EXHIBIT A — THE PROPOSAL

[P2458-01] [17 MAY 2016]

Phase 1

Professional Services for Nags Head Beach Renourishment
Nags Head, Dare County, North Carolina

INTRODUCTION

The Town of Nags Head (Town or Owner) plans to implement a beach renourishment project scheduled to commence in the summer of 2018 (referred herein as short-term plan, or Phase 1). The Town also desires to develop a long-term Shoreline Management Master Plan for 30 years (referred herein as long-term plan, or Phase 2). This proposal is submitted by Coastal Science & Engineering Inc (CSE—Engineer) at the request of the Town for the Phase 1 professional services in connection with the beach renourishment project. Although this proposal focuses on the 2018 renourishment project, long-term planning will be considered to the extent possible during this phase of study.

The proposed 2018 renourishment project will supplement the 2011 beach nourishment project which placed 4.6 million cubic yards of beach-quality sand along 10 miles of Nags Head oceanfront. The Maintenance and Monitoring Plan for the 2011 project (dated 25 August 2011 prepared by CSE) outlines certain benchmarks and triggers for renourishment or post-storm restoration. Presently, the southernmost ~1 mile of the project is close to or below the 50 percent loss threshold. Fully 60 percent of Nags Head (ie – north of Jennette's Pier) contains more sand than the 2011 post-project condition.

With much of Nags Head retaining more sand than was placed in 2011, the formulation for renourishment can be based on a combination of thresholds beyond simply restoring areas which have lost at least 50 percent of the original nourishment. CSE will evaluate the performance of the 2011 project, comparing the performance with triggers for renourishment established during planning of the 2011 project. Working with the Town, CSE will discuss the applicability of these triggers and whether any adjustments should be made for long-term planning purposes (Phase 2). It would be advantageous to renourish the majority of Nags Head and further enhance the beach-dune system, improve project longevity, expand the project boundaries, and achieve certain economies of scale.

The general purpose of CSE's proposed work is to assist the Town in implementing the 2018 renourishment project using offshore sand resources. Work performed under Phase 1 will build on the previous engineering and permitting work conducted for the 2011 project and experience from

similar projects, and will take into account anticipated special conditions and schedule restrictions that are likely to be a part of state and federal permits for the project. For background information on the 2011 project as well as the project performance since its completion, see the references listed at the end of the proposal (USACE 2000, CSE 2005, 2008, 2011, 2012, 2013a, 2013b, 2014a, 2014b, and 2015a).

Numerous work elements are included in CSE's proposed Phase 1 services and are detailed under an orderly set of tasks (and subtasks) presented herein. Below is CSE's proposed list of the tasks.

Task 1 – Project Planning, Communication, and Liaison
Task 2 – Beach and Borrow Area Condition Surveys and Geotechnical Study
Task 3 – Coastal Engineering and Plan Development
Task 4 – Permitting and Environmental Studies
Task 5 – Project Final Design, Specifications, and Construction Documents
Task 6 – Bidding and Negotiation
Task 7 – Construction Observation and Administration
Task 8 – Final Report and Recommendation for Acceptance

Tasks 1–4 encompass items principally in support of the permit application. Tasks 5–8 support the final design, bid documents, bidding coordination, construction administration, and the post-project final report. Normally, Tasks 5–8 are initiated after it is clear that permits are likely to be issued. These later tasks will not be initiated without express authorization by the Town to proceed.

CSE's understanding is that during the implementation of Phase 1, the Town will give CSE more direction on preparing a proposal for Phase 2 to assist the Town with the development of a long-term, shoreline management master plan.

The scope of services presented herein encompasses the anticipated steps and requirements for the 2018 renourishment project. If, during the course of the work, it is determined that there is not enough funding for the project, the Town may suspend remaining work under this proposal at its discretion.

CONTINGENCY

Per the Town's request, the present proposal does <u>not</u> include contingency for the proposed services.

TARGET BUDGET

The Town's preliminary estimate of the project is between $20 and $23 million (per Town's Shoreline Management Planning presentation dated April 16, 2016). CSE understands that the total project budget will be fixed by the Town at certain "not-to-exceed" amounts and, if possible, will be less than this range. Contracts with dredging firms will likely be based on a fixed (by bid) mobilization/

demobilization cost, plus a variable sand pumping and placement cost. The payment for sand placement is normally based on "in-place" surveys and confirmation of quantities delivered, payable at a bid-unit price. The Town can assume that the contracted pumping quantity will be adjusted to fit the funds available within the overall project parameters allowed under the permits. CSE believes that substantially larger volumes or a reduction of construction cost may be feasible within the available budget and design volume provided construction occurs during fair-weather–summer periods.

CSE will advise the Town regarding the viability of a project which involves reductions in volume due to bid prices exceeding the pre-bid estimates. In general, potential volume reductions of up to 20 percent are factored into CSE's preliminary design. Similarly, increases in volume are possible within the limitations and guidelines imposed by permits if bid prices fall below the pre-bid estimates.

The 2011 project incurred a total construction cost of $30,180,000 including mobilization/demobilization of $4.65 million, and the pumping unit price of $5.55 per cubic yard ($/cy). The equivalent unit price (including mob/demob and pumping) was $6.56. Nags Head was able to accomplish the maximum permitted quantity in 2011 because of the favorable low bid received from the Contractor, Great Lakes Dredge & Dock (GLDD). The recent three-town nourishment project received a bid of $10.20/cy (submitted by GLDD on 8 March 2016), and the lowest bid for Buxton project is $8.52/cy (submitted by Weeks Marine on 7 April 2016). CSE assumes that the Town's budget ($20-23 million) includes the construction cost and soft costs for engineering, planning, permitting, and construction administration. These soft costs are normally estimated to total (~)$2–$3 million (8.5 to 15% of the total budget) excluding contingencies. The scale and scope of the 2018 renourishment project will be determined by the Town's construction budget, project goal and purpose, erosion rates, and present market of similar projects.

The present proposal details our team's scope of services and costs for Phase 1 services including planning, design, environmental documents, and construction administration. It identifies the work by task, followed by an itemized budget (personnel requirements and fees) for professional services for each task and estimated reimbursable costs.

SCOPE OF SERVICES

The scope of services proposed herein is based on CSE's experience on similar projects and project components, the scope of the project as defined by this proposal, and the regulatory requirements of agencies of the state of North Carolina and the federal government with jurisdiction over construction at the site. The following scope of services is proposed.

Task 1.0 Project Planning, Communication, and Liaison

The project-planning task of the project will include coordination and meetings with the Owner and various stakeholders (as required) and with other team members to:

- Determine the purpose and goal of the renourishment project.
- Determine the project boundaries especially the south boundary.
- Compare beach conditions from north to south and identify erosion hot spots.
- Develop the preliminary beach renourishment criteria and plan.
- Develop schedules and time lines.
- Provide liaison with federal, state, and local officials as well as property owners.
- Present the plan to government officials and property owners.
- Modify the plan according to changes in Owner-authorized funding levels or market conditions.
- Provide liaison with interested non-governmental organizations (NGOs) and the media as directed by the Owner.
- Prepare project fact sheets, news releases, and display graphics as directed by the Owner to enhance public involvement.

Following authorization to proceed with the proposed scope of services:

Task 1.1 — CSE will meet with Owner representative(s) and other team members to clearly define the goals and objectives for the work.

Task 1.2 — CSE will update the historical erosion rate and prepare work plans, time lines, and schedules for additional field data collection in support of the project.

Task 1.3 — CSE will assist Nags Head officials (as requested) in preparing periodic project summaries including display graphics for distribution to officials and the public by way of various mediums, including web sites, newspapers, or newsletters.

Task 1 includes professional fees and reimbursable costs to participate in public forums and to assist the Town officials (Owner) with public communication and liaison established for this task. Under Task 1, CSE has budgeted ten (10) round trips (two people) to Nags Head; three (3) of these trips would involve CZR. These should be sufficient to cover meetings with the Owner as requested prior to construction. This travel is separate from travel under other tasks.

Task 2.0 Beach and Borrow Area Condition Surveys

Task 2 will include certain condition surveys of the foredune, beach, inshore zone [to ~40-foot (ft) depths], and offshore borrow area(s). These surveys will supplement previous field data collected by CSE and the USACE, and will also provide data on conditions close to the anticipated time of construction for input into final plans and specifications for the project.

Nags Head beach has been surveyed annually in June since the completion of the 2011 nourishment project. CSE proposes to continue such regular surveys prior to renourishment construction. In addition to the annual survey in June 2016,* CSE proposes to survey the beach condition in winter 2016 to further evaluate erosion hot spots under "winter" beach conditions. Overall, CSE proposes to resurvey the Nags Head project area for up to three (3) times prior to construction. These data will be used to update average-annual volumetric erosion rates and develop the project formulation (Task 2.1).

> *[*The June 2016 survey is the last annual monitoring planned under CSE's existing five-year post-construction monitoring agreement with the Town following the 2011 project (CSE Job 2387). Professional time and expenses associated with completion of the "Year 5" monitoring survey are separate from work proposed herein.*]

The borrow areas have not been surveyed since October 2011 after the completion of the 2011 project. CSE plans to resurvey the borrow areas for current bathymetry. CSE obtained over 130 offshore borings during planning for the 2011 nourishment project, which yielded a high density of samples and provided confirmation of sediment quality for over 13 million cubic yards. Suitable borrow sands remain in designated offshore areas for renourishment. At the discretion of the Town, CSE recommends an initial reconnaissance search for one more area closer to north Nags Head. Another borrow area to the north could potentially yield further economies during future renourishment events.

CSE's borrow area strategy is to find beach-compatible deposits that are close enough to the project to be pumped via traditional suction cutterhead dredges as well as hopper dredges, yet in water depths that are well beyond the zone of active sediment exchange with the beach. Both types of dredges were used in the 2011 project with significant cost savings to the Town. Sand deposits off Nags Head are generally of high quality and plentiful based on studies by USACE (2000), Byrnes et al (2003), and CSE (2005 and 2011). CSE proposes to obtain a minimum of 30 borings near the borrow areas used in the 2011 project for purposes of confirming offshore sediment quality and determining the quality of sediment that has infilled the 2011 excavation. Some of these borings are intended to assist resource agencies in their review of environmental impacts during the permitting process. An additional 50 borings will be obtained within a new sand search area to determine whether beach quality sand is available for the 2018 renourishment project closer to Reach 1 near north Nags Head (Task 2.2).

Task 2 will also include geophysical and cultural resources field data collection and analysis in the project area with the assistance of Tidewater Atlantic Research Inc (Task 2.3). Task 2.4 will include analysis of beach and borrow area sediment quality and compatibility. It will evaluate borrow area configurations meeting NCDEQ (North Carolina Department of Environmental Quality, formerly NCDENR) sediment criteria standards for beach nourishment (Ref: 15A NCAC.07H.0312 Technical Standards for Beach Fill Projects). Task 2.5 will cover time and expenses to obtain wave, tide, and current data in the proposed borrow area(s). Task 2.6 covers one set of controlled aerial orthophotos of the project area for use in final design (via in-house mapping or using the services of Independent Mapping Consultant Inc – IMC).

Task 2.1 — CSE will conduct up to three (3) condition surveys of the beach for purposes of computing volumetric changes and gradients in erosion from reach to reach compared with the historic data and the erosion rate adopted in the 2011 project. The first condition survey under the present proposal will be performed in winter 2016, and the second survey will be performed in June of the following year before 2017 hurricane season, consistent with previous annual monitoring efforts under CSE Job 2387 after the 2011 project. The final survey under Task 2.1 will be performed approximately two (~2) months prior to completion of bid documents to facilitate the final design for construction of the anticipated renourishment project.

The alongshore boundaries of each survey will extend from ~1.5 miles north of Nags Head to ~1 mile south of Nags Head into the National Seashore. CSE will reoccupy established profile lines, obtaining cross-sections at minimum 500-ft spacing from low water to (~)−40 ft or deeper. Under the Town's direction, CSE may expand the survey boundaries further north or south if the Town decides to modify the project boundaries. Surveys will be referenced to the existing project baseline established for the 2011 project. These boundaries and profile spacing may be slightly modified, and the density of coverage increased for purposes of dune management, and final design modeling and analyses. The density of coverage may also be increased around ocean outfalls to assist the Town in plans for outfall renovation.

Additional topographic and bathymetric data will be collected near the toe of dune and high waterline to provide more or less continuous alongshore contours from which reference backshore/ berm elevations and a datum-based mean high waterline can be derived. These data may be used by others for purposes of estimating areas where temporary construction easements may be required. CSE recommends that the Owner retain a local, North Carolina state-registered land surveyor for preparation of official metes and bounds surveys or to establish easements as necessary to complete the work under North Carolina state laws and coastal-zone management regulations.

The purpose of Task 2.1 is to obtain field data from which historical volumetric losses can be updated. These data are necessary for apportioning the renourishment volumes in an equitable manner. The surveys will provide necessary transects across the dunes and mark vegetation lines, fishing piers,

walkovers, ocean outfalls, and other obstructions that must be protected during construction. The surveys will also provide data for locating protective sand fencing that the Owner may wish to install as part of the project. The Task 2.1 surveys provide critical input data for the design analyses under Task 3.

Task 2.2 — CSE will conduct beach and borrow area sampling and bathymetric mapping in the offshore sand search area, including up to 80 borings. The purpose of the borings is to reconfirm the sand quality in the borrow areas delineated but not used in the previous project, determine sand quality changes in areas utilized in 2011, and search for and confirm new sand deposits for potential use along north Nags Head. Borings will be accomplished via the same methods and target-recovery lengths (minimum 8 ft) as the 2011 project. An average of three (3) samples per core will be collected according to variations in lithology and processed for laboratory testing. CSE will follow standard sampling and laboratory testing protocols to analyze sediment quality and to determine compatibility with the native beach sediments. The offshore area(s) chosen for borings will be based on the search results and input from state and federal resource agencies as applicable.

As a requisite of permit applications, under Task 2.2, CSE will reoccupy the 14 sediment stations used in the 2011 project and collect a minimum of 182 samples from the beach and inshore zone along the project area for purposes of determining the native grain-size distribution across the active littoral zone. Such sampling is required by the federal and state agencies in support of permit applications and will follow the North Carolina sediment sampling rules (Ref: 15A NCAC.07H.0312 Technical Standards for Beach Fill Projects).

Samples will be analyzed in the laboratory via mechanical sieving at 0.25-phi intervals in the sand size range. Additional sieves will be used as necessary to distinguish small gravel gradations to −4.0 phi (16 millimeter diameter). These data are necessary for design of fill sections and for evaluating equilibrium slopes and post-project adjustment of the nourishment profile. The sediment quality seaward of the normal breaker line also provides an indicator of the type of bar morphology that controls breaker characteristics in the area. A goal of the final design is to minimize changes to slopes in the inshore zone after initial adjustment of the fill so as to preserve the general character of surf conditions.

CSE will perform a “large-clast” survey of the project beach as required under NCDEQ rules. The large-clast survey is intended to estimate the areal coverage (unit numbers per standard area) of large shells, stones, or other debris on the pre-nourishment beach. The purpose of this study is to document pre-nourishment conditions for comparison with post-project conditions. This potentially protects the Owner from false claims related to placement of rocky material on the beach. The borings under Task 2.2 will provide the most reliable indicators of the sediment quality for the project and will help to eliminate portions of the borrow area where large clasts are abundant.

Task 2.3 — CSE will subcontract for certain geophysical data collection in the offshore borrow areas to further confirm sediment quality according to requirements (as applicable) of NCDEQ. Task 2.3 data collection will include a magnetometer survey to identify potential cultural resources (eg – shipwrecks) in and around the borrow areas (including the new borrow area proposed in Task 2.2 for north Nags Head). CSE's recommended subconsultant for this work is Dr. Gordon Watts of Tidewater Atlantic Research Inc (TAR—Washington NC). The survey protocols, scope of work, report production, cost estimate, etc. are described in Attachment 1.

The purpose of cultural resource surveys is to identify potential obstructions in the borrow areas and eliminate those areas from the final borrow area. CSE's normal practice is to leave a minimum 300-ft buffer area around any "targets" detected by the geophysical surveys, provided sufficient volume remains to accomplish the project. Alternatively, potential targets can be investigated in detail by excavation and sampling. CSE generally avoids that approach by simply deleting questionable parts of the borrow area. Failure to identify obstructions before bids are received opens the possibility of claims by the contractor associated with "changed site conditions." Therefore, the geophysical data collection helps protect the Owner from additional charges by the contractor, as well as safeguarding potential cultural resources.

TAR proposed cost estimate of $85,153.78 for Task 2.3 services appears as a line-item allowance in the summary of CSE's budget (Table 1 on page 31). Task 2.3 budget also includes time for coordination of geophysical data collection, review, and analysis of data by CSE personnel. It is anticipated that one CSE staff coastal physical scientist/project engineer will participate in some of the field data collection with TAR, assisting with local logistics and refinement of the track lines.

Task 2.4 — CSE will prepare a detailed analysis of borrow-area sediment quality for alternate borrow area configurations, meeting NCDEQ and other state and federal criteria for borrow area sediment quality. CSE will evaluate the compatibility of offshore and native sediments using Industry standard statistical techniques as detailed in the USACE Coastal Engineering Manual (2002–2011), as well as performance-based standards applied by CSE in previous projects (cf — Kana and Mohan 1998; CSE 2004, 2006).

The ideal borrow sediment for the project will be slightly coarser than the existing native beach. Further, stiff clay should be <1 percent; mud (silt and clay) should be <5 percent; and gravel-sized shell or clastic material should be <5 percent above ambient conditions. Under no circumstances will CSE recommend a borrow area consisting of sediments that test significantly finer than the native beach (comparing composites). In the event that portions of the borrow area are found during construction to contain stiff clay, mud, or gravel-sized material greater than the percentages stated herein, CSE will direct the dredging contractor to relocate the dredge to another part of the borrow area and communicate the information to the Owner as part of the construction observations under Task 7.

Task 2.5 — CSE will obtain wave, tide, and current data around the borrow area(s) for purposes of documenting wave climate for the project site. These data will supplement the wave data collected by CSE in 2011 prior to the 2011 project and the wave data collected by the Contractor (GLDD) during the 2011 project before Hurricane *Irene*. CSE proposes to install one (1) in-situ recording gauge in the borrow area and obtain a minimum of three (3) months of continuous-recorded data during a representative fair-weather dredging period in 2017. These data will be presented on project drawings or in an engineering report for review by dredging companies. The data will also be used for certain coastal engineering analyses under Task 3. CSE will deploy an RDI Workhorse™ ADCP (Acoustic Doppler Current Profiler) set to record water level and currents at high frequency (used for wave height and direction estimates). The record also yields tide data. The ADCP will record in-situ and will be serviced midway through the deployment period.

Dredging companies use wave data for evaluation of site conditions prior to submitting bids. Such data are normally also collected by contractors during construction because of the critical impact waves have on operations. Ocean-certified cutterhead dredges generally cannot operate in long-period seas >3 ft. Self-propelled ocean-hopper dredges can usually continue excavations in waves up to 5 ft but sometimes have difficulty connecting to the landing pipe for pump-out in such conditions. Wave data are also used by contractors to estimate their standby time (due to weather) and to determine when it is necessary to exit the project site and return to a safe harbor. Time-series wave data collected by CSE will be downloaded, checked for anomalous spikes, and processed for input into various statistical and modeling software. These records will provide the site-specific data needed for finalizing the nourishment design. Applicable software for data reduction and processing includes WinADCP™ and MATLAB®. CSE has developed custom "macros" in MATLAB® for displaying the data and running statistics. Other numerical modeling software (Task 3) will be used for shoreline evolution modeling and wave transformation analyses.

Task 2.6 — CSE will arrange for controlled aerial orthophotography (ie – images referenced to a planimetric grid such as NAD'83) of the site under an allowance given in the budget. The purpose of aerial orthophotography is to provide a visual image of existing site conditions on which the project limits and dimensions can be presented. The imagery will be ordered ~2–3 months prior to final design. CSE retained the services of Independent Mapping Consultants Inc (IMC, Charlotte NC) for Nags Head in 2011 (before 2011 nourishment) and 2014 (the third year after completion of the 2011 project). CSE plans to purchase a professional mapping drone within a year or so. With such an advanced mapping drone, aerial orthophotography can be obtained in-house. If CSE does not have a mapping drone in time for the final design, we plan to continue to retain IMC for this work. The costs for the previous two digital orthophotography services for Nags Head were $13,052 in 2011 and $14,115 in 2014 (respectively) for the project area. IMC's estimated cost for similar service for the 2018 renourishment project is $13,052.00 (Attachment 2). It is included in CSE's proposed budget as a line-item allowance.

Summary — CSE's Task 2 services will require up to 38 days of senior professional time (ie — project director and project engineer) and up to 229 days of technical staff time for the various subtasks listed above. Professional fees and reimbursables to accomplish the Task 2 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. CSE anticipates there will be ten (10) round trips (RTs) via tow vehicle with survey boat from Columbia to the project site. Reimbursables include rentals of in-house tow vehicle, off-road 4-by-4, 24-ft survey vessel, RTK–GPS, diving and coring equipment, wave gauges(s), and lodging and per diem. Proposals from subconsultants for Tasks 2.3 and 2.6 are included in Attachments 1 and 2 (respectively), and their cost estimates are listed under Allowance in Table 1.

Task 3.0 Coastal Engineering and Plan Development

Task 3 will include engineering analyses and plan development necessary to determine the renourishment plan, to analyze renourishment adjustment, to evaluate changes in wave energy and sand transport after dredging, and to prepare an updated estimate of probable construction costs. CSE's analyses will assist the Owner in determining the size of the project and how best to configure the beach fill in relation to the budget available. Engineering analyses will serve as a rationale for the final plan and will provide the Owner with an outline of the construction plan and likely outcome of the project.

Task 3.1 — CSE will evaluate the beach-dune system and prepare an updated analysis of erosion/accretion rates since completion of the 2011 project comparing it with the results of previous studies (USACE 2000, USACE 2010, CSE 2005, CSE 2011, NCDENR 2012). The analysis will be used to develop a fill plan based on a determination of volume surpluses and deficits along the project area (taking into consideration certain constraints on construction via ocean-certified dredges). Particular focus will be on evaluating post-project transformation of the construction berm (fill template), drawing on data from the first five-year performance after the 2011 project. CSE will evaluate alternative taper sections so as to create acceptable transitions between nourished and unnourished areas and minimize potential adverse impacts to adjacent property. CSE will prepare an updated sediment budget describing inputs and outputs as measured and inferred from the condition surveys.

CSE will evaluate the impact of the project on the shoaling of Oregon Inlet and in the immediate vicinity. This analysis will include an assessment of likely cross-shore changes after nourishment including (1) aeolian transport and enhancement of the foredune, (2) modification of the dry-sand beach, (3) adjustment of the inshore profile, and (4) expected seasonal variations of profile geometry. The analysis will also consider longshore changes, including updrift and downdrift impacts, and estimates of spreading rates of the nourishment sand. The analysis will be focused on addressing concerns expressed by state and federal regulatory officials during pre-application meetings.

The proposed condition surveys under Task 2 along with the data collected since 2012 will allow CSE to calculate how much additional sand has been lost along different sections of the beach since completion of the 2011 project.

Task 3.2 — Similar to the 2011 project, CSE will evaluate alternative renourishment scenarios, fill distribution, and profile dimensions by means of the USACE-approved models—STWAVE, SBEACH, and GENESIS. These models provide numerical simulations of cross-shore profile adjustment due to storms and shoreline change due to longshore processes and sediment transport. Each model requires input wave data which will be obtained from NOAA offshore buoys (provides long-term real-time data), USACE Wave Information Studies data (long-term hindcast data), and site-specific data collected under Task 2.

A dataset of bathymetry, wave observations, and related site-specific measurements will be used to set up each model and calibrate it for local conditions. Once calibrated, these models allow simulations of alternative nourishment configurations (eg – dry-sand berm and foredune dimensions) and the impacts of storms of varying intensities (waves and surge levels). STWAVE enables evaluation of wave-energy changes at the shoreline due to excavation of the borrow area, and GENESIS evaluates shoreline evolution during various stages of the design life following the beach renourishment project. SBEACH is used to estimate the amount of sand loss (profile adjustment) in the visible beach under a range of storm intensities. The models will help demonstrate the viability of the project and can also provide a measure of the degree of protection renourishment offers. This will give the Owner a quantitative basis for the design.

Task 3.3 — CSE will revise the renourishment plan based on results of Tasks 2.1 through 3.2 herein along with consideration of funding levels established by the Owner. CSE will prepare periodic updated estimates of probable construction costs. Under Task 3.3, CSE will prepare periodic memorandum reports on the beach condition and updated erosion rates following each condition survey. Task 3.3 will also include professional time to prepare a final engineering report for the project, incorporating results of field data collection (Tasks 2.1–2.6 and Tasks 3.1–3.2). Normally, the engineering report is completed around the time of bids so that its content is consistent with final design conditions and the actual scope of the project. The engineering report serves as a primary design document, summarizing the basis and rationale for the project formulation, borrow area, and beach nourishment configuration. Prospective bidders for the 2011 project requested the report and found it helpful in describing the local site conditions.

Summary — CSE's Task 3 services will require up to 109 days of senior professional time and up to 62 days of technical staff time. Professional fees and reimbursables to accomplish the Task 3 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. Work involves extensive data reduction and analysis (Task 3.1), model setup, calibration, and simulation of alternative

nourishment configurations and storm intensities (Task 3.2). The majority of remaining time covers preparation of periodical memoranda and the final engineering report (Task 3.3).

Task 4.0 Permitting and Environmental Studies

Task 4 involves pre-application meetings with regulatory and resource agencies, preparation of supporting environmental documents, preparation of the permit applications (state and federal under NCEPA and NEPA, including drawings, narrative, and application forms), review of comments, preparation of responses to comments, participation in public hearings, and ongoing liaison with state and federal officials. In addition, Task 4 will include liaison and meetings with state and federal regulatory officials to obtain necessary approvals and support of the plan under their regulations.

CSE will have overall responsibility for permitting and document preparation, and CZR will provide major input for some of the required environmental documents. We assume, at minimum, the required documents will include:

- Environmental Assessment (EA)
- Littoral Processes
- Biological Assessment (BA)
- Geotechnical Data
- Essential Fish Habitat (EFH) Assessment
- Cultural Resources
- Monitoring and Mitigation Measures
- Cumulative Impact Assessment

The CSE/CZR scope of services for permitting under Task 4 will include the following subtasks.

Task 4.1 — Assemble Relevant Documents — The team will review relevant documents for similar or ongoing beach restoration projects in Dare County, including other EIS's, EA's, EFH's and BA's. To the extent practicable, the team will draw on relevant findings and results from the 2011 Nags Head permitting documents (USACE 2000, 2010; CSE 2008) and 2016 Buxton nourishment (CSE 2015b) and ongoing work by others for projects at Duck, Kill Devil Hills, and Kitty Hawk (CPE 2015). This subtask will also provide professional time to assemble and review recent environmental monitoring studies from similar projects including Nags Head (CSE 2012, CZR 2014) and other North Carolina projects. Data on turtle nesting after the 2011 project, for example, will be acquired and incorporated into environmental documents.

Task 4.2 — Pre-Application Meetings — The team will meet with USACE, NCDEQ/ NCDCM, NPS (if necessary), USFWS, and NMFS officials prior to submission of applications for purposes of determining the relevant issues of concern and specific impacts to be addressed in the application and

supporting environmental documents. The primary issues with beach nourishment include the following:

- Impacts to jurisdictional waters — water quality, cultural resources, sediment quality.
- Impacts to threatened and endangered species — sea turtles, piping plover, red knot, seabeach amaranth, marine mammals, etc.
- Impacts to in situ organisms — benthic marine organisms, fisheries, etc.

In addition, the renourishment project may impact the National Seashore and Oregon Inlet. The objective of pre-application meetings is to present the preliminary plan and solicit input from the permitting agencies before submission of an application.

The team has budgeted for a number of meetings (not to exceed) with representatives of NCDCM (in Elizabeth City and Morehead City), USACE Regulatory (in Washington NC and Wilmington), USFWS (in Raleigh and PINWR), and NMFS. The team anticipates three interagency meetings will be convened involving other North Carolina agencies including Wildlife Resource Commission (WCR), Division of Marine Fisheries (DMF), and Division of Water Resources (DWR).

Task 4.3 — Preparation of Environmental Documents — The team anticipates obtaining clarification from state and federal officials on the specific requirements for supporting environmental documents during Task 4.2. Task 4.3 will cover professional time and expenses to prepare the following documents (as required).

4.3.1 — Preparation of Essential Fish Habitat (EFH) Assessment — CZR will provide the bulk of the EFH assessment, and CSE will finalize the report. The EFH is required by NMFS under the Magnuson-Stevens Fishery Conservation and Management Act of 2006 (2014 re-authorization bill pending).

4.3.2 — Preparation of Biological Assessment (BA) — CZR will provide the lead role in preparing a BA report in connection with the project. A BA is required by USFWS for projects which trigger Section 7 consultation under the Endangered Species Act (ESA). Nourishment projects constructed during summer months impact turtle nesting activities. The BA will address impacts to threatened and endangered species, and will identify protective measures to be taken. The principal species of concern are the piping plover, red knot, sea turtles (five species), shortnose sturgeon, Atlantic sturgeon, seabeach amaranth, West Indian manatee, and whales (several species). This species list differs somewhat from the species of concern leading up to the 2011 project, hence the requirement for a new BA. The USFWS uses the BA to assist them in preparation of their Biological Opinion (BO) under Section 7. In addition to compiling readily available information from prior BAs for similar projects, the team will incorporate new information as available from recent projects by USACE and others.

4.3.3 — Preparation of Environmental Assessment (EA) — The project team anticipates state and federal agencies will require a full EA for the project because of its potential impacts to endangered species (due to the requirement for summer dredging) and to the nearby properties. Our team will prepare the initial document as a draft, then incorporate correspondence and prepare responses to comments. A final document will be prepared at the direction of the regulatory agencies upon satisfaction of all issues regarding the project. The team will draw on relevant EA documents for Dare County projects including the EIS for the Nags Head 2011 project (USACE 2000, 2010), Buxton (CSE 2015), Bonner Bridge (NCDOT 2008), and Duck, Kill Devil Hills, and Kitty Hawk (CPE 2015). Our team's costs for preparation of the EA assume considerable amounts of information remain the same as conditions for the 2011 project (USACE 2010) and, therefore, will not require major revision.

4.3.4 — Preparation of Cumulative Impacts Report — The project team will prepare a cumulative impacts assessment for the project using available information regarding all other known projects in Dare County and the northern Outer Banks/Virginia Beach area (ie – primary littoral cell between Chesapeake Bay and Cape Hatteras). This information and analysis will either be compiled as a separate report or will be incorporated into the EA—as directed by resource and regulatory agencies. The team anticipates using the 2011 project (USACE 2000, 2010; CSE 2012) as the principal project for assessing impacts and the frequency and scale of projects in the upper Outer Banks.

Task 4.4 — Preparation of Permit Applications — The Engineer will prepare and submit permit applications to USACE and NCDEQ as required for projects of this type. Work under Task 4.4 will include technical criteria, project narratives and design data, drawings, and completed application forms for filing applications to secure the necessary permits from federal and state agencies that have jurisdiction to approve the design of the project. The Engineer will assist the Owner in consultations with appropriate authorities to obtain the required permits and approvals.

Specific work items will include:

A) Preparation of permit drawings – vicinity map, project plan, borrow area layouts, beach fill sections, and geotechnical data.
B) Preparation of a project synopsis, computation of anticipated dredge and fill volumes, excavation and reclamation areas, and a description of the construction methodology.
C) Selection and editing of supporting data and reports (attachments to the permit) covering the topics of engineering, geotechnical surveys, environmental surveys, etc.
D) Review meeting(s) with the Owner before permit submittal.
E) Preparation of miscellaneous supporting materials (eg – public advertisements, ownership affidavits, etc) as required.

Task 4.5 — Permitting Liaison and Public Hearings — The team of CSE/CZR will provide permitting liaison with state and federal agencies as required to follow up with document requests, responses to comments, and participation in formal public hearings and other regulatory forums (not covered under Task 1.0). Task 4.5 will also provide time to prepare monitoring and maintenance plans for the project if required by regulatory agencies. Normally, the regulatory agencies provide a set of draft conditions for implementation of the project. The team will review the special conditions and provide recommendations to the Owner regarding acceptance or rejection of the conditions along with the rationale for the recommendation. The Engineer will also provide an informal opinion on the potential cost implications of the agency recommendations.

Summary — Task 4 will require up to 115 days of CSE senior professional time and 155 days of CSE technical support time. Most of CSE's time covers Tasks 4.2, 4.4, and 4.5 along with preparation of the EA (Task 4.3.3). CZR's service mainly covers Tasks 4.1, 4.3, and 4.5. Attachment 3 provides CZR's estimated costs for their proposed work under these tasks, and the $150,000.000 budget is given as an allowance in Table 1. The team has budgeted for up to 15 RTs to meetings during the anticipated, two-year permitting process.

5.0 Project Final Design, Specifications, and Construction Documents

Task 5.1 — On the basis of the approved project scope, the authorized project budget and the revised opinion of total project costs, CSE will prepare final drawings and specifications (hereinafter called Drawings and Specifications) to show the general scope, extent, and character of the work to be furnished and performed by the contractor. The drawings will reference a project baseline established by CSE with appropriate reference control points from which project fill sections, before and after dredging surveys, and compliance/payment quantities will be measured by the contractor.

Task 5.2 — CSE will advise the Owner of any changes in general scope, extent or character, or design requirements of the project or construction costs. CSE will furnish to the Owner a revised opinion of total project costs based on the Drawings and Specifications and consultation with prospective contractors.

Task 5.3 — CSE will prepare for review and approval by the Owner, their legal counsel, and other advisors contract agreement forms, general conditions, supplementary general conditions (all of which shall be consistent with the forms and pertinent guide sheets of the EJCDC–Engineer's Joint Contract Documents Committee). CSE will assist in the preparation of other related documents as specifically required by the Owner, limited to such Owner-supplied forms for construction projects which may supplement or take the place of standard EJCDC forms.

Task 5.4 — CSE will furnish the above-referenced documents and the Drawings and Specifications to the Owner, and will present and review them in person with the Owner.

Under Task 5, CSE will incorporate into Drawings and Specifications for the project such environmental protection as necessary and required under special conditions or general conditions of state and federal permits for the work (to the extent these are known prior to issuance of Drawings and Specifications for prospective bidders). It is the intent of this work to require the contractor to comply with all state and federal environmental laws, to provide for safe operations in and around the job site, and to maintain operations within the boundaries established for the offshore borrow area(s) and beach fill area(s). Where mandated by state or federal regulations and permits, the contractor will be required to provide qualified personnel and equipment for endangered species monitoring, public safety and environmental protection during construction.

Project engineer, Dr. HL Kaczkowski (NC PE 37281) will be responsible for final design and will seal the construction drawings.

Summary — CSE's Task 5 services will require up to 35 days of registered professional time and up to 55 days of technical support time. Professional fees and reimbursables to accomplish the Task 5 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. This covers preparation of construction drawings, technical specifications, bid documents, contract documents, and coordination with the Owner. CSE assumes Task 5 will require three (3) RTs for necessary plan review meetings with the Owner.

Task 6.0 Bidding and Negotiation

After written authorization to proceed with the bidding and negotiation:

Task 6.1 — CSE will assist the Owner in advertising for and obtaining bids for construction, materials, equipment, and services. Where applicable, CSE will maintain a record of prospective bidders to whom Bidding Documents (which incorporate Drawings and Specifications as well as bid forms, contract forms, etc) have been issued, schedule and attend pre-bid conference, and receive and process deposits for Bidding Documents.

Task 6.2 — CSE will issue Addenda as appropriate to interpret, clarify, or expand the Bidding Documents, including preparation of responses to questions from prospective bidders related to local conditions, staging, and access to the project area. CSE will also provide clarification to prospective bidders regarding environmental protection requirements and restrictions under the permits.

Task 6.3 — CSE will consult with and advise the Owner as to acceptability of subcontractors, suppliers, and other persons and organizations proposed by the prime contractor(s) for those portions of the work as to which such acceptability is required by the Bidding Documents.

Task 6.4 — CSE will consult with the Owner concerning (and determine) the acceptability of substitute materials and equipment proposed by the contractor(s) when substitution prior to the award of contracts is allowed by the Bidding Documents.

Task 6.5 — CSE will attend the bid opening, prepare bid tabulation sheets, and assist the Owner in assembling and awarding contracts for construction, materials, equipment or services. CSE will prepare contract documents for execution by the Owner and the contractor. CSE assumes the Owner will draft and issue Notice of Award upon review of documents by its legal counsel unless otherwise directed. CSE will issue Notice to Proceed upon direction by the Owner that all documents, performance bonds, funding, and project permits are in place.

Summary — CSE's Task 6 services will require up to 20 days of registered professional time and up to 15 days of technical assistant time. Professional fees and reimbursables to accomplish the Task 6 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. CSE assumes that Task 6 will require up to four (4) RTs to Nags Head. This covers identification of prospective contractors, fielding questions prior to bids, attending mandatory pre-bid conferences, site visits with contractors, and the bid opening, providing for responses to bidders' questions (as addenda to the bid documents), reviewing bids, and otherwise advising the Owner on the qualifications of each bidder and the acceptability of each bid.

Task 7.0 Construction Observations and Administration

CSE will perform daily construction observations and administration during the construction period using a combination of engineering and technical personnel representatives. The responsibilities of CSE and the Owner are as follows for Task 7. For purposes of budgeting, CSE assumes construction, including mobilization and demobilization, will require no more than three calendar months if performed during fair-weather summer conditions.

Task 7.1 — *General Administration of the Construction Contract.* The Engineer will consult with and advise the Owner and act as their representative as provided in the Standard General Conditions of the Construction Contract. The extent and limitations of the duties of the Engineer as assigned in the Standard General Conditions will not be modified, except as the Engineer may agree to in writing. All of the Owner's instructions to the contractor will be issued through the Engineer who will have the authority to act on behalf of the Owner to the extent provided in the Standard General Conditions except as otherwise provided in writing.

Task 7.2 — *Visits to the Site and Observation of Construction.* The Engineer, through the on-site technical representative (OTR), will provide continuous daily observations of the work while construction is underway and will make visits to the site at intervals appropriate to the various stages of construction as the Engineer deems necessary to observe as an experienced and qualified design

professional the progress and quality of the various aspects of the contractor's work. Based on information obtained during the site visits and on observations by other members of the project team, the Engineer will endeavor to determine in general if such work is proceeding in accordance with the Contract Documents and the Engineer will keep the Owner informed of the progress of the work.

Task 7.3 — *Defective Work.* During such site visits and on the basis of daily observations of the work by the Engineer's OTR, the Engineer may disapprove of or reject the contractor's work while it is in progress if the Engineer believes the work will not produce a completed project that conforms generally to the Contract Documents or that it will prejudice the integrity of the design concept of the project as reflected in the Contract Documents or that it will violate project permit conditions. The Engineer will establish a line of communication for purposes of receiving comments or observations of defects by interested third parties and have in place procedures for reporting and responding to such third-party observations as merited.

Task 7.4 — *Interpretations and Clarifications.* The Engineer shall recommend to the Owner work-directive changes or change orders as required.

Task 7.5 — *Shop Drawings.* The Engineer will review and approve (or take action to obtain review and approval by the appropriate member of the project team) Shop Drawings, samples and other data which the contractor is required to submit, but only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. Such reviews and approvals or other action will not extend to means, methods, techniques, sequences or procedures of construction, or to safety precautions and programs incident thereto.

Task 7.6 — *Substitutes.* The Engineer will evaluate and determine the acceptability of substitute materials and equipment proposed by the contractor.

Task 7.7 — *Inspections and Tests.* The Engineer will have authority, as representative of the Owner, to require special inspection or testing of the work, and will receive and review all certificates of inspections, testing and approvals required by laws, rules, regulations, ordinances, codes, orders, or the Contract Documents (but only to determine generally that their content complies with the requirements of, and the results certified indicate compliance with the Contract Documents).

Task 7.8 — *Disputes Between Owner and Contractor.* The Engineer will assist the Owner in the initial interpretation of the requirements of the Contract Documents and judgment of the acceptability of the work thereunder and make decisions on all claims of the Owner and the contractor, in full consultation with the Owner, relating to the acceptability of the work or the interpretation of the requirements of the Contract Documents pertaining to the execution and progress of the work. The

Engineer will not be liable for the results of any such interpretations or decisions rendered in good faith.

Task 7.9 — *Applications for Payment.* Based on the Engineer's on-site observations as an experienced and qualified design professional and on review of applications for payment and the accompanying data and schedules, the Engineer will determine the amounts owing to the contractor and recommend in writing payments to the contractor.

Task 7.10 — *Inspections.* The Engineer will conduct an inspection of the work to determine if the work is Substantially Complete and a final inspection to determine if the work is acceptable so that a recommendation can be made in writing to the Owner for final payment to the contractor.

Task 7.11 — *Limitations of Responsibilities.* The Engineer will not be responsible for the acts or omissions of any contractor, or of any subcontractor or supplier, or of any contractor(s) or subcontractor's or supplier's agents or employees or any person (except the Engineer's own employees or agents) at the site or otherwise furnishing or performing any of the contractor(s) work; however, nothing contained in paragraphs 7.1–7.11 (inclusive) will be construed to release the Engineer from liability for failure to properly perform duties and responsibilities assumed by the Engineer in the Contract Documents.

CSE's work under Task 7 involves extensive daily and weekly reporting and maintenance of project records. In addition to daily visits to the work site, CSE personnel will perform sampling and geotechnical analysis to check sediment quality and obtain spot profiles to verify slopes and grades of finished sections. The Engineer will evaluate the as-built sections for unit fill quantities and slopes to verify the contractor is not under-filling or over-filling beyond prescribed tolerances. The Engineer will make adjustments to the sections as necessary to allow for variations in underwater slopes (from design), altered site conditions, or other factors so as to insure that all reaches of the project obtain the design volumes given in the contract documents. Such adjustments are standard practice for projects of this type because underwater slopes cannot be controlled during placement. The Engineer will also obtain synoptic measurements of turbidity, bathymetric cross-sections in the borrow area and wave data during construction as a check on the contractor's work.

Summary — CSE's Task 7 services will require up to 75 days of professional time, and up to 215 days of technical support time. Normal field days during construction are 10–12-hour days for CSE on-site staff. Professional fees and reimbursables to accomplish the Task 7 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. Construction activities are anticipated to occur 24-7 until the project is complete. Reimbursable expenses include monthly rental of housing (high season), RTK-GPS equipment, survey boat, field computer and printer, turbidity meter, 4-by-4 off-road vehicle, and associated supplies as detailed in the proposed budget. The budget provides for up to 8 RTs by tow vehicle/car and 22 RTs by car for CSE personnel to be on site daily for the duration of

construction. Multiple trips are required for periodic visits by the project engineer, to rotate CSE staff as necessary, and to provide certain specialized technical staff for key sampling events and field data collection during construction.

An anticipated special condition of the permit will be endangered species monitoring during construction including possible turtle and piping plover surveys along the beach or trawling for turtles ahead of a hopper dredge and relocation of caught turtles away from the borrow area. CSE arranged for these services at Nags Head in 2011 after the specific scope of monitoring was determined by regulatory and resource agencies. The proposed budget under Task 7 includes a line item of $50,000 as an allowance for this possible project requirement.

Task 8.0 Final Report and Recommendation for Acceptance

CSE will coordinate project completion and final surveys for pay requests with the contractor and the Owner. CSE will observe the final grading and beach shaping, and will note any discrepancies with respect to slopes and grades. CSE will coordinate equipment removal and cleanup with the contractor and participate with the Owner in reviewing the final completion list. Task 8 will include time to verify final pay volumes and requests for payment (Task 8.1). Upon review and verification of these items, the Engineer will recommend acceptance of the project and final payment. CSE will compile environmental compliance reports and coordinate project completion documents with regulatory and resource agencies as required under the terms and conditions of the permits. CSE will incorporate relevant environmental documents into the final report for the project (Task 8.2).

Task 8.1 — CSE will mobilize personnel to the site within approximately one month of project completion and perform a comprehensive as-built condition survey within and immediately adjacent to the project area(s) using the established transects from Task 2.2. Beach surveys will encompass the foredune, dry beach, intertidal zone, and inshore zone to a minimum of 40-ft depths offshore. In addition, the post-construction survey will encompass the offshore borrow area. As-built sediment samples will be collected at ~4,000-ft spacing (stations) at the 13 cross-shore positions along the 14 long-shore transects prescribed by NCDEQ sediment criteria rules (same stations and depth contours as pre-project sampling). Samples will be tested in the lab and the results compared with pre-project samples.

Results will be incorporated in the final report. These data will be combined with the historical profile and sediment data, and will be used to evaluate profile changes and as-built conditions. Profiles and volume change calculations will be submitted to the Owner as part of the project records. The post-project survey will identify specific boundaries recommended for sand fencing and dune stabilization after nourishment (sand fencing plan) in close coordination with the Owner.

Task 8.2 — CSE will prepare a final report for the Owner, documenting the results of the project and offering general recommendations for maintenance. CSE senior professionals will meet with the Owner upon completion of the final report and present a summary of findings to the Owner and interested parties. The final report will include (as applicable):

- General project description.
- Contractor information.
- Contract milestones.
- Weekly production records.
- Final pay volume.
- Survey volumes (pre-nourishment and post-nourishment).
- Representative photos.
- Sand fencing plan (in coordination with the Owner).
- Post-project monitoring requirements (as specified in permits).
- Environmental monitoring and compliance documents (c/o CZR).
- Recommendations for maintenance.
- Requirements for post-project environmental monitoring (c/o CZR).

Summary — CSE's Task 8 services will require up to 30 days of senior professional time and up to 66 days of technical support time to perform as-built surveys, analyze data, compile project documents, and prepare the final report. Professional fees and reimbursables to accomplish the Task 8 scope of services (not-to-exceed) are given in the proposed budget section in Table 1. The reimbursables budget includes one (1) RT by car/truck vehicle and three (3) RTs by car, equipment rentals for five (5) days (RTK-GPS, 4-by-4 field vehicle, survey boat), sediment testing (140 samples), and report production expenses.

Work under this Phase 1 proposal ends upon completion of Task 8.

ADDITIONAL SERVICES

The work described in the scope of services (Tasks 1 through 8, paragraphs 1.1 through 8.2) does not include work in the following categories. Work in these categories or other services requested by the Owner will be considered Additional Services.

If the Owner wishes the Engineer to perform any of the following Additional Services, the Owner shall so instruct the Engineer in writing and Engineer will perform or obtain from others such services and will be paid for these services using the normal hourly rates given herein and as provided in the Agreement for Services between Owner and Engineer for Professional Services.

- Services resulting from significant changes in the general scope, extent, or character of the project, or major changes in the documentation previously accepted by the Owner where changes are due to causes beyond the Engineer's control.
- Providing renderings or physical models.
- Preparing documents for alternate bids requested by the Owner for work which is not executed or for out of sequence work.
- Detailed consideration of operations, maintenance and overhead expenses; value engineering; and the preparation of rate schedules, earnings and expense statements, cash flow and economic evaluations, feasibility studies, appraisals and valuations.
- Furnishing the services of environmental scientists, biologists, fisheries scientists, chemical analysis laboratories or other specialized scientific testing, evaluations or services not specifically included in the scope of services.
- Preparation of operations and maintenance manuals not specifically included in the scope of services.
- Geotechnical engineering studies including borings and reports, except for borrow area confirmation studies (additional coring and geophysical data collection) described herein.
- Surveys for purpose of staking out work of contractor(s).
- Preparing to serve or serving as a consultant or witness in any litigation, arbitration, or other legal or administrative proceeding except where required by the scope of services.
- Services of an independent cost estimator shall be Additional Services.
- **Services of an environmental subconsultant for endangered species monitoring before, during or after construction.** Normally, local bird or turtle experts can provide piping plover monitoring or turtle monitoring during construction as required under federal and state permits. Certain endangered species monitoring (eg – marine mammals) onboard dredges is generally incorporated into the bid for construction. CSE assumes that CZR will be responsible for implementation of environmental monitoring (eg – biological sampling and analysis) before, during, and after construction, and will perform these services, if requested, under a separate agreement between the Owner and CZR. Endangered species monitoring onboard dredges, or related trawling activities in advance of hopper dredges, if prescribed by permits, will be incorporated into the contract documents and will be the responsibility of the dredging contractor.
- Services associated with acquiring individual easements for construction additional to routine assistance in preparing a recommended temporary construction easement agreement for the Owner to use.

PROJECT SCHEDULE

The project schedule outlined herein is based on an earliest construction date of the summer of 2018. The schedule of services herein will be periodically modified based on the progress of the permit reviews and approvals.

The target work period for the services proposed herein is May 2016 to February 2019 for Tasks 1-8. **This schedule does not include any permitting delays and additional costs incurred by such delays,** which would postpone earliest construction until summer 2019 and final report completion (Task 8) until December 2019.

The preliminary schedule is based on CSE's understanding of the goals and objectives of the Owner and likely issues to be raised by resource and regulatory agencies. CSE will make all reasonable attempts to accomplish the summer 2018 start date schedule for construction. However, because permitting and dredge availability issues may arise that will adversely impact the schedule, the Engineer cannot guarantee that the construction can be completed by December 2018.

Schedule. The following schedule assumes permits can be obtained in time for start of construction around May 2018. It also assumes construction must occur during fair-weather months (ie – May through August).

Date	Description
May 2016	Initiate Phase 1 work under present proposal Discuss goals and objectives with Nags Head officials
Jun-Sept 2016	Project planning, liaison with Owner Define the beach-dune system and target beach condition Develop renourishment requirements and dune stabilization alternatives Conduct the borrow area survey and obtain borings during fair weather
Oct-Dec 2016	Design analyses for alternate fill scenarios and cost estimates Pre-application meeting(s) with resource and regulatory agencies Initiate supporting environmental documents Conduct the first beach survey for "winter" beach condition Analyze and update erosion rates
Jan-Feb 2017	Coastal engineering analysis (ongoing) Complete EFH and BA reports Complete draft EA Pre-application meeting(s) with regulatory agencies
Mar-Jun 2017	Complete EA and all supporting documents Submit permit applications Conduct the second beach condition surveys
Jul-Dec 2017	Permit liaison Conduct the third beach condition survey to facilitate final design Finalize design

	Prepare plans and specifications Receive permits
Jan-Feb 2018	Request bids Receive bids Select contractor
Mar-Apr 2018	Pre-construction coordination
May-Aug 2018	Construction and construction administration (assume maximum 90 days)
Sept-Dec 2018	Post-construction survey Final report

Note: The final design, plans, and bid documents will be postponed and will be completed later if determined necessary by the Engineer in consultation with the Owner because of delays in receipt of permits which would preclude construction in summer 2018. The final design is based on a condition survey of the beach (Task 2). It is therefore advantageous to prepare the final design as close as possible to the anticipated time of issuing bid documents so as to more accurately depict site conditions for prospective contractors. The proposal provides for up to three condition surveys associated with design analyses and the final design survey, but does not include possible post-storm surveys in a given year.

PROJECT MANAGEMENT

Coastal Science & Engineering (CSE)

The Engineer's professional and technical support staff who will be directly involved in the project will include the following.

Timothy W Kana PhD – Registered Professional Geologist (NC 1752) – Project Director
Dr. Kana is president of CSE and senior coastal scientist with over 35 years of experience in coastal erosion studies, beach nourishment design, preparation of sediment budgets, and studies of sea-level rise impacts. He has prepared numerous shoreline erosion assessments and plans for beach nourishment including the Myrtle Beach (SC) project (1984–1990), Bogue Banks (NC) project (1999–2007), and Nags Head (NC) nourishment project (2006–2011).

Dr. Kana was project director and principal liaison for the 4.6 million cubic yard Nags Head beach nourishment project, which was completed on time and under budget between May and October 2011. Kana has been principal investigator for contracts from the US Army Corps of Engineers for a number of coastal engineering studies, including Buffalo District (inventory and analysis of 200 shore-protection structures, Lake Ontario), New York District (sediment budget for Fire Island Inlet to Montauk Point), Charleston District [sand search for Horry County (SC) and ICWW erosion], and CERC [sediment transport at Duck (NC), and performance evaluation of three SC beach nourishment projects)]. Dr. Kana has served as project director or technical advisor on more than 30 beach restoration project totaling nearly 25 million cubic yards. Major nourishment projects Kana directed or provided major assistance for in North and South Carolina and in New York include:

Myrtle Beach (SC)	1.3 million cubic yards		Seabrook Island (SC)	0.6 million cubic yards
Hunting Island (SC)	1.3 million cubic yards		Nags Head (NC)	4.6 million cubic yards
Bogue Banks (NC)	4.5 million cubic yards		Bridgehampton (NY)	2.5 million cubic yards

Dr. Kana will serve as principal in charge of CSE's work and overall project director for CSE staff, participating in key meetings with the Owner and interested parties.

Haiqing L Kaczkowski, PhD, PE, Registered Coastal Engineer (NC 37281) – Project Engineer
Dr. Haiqing ("*hi-ching*") Kaczkowski is a professional engineer with 20 years of experience in beach nourishment design, coastal hydrodynamics, numerical modeling of shoreline change and sediment transport, and project planning. Dr. Kaczkowski was project engineer for the award-winning 4.6 million cubic yard Nags Head (NC) beach nourishment project. Nags Head is the largest locally funded nourishment project ever accomplished in the U.S. CSE completed all permitting, environmental studies, and preliminary design. As project engineer, Dr. Kaczkowski prepared final design analyses including implementation of the USACE-approved GENESIS shoreline change model. GENESIS and SBEACH (cross-shore sediment transport model) were used to optimize the nourishment design. This was an important element of the plan given the large gradients in erosion along Nags Head. Dr. Kaczkowski provided close liaison between the contractor, Great Lakes Dredge & Dock Company, and the Town of Nags Head throughout implementation of the project. As project engineer, Kaczkowski was responsible for revising design sections according to natural changes along the beach during the construction period and for verifying as-built surveys and pay quantities.

She has served as project engineer on beach monitoring/ restoration projects in North and South Carolina and New York. Major projects include Isle of Palms (SC) shoal management, Captain Sams Inlet (SC) relocation, Myrtle Beach (SC) annual monitoring/analyses, Singleton Swash stabilization (SC), and the recently completed beach restoration projects at Sagaponack and Bridgehampton–Water Mill (NY). Dr. Kaczkowski has demonstrated numerical modeling expertise with the following models: EFDC, WQMAP, RMA2, ADCIRC, GENESIS, SBEACH, SWAN, STWAVE, CGWAVE, BOUSS2D, SSFATE, D-CORMIX, VISUAL PLUMES, WAMVIEW. She has extensive international project experience, including major waterfront projects in North America, the Caribbean, Middle East, and China.

Dr. Kaczkowski will serve as project engineer and senior modeler for the project.

Steven Traynum, MS, Coastal Physical Scientist – 9 years of experience – As project manager for the Isle of Palms (SC) beach restoration project (2008) and post-project monitoring, he prepared sediment budgets, historical erosion rates, post-project monitoring reports, comparative bathymetry via DTMs, and was responsible for managing and analyzing large survey databases. Mr. Traynum has supervised annual monitoring and reporting of beach and groin conditions since completion of the 2007 Hunting Island project and is assistant project manager for the Nags Head (NC) beach nourishment project. He

is well-versed in managing large data sets and in writing custom MATLAB® programs for efficient data reduction and analysis and is in the process of obtaining a second master's degree in coastal engineering from Old Dominion University. He will assist the project engineer, participate in selected meetings, and provide technical assistance in all aspects of the project.

Drew Giles, Technical Associate (Captain USCG Licensed OUPV) – 10 years of experience – Bathymetric and topographic field data collection and data management for CSE (2006-present). Mr. Giles holds a BS from the University of South Carolina. He is a Coast Guard-licensed Operator of Uninspected Passenger Vessels (OUPV), has HYPACK® Certification (2012), and is certified in CPR/First-Aid. Mr. Giles was field team leader for post-construction monitoring of the 2011 Nags Head project and data collection at Buxton and Rodanthe. His field data collection experience includes offshore coring, field deployment of instrumentation, and topographic and bathymetric surveys using the newest methods of Real-Time-Kinematics positioning (RTK-GPS) utilizing Virtual Reference Station (VRS) and Real Time Networks (RTN) for achieving centimeter-level accuracy. He has served as field team leader for thousands of long profile lines in support of beach nourishment design and monitoring, including:

Sagaponack and Bridgehampton, NY – Technical Associate (data collection and construction observation). Collected data along ~85 profiles (~3,000 ft long) during multiple deployments, including pre- and post-project beach condition surveys and offshore borrow area surveys, and collection of beach sediment samples and offshore borings.

Nags Head, NC – Technical Associate (data collection). Collected data along ~100 profiles (~2,000 ft long) during multiple deployments, including post storm surveys and offshore borrow area surveys (pre- and post-dredging bathymetric data collection for preparation of DTMs).

Myrtle Beach, SC – Technical Associate (data collection). Collected data along ~100 profiles (~3,000 ft long) during multiple deployments.

Isle of Palms, SC – Technical Associate (data collection). Collected data along ~130 beach and inshore profiles located along the Isle of Palms beach. The annual monitoring services include bathymetric surveys of Dewees Inlet and Breach Inlet (lines spaced between 200 and 800 ft over ~8 sq miles) and the development of three-dimensional DTMs.

Trey Hair, CAD Technician – 17 years of experience – Certified in Autodesk® Civil3D. Mr. Hair has prepared permit documents, beach nourishment plans, digital terrain models (interfacing between GIS and AutoCAD®), and has assisted with construction administration, and field data collection on numerous projects. Mr. Hair has been lead CAD technician for preparation of beach nourishment drawings for over ten nourishment projects and three groin construction/repair projects in North and South Carolina. He has prepared numerous shoreline maps from various sources ranging from uncontrolled vertical photographs to LIDAR data sets. His work experience includes extraction of habitat areas from DTMs and DEMs based on elevation criteria and related morphological indicators. Mr. Hair has participated in annual AutoDesk University and has developed macros and other drawing techniques that have been incorporated in Civil 3D software. He will assist the project team with all

graphic production including displays for community forums, permit drawings, and final design drawings. During Phase 1, Mr. Hair prepared the report graphics and permit application drawings for the project. He will continue in this role during Phase 2.

Diana Sangster, Editorial Associate and Administrator – 35 years of experience – Report editing and production, contractor liaison, insurance coordinator, contract administration. Ms. Sangster has prepared manuscripts for hundreds of journal articles, proceedings papers, and technical reports related to coastal erosion, beach restoration, and coastal engineering. This work includes EIS documents, biological assessments, and essential fish habitat assessments for projects at Bogue Banks and Nags Head and bid packages/contract documents using EJCDC forms for numerous projects. Ms. Sangster prepared the manuscripts for the Phase 1 feasibility study.

Other CSE staff who will assist in the project include:

Luke Fleniken — Technical Associate
Jim Salter — IT Specialist and Web Manager
Libby Marcum — Accounting Manager

CZR Incorporated

The professional and scientific support staff of CZR who will be directly involved in the project will include the following.

Julia Kirkland Berger, MS Geology, Technical Director I – Ms. Berger has over 20 years of experience in NEPA/SEPA coordination and preparation of environmental documents. Her specialty is southeastern coastal and nearshore marine environments. As manager for over 20 North Carolina environmental assessments, including assistance with the FEIS for replacement of Bonner Bridge, as task manager of the 2008 FEIS for PCS Phosphate Company Inc. and of NC State Ports EA, Ms. Berger has successfully collaborated and negotiated with multiple regulatory representatives. She served as project supervisor for the biological monitoring of the Nags Head beach nourishment project which involved quarterly beach and offshore sampling and two years of annual reporting to NCDCM, NCDMF, and federal regulatory and resource agencies. She also prepared the BA, EFH, and natural resource sections of the EA submitted by Dare County for the recent Buxton NC beach restoration project. The Buxton project required close coordination and liaison between the two federal permit authorities, the National Park Service and the Corps; CZR assisted CSE throughout the process.

Samuel Cooper, MS Marine Biology, Technical Director II– As technical director and office manager of the Wilmington office, Mr. Cooper has the experience and resources to obtain necessary information, negotiate with regulatory agencies, and resolve a variety of environmentally sensitive projects. Mr. Cooper's principal areas of expertise gained with over 27 years at CZR are in natural resource inventories, wetland evaluations, NEPA/SEPA documentation, and ornithology-related topics. He is

familiar and experienced with the environmental documentation required for the preparation of complicated and controversial NEPA documents and associated permits for activities affecting Section 404 jurisdictional areas and has considerable aquatic/fisheries experience involving the sampling of both fresh and estuarine species using a variety of collection techniques. Mr. Cooper offers our team exceptional expertise and familiarity with state and federal regulatory agency requirements.

Lorrie C Laliberte Boswell, MS Coastal Marine & Wetland Studies, Senior Environmental Scientist I— Ms. Laliberte Boswell has over 10 years experience with CZR and has been involved with environmental studies associated with transportation and mine industry projects. Her work tasks have ranged from wetland delineation to SAV mapping , mitigation site monitoring, calculation of impacts, and alternatives analyses. Ms. Laliberte Boswell's research experience has focused on plant distribution in relation to various environmental parameters. She has extensive experience with large- and small-scale wetland delineations, field collection of vegetation, hydrology, benthic organism sampling, and fish population studies. She has been involved in the monitoring of mitigation sites and also performs report editing tasks. As a certified boat operator, she is experienced with a variety of aquatic sampling procedures, including collection of water quality samples.

Other CZR staff scientists available for the project include:

Randall Pulley, MS, Biology, Fisheries Management, Senior Environmental Scientist I
Amanda Johnson, MS, Natural Resources & Restoration Ecology, Biologist I

CSE maintains **in-house** capabilities for the following:

- Baseline control, beach and inshore surveys via state-of-the-art Trimble R8-GNSS RTK-GPS.
- Fully outfitted, 24-foot shallow draft, survey vessel for controlled bathymetric surveys in the ocean and surf zone using RTK-GPS linked to an Odom™ CV-100 survey depth sounder.
- Proprietary coring system for borrow area investigations. CSE's system has been used to collect hundreds of cores up to 15 ft long in water depths up to 70 ft.
- Sediment testing laboratory for sand compatibility studies. Samples are processed at 0.25 phi intervals for better precision (versus 0.5 phi typical for most labs).
- Full complement of tide, current, wave, and turbidity measurement systems for in-situ time-series recording or ship-borne synoptic measurements.
- Certified scuba-diving services for bottom surveys and equipment deployment including diver-to-diver-to-surface communication.
- CADD services using AutoCAD® Civil 3-D which facilitates integration of digital and aerial orthophotos, LIDAR imaging and ground truth, and survey data.
- ARC-GIS and Global Mapper services for developing maps of spatial data.

- Custom software for coastal engineering applications including CSE's Beach Profile Analysis System (BPAS) for data reduction, QA/QC, graphic plotting, volumetric change analyses, preparation of beach fill templates, and data archiving.
- In-house computer programming capabilities using MATLAB®, Java™, and Visual Basic for developing specialized software such as CSE's core-logging program.
- Numerical modeling capabilities and demonstrated experience using USACE-approved models including ADCIRC, STWAVE, GENESIS, SBEACH, and others.
- Limited environmental sampling and analysis capabilities.

FEE SCHEDULE *[Effective through 31 December 2018]*

The fee for our services is based on estimates of personnel time required to perform the indicated scope of services as given under each task according to the following fee schedule. All rates are listed in U.S. dollars.

Personnel	**Title**	**Category Rate**
CSE	Senior Principal	160.00
	Project Engineer (Sr Coastal Engineer)	130.00
	Coastal Engineer/Scientist II	110.00
	Engineer / Scientist I	100.00
	Senior Technical Associate	90.00
	Technical Staff (CAD)	85.00
	Support Staff (Editorial/Admin)	65.00
	Field/Technical Assistants	65.00
CZR	Technical Director II	180.00
	Technical Director I	176.00
	Senior Environmental Scientist I	91.00
	Biologist II	71.00
	Biologist I	59.00
	Secretarial	75.00
	Graphic Design	52.00
	Secretary	72.00

Expert witness services are available at 1.5 times the base billing rates. Such services include trial preparation, depositions, and court appearances (travel excluded). Subconsultant items and direct expenses will be billed at cost.

CSE charges a flat rate of 5 percent of fees for each project to cover in-house expenses (eg – communications, IT services, mailing, copying, project E&O insurance, etc) in lieu of separate itemization of these items.

Billing Schedule — Progress invoices are issued monthly and shall be paid within 30 days of date of invoice. Balances remaining unpaid at due date are subject to a monthly finance charge of 0.5 percent (annual rate of 6 percent per year) until paid. CSE reserves the right to cease work on any project that has past-due invoices until all outstanding balances are paid.

PROJECT BUDGET ESTIMATE AND FEE PROPOSAL

The Town's preliminary estimate for the project is between $20 and 23 million (Town's Shoreline Management Planning presentation dated April 16, 2016), and the construction of the renourishment project is anticipated in the summer of 2018. The preliminary project scale and anticipated schedule serve as a basis for determining personnel requirements.

An estimate of fees and reimbursables (not-to-exceed) for the various tasks is summarized in Table 1.

Direct expenses will be billed at cost covering equipment rental, vehicle rental, travel, lodging, meals, laboratory testing, expendable supplies, presentation graphics, overnight shipping, etc. Anticipated reimbursables billed at cost include subconsultant services for geophysical data collection and controlled aerial orthophotography (shown as allowances). Mileage will be billed at the IRS reimbursement rate ($0.54 per mile for 2016). Lodging and meals typically average $175 per day per person in Nags Head (high season). Equipment rental for data acquisition includes daily rates for CSE's 24-ft survey vessel ($500/day) with diesel 4-by-4 tow vehicle ($50/day), RTK-GPS ($400/day), coring equipment ($600/day), positioning equipment ($100/day), scuba gear/underwater communications system ($150/day), off-road 4-by-4 vehicle ($120/day), and housing rental during construction ($5,500/month—high season).

Fees for engineering services are proposed on a time-and-expense basis by task not to exceed the budgeted amounts. Labor costs include the professional time to complete the work outlined herein and are based on CSE's experience with similar projects and the standard of care required for specialized coastal engineering projects. CSE will submit monthly invoices which itemize the labor expended for each task as applicable for the prior month. CSE reserves the right to substitute personnel within each task and to shift funds among tasks so as to accomplish the work in an efficient manner for the benefit of the Owner, provided such substitutions do not exceed the overall budget or do not otherwise reduce the quality of work performed under this proposal.

CSE may request a no-cost transfer of funds between tasks if necessary to complete the work efficiently. Such transfers will be accomplished through written request and, to the fullest extent possible, will not involve an overall budget increase for the Engineer's services. Should extraordinary

additional services (eg – preparation of detailed plats for construction easements or excess liaison with regulatory and resource agencies), or additional condition surveys due to delays in project execution), CSE will submit a written proposal for such additional services.

TABLE 1. Estimate of fees, direct expenses, and subconsultant services for the Nags Head beach renourishment project. The indicated amounts are the maximum not-to-exceed totals.

TASK #	TASK DESCRIPTION	ESTIMATED PROFESSIONAL FEE	ESTIMATED REIMBURSABLES	TOTAL
1	Project Planning, Communication, Liaison	91,800	16,090	107,890
2	Supplementary Beach & Borrow Area Condition Surveys	202,280	149,184	351,464
3	Coastal Engineering and Plan Development	158,920	9,946	168,866
4	Permitting and Environmental Studies	243,400	28,470	271,870
5	Final Design, Specifications, Construction Documents	74,600	6,550	81,150
6	Bidding and Negotiation	32,680	6,304	38,984
7	Construction Observations & Administration	224,200	90,910	315,110
8	Final Report, Condition Survey, Recommendation for Acceptance	75,120	25,551	100,671
	Labor Subtotal	**1,103,000**	**333,005**	**1,436,005**
TASK #	**ALLOWANCE**			
2.3	Allowance for Geophysical study			85,154
2.6	Allowance for Aerial Orthophotography			13,052
4	Allowance for CZR Incorporated			150,000
	Allowance Subtotal			**248,206**
	PHASE 1 TOTAL NOT TO EXCEED PROFESSIONAL FEES, REIMBURSABLES, AND ALLOWANCES	**1,684,211**		

REFERENCES CITED

Byrnes, MR, RM Hammer, BA Vittor, SW Kelley, DB Snyder, JM Côté, JS Ramsey, TD Thibaut, NW Phillips, JD Wood, and JD Germano. 2003. Collection of environmental data within sand resource areas offshore North Carolina and the environmental implications of sand removal for coastal and beach restoration. US Dept Interior, MMS, Leasing Div, Sand and Gravel Unit, Herndon, VA; OCS Rept MMS 2000-056, Vol I (main text 256 pp), Vol II (appendices 69 pp).

CPE 2015. Environmental assessment: Town of Kill Devil Hills shore protection project. Prepared for Town of Kill Devil Hills, North Carolina. CPE, Wilmington , NC, January: 158 pp.

CSE. 2004. Reconnaissance borings in potential offshore borrow areas: Edisto Beach restoration project. Data Report for Town of Edisto Beach, Edisto Island, SC. CSE, Columbia, SC, 24 pp + appendices.

CSE. 2005. Preliminary coastal engineering analyses for large-scale beach restoration at Nags Head. Technical Report for Town of Nags Head (NC). CSE, Columbia, SC, 88 pp + three appendices.

CSE. 2006. Beach restoration project, Edisto Beach, Colleton County, South Carolina. Final Report for Town of Edisto Beach, Edisto Island, SC; and SC Department of Parks Recreation & Tourism, Columbia, SC. CSE, Columbia, SC, 75 pp + 7 appendices.

CSE. 2008. Final environmental impact statement, Nags Head emergency beach nourishment, Dare County, North Carolina. EIS for US Army Corps of Engineers, Wilmington District, NC (Action ID SAW-2006-40282-182). CSE, Columbia (SC), 126 pp + appendices.

CSE. 2011. Coastal engineering & geotechnical analyses for beach nourishment, Nags Head, North Carolina. Final Design Report for Town of Nags Head, NC. CSE, Columbia (SC), 163 pp (incl Executive Summary) + appendices.

CSE. 2012. Final Report for the 2011 Nags Head beach nourishment project, Volumes 1 and 2. CSE, Columbia (SC), 101 pp + 10 appendices.

CSE. 2013a. Monitoring and analyses of the 2011 Nags Head beach nourishment project – 2012 Beach monitoring. Year 1 monitoring report for the Town of Nags Head, NC. CSE, Columbia (SC), 81 pp + appendices.

CSE. 2013b. Monitoring and analyses of the 2011 Nags Head beach nourishment project – 2013 Beach monitoring. Year 2 monitoring report for the Town of Nags Head, NC. CSE, Columbia (SC), 83 pp + 8 appendices.

CSE. 2014a. Memorandum: 2011 Nags Head beach nourishment project – post-project monitoring Year 3 (2014) sediment compaction results. Prepared for USFWS. CSE, Columbia (SC), dated 13 March 2014, 16 pp.

CSE. 2014b. Monitoring and analyses of the 2011 Nags Head beach nourishment project – 2014 Beach monitoring. Year 3 monitoring report for the Town of Nags Head, NC. CSE, Columbia (SC), 114 pp + 9 appendices.

CSE. 2015a. Monitoring and analyses of the 2011 Nags Head beach nourishment project – 2015 Beach monitoring. Year 4 monitoring report for the Town of Nags Head, NC. CSE, Columbia (SC), 97 pp + appendices.

CSE. 2015b. Environmental Assessment for Beach Restoration to Protect NC Highway 12 Clean Water Act 404 and NPS Special Use Permit at Buxton, Dare County, North Carolina. Prepare for Dare County, NC. CSE, Columbia (SC), 204 pp plus 7 appendices.

CZR. 2014. Nags Head beach 2011 nourishment project. Post-Year 2 and Final Report for Town of Nags Head, North Carolina. CZR Incorporated (Wilmington NC) and CSE (Columbia SC), 65 pp plus appendices.

Kana, TW, and R.K. Mohan. 1998. Analysis of nourished profile stability following the fifth Hunting Island (SC) beach nourishment project. Jour. Coastal Engineering, Vol. 33, pp 117-136.

NCDENR. 2012. North Carolina 2011 long-term average annual oceanfront erosion rate update study methods report. NC Department of Environment and Natural Resources, Division of Coastal Management, Raleigh, 125 pp.

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USACE. 2000. Final feasibility report and environmental impact statement on hurricane protection and beach erosion control: Dare County beaches (Bodie Island portion), Dare County, North Carolina. Vol I and Vol II, US Army Corps of Engineers, Wilmington District, South Atlantic Division, 99 pp + appendices.

USACE. 2002. *Coastal Engineering Manual.* U.S. Army Corps of Engineers, Engineer Manual 1110-2-1100, Washington, DC (in 6 volumes).

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ATTACHMENT 1

Prepared by Tidewater Atlantic Research, Inc.

TIDEWATER ATLANTIC RESEARCH, INC.

Gordon P. Watts Jr., Director
252.975.6659/Fax: 252.975.2828
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Post Office Box 2494
5290 River Road
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17 May 2016

Dr. Tim Kana
President
Coastal Science & Engineering
P.O. Box 8056
Columbia, South Carolina 29202-8056

RE: Proposed 2017 Nags Head Beach Nourishment Project

Dear Dr. Kana,

On behalf of Tidewater Atlantic Research (TAR), thank you for the opportunity to submit a fixed-price cost estimate for the referenced Nags Head project. Like all survey work conducted off the northern Outer Banks, we require considerable latitude in scheduling to take advantage of favorable weather. I included two weather days, but we may be compelled to run back and forth during operations as well due to adverse conditions.

Fortunately, the TAR office is only a couple of hours travel from Oregon Inlet and we can retreat when weather deteriorates for a lengthy period. We proposed a $225.00 rate for accommodations. That would likely cover expenses in late spring or early autumn. However, rates advertised for hotel/motel rooms (without fees/taxes) for prime summer *2016* dates can be double that amount; where anything is actually available.

As for the technical perspective, we can provide a detailed proposal that describes the research methodology to support the budget. We would first obtain the necessary permit from the Underwater Archaeology Branch (UAB) located at Fort Fisher, North Carolina, survey its on-site files, and consult with state personnel to be sure that our firm's survey methodology meets with North Carolina Department of Natural and Cultural Resources approval.

The approved survey would employ both acoustic and magnetic remote sensing. We will use a KLEIN 3900 sidescan sonar, an EDGETECH CHIRP sub-bottom profiler and a GEOMETRICS cesium vapor magnetometer to generate data necessary to identify and assess submerged cultural resources in the survey areas. All data will be tied to North Carolina State Plane, NAD 83, U.S. survey foot positioning coordinates generated by a TRIMBLE DGPS. Our budget is based on 100-foot survey line spacing but we will need to have advance UAB approval.

We will analyze the data, identify all acoustic and/or magnetic signatures that share characteristics with known significant submerged cultural resources and make recommendations for avoidance or additional investigation; if avoidance is not possible. All survey details, data assessment, conclusions and recommendations will be included in a document designed to satisfy both state and Federal legislation and regulations.

Our proposed costs for the project total $85,153.78. That figure is based on conducting a Phase I submerged cultural resource survey of two offshore borrow sites. Each of the sites is anticipated to contain up to 400 acres and survey line spacing is anticipated to be 100 feet. The survey areas are similar in size to one surveyed in 2014 and 2015 for Coastal Science & Engineering (CS&E) located off Buxton, North Carolina. Task 1 includes securing a permit from the UAB, mobilization and demobilization, project travel and nine days of remote-sensing survey operations. The Phase 1 amount totals $59,213.84. Of that amount $22,671.00 represents direct labor, 26,775.00 represents equipment costs, and $9,767.84 represents travel, lodging and per diem expenses.

Two weather days were included in the proposal as finding nine days of suitable weather is statistically unlikely off the northern Outer Banks. The cost for two weather days is $5,775.70. Of that amount, $3,762.00 represents personnel costs, $250.00 represents dockage and $1,763.70 represents lodging, per diem and mileage. As previously noted, the TAR complex is located in Washington, North Carolina, so field operations can be suspended and the crew can return to the office to work on data analysis during any protracted period of unsuitable weather.

Phase II of the project includes historical and literature research to establish a background for the project area and to attempt to identify specific shipwrecks that could be associated with sonar and/or magnetic signatures. Phase II activity will also include analysis of the data, report preparation and addressing any comments from CS&E, the client and/or state and Federal agencies. The cost of those activities is $20,164.24. Of that amount $18,414.00 represents personnel, $1,005.24 represents travel lodging and per diem, and $745.00 represents report preparation and revision.

Best regards,

Gordon P. Watts, Jr., PhD, RPA
Director

ATTACHMENT 2

Prepared by Independent Mapping Consultants, Inc

May 15, 2014

CONTACT:
Mr. **Trey Hair**

I# P16125C
IMC#

Coastal Science & Engineering, Inc.
PO Box 8056
Columbia SC 29202-8056
803-799-8949 - Office
803-467-8034 - Mobile
www.coastalscience.com

P: 803-799-8949 *Email: Trey <thair@coastalscience.com>*

PROJECT: Nags Head, NC - 2017

Dear Trey,

Independent Mapping Consultants, Inc. (IMC) greatly appreciates this opportunity to provide you with our proposal to perform mapping services for the above mentioned project. The following proposal is based on our understanding of the scope of work. This proposal can be individually modified to meet your requirements, upon request. Our proposed Scope of Work is as follows:

SCOPE OF SERVICES

Aerial Photography:
IMC will obtain 4 band Digital aerial photography to cover the mapping area.

The aircraft will be equipped with a precise aerial camera fitted with a 6” focal length lens cone.

The photography will be flown at 60% forward overlap, and will not contain any excessive tip, tilt, crab or cloud cover.

The aerial photography will be flown at 5.51” GSD (14.0cm).

Ground Control

We understand that Coastal Science will provide sufficient horizontal and vertical control at no cost to IMC. Paneled points prior to the flying may be used or photo identifiable ones may be obtained given sufficient detail exists.

DEM Collection
Digital Elevation Data will be compiled using our Softcopy Stereo Plotters.
The digital data will be interactively captured, and stored during the compilation process.

Accuracy
Production procedures for photogrammetric mapping surveys shall be in accordance with the standards established by the Federal Geographic Data Commission (FGDC) Geospatial Positioning Accuracy standard and applicable extensions and revisions.

Horizontal
95% of all visible planimetric features will be within 1/40th of an inch, at map scale, of their correct coordinate positions, and no such well defined features shall be in error by more than 1/20th of an inch.

Analytical Aerial Triangulation
Using the horizontal and vertical control survey data, IMC shall precisely perform automatic digital aerial triangulation using our Trimble Inpho Match-AT software. Automatic and manual tie point matching shall be done on the entire set of imagery to best contribute to the strength and quality of the block.

DELIVERABLES
RGB and FCIR Digital Orthophoto tiles @ 0.5' pixel.

DELIVERY SCHEDULE
The photogrammetric mapping data will be delivered 17 days after receipt of the ground control or completion of the aerial photography, whichever is the latter. Please call us if an earlier delivery is required. We will work with you to accommodate your schedule.

FEE
4 Band DMC II-230 aerial imagery @ 5.51" GSD (3 lines, 119 exposures).....$7,900.00
Digital Aerial Triangulation- Inpho Match-AT_119 frames @ $8.00 each $952.00
NC Flood Plain LiDAR DEM update + Rectify and Mosaic in RGB and FCIR $4,200.00

Total.....$13,052.00

PAYMENT TERMS

IMC will invoice monthly in accordance with percent complete. Payment terms are 30 days. IMC reserves the right to charge 1½ percent per month on all past due accounts. It is understood that this agreement is between ACA and the addressee and payment is not contingent on payment from a third party unless other written agreements or guarantees are agreed to by both parties and attached hereto.

We appreciate the opportunity of submitting this proposal and look forward to working with you on this project. If you wish to discuss this proposal in more detail or have any questions regarding our approach to this project, please do not hesitate to call me.

If acceptable, a space is provided for an authorized signature. We will consider the return of the signed original letter as our legal contract and Notice to Proceed.

By signing below I APPROVED AND ACCEPT this letter as a legal contract and I have read and agreed to the payment terms as set forth above.

By: _____ Date:

(Authorized Signature)

_____ Title:

(Typed or printed name)

Sincerely,

INDEPENDENT MAPPING CONSULTANTS, INC.

Paul Badr

Paul Badr, CP, PLS, PPS, SP
President

ATTACHMENT 3

Prepared by CZR Incorporated

Draft CZR Incorporated Environmental Documentation and Permitting Assistance for 2018 Nags Head Beach Renourishment

	Task	Cost Estimate
1	Desktop analysis of other EAs, EISs, EFHs, or BAs or data or reports for suitable and pertinent information	$8,000.00
2	Meet with CAMA representative in Elizabeth City includes two pre-application meetings	$5,000.00
3	Meet with Nags Head representatives includes up to six 4 hr meetings	$20,000.00
4	Preparation of EFH natural resource sections includes two rounds of internal review of draft and response to comments assistance on natural resource sections	$10,000.00
5	Preparation of BA natural resource sections includes two rounds internal review and response to comments on natural resource sections	$10,000.00
6	Preparation of draft EA natural resource sections assumes 2 CZR reviews of entire CSE document includes assistance with response to comments on natural resources includes 4 alternatives includes attendance at one public meeting	$52,000.00
7	Finalization of final EA natural resource sections includes two CZR reviews of entire CSE document includes attendance at one public meeting includes assistance in response to comments on natural resources	$35,000.00
8	Assistance and review of Major CAMA permit includes two CZR reviews of entire CSE document	$10,000.00
	PROJECT TOTAL TASKS 1 - 8	**$150,000.00**

CZR ASSUMPTIONS:

CSE is lead for all agency coordination and all document and permit production and preparation
No coordination with National Park Service (NPS) included
NPS Wetland Statement of Findings not required
Public meetings held in Nags Head
Supplies and coordination for public meetings not included
No additional data collection or studies to be performed or coordinated by CZR
Alternative descriptions and comparisons and graphic depictions to be provided
No hazardous site evaluation required
$475 CAMA application fee not included
No pre- or post-monitoring included
No effort for supplemental EA included