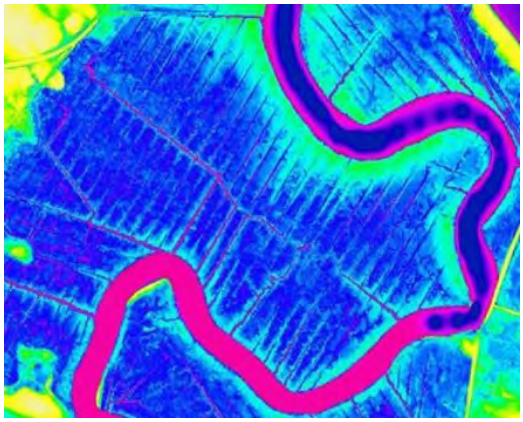
# REFERENCES

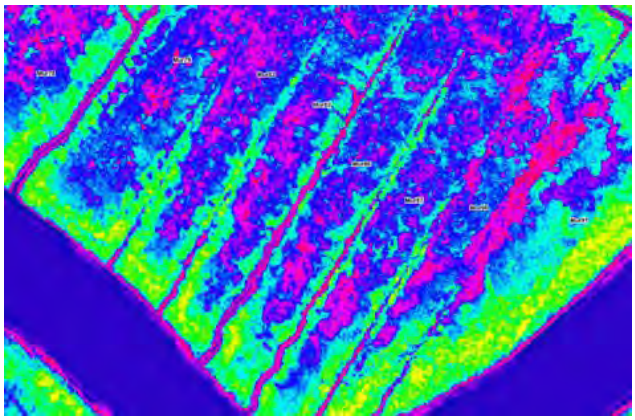
Coxe, R. 2012. Historical Analysis and Map of Vegetation Communities, Land Covers, and Habitats of Milford Neck Wildlife Area Kent County, Delaware. Completed for Delaware Natural Heritage and Endangered Species Program.

Smith, J.A.M., S.C. Adamowicz, G.M. Wilson, and I Rochlin. 2021. “Waffle” Pools in Ditched Salt Marshes: Assessment, Potential Causes, and Management. Wetlands Ecology and Management 2021,30(5):1081–1097.

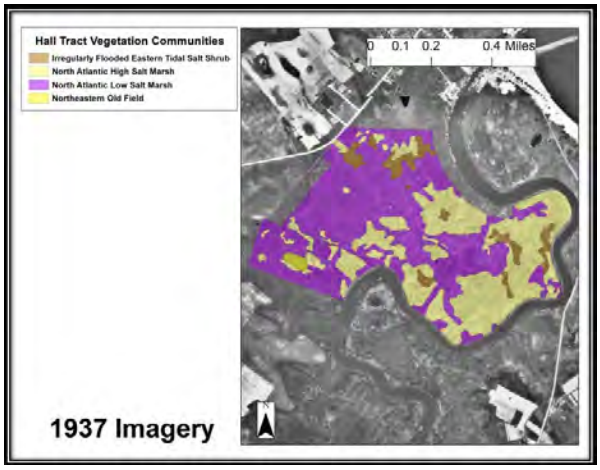
# FIGURES

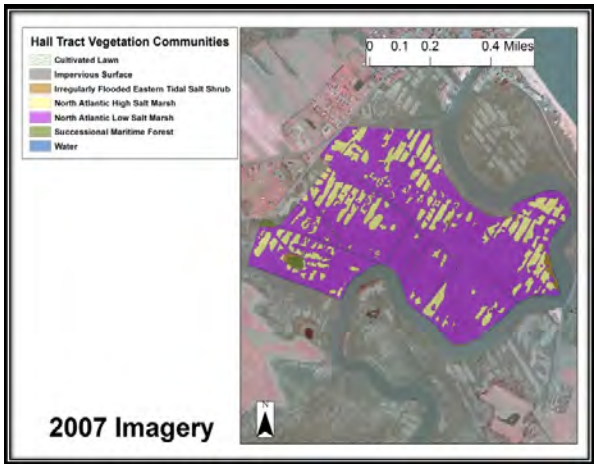
*2015 LiDAR: Lighter greens and yellows are higher elevations whereas reds and blues are lower elevations. The second image zooms into the southeastern section of the project area and cleary shows how the platform between the ditches is lower than the edges of the ditches which leads to trapped water on the ebb tide.*





*1937 map of vegetation compared to a 2007 map of vegetation communities on the Hall Tract showing the decrease in high marsh (Coxe 2012).*




*1936 image from the Delaware State Archives of the Hall Tract during ditching*



*1968 aerial showing extensive ditching*



*Image from a plane circa 1970 from the State Archives looking southwest over the Murderkill River with the project area in the left of the background. Many of the ditches have since begun to fill in and heal the marsh surface with exceptions where runnels would be beneficial.*

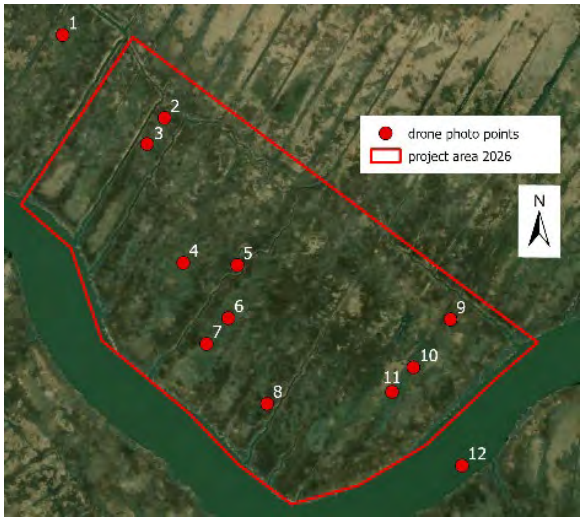


*Map of water level logger locations*




## SITE PHOTOS - DRONE IMAGES

*Image locator*



*Drone photo 1: Looking southeast. 3/31/2026*



*Drone photo 2: Looking straight down at functional tidal channels next to marsh that persistently has standing water and is targeted for runnels. 3/31/2026*



*Drone photo 3: Looking southwest over area targeted for runnels. 3/31/2026*



*Drone photo 4: Looking southeast at area targeted for runnels on either side of the ditch that has naturalized into an effective tidal creek. 3/31/2026*



*Drone photo 5: Looking southwest at area targeted for runnels on either side of the ditch that has naturalized into an effective tidal creek. 3/31/2026*



*Drone photo 6: Looking straight down at area targeted for runnels. 9/26/2025*



*Drone photo 7: Looking straight down at area targeted for runnels. 9/26/2025*



*Drone photo 8: Looking straight down at area targeted for runnels. 9/26/2025*



*Drone photo 9: Looking southwest over area targeted for runnels. 3/31/2026*



*Drone photo 10: Looking straight down at area targeted for runnels. 9/26/2025*



*Drone photo 11: Looking straight down at area targeted for runnels. 9/26/2025*



*Drone photo 12: Looking northwest. 3/31/2026*



# SITE PHOTOS - GROUND IMAGES

*Image locator*




*Ground photo 1: Showing vegetation starting to die and ponding beginning in an area where runneling will benefit the salt marsh. 10/17/2024*



*Ground photo 2: Showing stressed vegetation and ponding beginning in an area that will benefit from runneling. 10/17/2024*



*Ground photo 3: Ponding on the salt marsh. Despite the persistent ponding throughout the tidal cycle, the elevation of an area like this is above mean tide level in the nearby ditches showing that enough elevation capital is present to support effective runneling. 8/2/2023*



*Ground photo 4: Ponding and low-density short form S. alterniflora that will be improved by runneling. 10/25/2024*

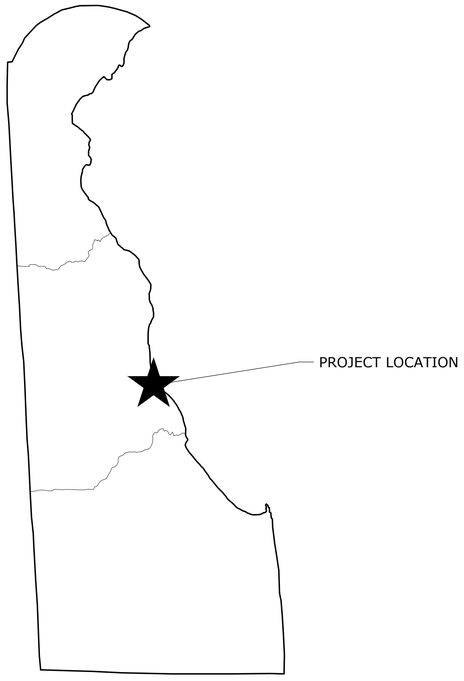


# MURDERKILL
# SALT MARSH RESTORATION

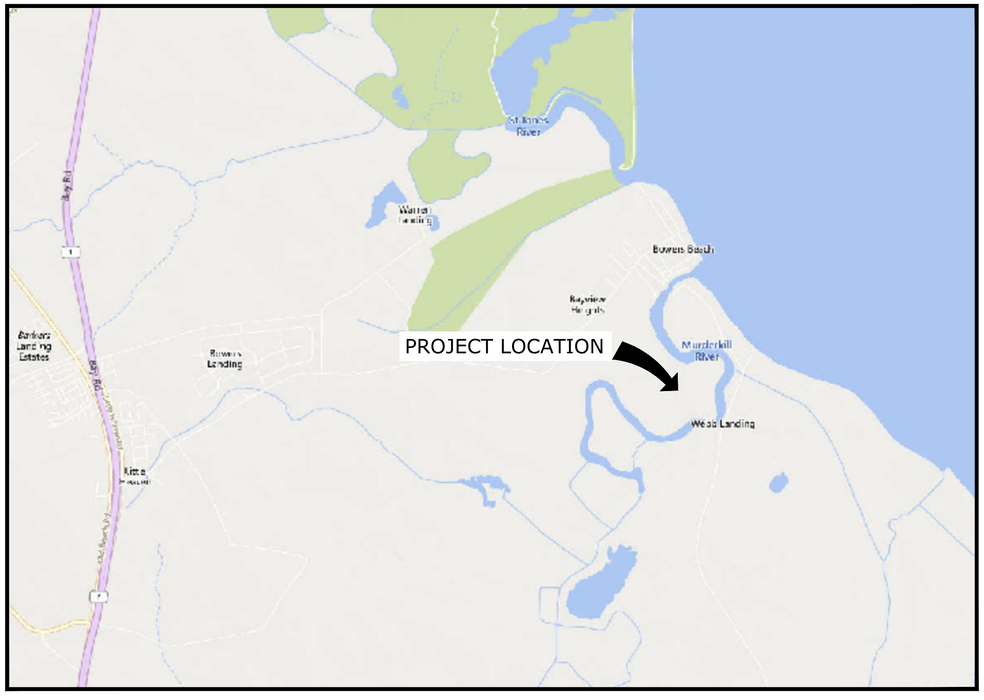
## MILFORD NECK WILDLIFE AREA
## KENT COUNTY, DELAWARE

IN COOPERATION WITH

## U.S. FISH AND WILDLIFE SERVICE




DELAWARE




PROJECT LOCATION MAP

SCALE: NOT TO SCALE

| SHEET LIST TABLE | |
|---|---|
| SHEET NUMBER | SHEET TITLE |
| C001 | COVER SHEET |
| C101 | OVERALL SITE PLAN |
| C102 | SITE PLAN 1 |
| C301 | DETAILS |

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www.ducks.org
DUCKS UNLIMITED


AFFIX SEAL: DUCKS UNLIMITED, INC.
ON:

COVER SHEET
MURDERKILL
KENT COUNTY, DE

| Revision | Sheet | Revisions | Date | By |
|---|---|---|---|---|

CAD FILE: NJ-100-5 MURDERKILL COVER
DESIGNED BY: LL
DRAWN BY: ZB / JB
SURVEYED BY:
BIOLOGIST: JF
DATE: 8/12/26
PROJECT NUMBER: US-NJ-100-5
C001


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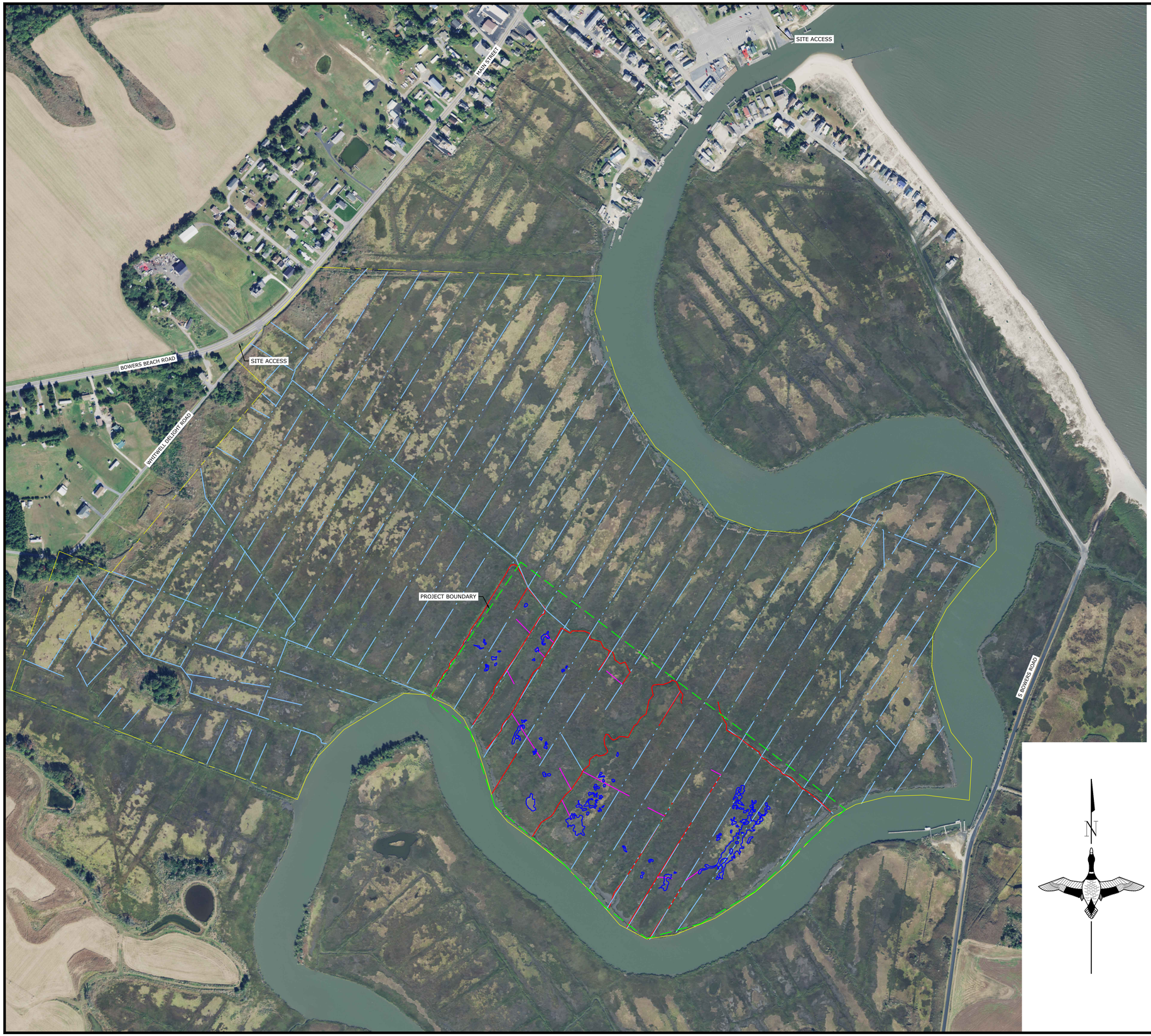


## LEGEND

- PROJECT BOUNDARY
- PROPOSED RUNNEL
- EXISTING OPEN WATER
- EXISTING DITCHES
- EXISTING TIDAL CHANNELS
- APPROXIMATE PROPERTY LINE

| TIDAL PARAMETERS | |
|---|---|
| | MURDERKILL RIVER AT BOWERS, DE |
| MHHW | 3.27 |
| MHW | 2.86 |
| MSL | 0.57 |
| MTL | 0.57 |
| DTL | 0.70 |
| MLW | -1.73 |
| MLLW | -1.87 |

NOTES:

1. "MURDERKILL RIVER AT BOWERS, DE" IS THE USGS REFERENCE TIDE GAUGE FOR THIS PROJECT. IT IS LOCATED NORTH OF THE PROJECT LOCATION IN THE MOUTH OF THE MURDERKILL RIVER.
2. SURFACE, GROUND WATER AND CHANNEL LOGGER DATA WAS PROVIDED BY UNITED STATES FISH AND WILDLIFE SERVICE (USFWS) STAFF.
3. ALL VALUES SHOWN ARE IN US SURVEY FEET NAVD88.
4. DATA WAS COLLECTED FROM AUGUST 2023 THROUGH DECEMBER 2023.

DRAWING NOTES:

1. PROJECT COORDINATES AND THIS DRAWING ARE NAD83 2011, DELAWARE STATE PLANE COORDINATES SYSTEM, UNITS U.S. SURVEY FEET. THE VERTICAL DATUM IS NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
2. EXISTING FEATURES SUCH AS OPEN WATER, DITCHES, TIDAL CHANNELS, AND PROPERTY LINES SHOWN WERE PROVIDED BY U.S. FISH AND WILDLIFE SERVICE (USFWS), DUCKS UNLIMITED (DU), AND OTHER EXTERNAL SOURCES.
3. EXISTING CHANNELS WERE OUTLINED BY DU BIOLOGISTS TO SHOW THE CONTEMPORARY FUNCTIONAL MAJOR FLOW PATHS ORIGINATING FROM MURDERKILL RIVER. THE EXISTING CHANNELS SYMBOLOGY DEFINE THE DRAINAGE AREAS AND ARE COMPARED WITH HYDROLOGY PATTERNS WITHIN THESE DRAINAGE AREAS.
4. HISTORIC DITCHES WERE TAKEN FROM DITCH LAYERS OBTAINED FROM EXTERNAL SOURCES. HISTORIC DITCHES SYMBOLOGY DENOTES OLD DITCHES THAT ARE STILL DISCERNIBLE FROM AERIALS, BUT SOME HAVE FILLED IN OVER TIME AND MAY NO LONGER BE ACTIVE. SOME EXISTING CHANNELS SHOWN ARE REMNANTS OF HISTORIC DITCHES THAT EITHER REMAINED WITHIN THE EXACT FOOTPRINT OF THE FORMER DITCHES AND/OR CREATED/RE-CREATED THEIR OWN FLOW PATH.
5. FIELD OBSERVATIONS AND SITE RECONNAISSANCE WAS CONDUCTED BY USFWS, DU, PARTNERSHIP FOR THE DELAWARE ESTUARY (PDE), ENTOSTAT, AND OTHER PARTNERS.
6. PROJECT AND DESIGN GOALS WERE SET BY USFWS. IMPLEMENTATION SHALL BE CARRIED OUT BY USFWS STAFF.
7. ALL LOCATIONS FOR PROPOSED ITEMS ARE APPROXIMATE AND THE FINAL PLACEMENT SHALL BE DETERMINED IN THE FIELD BY THE USFWS STAFF ACCORDING TO EXISTING SITE CONDITIONS.
8. EVERY EFFORT SHALL BE MADE TO MINIMIZE IMPACTS TO THE SITE. NO HEAVY MACHINERY SHALL BE USED IN THE MARSH AND ALL IMPLEMENTATION SHALL BE DONE BY HAND. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE USED WHERE POSSIBLE.
9. HABITAT MOUNDS WILL BE CREATED FROM SIDE CAST MATERIALS FROM RUNNELING WILL NOT EXCEED LOCAL MHW TO MHHW ELEVATIONS AFTER SETTLING. FINAL LOCATIONS WILL BE DETERMINED AND RECORDED DURING CONSTRUCTION.
10. ALL PROPERTY LOCATED WITHIN THE PROJECT BOUNDARY BELONGS TO THE DELAWARE DIVISION OF FISH AND WILDLIFE.
11. ONLY LARGER, MORE PROMINENT OPEN WATER FEATURES ARE DELINEATED.

GRAPHIC SCALE

300 0 150 300 600 1200

1 inch = 300 feet

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www.ducks.org
DUCKS UNLIMITED

AFFIX SEAL: DUCKS UNLIMITED, INC.

ON:

# OVERALL SITE PLAN
# MURDERKILL
# KENT COUNTY, DE

| | By | Date | Revisions | Sheet | Revision |
|---|---|---|---|---|---|
| | | | | | |

CAD FILE:
NJ-100-5 MURDERKILL SITE PLAN

DESIGNED BY: LL
DRAWN BY: ZB / JB
SURVEYED BY:
BIOLOGIST: JF
DATE:
8/12/26
PROJECT NUMBER:
US-NJ-100-5

C101

**NOT FOR CONSTRUCTION**

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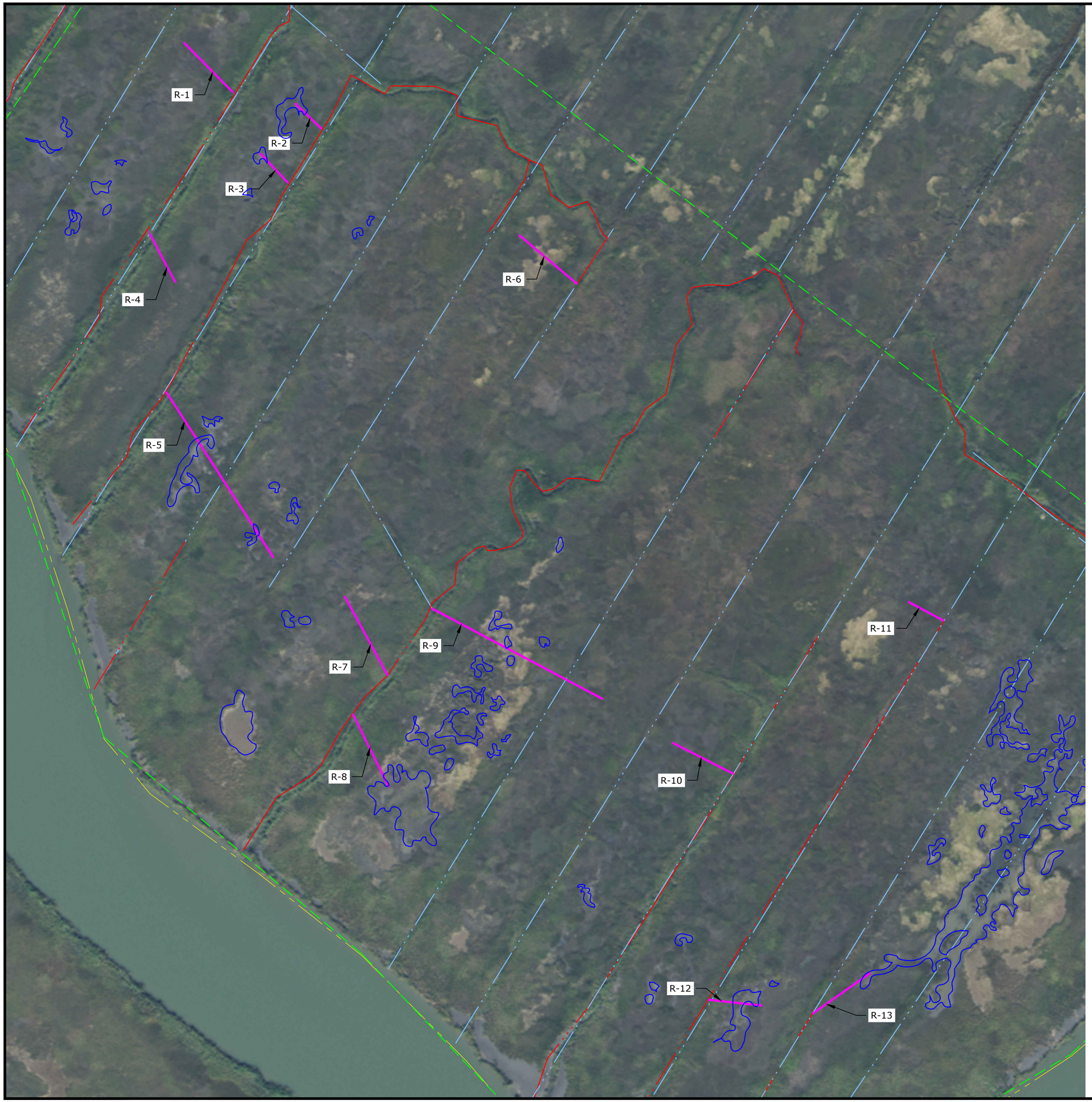


## LEGEND

- PROJECT BOUNDARY
- PROPOSED RUNNEL
- EXISTING OPEN WATER
- EXISTING DITCHES
- EXISTING TIDAL CHANNELS
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N

GRAPHIC SCALE

80 0 40 80 160 320

1 inch = 80 feet

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AFFIX SEAL: DUCKS UNLIMITED, INC.

ON:

# SITE PLAN 1
# MURDERKILL
# KENT COUNTY, DE

| Revision | Sheet | Revisions | Date | By |
|---|---|---|---|---|
| | | | | |

CAD FILE: NJ-100-5 MURDERKILL SITE PLAN

DESIGNED BY: LL

DRAWN BY: ZB / JB

SURVEYED BY:

BIOLOGIST: JF

DATE: 8/12/26

PROJECT NUMBER: US-NJ-100-5

C102

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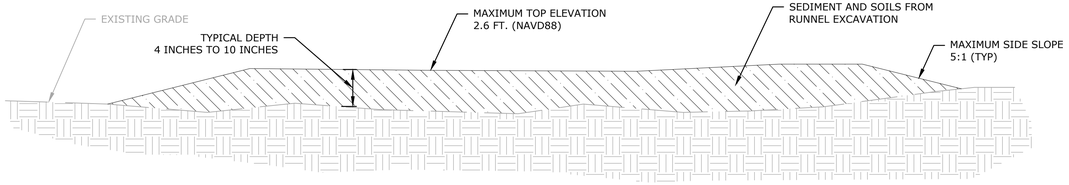
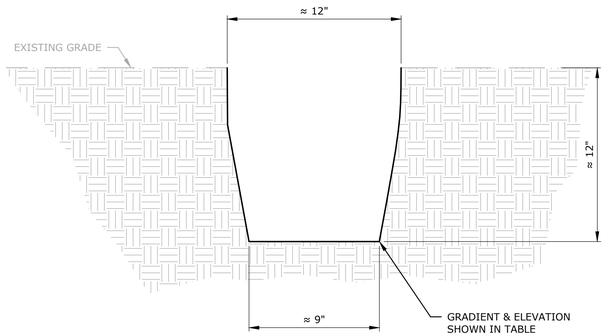



## TYPICAL HABITAT MOUND CROSS SECTION

NOT TO SCALE



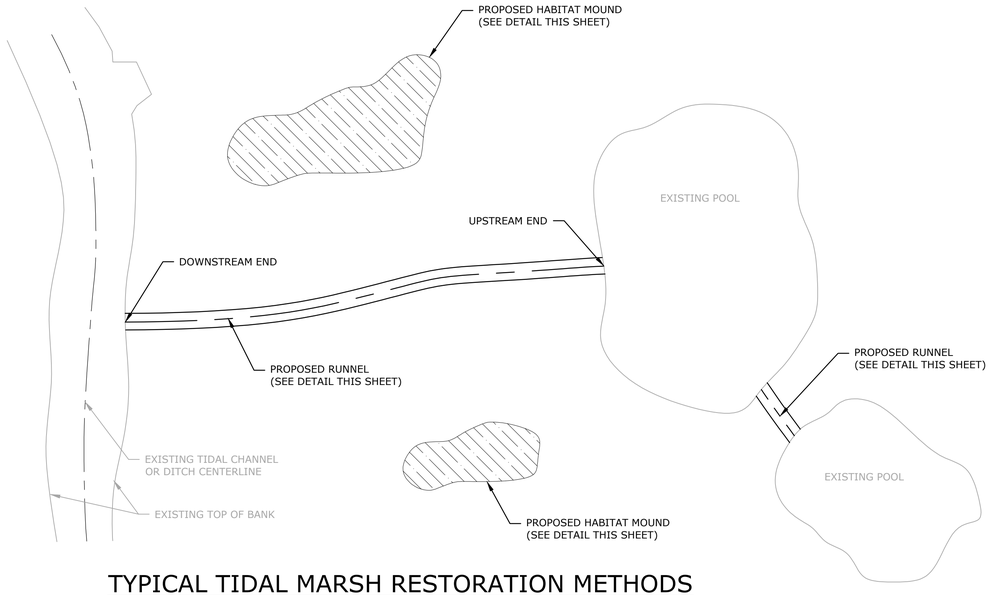

## TYPICAL RUNNEL EXCAVATION CROSS SECTION

NOT TO SCALE

| RUNNEL ID | UPSTREAM ELEVATION | DOWNSTREAM ELEVATION | SLOPE (%) | APPROX. LENGTH (FT) | UPSTREAM NORTHING | UPSTREAM EASTING | DOWNSTREAM NORTHING | DOWNSTREAM EASTING | QTY OF MATERIAL (CY) |
|---|---|---|---|---|---|---|---|---|---|
| R-1 | 2.4 | 0.3 | 2.0 | 106 | 79922.31 | 235768.23 | 79846.55 | 235843.06 | 3.9 |
| R-2 | 2.1 | 1.0 | 2.0 | 56 | 79828.86 | 235939.62 | 79789.88 | 235979.88 | 2.1 |
| R-3 | 2.1 | 0.5 | 2.6 | 62 | 79751.87 | 235885.55 | 79706.75 | 235928.26 | 2.3 |
| R-4 | 2.6 | 0.5 | 2.5 | 84 | 79553.05 | 235754.95 | 79627.49 | 235715.98 | 3.1 |
| R-5 | 2.4 | 0.9 | 0.5 | 304 | 79129.02 | 235906.18 | 79380.13 | 235743.69 | 11.3 |
| R-6 | 2.5 | 1.5 | 0.8 | 117 | 79625.92 | 236284.41 | 79550.61 | 236373.82 | 4.3 |
| R-7 | 2.3 | 1.1 | 0.9 | 139 | 79069.52 | 236015.86 | 78947.54 | 236082.03 | 5.1 |
| R-8 | 2.5 | 1.4 | 0.8 | 126 | 78796.13 | 236077.11 | 78883.24 | 236030.99 | 4.7 |
| R-9 | 2.5 | 1.0 | 0.5 | 298 | 78911.14 | 236413.48 | 79050.47 | 236150.63 | 11.0 |
| R-10 | 2.4 | 1.0 | 1.3 | 105 | 78843.84 | 236520.76 | 78796.00 | 236614.49 | 3.9 |
| R-11 | 2.6 | 2.4 | 0.4 | 62 | 79060.91 | 236884.01 | 79031.59 | 236938.72 | 2.3 |
| R-12 | 2.3 | 1.8 | 0.6 | 83 | 78438.93 | 236658.33 | 78448.09 | 236575.74 | 3.1 |
| R-13 | 2.2 | 2.1 | 0.1 | 109 | 78489.03 | 236825.11 | 78426.49 | 236736.33 | 4.0 |

## RUNNEL LAYOUT TABLE

NOTE: ALL ELEVATIONS SHOWN ARE IN NAV88




## TYPICAL TIDAL MARSH RESTORATION METHODS

NOT TO SCALE

RUNNEL AND HABITAT MOUND NOTES:

1. MATERIAL EXCAVATED FROM THE RUNNELS SHALL BE USED FOR THE HABITAT MOUNDS. THE LOCATION FOR THE HABITAT MOUNDS WILL BE UP TO THE DISCRETION OF THE FISH AND WILDLIFE FIELD STAFF.
2. HABITAT MOUNDS SHALL BE PLACED IN SUCH A MANNER THAT WILL NOT PREVENT THE DRAINAGE OF WATER FROM THE MARSH SURFACE TO THE PROPOSED RUNNELS.
3. ALL MATERIAL EXCAVATED WILL REMAIN ONSITE AND NO MATERIAL SHALL BE PLACED ABOVE ELEVATION 2.6 FEET (NAVD88).
4. DOWNSTREAM END OF RUNNEL SHALL DAYLIGHT INTO EXISTING TIDAL CHANNEL OR DITCH AND UPSTREAM END OF RUNNEL SHALL BE CUT INTO EDGE OF EXISTING POOL OR OVERLY SATURATED AREAS WHERE WATER IS REPEATEDLY INUNDATING THE MARSH (SEE TYPICAL RUNNEL CROSS SECTION).
5. THE AREAL SIZE OF THE HABITAT MOUNDS WILL VARY BASED ON THE AMOUNT OF MATERIAL BEING REMOVED IN THE IMMEDIATE AREA AND THE SIZE OF THE DEGRADED MARSH AREA WHERE THE MOUND IS BEING PLACED. MOST MOUNDS WILL BE 25 SQFT ON AVERAGE.

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AT THE USERS SOLE RISK. BY USING ANY OF THIS MATERIAL, DATA AND INFORMATION, USER AGREES THAT DUCKS UNLIMITED, INC. IS NOT RESPONSIBLE FOR THEIR USE OF THE MATERIAL, DATA AND INFORMATION OR THE RESULTS THEREOF.
P.E. & SURVEYOR STAMP: ALL PLANS, DESIGNS, SPECIFICATIONS, AND REPORTS PREPARED FOR OR SUBMITTED TO DUCKS UNLIMITED, INC. FOR USE IN PERMITTING OR CONSTRUCTION SHALL BEAR THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

C:\Users\zbaroudi\OneDrive - Ducks Unlimited Incorporated\GLARC3D - Documents\NJ\NJ0100010 Murderkill\C3D_DRAWING\NJ-100-5 MURDERKILL SITE PLAN.dwg, 8/12/2026 9:31 AM, Zaryn Baroudi, DETAILS, None

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GREAT LAKES/ATLANTIC REGIONAL OFFICE
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DEXTER, MICHIGAN 48130
(734) 623-2000
www.ducks.org

AFFIX SEAL: DUCKS UNLIMITED, INC.

ON:

DETAILS
MURDERKILL
KENT COUNTY, DE

| By | Date | Revisions | Sheet | Revision |
|---|---|---|---|---|
| | | | | |

CAD FILE:
NJ-100-5 MURDERKILL SITE PLAN
DESIGNED BY: LL
DRAWN BY: ZB, JB
SURVEYED BY:
BIOLOGIST: JF
DATE:
8/12/26
PROJECT NUMBER:
US-NJ-100-5

C301

811 Know what's below. Call before you dig.

FOR PERMIT

NOT FOR CONSTRUCTION

# INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

| | | | |
|---|---|---|---|
| **Project Name:** | Salt Marsh Hydrological Modification at Delaware Salt Marshes: Port Mahon, Murderkill, Cedar Creek, and Buckaloo | **Originating Person:** | Brian Marsh |
| **Landowner:** | Delaware Division of Fish and Wildlife | **Telephone number:** | [redacted] |
| **Project Address:** | Multiple sites | **Email:** | [redacted] |
| **County:** | Kent and Sussex Counties, DE | **Date:** | 5/11/2026 |

**I. Region:** R5 - Northeast

**II. Service Activity (Program):** The Delaware Bay Coastal Program (DBCP) proposes to restore the hydrology of salt marsh at four State-owned sites in Delaware: Davey Crockett Tract (aka Port Mahon site) of the Little Creek Wildlife Area, Kent County; Hall Tract (aka Murderkill site) of the Milford Neck Wildlife Area, Kent County; Cedar Creek Tract (aka Cedar Creek site) of the Milford Neck Wildlife Area, Sussex County; and Buckaloo Tract (aka Buckaloo site) of the Ted Harvey Conservation Area, Kent County (an adjoining private property may be hydrologically affected too but not require access). The work proposed primarily involves doing ditch maintenance to partly clear out old mosquito ditches and to create runnels. Improved hydrology will reduce excessive saturation and inundation on the marsh that is causing ongoing vegetation loss, habitat loss, and resilience loss. For the Cedar Creek site, we also propose to move accumulated peat-like material from Cedar Beach (north end of Slaughter Beach) and place it on the marsh to restore elevation and high marsh substrate while temporarily improving horseshoe crab spawning and shorebird foraging habitat on Cedar Beach.

DBCP will do some of the work ourselves and we propose to partly do the implementation of this work through a Cooperative Agreement with American Conservation Experience and likely a Cooperative Agreement with the Delaware Mosquito Control Section. We will also be submitting to the Corps for either use of one Nationwide 27 approval to cover the four projects or submitting for four separate uses of Nationwide 27.

**III. Pertinent Species and Habitat:**

**A. Listed species and/or their critical habitat within the action area:**

- eastern black rail (*Laterallus jamaicensis ssp. jamaicensis*)
- rufa red knot (*Calidris canutus rufa*)

**B. Proposed species and/or proposed critical habitat within the action area:**

- monarch (*Danaus Plexippus*)
- tricolored bat (*Perimyotis subflavus*)

**C. Candidate species within the action area:**
none

**D. Include species/habitat occurrences on a map.** see attached plans

**IV. Description of proposed action (attach additional pages as needed):** See attached plans and project summaries for more detail.

We propose to improve the hydrology at four salt marsh sites that have limited tidal connection during most tidal conditions which results in ponding marsh, vegetation loss, resilience loss, elevation loss, and habitat degradation. By restoring intertidal character through strategically clearing out portions of salt marsh ditches (i.e., ditch maintenance) and creating runnels, we plan to reduce inundation/saturation rates which will lead to vegetation recovery that will in turn improve the sites' resilience and habitat value.

As material is removed during ditch maintenance and runnel creation, it will be used beneficially on the surrounding marsh by being placed in low habitat mounds in relatively low areas where vegetation has died or become stressed due to unnatural persistent saturation or inundation.

The problems at these sites are mostly caused by the history of ditching which causes leveling of the marsh surface, lower tidal energy, sediment deposition leaving low berms along ditch edges, loss of biological accretion (i.e., belowground growth), oxidation of peat, loss of natural tidal channels, and ditches that fill in leaving areas of the marshes without tidal connection during much of the tidal cycle. Typically, the highest tides reach these sections of marsh but the water is not able to ebb leaving marsh too inundated or at least too saturated for vegetation.

The priority for our work at Cedar Creek is the restoration of the hydrology. However, we are proposing to include an additional component to the project. Peat-like material accumulates on Cedar Beach throughout the year likely coming mostly from salt marsh vegetation or edge erosion of salt marshes throughout the bay. The amount and exact location varies by season and storms but can at times be several feet thick. The community had wanted to remove this material from the beach as a waste product to improve the accessibility and recreational use of the beach. We propose removing the material to improve horseshoe crab spawning habitat and shorebird habitat and then using the material beneficially at the Cedar Creek site to improve high marsh habitat. This will be a pilot effort to test the feasibility and benefits of this kind of action based on recent success seen at EBF NWR using compost in a similar manner. The use of this peat material is a secondary priority. We are pursuing it for permitting but, if funding and partner support is limited, we may only do the ditch maintenance and runneling work at Cedar Creek. More material will likely return to the beach within a season after we remove it so the benefits to the beach will be temporary. The north end of Cedar Beach is eroding towards the Mispillion Inlet so we are not certain the currents will maintain this pattern of deposition of material on Cedar Beach.

## V. Determination of effects:

### A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):

- Eastern black rail: May Affect but Not likely to Adversely Affect. We have done two years of surveys at the four sites using the SHARP protocol and we have not seen or heard black rail and we have not heard black rail while in the areas doing other work throughout the year. However, a partner on the project heard a black rail at Port Mahon outside of a survey. That rail was not picked up on ARUs that have also been in use at the site for two seasons. Of the four sites, Port Mahon is most likely to have black rail and there are at least limited records of them in the general area such as along Port Mahon Road to the south of our proposed area. Cedar Creek and Murderkill are mostly low marsh but Buckaloo and especially Port Mahon do have high marsh where black rail could be present. The intent of the proposed work is to improve the health and cover of the vegetation which includes high marsh vegetation at Port Mahon and Buckaloo. The proposed work will have positive effects on the habitat for black rails by improving vegetation and maintaining high marsh. Very limited patches of high marsh at Cedar Creek and Murderkill could also benefit but would not be expected to significantly add to black rail habitat. The work at Cedar Creek and Port Mahon will include some work done by pontoon excavator. All work at Buckaloo and Murderkill and part of the work at Cedar Creek and Buckaloo will be by hand but involve crews of up to ten people on the marsh at a time.

- Rufa red knot: May Affect but Not likely to Adversely Affect. We have not seen evidence of red knot using any of the salt marsh at these four sites for roosting and would not expect it due to a mix of ponding, low elevations, and some of the vegetation being too high for roosting habitat in areas where ponding does not occur. Removal of the peat-like material from Cedar Beach could affect red knot by temporarily improving foraging habitat. Currently, horseshoe crabs get stranded in the material, little spawning occurs, and shorebirds avoid the peat-like material likely due to the lack of spawning and egg availability. Even shorebird species, such as short-billed dowitchers and dunlin, that are typically more often found in peat and mud areas do not forage in this material. Red knot generally do not favor the other areas of Cedar Beach where the material has not accumulated but occasionally they may occur in the area and therefore could benefit from the project by having improved foraging opportunities. The benefits will only be temporary assuming more of the material will likely begin to deposit within the area within months of our project. The material will be taken off the beach using equipment such as a skidsteer loader and dumptruck.

- Monarch: May Affect but Not likely to Adversely Affect. The sites are predominantly low marsh vegetation and ponded salt water not likely providing monarch habitat. However, at Buckaloo and particularly at Port Mahon, high marsh vegetation will benefit from the project. This may include some of the highest areas of the marsh where plants beneficial to pollinators could benefit such as seaside goldenrod (*Solidago sempervirens*) and perennial salt marsh aster (*Symphyotrichum*

*tenuifolium*). However, benefits to these plant species is not a goal of the project and any positive effect on pollinators, such as monarch butterfly, would be minimal.

- Tricolored bat: No Effect. No trees will be removed or otherwise disturbed. The sites are open salt marsh and one beach and all will be accessed through open areas without needing to disturb tree cover.

**B. Explanation of actions to be implemented to reduce adverse effects:**

Impacts to salt marsh habitat: Work will take place outside of the growing season, likely in February or ideally March. No installation work will take place between April 1 and September 15.

We do propose using a pontoon excavator at Port Mahon but only in areas of low marsh. We will also use a pontoon excavator at Cedar Creek but outside of the small remanent areas of high marsh. The work in the large area of high marsh at the north end of our Port Mahon site will only be by hand to prevent damage to the existing cover such as from the pontoon excavator turning and tearing up the *Spartina patens*. By using only hand tools in the most sensitive areas of the marsh where high marsh vegetation is present, we can control the depth and width of ditch work and runneling far better than the large bucket of an excavator.

We will limit field crew time on the marsh, have them avoid unnecessary walking in healthy areas of salt marsh, and they will use planks to cross some of the softest degrading areas.

We propose to place the peat-like material from Cedar Beach onto the marsh at Cedar Creek. We will likely to do this using an airboat to minimize impact to the marsh surface. If we use a Marshmaster and sled to move the material which is unlikely, we would use single points of entry, minimize trips, travel over areas of intact but unvegetated platform, and repair areas damage from the Marshmaster tracks by placing more of the peat material and planting it. The material will be spread by hand. We will favor placement sites that require the least passage time over the salt marsh of the airboat.

Habitat mounds of the spoil material from ditch maintenance and runneling will be placed in degraded marsh to gain elevation not areas where good high marsh habitat already exists and could be used by black rail.

Impacts to beach habitat: Work will take place outside of the horseshoe crab spawning season or shorebird migratory stopover period. Work will likely take place in February or ideally March.

We do not propose removing sand below the accumulated material on the beach. We do not expect a change in beach profile. If the beach profile does change, we would add sand. We would use mined sand of the largest grain size available and spread it on the beach using a skidsteer loader or similar equipment.

**VI. Effect determination and response requested: [* = optional]**

**A. Listed species/designated critical habitat:**

| **Determination** | **Response requested** |
|---|---|
| no effect/no adverse modification (species: *tricolored bat* ) | X Concurrence |
| may affect, but is not likely to adversely affect species/adversely modify critical habitat (species: *rufa red knot, eastern black rail, monarch*) | X Concurrence |
| may affect, and is likely to adversely affect species/adversely modify critical habitat (species:_____) | ____ Formal Consultation |

BRIAN MARSH Digitally signed by BRIAN MARSH Date: 2026.05.11 12:09:44 -04'00'

_____ _____

Project Biologist (Requestor), Delaware Bay Coastal Program Date

**VII. Reviewing ESFO Evaluation:**

**A. Concurrence** X

**B. Formal consultation required**_____

**C. Conference required**_____

**D. Informal conference required**_____

**E. Remarks (attach additional pages as needed):**

JULIE SLACUM Digitally signed by JULIE SLACUM Date: 2026.05.12 12:47:01 -04'00'

_____ _____

Endangered Species Biologist (Reviewer), Chesapeake Bay Field Office Date

_____ _____

Endangered Species Biologist (Reviewer), Chesapeake Bay Field Office Date

Outlook

**[EXTERNAL] Re: EFH and FWCA consultation for four salt marsh sites in Delaware**

**From** Robert Bourdon - NOAA Federal <[redacted]
**Date** Wed 6/10/2026 11:08 AM
**To** Marsh, Brian [redacted]
**Cc** Ripple, Kaitlyn (Kaity) [redacted]

**This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.**

Hi Brian,

Thank you for providing these consultation materials for our review. We view these proposed marsh modifications as minor and temporary disturbances to essential fish habitat that will result in net biological uplift. Therefore, we have no comment on the proposed actions.

Good luck with the project. If you ever need an extra hand in the field, keep me in mind. I'd be interested in helping out and seeing a few of the sites you are working on.

Thanks,
Rob

On Wed, May 13, 2026 at 4:14 PM Robert Bourdon - NOAA Federal [redacted] wrote:

> Hi Brian,
>
> Thanks for providing this information. I think it will be fine for us to consult on all of these locations at once even if you end up having to split them for USACE permitting. I'll review these materials soon and let you know if I need more information.
>
> Regards,
> Rob
>
> On Wed, May 13, 2026 at 1:30 PM Marsh, Brian [redacted] wrote:
>
> > Hi Rob -

We are proposing to do work at four salt marsh sites in Delaware. The sites are on the same planned timeline, all on DE Division of Fish and Wildlife lands, and mostly involve the same work so we've been thinking of them as a single project.

We plan to submit an application to the Corps for NWP27 approval around the end of June or early July so therefore are providing the attached materials to you for consultation on EFH and for FWCA. The EFH Mapper suggests a lot of EFH in the general project area but a review of the species habitat needs didn't suggest to us that EFH is present in the immediate areas we're working in.

We are planning on one application to the Corps. If for some reason we end up needing to submit separate applications to the Corps, let us know if consulting with you on them together is a problem.

Attached are project summaries of each site with site photos, monitoring plan, location maps, and plans. Also attached are the EFH list and EFH form. The EFH list showed the same list of species regardless of which of the four sites was used as the center point.

We have somewhat longer project narratives that provide more information than the attached summaries especially on the hydrology if you'd like more info.

The projects all involve two main actions. Ditch maintenance by shallow partial clearing out of select mosquito ditching that was created in the 1930s, or later in some cases. This would be done by hand for the smallest ditches or where the marsh surface is especially vulnerable. For larger ditches at two of the sites (Port Mahon and Cedar Creek), we propose using a pontoon excavator. Runneling is creating shallow channels between areas on the salt marshes that have started to pond water or remain saturated and ditches or other channels that are open to the tide. A third action is proposed just at Cedar Creek where we propose to remove accumulated peat like material from the north end of Slaughter Beach (aka Cedar Beach) and place it in low areas on the salt marsh. A study on that material was done in 2021 and also attached.

Happy to provide more info or we could show you these sites or the Prime Hook NWR site where the runneling and ditch maintenance were done this past winter.

-Brian

Brian Marsh
USFWS - Delaware Bay Coastal Program
2591 Whitehall Neck Road
Smyrna, DE 19977
mobile: [redacted]

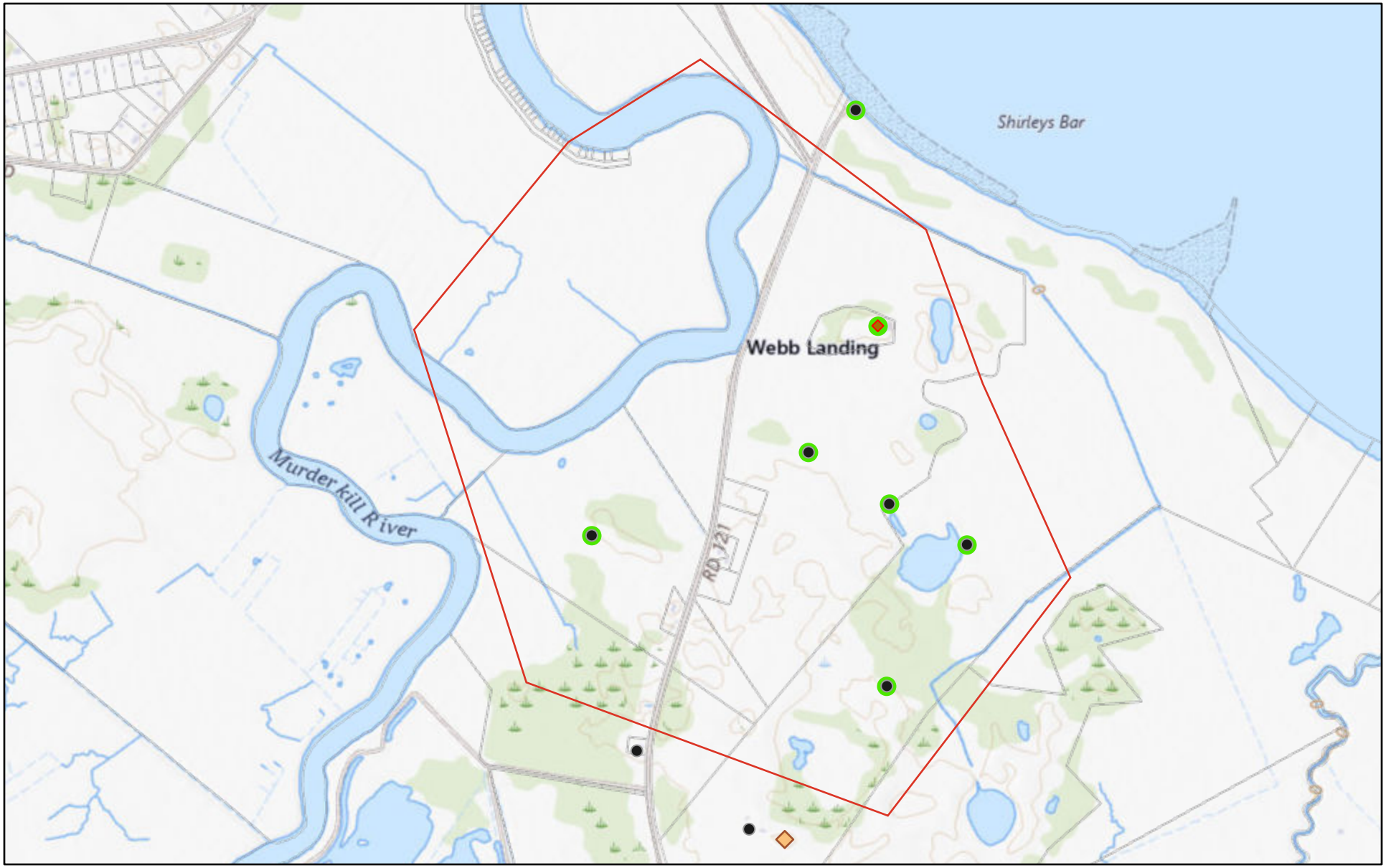
Brian Marsh
USFWS - Delaware Bay Coastal Program
2591 Whitehall Neck Road
Smyrna, DE 19977
mobile: [redacted]

--

**Robert Bourdon**
*Marine Habitat Resource Specialist*
*Greater Atlantic Regional Fisheries Office*
NOAA Fisheries | U.S. Department of Commerce
Office: [redacted]
www.fisheries.noaa.gov



# Research/Edit Map (Basemap - USGS National Map)




September 8, 2026

1:18,056

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

Other Proposed Properties

HistoricPropertySync

National Register-listed

other surveyed, assigned CRS inventory #

HistoricProperty_Archaeo

State Parcels

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography

HCA
DELAWARE HISTORICAL & CULTURAL AFFAIRS

Delaware Division of Historical & Cultural Affairs
29 N. State St., Dover, Delaware 19901
Tel. (302) 736-7400 | Fax. (302) 739-5660
history.delaware.gov

October 28, 2026

Brian Marsh, Wildlife Biologist
US Fish and Wildlife Service – Delaware Bay Coastal Program
2591 Whitehall Neck Rd, Smyrna, DE 19977
Sent via email to: [redacted]

**Subject: Salt Marsh Hydrological Modification, Buckaloo, Cedar Creek, Murderkill, Port Mahon**
**DE SHPO Project Review #2026.07.02.02, 2026.07.02.03, 2026.07.02.04, 2026.07.02.05**

Dear Brian Marsh,

In response to the letter sent, the staff of the Delaware State Historic Preservation Office (DE SHPO) has reviewed the material submitted regarding the above cited project by the US Fish and Wildlife Service (FWS). The undertaking has been described to include the clearing of pre-existing ditches and excavation of new ditches and runnels in four locations in Delaware's salt marshes to improve natural hydrology. This undertaking is subject to compliance with Section 106 of the National Historic Preservation Act of 1966 (as amended).

The DE SHPO and FWS agreed to split the four locations that are part of this project as four separate projects for the DE SHPO's records. However, as the recommendations and conditions for these projects are connected, we are addressing all four undertakings in a single letter.

The four locations being considered for the undertakings described are Buckaloo Marsh north of Bowers Beach, a portion of marshland just south of Bowers Beach alongside the Murderkill River, an area just south of the town of Port Mahon, and an area just south of Cedar Beach alongside Cedar Creek. These areas are in the jurisdiction of the Delaware Department of Natural Resources and Environmental Control (DNREC).

At all four sites, older ditches that have not been maintained since approximately the mid-20th century are to be cleared of organic material and returned to their original dimensions, and new runnels of no deeper than six to twelve inches will be dug in strategic locations to improve water flow. At Cedar Creek, peat-like material from the nearby Cedar Beach will be harvested and placed within the Cedar Creek project area for beneficial habitat creation. The material grows over a large area, so the final collection locations will be selected based on where the material is concentrated and will be determined closer to the time of the undertaking. At Port Mahon, some new ditches will be dug to similar dimensions as the extant ditches. Heavy machinery will be used only at Cedar Creek and Port Mahon for these extra undertakings. The soil and other material collected from the project will be used within the project areas as beneficial habitat creation. The Areas of Potential Effect (APEs) for the four sites will include the area where the channels are being modified and runnels are being dug, along with any other ground disturbing work being done, as well as any access, staging, or stockpiling.

The extant ditches are mosquito and drainage ditches from approximately the 1920s and 30s and, based on archival research, most were dug by the Civilian Conservation Corps (CCC). There are also more modern ditches in the vicinity from the Delaware Open Marsh Water Management (OMWM) program that were mainly dug in the 1980s and 90s, but these are not being modified and thus are not being considered in this project. After consultation with the DE SHPO, DNREC, and FWS, all parties agreed that so long as the improvements to the ditches do not purposely change the original dimensions of the ditches, our Office has no concerns with this portion of the undertaking.





American Alliance of Museums Accredited Museum

All four project areas have a high potential for precontact archaeological resources. All four project areas are in the larger coastal salt marsh region which is known for both precontact and historic settlement and use. Three of the project areas have known archaeological sites within the APE or in the vicinity: The Buckaloo APE is in the vicinity of a known precontact site (7K-F-164). The Murderkill project area is in the vicinity of a large archaeological complex with mainly precontact but some historic components, and a site that is listed on the National Register for Historic Places (NR). There is a known archaeological site within the Cedar Creek APE (7S-A-012) and there is a known archaeological site in the vicinity of the wider location proposed for peat collection at Cedar Beach (7S-A-005).

Our Office has archaeological concerns about the ground disturbing work within the four project areas. However, due to the limited but widespread nature described for the undertakings, archaeological monitoring during work on portions of all four project areas shall be a condition of our concurrence. After consultation, our Office provided maps showing the loose areas of highest archaeological potential for the four sites. An SOI qualified archaeological monitor must be on site during any work in those areas. The SOI qualified archaeologist will sample portions of the soil excavated from digging the channels at Port Mahon and the runnels on all four sites as needed. If archaeological resources are identified during work, all work must stop and our Office and DNREC's cultural resource office are to be notified immediately. Once work has been completed, the monitor shall submit a report on their findings for the DE SHPO.

For Cedar Creek, as the archaeological site at Cedar Beach is only in the vicinity of a small portion of the overall potential collection area, please contact our Office once the peat collection locations have been determined to consider the need for further monitoring.

FWS has informed our Office that they are in the process of consulting with the Federally Recognized Tribes on their concerns and conditions.

So long as the conditions laid out in this letter are followed, our Office finds there to be No Adverse Effect to historic properties from the proposed undertaking. If you have any other questions at this time, please feel free to contact me at (302)-736-7437 or at Hannah.lewis@delaware.gov.

Sincerely,

*Hannah Lewis*

Hannah Lewis, Archaeologist, SHPO

cc: Gwen Davis, Deputy SHPO
Sarah Carr, Archaeologist, SHPO
Amy Wood, FWS
Esther Westfall, FWS
Kaitlyn Ripple, FWS
Taylor Reynolds, DNREC
Linda Seminario, DNREC

DELAWARE DEPARTMENT OF
NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL

89 Kings Highway
Dover, DE 19901
302-739-9000
dnrec.delaware.gov

September 15, 2026

Brian Marsh

USFWS – Delaware Bay Coastal Program

2591 Whitehall Neck Road

Smyrna, DE 19977

*Re: USFWS 2026 Murderkill Salt Marsh Hydrological Modification Tax Parcel # 8-00-12300-01-2025-00001*

Dear Brian:

Thank you for contacting the Species Conservation and Research Program (SCRP) about information on rare, threatened and endangered species, unique natural communities, and other significant natural resources as they relate to the above referenced project.

*State Natural Heritage Site*

A review of our database indicates that there are currently no records of state-rare or federally listed plants, animals or natural communities at this project site. As a result, at present, this project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve which are two criteria used to identify "Designated Critical Resource Waters" in the Army Corps of Engineers (ACOE) Nationwide Permit General Condition No. 22. A copy of this letter shall be included in any permit application or pre-construction notification submitted to the Army Corps of Engineers for activities on this property.

*Delaware Ecological Network*

Habitat on this parcel has been identified as ecologically important by the Delaware Ecological Network (DEN) and is classified as a core area. DEN, although non-regulatory, is a statewide conservation network developed using GIS and field collected datasets that help to identify and prioritize ecologically important areas for natural resource protection. The DEN includes ecologically important areas such as forests, wetlands, streams, and habitats that supports rare species and areas of especially high quality. The DEN includes the following key elements: 1) Core areas – which contain relatively intact natural ecosystems, and provide high-quality habitat for native plants and animals, 2) Hubs – which are slightly fragmented aggregations of core areas with contiguous natural cover and 3) Corridors – which link core areas together, allowing wildlife movement and seed and pollen transfer between them. The DEN can be accessed through First Map: Delaware Ecological Network 2.0 | Delaware Ecological Network 2.0 | State of Delaware (arcgis.com). We recommend that this DEN designated area be protected to the fullest extent possible.

*State Wildlife Management Area*

The proposed project is within ½ mile of the boundary of Milford Neck Wildlife Area, a State Wildlife Area managed by the Division of Fish and Wildlife, DNREC. The State is concerned that the quantity and quality of wildlife habitat in the State Wildlife Area, particularly near the border, might be negatively affected by development activities, or by permanent land use changes, on the property in question. The developer should consult with the Regional Wildlife Biologist, Sean O'Connor (302-284-4795), to minimize potential negative impacts of the proposed project on State Wildlife Area lands. Additionally, the developer should be aware that people using the property in question could be subject to the effects of legal hunting activities in the Wildlife Area, such as firearm noise or dogs barking when pursuing game.

*State Natural Area*

The proposed project area occurs within Delaware's Natural Areas Inventory. State Natural Areas are composed of areas of land and/or water, whether in public or private ownership, which have retained or reestablished its natural character (although it need not be undisturbed), has unusual flora or fauna, or has biotic, geological, scenic, or archaeological features of scientific or educational value. If you require further information about this area for your planning, please contact Benjamin Schlusser at 302-739-9039 or Benjamin.Schlusser@delaware.gov.

*Wetland restoration activities (e.g., beneficial use of dredge material)*

Tidal wetland restoration activities, such as through the beneficial use of dredge material, can negatively affect marsh vegetation necessary for breeding marsh birds in the short-term, even if these activities aim to improve wetland condition in the long-term. Sediment application to the marsh surface, or associated construction activities, may also destroy marsh bird nests. Therefore, we recommend a time of year restriction of **April 1st to July 31st** to avoid impacts to marsh nesting birds.

*Migratory Shorebirds (incl. Red Knot)*

To date we have no records of migrating shorebirds using the wetlands at this site. However, prior research indicates federally protected red knot (*Calidris canutus*), may roost in marsh habitat behind the Delaware Bay shore beaches. We recommend avoiding work between **April 15th – June 7th** to mitigate disturbance to such species during their brief migration stopover in the Delaware Bay.

Fisheries

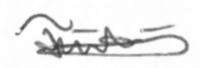
*American Eel*

Murderkill River is used by large numbers of American eel (*Anguilla rostrata)*. We request that in-stream work not take place from **March 1st to May 15th** to allow upstream passage of elvers (young eels).

We are continually updating our records on Delaware's rare, threatened and endangered species, unique natural communities and other significant natural resources. If the start of the project is delayed more than a year past the date of this letter, please contact us again for the latest information.

Please feel free to contact me with any questions or if you require additional information.

Sincerely,



Faith Garcia

*Environmental Review Coordinator*

Phone: (302) 735-8665

Cell: (302) 443-3812

Email: christinefaith.garcia@delaware.gov

89 Kings Highway

Dover, DE 19901