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May 27, 2020

Mr. David Ryan, PE
Town Engineer, Town of Nags Head
PO Box 99
Nags Head, NC 27959

RE: Work Order Proposal: Year 1 (2020) Coastal Engineering and Consulting Services for the
Town of Nags Head, NC

Dear Mr. Ryan:

Moffatt & Nichol (M&N) presents this proposal to the Town of Nags Head, NC, to provide professional services for a range of tasks assisting the Town to maintain and enhance the protective and recreational capacity of its beach and dune system. As requested, this proposal includes a group of four main Tasks that each have a distinct focus, timeframe and sets of deliverables. The four Tasks are described briefly below:

1. Task 1 – Annual Beach Monitoring and Analysis program for 2020. Task 1 includes the preparation of the annual beach monitoring report, with all associated shoreline and volume change calculations, analysis of beach system performance and its relationship to long-term trends, along with recommendations for future actions. The primary purpose of the beach monitoring is to determine the condition of the beaches, measure shoreline change and volumetric rates of erosion and accretion, and evaluate the performance of beach nourishment and other restoration efforts.
 - Please note that Task 1 includes optional subtasks for post-storm monitoring surveys, and preparation of documentation for FEMA requesting post-storm beach restoration funds. These subtasks would only be utilized, and their associated fees would only be billed, if the Town chooses and provides written authorization to conduct these tasks in the event of a hurricane or other severe coastal storm erosion event. These tasks provide for expedited authorization for M&N to conduct post-storm beach monitoring analysis and subsequent support to the Town in coordinating with the Federal Emergency Management Agency (FEMA) following a significant coastal storm event.
2. Task 2 – Multi-Decadal Beach Nourishment Master Plan (Year 1). Task 2 provides the professional services for the first year of preparation of a Master Plan for beach nourishment in the Town of Nags Head. Year 1 tasks generally include project planning, meetings and coordination, data collection and review, and initial modeling and development of preliminary nourishment trigger estimates.
3. Task 3 – Coastal Storm Damage Mitigation (CSDM) Fund Grant Application Support. Task 3 provides professional services to compile necessary documents and technical data, maps

and tables required by the State's CSDM application form to support the Town's request for CSDM funds. The CSDM request is for funds to supplement expected Federal funding of the Town's beach nourishment and repair project for damages incurred by Hurricane Dorian.

4. Task 4 – Post-Dorian Restoration Beach Nourishment Engineering Services. Task 4 provides the engineering design, permitting coordination, preparation of construction documents and bidding and construction phase engineering support to the Town as it implements its Post-Dorian beach restoration project.

Detailed scopes of work for each main Task, along with schedules and a breakdown of the fees for each Task, are provided in the attachments to this letter.

M&N fees for Task 1, 2, 3 and 4 services are lump sum by Task, and the fee for each task is summarized in the table below. M&N proposed to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town's requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on each Task during the invoice period.

Task	M&N Fee
Task 1: Beach Monitoring Analysis, Reporting and Post-Storm FEMA Support (2020)	
Task 1.1 – Completion of Annual Monitoring Report	\$57,119
Task 1.2 – Completion of Post Storm Survey and Report (OPTIONAL)	\$57,119
Task 1.3 – Documentation for FEMA Category G Project Funding (OPTIONAL)	\$33,660
Task 2: Multi-decadal Beach Nourishment Master Plan – Year 1	\$208,100
Task 3: Coastal Storm Damage Mitigation (CSDM) Grant Application Support (2020)	\$14,280
Task 4: Post-Dorian Beach Renourishment Design and Construction Phase Support	\$717,512
Total for Tasks 1 through 4 (Excluding Optional Tasks)	\$997,011
Total Optional Tasks Only	\$90,779

Brian Joyner and I will be the Town's primary points of contact for this contract. Please don't hesitate to reach out to either or both of us by phone or email at the numbers and addresses provided below. We are excited to begin providing services to the Town and look forward to continue developing our partnership.

Sincerely,
MOFFATT & NICHOL



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Attachments: Detailed scopes of work and fee tables for Tasks 1, 2, 3 and 4



TASK 1 INTRODUCTION

Task 1 includes professional services to conduct the Town of Nags Head Beach Monitoring and Analysis program for one year, generally including the summer 2020 annual monitoring survey period and the 2020 hurricane season to early 2021 winter storm season. The Town's Beach Monitoring and Analysis program represents a continued effort of conducting beach monitoring surveys and providing analyses, building upon past efforts by Town of Nags Head from 2012 through 2019 in association with the 2011 and 2019 Nags Head Beach Nourishment post-construction monitoring. The primary purpose of the beach monitoring is to determine the condition of the beaches, measure shoreline change and volumetric rates of erosion and accretion, maintain eligibility for designation as a FEMA engineered beach, estimate when future maintenance activities may be warranted, and evaluate the performance of beach nourishment and other restoration efforts.

In addition to the primary Annual (Summer 2020) monitoring analysis and report, this Scope of Work includes two optional tasks to conduct, if necessary, analysis and reporting on post-storm monitoring surveys, and preparation of documentation to FEMA requesting post-storm beach restoration funds.

It is understood that McKim & Creed will be conducting the monitoring surveys under a separate contract with the Town. M&N has been coordinating with McKim & Creed to ensure that their survey scope and M&N's analysis scope are in alignment. Under this proposed scope of work, M&N will be responsible for receiving the survey data products from McKim & Creed, writing and production of the reports, and the shoreline/volumetric analyses associated with the reports.

TASK 1 SCOPE OF WORK

As stated above, the proposed Scope of Work is for the 2020 Town of Nags Head Beach Monitoring and Analysis. In general, the tasks include preparation of an annual report and presentation to summarize the shoreline and volume change analysis of 174 profiles along the Town of Nags Head shoreline that will be surveyed under a separate contract between the Town and McKim & Creed. Those surveying efforts include capturing topographic data at 126 transects that have been part of the 2011 through 2019 beach monitoring and analysis. After discussions with the Town it has been decided that an additional 48 transects will be surveyed to capture a better understanding of the project area and longshore transport outside the project area. Two optional tasks have been developed to supplement the annual beach profile analysis including (1) a post-storm survey and analysis and (2) preparation of documentation in support of application for FEMA post-storm beach restoration funds which would only be completed if authorized in writing by Town staff. A more detailed outline of project tasks is as follows.

Task 1.1 – Completion of Annual Surveys and Report

(A) Survey Scheduling and Client Coordination - The monitoring schedule for each year typically includes a comprehensive survey of the transects conducted by late spring/early summer to ensure seasonal differences in the beach profile are consistently measured from year to year,



and to document annual pre-hurricane season beach conditions. **M&N** will coordinate with **McKim & Creed** and the Town to verify that the surveys are collected during this time period. The project team will coordinate with the Town concerning the time and approaches to be followed for each survey.

(B) Survey Profiles – Survey transect stationing established in 2012 for the 2011 Nags Head Beach Nourishment post-construction monitoring along 126 transects will be used to ensure continuity of comparison with future surveys. **M&N** has coordinated with the Town and with McKim & Creed to introduce 48 additional transects to better track sand movement at southern and northern end of the beach nourishment project and hotspots.

(C) Data Analysis and Reporting - Using data provided by **McKim & Creed**, **M&N** will perform the following annual monitoring analysis:

Annual Shoreline Change

M&N will compute shoreline changes between subsequent surveys for the MHW elevation of +1.18 ft NAVD88. **M&N** will report these results at each transect as well as the average changes for each of the previously established subreaches.

Annual Volume Change

M&N will compute volume changes above several strategically selected elevations to ensure the complete tracking of sand movement along the profile. **M&N** expects to calculate these volume changes in accordance with previous monitoring efforts from 2012 through 2019 from a landward point on the back of the dune out to the seaward edge of the nourishment berm (+6 ft NAVD88), above -6 ft NAVD (wading depth), and above -19 ft NAVD (depth of closure). **M&N** intends to add additional calculation lenses above MHW (+1.18 ft NAVD88), approximately above -14 ft NAVD88 (capturing the offshore bar), and above -30 ft NAVD (seaward extent of surveys). **M&N** may revise these elevations after the historical data and trends have been reviewed. The Town will be consulted concerning these elevations for final approval prior to completion of the calculations for the monitoring report. **M&N** will report these results at each transect as well as the overall changes for each of the previously established subreaches.

Beach Nourishment Project Performance

The volumetric change calculations performed during the annual analyses will be used to track the performance of any Beach Nourishment or other maintenance projects. Annual changes from each placement area will be documented throughout the nourishment cycle to gain an understanding of actual volume lost, providing insight into future volume need. Upon development of nourishment triggers (covered under a separate task order), comparisons will be made between the current condition of the beach and the calculated triggers, allowing for estimates of when the next nourishment will be needed.

Background Erosion Rates

The volumetric change calculations performed during the annual analyses will be used to determine the background erosion or accretion rates. These are erosion rates that would be expected if no Beach nourishment or maintenance projects were to occur.



Dune Behavior

The volumetric change calculations performed during the annual analyses will be used to determine the dune growth/erosion trends, allowing for identification of areas vulnerable to overwash or exhibiting significant dune growth.

Long-term Trends

The volumetric change calculations performed during the annual analyses will be used to develop long term trends by incorporating the current datasets with those acquired during the 2012 through 2019 monitoring efforts. Annual volume changes from each year (excluding nourishment) will be averaged and plotted for each transect, allowing for identification of long-term stable locations and erosional hotspots in each survey reach as compared to annual changes that may vary significantly from year to year.

In addition, nodal zones established during previous modeling efforts will be analyzed with respect to volume changes in these areas, providing insight into longshore sediment transport patterns and optimal future nourishment placement locations.

Reporting

Once all of the analyses are completed, the resulting calculations and analysis will be included within the annual report. One (1) copy of the draft report will be submitted to the Town by September 15, 2020 (or six weeks after receiving all survey products from **McKim & Creed**) for Town review and comment. The report will include sections such as introduction, methodology, results/conclusions, and appendices. **M&N** will submit four (4) hard copies of the final report (including profiles print outs) to the Town by October 15, 2020. **M&N** will also develop, attend and provide a presentation to the Town's Board of Commissioners at one of their monthly, regularly scheduled meetings. Eight (8) hard copies of the report (including profiles print outs) and one (1) electronic copy of the report, the annual presentation, and all data collected for each survey event, etc. will also be provided on a USB flash drive.

Task 1.2 – Completion of Post Storm Survey and Report (OPTIONAL TASK)

This task will only be completed if authorized by Town staff.

In the event of a significant coastal storm, and if authorized by the Town, **M&N** will complete a post-storm field reconnaissance trip to document storm effects. It is understood that McKim & Creed will provide post-storm surveying under separate contract between the Town and McKim & Creed. **M&N** will assist the Town to coordinate the survey with McKim & Creed. Following receipt of the survey data products from McKim & Creed, M&N will prepare a Post-Storm monitoring report documenting the shoreline and volume change due to the storm, and making recommendations on needs for renourishment to address the storm impacts. Shoreline and volume changes will be calculated to assess storm related damages.

Task 1.3 – Preparation of Documentation for FEMA Category G Project Funding (OPTIONAL TASK)

This task will only be completed if authorized by Town staff.



In the event of a significant coastal storm and a subsequent Federal disaster declaration that provides for Category G Public Assistance, and if authorized by the Town, **M&N** will prepare the supporting documents to show eligibility of the beach for the FEMA Category G post storm restoration funding, reporting previous beach monitoring and maintenance efforts, storm event volume losses, potential sand sources, restoration project cost estimates and schedule. M&N will utilize the post-storm survey and analysis report resulting from Task 1.3 above to support the preparation of documents for FEMA submittal. In association with this subtask, M&N anticipates attending up to two additional in-person meetings in Nags Head and up to four (4) virtual meetings or teleconferences with Federal, State and Town representatives to coordinate the agencies' review of the Category G funding request.

TASK 1 PROJECT COST

The total estimated fee for the 2020 Town of Nags Head Beach Monitoring and Analysis is a lump sum of **\$57,119**, including expenses for travel for a site visit and reproduction. If a storm event were to occur, post storm monitoring and analysis would total a lump sum of **\$57,119**, including expenses for travel for a site visit and reproduction, and support for FEMA post-storm beach restoration funds would total a lump sum **\$33,660** in the event that these tasks were authorized by the Town.

M&N proposes to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town's requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on the Task during the invoice period.

The fees for each of these subtasks are summarized below:

Task 1: Beach Monitoring Analysis, Reporting and Post-Storm FEMA Support (2020)	M&N Fee
Task 1.1 – Completion of Annual Surveys and Report	\$57,119
Task 1.2 – Completion of Post Storm Survey and Report (OPTIONAL TASK)	\$57,119
Task 1.3 – Preparation of Documentation for FEMA Category G Project Funding (OPTIONAL TASK)	\$33,660



TASK 2 INTRODUCTION

Moffatt & Nichol (M&N) is pleased to present this scope of work and fee estimate for Year 1 services needed for the Multi-Decadal Master Plan. Although the Master Plan is expected to take three to five years to complete, the following Scope of Work details services to be completed during the 2020-2021 fiscal year, and this Year 1 effort will provide the basis for outlining efforts for subsequent years.

The scope of work below is focused on developing preliminary estimates of the following items after data collection and review are completed:

- 1) revised beach reaches (based on dune/berm shape and morphology as well as documented erosional/accretional trends),
- 2) the level of protection currently provided along these reaches as well as the volumes needed to provide different levels of protection in various storm events, in order to determine preliminary nourishment triggers, and
- 3) estimates of long-term sand needs over 50 years.

The above items will initially be estimated based upon analytical calculations and preliminary modeling that will be refined during later design phases. After discussions with Town staff, M&N believes that it is important to complete this work initially in a preliminary and cost-effective manner so that the Town can see the potential implications of this master plan approach before significant investments are made in more detailed modeling and engineering as well as field investigations and environmental studies, documentation and permitting.

It is currently estimated that the master plan process as a whole could cost between \$1M-\$3M depending on alternatives developed (and the level of environmental documentation/permitting needed for these alternatives), the overall sand volume needed for the 50 year horizon, and the amount of additional field work (geotechnical and environmental clearances) needed for the borrow sites to permit that 50 year volume of material. The products from this proposed Year 1 scope of work will provide a preliminary road map for the Town to see what the potential range of those volumes are, the locations where the sand is needed and how often, and the potential effects of this master plan approach on current and future funding options for projects.

TASK 2 SCOPE OF WORK

This Scope of Work defines the services to be provided during Year 1 of the multi-year Master Plan process. These tasks generally include project planning, meetings and coordination, data collection and review, and initial modeling and development of preliminary nourishment trigger estimates.

Task 2.1 – Project Planning, Meetings and Coordination – YEAR 1

M&N will attend meetings and provide coordination services for the project as needed. It is intended that the meetings and coordination included in Task 2.1 will discuss progress, findings and recommendations related to Task 2.2, Task 2.3 and Task 2.4 work items. As part of the project, M&N expects the following in-person meetings and virtual meetings / teleconferences to occur in Year 1 of the Master Plan process (Town fiscal year 2020-2021):

- Four (4) in-person meetings in Nags Head with Town staff to discuss the various coastal engineering professional services tasks
- Attendance and presentation at two (2) Board of Commissioners meetings to update the Board on



the progress of the various engineering, monitoring and master plan tasks

- Standing one-hour progress calls / virtual meetings with Town staff, anticipated to occur in months without in-person meetings, for a total of eight (8) such calls.

It is expected that each in-person meeting will include two M&N staff attendance in Nags Head along with their time and supporting staff time to prepare materials for the meetings and to provide meeting notes and summaries.

It is expected that the calls and virtual meetings will include more of the M&N project team and any number of Town staff or other stakeholders that the Town decides to invite to those calls.

This anticipated number of in-person meetings and standing calls does not exclude or limit additional calls between the Town and M&N's points of contact as specific questions and coordination needs arise.

Task 2.2 – Data Collection and Review of Existing Engineered Beach Monitoring/Maintenance Plan and Triggers– YEAR 1

M&N will gather and assess the available relevant data for the Town of Nags Head to provide a basis for understanding historical beach and shoreline behaviors and trends. M&N will collect and review the following data:

- Wave and Water Levels (Normal and Storm) – (as available from NOAA & USACE)
- Available Sediment Resource Data
- Engineering Activities (Nourishment/Dredging/Etc. – Volumes and Extents) – (as available from Town & other Consultants)
- Monitoring Data – (as available from Town & other Consultants)
- Current Engineered Beach Monitoring and Maintenance Plan
- Project Aerials – (as available from Town & other Consultants)

As applicable, selected available geo-referenced mapped data will be placed by M&N in GIS format for ease of analysis and future tasks. As part of this effort, M&N will also review the data for quality and applicability for use in study modeling and analyses. M&N will import these datasets into formats appropriate for our inclusion within our modeling packages and well as analytical spreadsheet and other tools.

In addition, M&N will review the Town's current Engineered Beach Monitoring/Maintenance Plan and current triggers. M&N will evaluate the plan and maintenance triggers versus the preliminary ones developed in Task 2.3 below.

Task 2.3 – Initial Modeling and Development of Preliminary Nourishment Triggers – YEAR 1

1. Develop and Calibrate Cross-Shore Beach Profile Models for Town of Nags Head – M&N will use available offshore wave data and beach profiles taken from the survey monitoring data to develop and calibrate cross-shore models in USACE's CSHORE software. Alternatively, the XBEACH software may be used, and the decision on model software will be made during the initial setup and calibration of the models. CSHORE and XBEACH simulate erosion of the beach and dune profile caused by storm surge and waves, including dune overwash. M&N will employ a combination of storm conditions for model calibration/verification and sensitivity analysis to provide assurance of the necessary robustness for the models' applicability for a wide range of conditions for the Level of Protection assessment. For the CSHORE/XBEACH model, up to twenty (20) representative survey profile sections will be used by M&N to estimate cross-shore transport and profile change during storms. The representative profiles will be



developed considering variations in existing profiles (i.e. beach width, dune height, etc.) and in existing apparent vulnerability of landward areas to storm impacts; these choices will be discussed and confirmed with Town staff.

2. Confirm Background Erosion Rates – M&N will use a combination of data evaluation / analytical techniques and the available beach profile monitoring data to determine background erosion rates, and erosion rates immediately subsequent to beach nourishment projects, within the Town of Nags Head.
3. Determine Current Level of Protection Provided by the Beach Profiles – M&N will use historical storm data to develop a suite of design storms (return periods of 2 yr, 5 yr, 10 yr, 25 yr, 50 yr, and 100 yr) from which to determine the current level of protection from storm surge and waves afforded by the dune and berm system in the Town of Nags Head. The representative survey profile sections utilized in Task 2.3.2 above will be used for these analyses. The extent of damages from each return period storm will be qualified at each representative transect to determine the largest return period storm for which the existing system is providing adequate protection to the first row of structures. It is expected that the level of protection currently provided by the beach and dune will vary throughout the Town of Nags Head, and this stage of the analysis will document which reaches have greater and lesser protection to inform subsequent tasks in the master plan workflow.
4. Determine Desired Level of Protection – Based on the current level of protection analysis, M&N will discuss with the Town if they desire to increase the current level of protection across the whole project or in any specific areas by developing some estimates of what volume and cost would be required to increase and maintain the additional level of protection.
5. Development of Optimal Nourishment Triggers - Once the desired level of protection is determined, M&N will use the calibrated CSHORE/XBEACH cross-shore profile models to determine the minimum volume required at each representative transect to provide adequate protection to the first row of infrastructure. In cases where the existing level of protection is equal or greater than the desired level of protection, the minimum volume will be calculated by “eroding” the profile in the model until it just provides protection against the desired level of design storm – this provides an estimate of how low the profile volume could get before the desired level of protection would be lost. In cases where the existing level of protection is desired to be increased above current levels, the profiles will be “built out” in the model until they just provide the desired level of protection. These minimum volumes will then be used to define nourishment triggers by which to determine the need for a project and a maintenance criteria by which to maintain and describe the Town’s “engineered beach” plan to FEMA. These triggers may be adjusted throughout the course of the Master Plan development if additional modeling (longshore transport, 2D/3D nearshore models, etc.) or statistical analysis indicates a need to adjust. During later project phases, M&N will assist the Town to coordinate with FEMA representatives to discuss how the proposed nourishment triggers will be incorporated into the engineered beach maintenance.
6. Develop and Calibrate a GENCADE Longshore Transport and Shoreline Change Model - M&N will use available offshore wave data and shoreline positions taken from the survey monitoring data to develop and calibrate a GENCADE model covering the limits of the Town of Nags Head and a sufficient distance north and south of the Town to account for model boundary effects. The purpose of developing and calibrating the model in YEAR 1 is to have this model ready to utilize early in YEAR 2 to begin evaluating the relative benefits of different beach nourishment phasing strategies. This can include looking at optimizing hot spot management in collaboration with neighboring towns, or otherwise staging different reaches of the beach to receive nourishment on different cycles, with the intent to



optimize long-term spending on dredge mobilization and other fixed costs. This evaluation is also useful for illustrating the benefits to each reach and subreach for developing funding and financing plans. M&N will employ a combination of long-term and storm conditions for model calibration/verification and sensitivity analysis to provide assurance of the necessary robustness for the models' applicability for a wide range of conditions for the alternatives assessment.

7. Estimate Long Term Sand Needs – M&N will use the results of the prior subtasks to develop an initial estimate of the long-term needs for nourishment sand to provide the discussed levels of protection while keeping up with anticipated background erosion rates, expected significant storm events. M&N will use analytical / statistical techniques – such as the Oracle Crystal Ball techniques M&N has utilized successfully elsewhere – to project out sand needs based on the historical erosion rates calculated from the historical beach monitoring data. These estimates will be confirmed in later project phases with detailed modeling.

Task 2.4 – YEAR 1 Interim Report

At the conclusion of Task 2.3, M&N will prepare an interim report that documents YEAR 1 findings and recommendations. This report will serve as the basis for future master planning efforts and include recommendations regarding additional field data to be collected and the steps necessary to acquire permits. Draft and final versions will be submitted to the Town.

TASK 2 PROJECT COST

The total estimated fee for the project for Master Plan Year 1 tasks inclusive of all efforts is lump sum of **\$208,100**, including expenses for travel to the Town for meetings and reproduction.

M&N proposes to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town's requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on the Task during the invoice period.

The fees for each of these subtasks are summarized below:

Task 2: Master Plan Year 1 (2020-2021)	M&N Fee
Task 2.1 – Project Planning, Meetings, and Coordination	\$38,520
Task 2.2 – Data Collection and Review of Existing Engineered Beach Monitoring/Maintenance Plan and Triggers	\$52,920
Task 2.3 – Initial Modeling and Development of Preliminary Nourishment Triggers	\$96,340
Task 2.4 – Year 1 Interim Report	\$20,320
Total for Task 2	\$208,100



TASK 3 INTRODUCTION

Moffatt & Nichol (M&N) is pleased to present this scope of work to support the Town's application for Coastal Storm Damage Mitigation (CSDM) application for funding due to damages to the beach from Hurricane Dorian.

TASK 3 SCOPE OF WORK

This Scope of Work defines the services to be provided in support of the Town's Coastal Storm Damage Mitigation Fund application to support funding of a beach nourishment and repair project for damages incurred by Hurricane Dorian.

Additional meeting time and coordination is included to allow for review of documents by the Town.

Task 3.1 – CSDM Application Support

M&N will prepare the CSDM application package for submittal to NC Department of Environmental Quality (DEQ). The application package will include documents collected during Task 1. Additional documents to be prepared include project maps, identification of borrow area, opinion of probable cost, and project schedule.

TASK 3 PROJECT COST

The total estimated fee for the project for the CSDM Application Support tasks inclusive of all efforts is lump sum of **\$14,280**.

M&N proposes to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town's requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on the Task during the invoice period.

The fees for each of these subtasks are summarized below:

Task 3: CSDM Application Support	M&N Fee
Task 3.1 – CSDM Application Support	\$14,280



TASK 4 INTRODUCTION

The Town of Nags Head incurred damages to its recently constructed beach nourishment project when Hurricane Dorian impacted the area in September 2019. Approximately 508,070 cubic yards (cy) of sand volume was lost from the project area, and the Town submitted a request to FEMA for Category G reimbursement. In addition, the Town has submitted an application for funding from the State Coastal Storm Damage Mitigation (CSDM) grant program to augment the post-Dorian restoration project with an additional 141,150 cy. If both funding requests are granted in full, the Town plans to construct a beach nourishment project in the summer of 2022 that would place approximately 650,000 cy within a 10-mile long project area, for an average profile volume nourishment of approximately 12.3 cy/ft. The scope of Task 4 is proposed to provide for the engineering design, permitting coordination, preparation of construction documents and bidding and construction phase engineering support to the Town as it implements this Post-Dorian beach restoration project.

TASK 4 SCOPE OF WORK

M&N will provide professional services as described in the subtasks below to assist the Town to execute its Nags Head Post-Dorian Category G Restoration Project in accordance with FEMA guidelines for federal cost reimbursement. The project requires the following tasks:

Task 4.1 – Meetings and Coordination with Agencies and Stakeholder Groups

In addition to the specific meetings and standing calls with Town staff and elected officials described under the Task 2, M&N will attend meetings and provide coordination services for the Post-Dorian nourishment project as needed for project development, acquiring the necessary permits and addressing citizen and other stakeholder concerns. These will include meetings with Town staff and elected officials, regulatory and other governmental agencies such as NCDCM, USACE, NCDM and FEMA, potential construction contractors, as well as interested or concerned citizens. M&N's proposed fee for Task 4 includes an assumption of up to four (4) in-person meetings in Nags Head or in Washington and up to four (4) virtual meetings during the course of the Post-Dorian project development. Time to develop presentations for some of these meetings (when needed) are included.

Task 4.2 – Coastal Engineering, Design, Environmental Permitting and Preliminary Plan Development

M&N will compile existing data available for the project including available beach surveys and geotechnical information collected by others.

M&N will perform one site visit to determine the current condition of the beach and shorefront properties throughout the Post-Dorian Category G Restoration Project area. M&N will first develop a new digital elevation model of the current survey at the time (expected to be the summer 2020 annual monitoring survey) to serve as the base map for the permit drawings and preliminary construction drawings. M&N will then develop the permit drawings consisting of preliminary plans and typical cross-sections for a proposed project that restores the berm with an equal fill density of material along the Project area. The proposed berm width will vary along the Project area to achieve this equal distribution of alongshore fill density.



M&N will utilize the after-dredge survey from the 2019 Nags Head Beach Renourishment Project to verify the remaining volume of beach compatible material available for use from the Borrow Area 3A and Borrow Area 4 as borrow sources for the Restoration Project.

M&N will also be responsible for preparing application packages for the Town to acquire state and federal permits for the project. Agency coordination and stakeholder interaction is expected to be an important part of this project. M&N will participate in an agency pre-project scoping meeting to determine appropriate documentation necessary to support permitting and regulatory review. M&N staff will be available for one additional agency meeting, if necessary, as the project progresses, or for public input.

M&N will work with the Town and with the U.S. Army Corps of Engineers, NC Division of Coastal Management and NC Division of Water Resources to obtain a permit modifications to existing permits to allow the Project to proceed more quickly. The design of the berm restoration and the construction procedures to be followed will be in accordance with agency requirements. M&N will work closely with permit personnel to identify their requirements and restrictions.

Deliverables from Task 4.2 to the Town will include:

- Permit drawings consisting of preliminary plans and typical cross-sections and construction notes, along with a project narrative for coordination with permitting agencies
- Notes / minutes of meetings and coordination with permitting agencies
- Applications / letters requesting permit modification
- Preliminary construction plans and specifications at an approximate 70% level of completion, for Town review and comment prior to preparation of final plans and specifications for project bidding.

Task 4.3 – Final Plans and Specifications and Bid Documents

M&N will develop a complete set of bid documents for advertisement by the Town. This will include a complete set of construction drawings, technical specifications, general provisions, and other necessary documents that form the complete bid package, and the Engineer's Opinion of Probable Cost confirming M&N's opinion that the project can be constructed within the Town's available funds for the project. The preliminary plans will be revised based on the updated monitoring survey from summer 2021. It is assumed that the Town will be responsible for any right-of-way/easement acquisitions as well as identification of staging areas.

Deliverables from Task 4.3 to the Town will include:

- A Prefinal set of plans and specifications for final review by the Town before submittal of the Final signed and sealed bid documents.
- Final bid documents, signed and sealed as necessary by a licensed North Carolina Professional Engineer, for the Town to use in project bidding and construction.



Task 4.4 – Project Bidding, Negotiation and Award

M&N will lead coordination with contractors, with assistance from the Town, during the bidding/construction award phase of the project. These tasks will include: leading an industry day virtual conference 2-3 months before the bid announcement, developing a bid announcement, advertising the bid in local papers and with known contractors and plan rooms, leading a pre-bid conference with the Town, providing construction bid packages to the various contractors and plan rooms, answering bidding contractors' questions, providing addendums, and helping the Town evaluate bids and providing a bid tab and summary with recommendations concerning the contract award. In the event that the bids exceed the project budget, M&N will assist the Town in negotiating with the apparent low bid contractor to evaluate options that will meet the project budget.

Task 4.5 – Construction Observations and Administration

After contract award, M&N will provide construction observation and assist the Town with administrative services for the project. M&N will lead a pre-construction meeting with the Town, resource and permit agency representatives, stakeholders and the selected contractor to go over the project reporting and pay request protocols as well as operational expectations and permitting compliance items that must be completed by the contractor. M&N will also go over the contractor requirement for a pre-construction survey to be submitted before contractor mobilization so that M&N can, if needed, revise the beach placement plan based on significant changed conditions between the beach profiles that were the basis for the design and the actual conditions at the start of the project.

M&N will also review contractor submittals (such as the QA/QC Plan, Work Plan, Environmental Plan, etc.) and address contractor Requests For Information (RFIs). It is expected that the construction period will require approximately three months during May 2022-July 2022. Because of the rapid pace of construction activities that we are expecting and based on our successful experience in other NC beach communities, we anticipate having M&N staff on-site for construction observation during two to three days per week, with weekly contractor meetings occurring during those two to three days. M&N will also coordinate with the contractor to facilitate having required environmental submittals and reports provided to agencies within appropriate timeframes.

M&N will review regular interim construction surveys and post-construction surveys, to be provided by the contractor, and M&N will compute pay volumes to verify that the fill is placed in accordance with the bid documents. M&N will also work with the contractor to make "real-time" adjustments to the nourishment template if needed. It has been established through experience that this real-time check and adjustment is necessary to avoid construction delays and volume over-runs, to keep the possibilities of contract conflicts to a minimum and to work through issues in an efficient, but adaptive way. M&N will also review and approve contractor pay requests and will coordinate with the contractor as needed.

Lastly, M&N will develop a final report summarizing the project, field visits, meetings, pay requests and other applicable project documentation and lessons learned for submittal to the Town and FEMA. M&N will also provide a final presentation to the Town summarizing the project.

TASK 4 PROJECT COST

The total estimated fee for the project for Post-Dorian Category G Restoration Project tasks inclusive of all efforts is lump sum of **\$717,512**, including expenses for reproduction and travel to the Town for meetings, site visits, and construction observation. This fee excludes additional geotechnical or environmental field investigations. If these are deemed necessary during design and permitting of the project, an additional scope and fee will be submitted to the Town for review and approval.



M&N proposes to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town’s requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on the Task during the invoice period.

The fees for each of these subtasks are summarized below:

Task 4: Post-Dorian Category G Restoration Project	M&N Fee
Task 4.1 – Meetings and Coordination with Agencies and Stakeholder Groups	\$77,004
Task 4.2 – Coastal Engineering, Design, Environmental Permitting and Preliminary Plan Development	\$253,238
Task 4.3 – Final Plans and Specifications and Bid Documents	\$97,730
Task 4.4 – Project Bidding, Negotiation and Award	\$39,530
Task 4.5 – Construction Observations and Administration	\$250,010
Total for Task 4	\$717,512

TASK 4 PROJECT SCHEDULE

The total project duration is expected to be approximately **18-21 months** to complete design, permitting, bidding and award, and construction with an end date of July 2022.