



January 27, 2022

Mr. John Apple
Assistant Town Manager
Town of Bethany Beach, DE

REFERENCE: Bethany Beach Loop Canal Dam Structure
30% Preliminary Design
MT No. 06143.002
McCormick Taylor, Inc.

McCormick Taylor, Inc. is pleased to present a scope and fee proposal to the Town of Bethany Beach to develop a 30% Preliminary Design for an inflatable dam structure that will assist in controlling tidal levels in the Loop Canal. We appreciate the opportunity to submit this proposal. The 30% design includes survey, geotechnical exploration, environmental assessment, initiation of the environmental permitting process, and type, size and location 30% plans for the dam and its substructure, located near the confluence of the Loop and Assawoman Canals. Additional detail may be found in the attached Scope of Services.

Our fee for completion of the work in the attached scope is \$251,500.00. Should you have any questions after reviewing our submission, we encourage you to contact Chris Brooks at 410.302.7562 or cjbrooks@mccormicktaylor.com

Sincerely,
McCORMICK TAYLOR, INC.

A handwritten signature in black ink, appearing to read "CB", written over a light blue horizontal line.

Chris Brooks
Director, Water Resources

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Following the completion of the hydraulic study of the dam, the Town of Bethany Beach has requested McCormick Taylor (MT) develop a scope for the engineering design of the installation of a retractable dam, controlled by inflatable bladders, with a top elevation of +3.0' and a retracted bottom elevation of -3.0' (NAVD 88). This scope will cover through the Preliminary (30%) design of the project, including survey, geotechnical exploration, and development of the project Type, Size and Location (TS&L) including the basic details of the dam apparatus, conceptual structures for the foundation and seepage control beneath the dam, staging of the support infrastructure for the dam pump and power supply, and plans showing the anticipated limits of disturbance, construction access and anticipated easement requirements. This plan will also include the installation of a tidal flap gate at the 36" pipe under the bike path north of the Salt Pond.

1.0 Project Initiation and Field Data Collection

1.1 Site Overview and Review of Available Information

McCormick Taylor will review all existing plans, deeds and property data, GIS files and other available data from the Town for the project area as related to geotechnical or other information from site development plans and land ownership records. The project team will visit the site with the Town to discuss local constraints to the project. MT will coordinate with a supplier of the mechanical dam products, review details provided and work with the supplier to refine the approach to the initial design and discuss additional questions from the Town with the supplier to inform project decision making.

1.2 Topographic Survey

Topographic Survey will be performed by our subconsultant Atlantic Group & Associates, Inc. which will include the following survey to perform the proposed work (Items A, B) as well as to verify existing data to confirm the hydraulic model (Item C) as shown on the attached exhibit:

A. Area 1: Objective is to determine overtopping elevation of the bike path and details of the area up and downstream of the pipe (invert, size, type, structural details, etc), for the purpose of installing a tidal gate on the northern end. Please collect at least 10LF of the channel in each direction, and any wetland flags.

B. Area 2: Goal is to get cross sections in channel for Assawoman north and south of confluence, and detailed channel surface in Loop Canal and confluence area. Survey limits beyond the top of channel bank on all sides and/or to a point above 5.0' elevation. Eastern limits of survey to the east of drainage channel on north side of Loop Canal. This is main area of proposed disturbance so all details (flags, utilities, boring locations, structures/piers/bulkheads, etc.) to be collected.

C. Area 3: Goal is to determine overtopping elevation of roadway through this stretch, as well as any culverts/storm drains in the area. Shots at CL and edge of roadway are sufficient to confirm hydraulic model as no disturbance is proposed in this area along with any channel and pipe/structure inverts.

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1.3 Geotechnical Field Data

Geotechnical exploration work will be performed by our subconsultant Hynes & Associates. The team will drill one Standard Penetration Test (SPT) boring on each side of the canal to depths of 40 feet and perform continuous sampling. With coordination assistance from the Town to obtain access as needed, on the north side of the canal access will be from Christine Lane. On the south side of the canal, the team will access the shore from the lot at the corner of Sandbar Court.

Prior to mobilization, Hynes will contact Miss Utility to mark public underground utilities at the property and will obtain boring permits from DNREC to drill the test borings.

Hynes will visually classify the boring samples and select soil samples for laboratory testing. If successful in collecting Shelby Tube samples, the team will perform Permeability tests, Unconfined Compressive Strength tests, Specific Gravity tests, Unit Weight Determinations, and Atterberg Limits (Liquid and Plastic) tests on the Shelby Tube Samples and a Consolidation Test on one of the Shelby Tube samples. Also, two Sieve Analysis tests, two Natural Moisture content tests and two sets of Corrosivity Tests on other split spoon samples. The corrosivity tests will include pH, Sulfates, Sulfides, Chloride, Redox Potential and Electrical Resistivity testing.

Following the field and laboratory programs, Hynes will prepare a report of geotechnical engineering evaluations. The report will include the test boring and laboratory test data, and evaluations for the proposed structure.

1.4 Wetland Delineation

McCormick Taylor will perform field delineation of wetlands and watercourses within the immediate vicinity of the study area in accordance with the United States Army Corps of Engineers (USACE) *1987 Corps of Engineers Wetlands Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0, 2010)* as well as the Delaware Natural Resources and Environmental Control (DNREC) Wetlands and Subaqueous Lands regulations. The delineation will fully cover the project limits of construction (LOC) and extend up to 100 feet beyond these limits. Wetlands and watercourses identified through review of the DNREC Statewide Wetlands Mapping Project (SWMP) and the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping will be placed on the project's base mapping and used to facilitate potential areas for delineation. These areas will be field verified, and all wetlands and watercourses found within the project area will be flagged for survey. The flag locations will also be picked up via GPS and/or hand drawn on existing plans for surveyor reference. The recorded flag locations will be provided for inclusion on the project plans. All wetlands identified will be mapped and classified according to the USFWS's *A Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et. al., 1979). Streams and other regulated watercourses will also be mapped and classified for project permitting purposes at the high tide line (HTL).

A Waters & Wetlands Identification and Delineation Report will be prepared to document the wetland and watercourse identification findings, including mapping, photographs of the project area's resources, and a wetland functional assessment (qualitative level analysis). Upon completion, this document will be submitted for approval to the Town of Bethany Beach Project Manager.

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2.0 NEPA Coordination

2.1 Environmental Assessment

Federal grant funding typically requires compliance with all applicable Environmental Planning and Historic Preservation (EHP) laws, Executive Orders (EOs) and regulations to assess potential impacts of a proposed project on affected physical, cultural (historic and archaeological), biological, and social resources. Therefore, all project applications that do not qualify under the listed Categorical Exclusions (*DHS Instruction Manual 023-01-001-01, Rev 01, Appendix A*) must undergo an EHP review as part of FEMA's eligibility review process prior to award. McCormick Taylor will prepare an environmental screening document to be reviewed by FEMA EHP experts. McCormick Taylor will work closely with FEMA EHP experts to ensure grant funding is received for project.

Since the proposed project does not fall under the approved Categorical Exclusions list, it is assumed that the project will require an Environmental Assessment to be prepared for NEPA approval. McCormick Taylor will work closely with the Project Manager and FEMA to prepare the Environmental Assessment for submission. This effort will include development of a purpose and need statement, alternatives analysis and review of impacts to resources. Since project activities are located within public protected lands, it is likely that Section 4(f) documentation will be required. Section 7 of the Endangered Species Act (ESA) also required consultation if the project will significantly affect species or habitats that are federally protected.

At this stage of the project, it is unknown what the design, area of potential effects (APE), and potential impacts the proposed dam will have on potential historic properties, both above ground and below. McCormick Taylor recommends coordinating with FEMA in order to initiate the Section 106 compliance review process initiating Section 106 consultation with the Delaware State Historic Preservation Office (DE SHPO) once project designs are further developed to provide a project description, area of potential effects (APE), a description of potential impacts, coordinate regarding known resources within the APE, and the potential for unknown resources within the APE. This Section 106 consultation will assume that the project will not have any potential to effect historic properties and that no cultural resources investigations will be required. If the design process and consultation with the DE SHPO result in the need for archaeological or architectural history surveys, a separate scope of work will be developed.

McCormick Taylor will conduct all necessary consultation and coordination with the appropriate agencies to ensure compliance with these sections. Additionally, this task will include Public Involvement including public workshops, interested party and public meetings, and stakeholder meetings. Coordination with FEMA will begin at the start of the project and will continue throughout the NEPA process to ensure a timely Record of Decision (ROD). McCormick Taylor assumes that the ROD will be a Finding of No Significant Impact (FONSI).

3.0 Permit Initiation

Due to the nature of the project, it is recommended that a pre-application conference be scheduled at the 30% design submission to ensure that any comments received from the agencies may be appropriately addressed for concurrent design submissions. McCormick

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Taylor will request a pre-application with USACE and DNREC once the project design has reached 30%. Material required for this meeting will include the preliminary project plans, *Waters & Wetlands Identification and Delineation Report*, figures including a project location map, photographs, and project description. Additionally, it is anticipated that the project will require a Sussex County Floodplain Permit. As a result, a meeting will also be held with the Sussex County Environmental and Flood Plain Manager.

4.0 Concept Design and Plan Development (30%)

4.1 Base Plan Development

McCormick Taylor will develop plan sheets that detail the layout of the dam components, including plan and profile for the dam, dam foundation components, wingwall structures, riprap revetments, pump areas, maintenance access locations, and a location plan for the installation of the northern tidal gate. The following sheets will be included in the 30% plan set

Title sheet w index	(1)
Baseline geometry sheet	(1)
Plan layout sheets for dam	(2)
Plan sheet for tidal flap gate	(1)
Dam Mechanical Details	(TBD)
Sediment Control Plan Sheets	(3)
Sediment Control Details and Notes	(2)
Structural Plan Details and Profiles	(3)
Geotechnical Borings and Data	(1)

4.2 Hydraulic Modeling

McCormick Taylor will utilize the previously developed 2-dimensional Hydraulic model and refine the surfaces of the existing and proposed conditions models based on the latest survey. The conceptual structure dimensions and grading will be entered into the proposed conditions model to provide an updated calculation of the impacts of the dam over existing conditions to the properties along the Assawoman Canal and the Loop Canal.

An animated model run will be prepared for 3 individual tidal scenarios (ex. and prop. conditions) for updated side-by-side comparisons (for a total of 6 animation clips) during the public involvement process.

The previous study report will be updated with the latest data for consideration during the initial engagement of permitting agencies.

5.0 Foundation and Seepage Evaluations and Structural Design

5.1 Preliminary Foundation Report

Using the information obtained from the geotechnical investigations and laboratory testing, MT will develop preliminary foundation types including shallow foundations (ie, spread footings) and deep foundations (ie. pile foundations). The various foundation types will be evaluated to identify the foundation type that provides the required support to the structure, constructability given the site constraints, and overall economy. The foundation will have

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to resist downward loads, upward loads (due to buoyancy of the inflated bladder), and lateral loads.

5.2 Seepage Control Evaluation

Seepage under and around the proposed inflatable dam will be evaluated and seepage cutoffs will be developed. The extent of the seepage cutoff both vertically under the dam and horizontally through the abutments will be established. Various types of seepage cutoffs will be developed and evaluated including steel sheeting, vinyl sheeting, cast-in-place concrete, and grout columns. The horizontal cutoffs will be incorporated into wing walls that will extend from the ends of the inflatable dam into both abutments. The wing walls will serve to tie out the dam into both abutments and provide a rigid surface for the inflatable dam to contact in the inflated position.

5.3 Preliminary Structural Layout

MT will provide a preliminary type, size, and location (TS&L) structural summary report including plans detailing the overall structural limits of the dam structure, and preliminary structure design parameters and cost estimate information. The plans will provide a plan view of the proposed structure with approximate dimensions and associated base mapping, and a profile view with structural dimensions and footing and wall elevations.

6.0 Dam Component Design

MT will coordinate with the manufacturer of the inflatable dam to obtain the proper specifications, details and layout for the dam location. MT will develop plan sheets from these proprietary details into a generic version. This will include the pump and power supply components, and the permanent staging area, which may require additional structures to elevate above the 100-year flood elevation.

7.0 Project Meetings and Public Outreach Support

MT will attend three (3) online project coordination meetings with the Town to discuss the preliminary dam design options and finalize concepts for the 30% Plan and Report development. MT will develop three (3) displays for the County for discussion with the community and attend 1 additional meeting. Additional meetings for Permit coordination are noted above.

8.0 30% Cost Estimate

MT will develop a 30% cost estimate, refining the assumptions made with the planning-level estimate developed for the Grant Application based on the concept developed using the additional survey and geotech data.

Assumptions and Exclusions:

- Town of Bethany Beach will assist the Team with coordinating all entry onto private property for the purposes of survey, geotechnical exploration, environmental field work and other general project development needs.

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- No boundary survey or utility designation is included at this time; necessary easements for temporary and permanent access will be determined following 30% design
- It is assumed that the project will require an Environmental Assessment to be prepared for NEPA Clearance
- It is assumed that the project will have no effect on historic and archaeological resources.
- It is assumed that the project will have no impacts to hazardous waste sites.

SURVEY INVESTIGATION AREA





