



**TOWN OF ORLEANS  
PURCHASE ORDER  
\$ 25,000 AND GREATER**

THIS ORDER NUMBER MUST  
APPEAR ON ALL INVOICES,  
PACKING LISTS, AND PGKS.

ORDER  
NUMBER

**3728**

SHIP  
PREPAID  
TO

Town of Orleans DPW  
139 Main Street  
Orleans, MA 02653

TO:

Woods Hole Group, Inc.  
81 Technology Park Drive  
E. Falmouth, MA 02536

TODZKQ O H SZO - JOCR - 62Z

1. INVOICE MUST BE SENT IN DUPLICATE AND MUST INCLUDE VENDOR'S S.S. OR F.I.D. NO.
2. ORDER NUMBER MUST APPEAR ON INVOICE.
3. OUR TAX EXEMPT NO. E 046 001 258.
4. ISSUE A BILL FOR EACH P.O. SEPERATELY.
5. INVOICES MUST SHOW NUMBER OF UNITS AND UNIT PRICE FOR EACH ITEM.
6. SHIP ALL GOODS PREPAD UNLESS OTHERWISE DIRECTED.
7. THIS P.O. EXPIRES 10 DAYS AFTER REQUIRED DELIVERY DATE.
8. TOWN OF ORLEANS WILL NOT BE LIABLE FOR ANY GOODS RECEIVED WITHOUT AN AUTHORIZED PURCHASE ORDER.

DATE OF ORDER <b>10/29/15</b>	VENDOR <b>16770</b>	DEPARTMENT <b>DPW/NR</b>	REQUIRED DELIVERY DATE <b>06/30/16</b>	ACCOUNT TO BE CHARGED <b>01295066-589120</b>
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I CERTIFY THAT THIS PURCHASE ORDER COMPLIES FULLY WITH THE TOWN OF ORLEANS PURCHASING PROCEDURES AND CORRESPONDING STATE STATUTES THAT ADEQUATE FUNDS EXIST FOR THIS PURCHASE.

DEPT. HEAD  
SIGNATURE

*[Signature]*

ITEM NO.	QUANTITY	UNIT	CATALOG NO.	DESCRIPTION	UNIT PRICE	REC'D	AMOUNT
				<b>Professional Services for Nauset Estuary Dredging project,</b>			<b>\$ 49,939.00</b>

**THIS PURCHASE IS NOT VALID UNLESS SIGNED  
BY TOWN ADMINSTRATOR AND FINANCE  
DIRECTOR.**

*[Signature]*  
DIRECTOR OF FINANCE

*[Signature]*  
TOWN ADMINISTRATOR

**10/29/15**  
DATE

**11/1/15**  
DATE

**AGREEMENT**

Made in triplicate this the 29 day of **October 2015** between the **Town of Orleans, Orleans, MA,** and **WOODS HOLE GROUP, INC., 81 TECHNOLOGY PARK DRIVE, EAST FALMOUTH, MA 02536** hereafter the "Contractor".

**WITNESSETH:** That for and in consideration of the following mutual covenants contained herein the parties agree with each other as follows:

**ARTICLE I:** The Contractor agrees to sell and/or deliver to the Town materials and/or services in accordance with the following:

**PROVIDE PROFESSIONAL SERVICES FOR NAUSET ESTUARY DREDGING PROJECT IN ACCORDANCE WITH THE SPECIFICATIONS AND THE FOLLOWING EXHIBITS;**

- Exhibit 1. Request for Proposals Permitting Efforts for Nauset Estuary Dredging Project
- Exhibit 2. Scope of Work + Fee Proposal dated 9/10/15
- Exhibit 3. Certificate of Non-Collusion
- Exhibit 4. Statement of State Tax Compliance
- Exhibit 5. Acknowledgement of Principal
- Exhibit 6. Certificate of Insurance

**ARTICLE II:** Payments to be made upon receipt of invoices for work performed and after review and approval by the appropriate Department Manager, Town Administrator and Town Accountant, the fee is not to exceed amount of Forty Nine Thousand Nine Hundred Thirty Nine and 00/100 (\$49,939.00) Dollars.

**IN WITNESS:** Whereof the respective parties hereto have caused this instrument to be duly subscribed and sealed.

**TOWN OF ORLEANS**

  
\_\_\_\_\_  
John Kelly  
Town Administrator

APPROVED AS TO APPROPRIATIONS:  
  
\_\_\_\_\_  
Orleans Town Accountant

SOURCE: 01295066-589120

Not to Exceed: **\$49,939.00**

**WOODS HOLE GROUP, INC.**

\_\_\_\_\_  
Signature of Individual or Corporate Name  
(Mandatory)

  
\_\_\_\_\_  
Corporate Officer  
(Mandatory, If applicable)

04-3408801  
\_\_\_\_\_  
EIN # (Mandatory)



# TOWN OF ORLEANS

## DEPT. OF PUBLIC WORKS & NATURAL RESOURCES

THOMAS E. DALEY, P.E.  
DIRECTOR

139 MAIN STREET, ORLEANS, MASSACHUSETTS 02653  
Telephone (508) 240-3700 ext. 363 Fax (508) 240-3711  
www.town.orleans.ma.us  
tdaley@town.orleans.ma.us

To: John Kelly / Town Administrator  
Fr: Tom Daley / Director of DPW&NR *TD*  
Re: Article 58 Selection Committee Recommendation  
Date: 10/7/15

Per your request a selection committee consisting of Judy Scanlon, Caroline Kennedy, Mark Mathison, Tedd Keon, George Meservey, Nate Sears and myself reviewed three RFP submissions. The three firms that submitted were Woods Hole Group, CLE with Applied Coastal and Bourne Consulting with LEC Environmental. After reviewing the RFP responses the committee agreed that all three firms were highly qualified to do the proposed work and in order to try and adequately find enough differences between them the committee conducted interviews of all three firms on 10/6/15.

After the interviews the Committee voted 5 to 1 to recommend Woods Hole Group to you. The 1 vote favored CLE. Caroline Kennedy was unable to attend the interviews and final selection. All members agreed again that all three firms were very qualified to perform the work described in the proposal. The following is the committee's ranking:

- 1) Woods Hole Group
- 2) CLE with Applied
- 3) Bourne with LEC

Once I have gathered all of the committee members ranking sheets I will forward them to you for your records.

I would like to thank the committee for their work on this phase of the project. It was a pleasure to work with all of them.

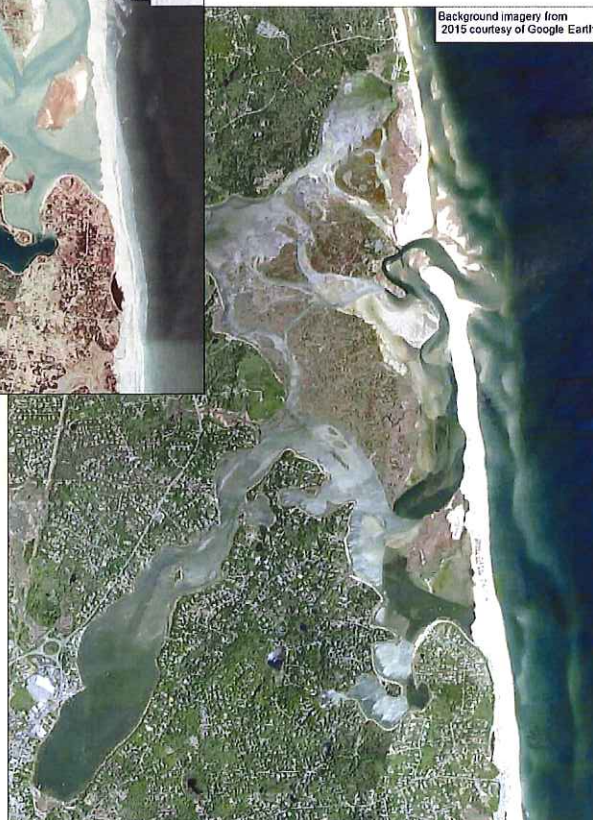
Please let me know if you have any questions.

Cc: Judy Scanlon  
Caroline Kennedy  
Mark Mathison  
Tedd Keon  
George Meservey  
Nate Sears  
Liana Surdut

**ORIGINAL**



## Proposal for Nauset Estuary Dredging Project



**Prepared For:**  
Office of the Town Administrator  
Town of Orleans  
19 School Road  
Orleans, MA 02653-3699

**Prepared By:**  
Woods Hole Group, Inc.  
81 Technology Park Drive  
East Falmouth, MA 02536

**September 10, 2015**

**Table of Contents**

**1.0 INTRODUCTION ..... 1**

**2.0 TECHNICAL APPROACH..... 2**

    2.1 TASK 1: REVIEW EXISTING DATA AND DREDGING PLAN ..... 3

    2.2 TASK 2: COASTAL PROCESSES ANALYSIS ..... 4

    2.3 TASK 3: DOCUMENTATION OF EXISTING CONDITIONS ..... 5

    2.4 TASK 4: HYDROGRAPHIC SURVEY ..... 7

    2.5 TASK 5: PROJECT FEASIBILITY AND REPORTING ..... 8

**3.0 QUALIFICATIONS AND PROFESSIONAL WORK EXPERIENCE..... 9**

    3.1 RELEVANT PROJECT EXPERIENCE ..... 9

    3.2 GENERAL COMPANY PROFILE ..... 17

**4.0 PROJECT STAFFING..... 19**

**5.0 PROJECT SCHEDULE/FUNDING ..... 21**

**6.0 DELIVERABLES ..... 21**

**APPENDIX A. PERSONNEL RESUMES..... A-1**

**APPENDIX B. RELEVANT EXPERIENCE ..... B-1**

**APPENDIX C. FORMS ..... C-1**

**List of Figures**

Figure 1. Location of Town’s dredging plan in relation to existing sediment and red tide cyst sample locations. ....5

Figure 2. Project Organization Chart. ....20

Figure 3. Project Schedule.....21

## **1.0 INTRODUCTION**

Woods Hole Group has prepared the following Technical Proposal for the Town of Orleans for *Permitting Efforts for Nauset Estuary Dredging Project*. As required in the Request for Proposals received by electronic mail on August 24, 2015, the Technical Proposal and the Cost Proposal are submitted in separately sealed envelopes clearly marked to indicate the contents and contact information for Woods Hole Group.

We understand the Town of Orleans is interested in engineering services to determine the feasibility of developing a dredging program for improved navigation in Nauset Estuary. Significant shoaling has resulted in major changes to the channel and mooring areas, and navigation is typically restricted to several hours on either side of high tide. Commercial fishing boats have been forced to moor in deeper areas of the channel immediately behind the barrier beach, and offload their catch and crew to nearby landings via skiff. This is a less efficient alternative to prior practices, which afforded the fleet the opportunity to moor directly offshore Snow Shore, Priscilla and Goose Hummock landings. The feasibility of pursuing a dredging program will depend on a host of factors including environmental impacts, project lifetime, costs and schedule for permitting, and costs for project construction. We understand the Town would like to include results of the feasibility analysis in the Town's five year Capital Improvements Plan to be presented to the voters at the May 2016 Town Meeting. To meet this objective, Woods Hole Group proposes a scope to provide specific information to aid Town decision-making. The scope proposed herein will provide information to help gauge the overall engineering and environmental feasibility for a project, as well as estimate financial resources required to design, permit, and construct the project.

Woods Hole Group has evaluated the Scope of Work and required project elements, and assembled a project team with extensive experience in the sediment dynamics, hydrodynamics, and ecology of the Nauset Estuary system. The team includes scientists from Woods Hole Group with dredging experience and analysis of geomorphologic change along the Nauset barrier beach complex. Also part of the team are leading scientists Don Anderson and Dave Ralston from the Woods Hole Oceanographic Institution (WHOI) who have years of experience with red tide research, and specific experience in Nauset Estuary with hydrodynamic modeling of the physical and biological controls on harmful red tide blooms. This group of professionals brings direct and relevant experience that will provide the Town of Orleans with the information needed to make an informed decision about how best to proceed with the *Nauset Estuary Dredging Project*. The past work also provides access to additional sediment grain size, red tide cyst observations, tide, current, and salinity data, which will improve decision-making and cost-effectiveness (i.e., leveraging more information to complement the data collected with Town funds).

Information presented in the proposal is organized to meet the RFP requirements:

- Section 2.0 Technical Approach
- Section 3.0 Qualifications

- Section 4.0 Project Staffing
- Section 5.0 Project Schedule
- Section 6.0 Deliverables

Resumes for key members of the project team are included in Appendix A. Appendix B provides project descriptions for relevant work, and Appendix C includes the completed forms requested by the RFP.

## **2.0 TECHNICAL APPROACH**

Woods Hole Group is proposing a technical approach consistent with the scope of work requested by the Town in the RFP. Since there is flexibility in the approach afforded by the RFP, we are specifically recommending a scope focused on pursuing answers to key feasibility/planning level questions for the Town, such as:

- What is the quantity and type of sediment that would need to be dredged given current bathymetric and sedimentation conditions?
- Where can the dredged material possibly be beneficially reused or disposed?
- Where are the areas that would likely shoal the fastest and require maintenance dredging?
- What are the primary environmental constraints, considering the known presence of red tide cysts, shellfish, eelgrass, and other sensitive resources?
- What level of regulatory review and permit approvals will be required, considering the prevailing local, state and possible federal jurisdiction related to NPS property?
- On what schedule could the project be designed, permitted, and constructed?
- What would be the scope and cost for subsequent phases from planning through design, permitting, and construction?

It is our understanding the Town needs to understand these project parameters to help decide whether and how to proceed with the project. The Woods Hole Group scope is geared to addressing these questions at a planning level. We also propose to take full advantage of existing data to provide greater value in addition to the new data and analysis that can be completed with the available Town resources for this effort. We recognize there will remain uncertainty after this phase of work is completed, so we will ensure the final work products reflect remaining data gaps, vulnerabilities, and areas of uncertainty. The recommended next steps, should the Town elect to proceed, will also clearly outline an incremental and cost-effective plan for resolving remaining uncertainties.

In short, the following scope of work is intended to provide the Town with the information required to make an educated decision regarding a value judgment on investing more Town resources, and fundamentally whether and how to move forward with the project.

## 2.1 TASK 1: REVIEW EXISTING DATA AND DREDGING PLAN

The collection and review of existing data describing the Nauset Estuary system will be an important first step in evaluating the conceptual implementation and feasibility of the Town's dredging program. The estuary has been the subject of previous studies looking at the changing geomorphology, tidal hydrodynamics, and controlling factors for harmful red tide algal blooms. Having served as the lead researcher or project manager for many of these studies, members of the Woods Hole Group project team are familiar with the existing work and data that were collected during these studies. Results from these past studies will be used to target data collection where it is needed (in subsequent Tasks), and to develop informed recommendations on the Town's dredging program. The team is also experienced with the types of public data available from MassGIS, local municipalities, NOAA, USACE, etc. for use in evaluating existing resources in the Nauset Estuary system. We will use our experience to evaluate the proposed project area and the Town's conceptual dredging program to make recommendations on the technical appropriateness and feasibility of the project.

Substantial knowledge and experience also will be provided by data and reports prepared previously by Woods Hole Group personnel and by team members Don Anderson and Dave Ralston (of WHOI). Specific items to be reviewed during Task 1 include the following:

- Sediment shallow core (e.g., grab samples subsampled in centimeter increments near-surface) data from 73 stations within Nauset Estuary collected in 2008, 2009, and 2011 and analyzed for red tide cyst density.
- Sediment shallow core data from approximately 60 stations collected in 2011 and analyzed for grain size.
- Current velocities and flow directions from a hydrodynamic model simulation of Nauset Estuary using the Finite Volume Coastal Ocean Model (FVCOM).
- Shoreline change data from 1856 to 2005 for the barrier beach protecting Nauset Estuary compiled for the Town of Orleans.
- Geomorphic analysis of the Nauset Estuary inlet from 1856 to 2014 prepared for the Town of Orleans.

We also propose to review the following data and/or reports prepared by others:

- Water level and tidal current measurements, and hydrodynamic model results of simulations of Nauset Estuary as reported by Aubrey et. al., (1997). Woods Hole Group personnel contributed to this investigation.
- Topographic and bathymetric data collected by the USACE in 2010 and 2007, as well as additional bathymetric data collected by the USGS in 2004 and 2005.
- GIS data from MassGIS and the Towns of Orleans and Eastham describing wetlands, eelgrass, shorebird, fisheries, and shellfish resources.

Information on historical dredging in Nauset Estuary, if available, will be obtained from the MA Department of Environmental Protection (DEP) and/or the Department of Conservation and Recreation (DCR). The Woods Hole Group permitting specialist will

work with these agencies to research past dredging permits or contracts, and associated disposal sites.

The project team will use the information compiled during Task 1 to evaluate the Town's conceptual dredging program. For example, sediment characteristic information will be used to identify the presence of fine-grained material within the dredge zone that could require specialized handling and/or placement alternatives. Similarly, data on red tide cyst densities may be used to refine the dredge zone boundaries and develop recommendations on time of year restrictions for dredging. Data from the hydrodynamic models and geomorphic analyses will be used to evaluate shoal areas prone to sediment deposition, where maintenance of a navigation channel may be difficult. Results from the Task 1 review will help to identify data gaps and will serve as the basis for development of a reconnaissance level sampling plan to be conducted as part of Task 3.

## 2.2 TASK 2: COASTAL PROCESSES ANALYSIS

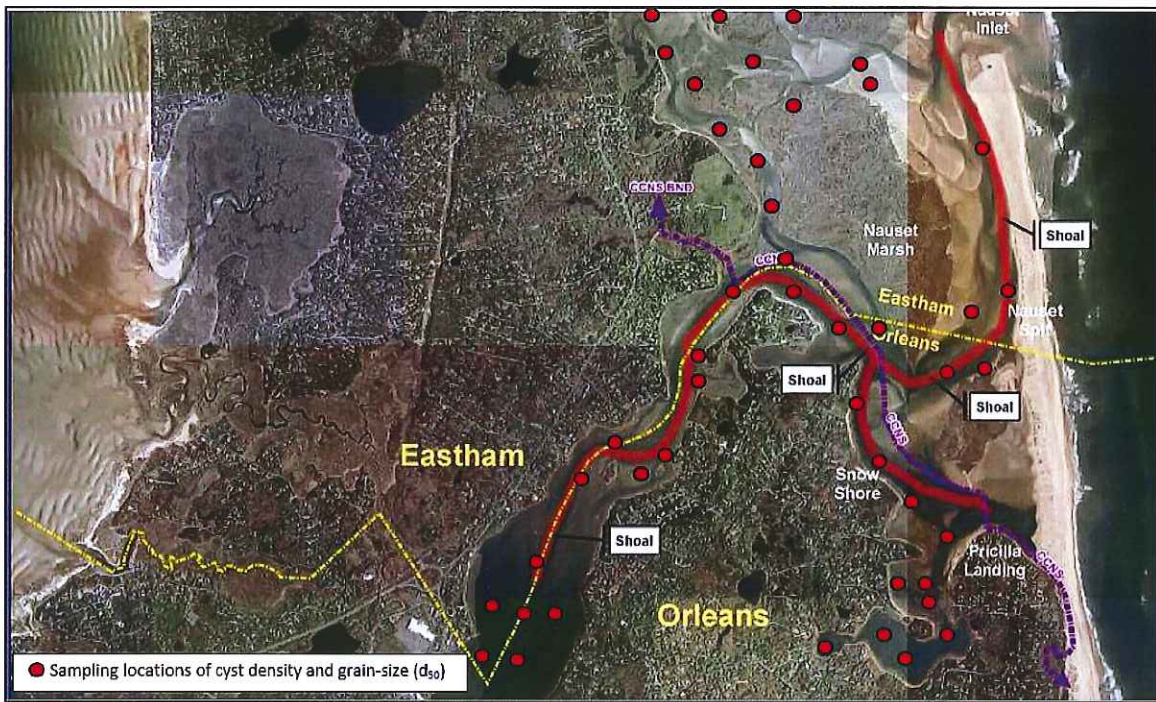
An improved understanding of coastal processes and existing conditions in Nauset Estuary will be important in evaluating response of the system to the Town's dredging program. Project feasibility and dredge zone layout will also be informed by an assessment of current conditions. Findings from the coastal processes analysis will be focused for planning purposes, recognizing more detailed analysis may be required as part of the engineering and permitting phases. Town resources can be conserved on studies and analysis at this stage, instead focused on overall project feasibility.

The Woods Hole Group project team proposes to evaluate the history of shoal formation and channel migration to gain a better understanding of the geomorphologic response of the system based on inlet location. Historical aerial photos in the Woods Hole Group library will be used to develop a time series of figures showing shoal growth along with channel location and width. The GIS-based analysis will provide valuable insight on the variability of shoal formation. A similar analysis was conducted for the Town of Chatham to help plan for maintenance dredging, including defining "zones" of dredging. The photo analysis will be supplemented with tidal current information (rates and directions) from the existing FVCOM hydrodynamic model to identify areas of the system prone to shoaling and/or increased scour. The USACE 2010 topographic and bathymetric LiDAR data will also be compared with the hydrographic data collected in Task 4 to highlight areas of increased shoaling and scouring over the past five (5) years. A color shaded relief map showing the difference between the two surveys will help to illustrate the most dynamic areas of the estuary.

The Task 2 analyses will guide identification of a conceptual dredging zone designed to minimize the volume and frequency of dredging by taking advantage of natural flow patterns and shoaling areas. Estimates of how long a dredged channel may last will also be determined. Potential impacts of dredging on increased erosion along the shoreline due to changes in current velocity or flow direction will also be evaluated.

2.3 TASK 3: DOCUMENTATION OF EXISTING CONDITIONS

The Woods Hole Group project team, including in-house staff and teaming partners at WHOI, has extensive and relevant experience with the Nauset Estuary system. Existing data collected by the team members provides a wealth of information on the geomorphology, hydrodynamics, and ecology of the system. These data will be used to maximize the Town's efforts under the current project to collect additional data where it is needed most. An overlay of the Town's conceptual dredging program with the 2011 stations sampled for red tide cyst density and grain size by Don Anderson and Dave Ralston of the Woods Hole Group team is shown in Figure 1. This type of geospatial display will be used to guide preparation of the reconnaissance level sampling plan during Task 1. Based on an evaluation of the existing data, a scope of supplemental data collection is proposed herein. We anticipate reviewing this scope with the Town as part of Task 1.



**Figure 1. Location of Town's dredging plan in relation to existing sediment and red tide cyst sample locations.**

Specific components of the existing conditions evaluation and sampling plan proposed in Task 3 include the following:

- Sediment Confirmatory Investigation – Coastal scientists from the project team will conduct confirmatory investigations for sediment characteristics and general distributions. The work will be conducted from a vessel and will cover areas of the Town's dredging program. A combination of grab samples and sediment probes will be used for qualitative evaluation of sediment type (i.e., sandy, silty,

shell hash). The purpose of the investigation will be to confirm sediment characteristics from the 2011 data and to gather general information about the sites where sediment cores will be collected. Focal points will be on helping to define boundaries (horizontal and vertical) between sandy and fine sediments. The goal will be to estimate the quantity of sands and fines in the dredge footprint as the basis for preliminary cost estimating. Dredging and disposing fine materials is substantially more expensive than clean-beach compatible sand, which can be dredged (for instance) economically with the County Dredge and beneficially reused within adjacent beaches, dunes, and wetlands.

- **Eelgrass Confirmatory Mapping –** Reconnaissance level eelgrass mapping will be performed in areas of Nauset Estuary included in the Town’s dredging program. Town staff will be consulted, and eelgrass maps from MassGIS will be used in the field to confirm the presence and location of existing eelgrass resources. New eelgrass beds identified in the dredging zone will be mapped by collecting x,y coordinates of the bed perimeter. Work will be performed by a coastal scientist experienced in seagrass identification using a view box operated by a small vessel. Resource coordinates will be collected using a RTK GPS.
- **Placement Site Investigation –** Coastal scientists from the project team will consult with Town officials, and conduct visual inspections of the shoreline and nearby coastal beach and dune areas for potential dredged material placement sites. The sites will be evaluated in terms of proximity to the dredge zone, constraints associated with pipeline placement from a hydraulic dredge or reach distance for a barge mounted bucket dredge, and equipment access for shore equipment. Sites offering potential benefits to endangered species habitat or for storm damage protection and flood control will be documented. Recent Google Earth aerial photography from 2015 will be used to map locations of the prospective placement sites.
- **Sediment Cores –** Up to seven (7) sediment cores will be collected in areas of the dredge zone where existing data are sparse. The cores will be collected from a vessel outfitted with both push and vibracoring equipment. The cores will be collected down to the depth of proposed dredging plus one additional foot to account for possible overdepth dredging. Sample locations will be recorded using a RTK GPS. Core depths will be determined based on the water depth and tide elevation at the time of coring. The sediment cores will be split, described, and photographed.
- **Grain Size Analyses –** The sediment cores will be sub-sampled based on the presence of vertical stratification. Cores with homogenous sediments will require only one sub-sample, while other cores with variations in sediment characteristics will require multiple samples. Up to twelve (12) samples will be sent to the laboratory for grain size analyses. If appropriate, sub-samples will be archived for later chemistry; however, it is anticipated that additional coring and testing would be required in the engineering design and permitting phases.

- Red Tide Cyst Analyses – Depending on the sediment characteristics, up to four (4) cores will be sub-sampled and analyzed for red tide cyst densities. Analysis to date has focused on presence of red tide cysts in near-surface sediments. There is evidence of red tide cysts in certain parts of Town Cove, Mill Pond, and Salt Pond Bay. Dormant cysts also can reside in deeper anoxic sediments at 20-40 cm or deeper, which could germinated if liberated by dredging and with exposure to oxygen. Proper planning in the form of avoidance and selection of appropriate time of year windows for dredging can decrease this risk. Specific mitigation measures would be defined in later engineering and permitting phases; however, this initial supplemental sampling would be focused on feasibility by targeting the existing data and filling certain data gaps.
- Shellfish Resource Investigation – Shellfish resources in Nauset Estuary will be identified through review of existing maps and interviews with Town staff and local shellfish stakeholders as appropriate. Existing maps and digital data will be obtained and used to delineate shellfish resources and aquaculture grants, including species and data sources. In cases where maps are not available, information gathered from the local shellfish officers will be used to generate spatial overlays of shellfish habitat.

Results from Task 3 will be combined with the existing WHOI sediment distribution data to create a map of sediment type and median grain size. Similar maps showing red tide cyst densities will be created. A conceptual dredge zone layout will be overlain to identify areas where dredging may be affected by the presence of fine-grained sediments, shellfish, submerged aquatic vegetation, or where time of year restrictions on dredging may be warranted due to the presence of red tide cysts or other factors. Methods and results will be documented and presented in a report developed during Task 5.

#### 2.4 TASK 4: HYDROGRAPHIC SURVEY

Hydrographic and topographic data describing the Nauset Estuary system are available from a number of sources (i.e., USACE, USGS, NOAA) dating from 2004 to 2010. Despite the high quality of these data sets, the dynamic nature of the system makes it important to obtain new hydrographic information that describes the current conditions. The updated hydrographic survey of the project area will be important to identify a channel layout for the dredging zone that takes advantage of naturally deeper areas of the system and minimizes the volume of dredged material. The survey will be used to determine the depth of dredging needed to meet the -5 ft MLW channel design, and will also be used to estimate the volume of dredged material. This information is essential in the feasibility stage for calculating preliminary quantities, and for budgetary planning.

Woods Hole Group will mobilize a two-person field crew including an ACSM certified hydrographer. The crew will be equipped with a survey vessel, survey grade RTK GPS positioning system, and an Innerspace Model 455 depth sounder. Survey transects will be planned at 100 ft spacing across the channels and 2-3 tie lines will be surveyed down the long axis of the channels. Data logging, realtime mapping and vessel control along survey transects will be accomplished using a tablet computer loaded with VESPOS

hydrographic software. Water depths will be obtained using the Innerspace Model 455 depth sounder and a 200 kHz transducer. The depths will be recorded continuously on a digital strip chart and also stored digitally at a rate of 20 readings per second. Water depth accuracy will be  $\pm 0.1$  foot. The depth sounder will incorporate transducer draft corrections and calibration for speed of sound through water. Horizontal position data with an accuracy of  $\pm 1$  cm will be collected using a Novatel RTK GPS system with an update rate of 20 points per second. Water levels will be continuously monitored during survey operations using a VP electronic tide data recorder and will also be monitored via the RTK GPS system (as back-up data). Tide data will be referenced to the Mean Low Water Datum (MLW) and during post-processing the soundings will be corrected to this datum. The tide gauge will be leveled to the nearest USACE, NOAA, or NGS survey monument. RTK elevations will be tied to the same survey monument. Horizontal control of the data will be referenced to the Massachusetts Plane Coordinate System, North American Datum 1983 (NAD83).

On completion of fieldwork, all data will be processed and presented as D-size (24"X36") plan view CAD drawings showing water depths as plotted text, contours, and shoreline features. Wetland resources identified in Tasks 1,2, and 3 to include salt marsh, coastal beach, eelgrass, and shellfish beds will be shown on the existing conditions plans. The potential dredging zone will also be overlain on the existing conditions CAD drawings. Cross sections will be established at representative locations along the channels and used with the dredge design (100 ft channel width, -5 ft MLW depth, 1V:3H side slopes) to compute the dredge volumes. The plans will be suitable for review with the regulatory agencies and will meet the requirements for Notice of Intent (NOI) filings with the local Conservation Commissions.

## 2.5 TASK 5: PROJECT FEASIBILITY AND REPORTING

The purpose of Task 5 will be to develop information on the feasibility of the *Nauset Estuary Dredging Project* so the Town can make an informed decision on how best to proceed. The Woods Hole Group project team will provide information to help gauge the overall engineering and environmental feasibility for the project, as well as estimate financial resources required to design, permit, and construct the project. Upon completion of Task 5 a summary report containing findings of data and analyses conducted during Tasks 1-5 will be submitted to the Town.

Specific work included in Task 5 includes the following:

- Two (2) meetings will be held with local stakeholders and permitting agencies (i.e., Conservation Commissions, DEP, MEPA, CZM, Cape Cod National Seashore, MA Division of Marine Fisheries, National Marine Fisheries, and the USACE). The purpose of the meetings will be to present the Town's desired project and to describe findings from Tasks 1-4. Comments from the attendees will be solicited and used to guide recommendations for further delineation of the dredge zone, and for potential recommendations in follow-on phases of the project to collect additional data. The meetings will also be used as a forum to

decide the required path forward for compliance with NEPA at the federal level, and the possible requirements for preparation of an EIR and/or DRI.

- Local, state, and federal wetland regulations will be reviewed in comparison to the identified dredge program, and a list of required permits for the project will be developed. Information gathered during the meetings with regulatory agencies will be used to help develop the list of required permits. Key project thresholds triggering the need for NEPA, EIR, and DRI will be highlighted, and potential alternatives for project design that would avoid the need for these permits will be identified. Costs associated with follow-on engineering and permitting, should the Town decide to proceed with the project, will also be developed.
- Additional data and/or analyses needed to support the permit applications will be identified. Costs for the follow-on data collection will also be developed, including preparation of an Essential Fish Habitat Assessment.
- Scheduling information will be prepared for the project, including follow-on phases for additional data collection (if necessary), engineering and design, permitting, and construction. For the construction phase of the project any anticipated time of year restrictions based on red tide cyst data will also be provided.
- Construction costs for the dredging program will be developed based on discussions with local and regional contractors capable of performing the work. The costs will factor in anticipated dredge volumes, sediment types, identified placement sites, and different dredging technologies (i.e., hydraulic vs. mechanical).

Findings of Tasks 1-5 will be summarized in a report that will be submitted to the Town by the January 15, 2016 deadline. The report will contain recommended next steps, should the Town elect to proceed, and will clearly outline an incremental and cost-effective plan for resolving remaining uncertainties. Ultimately, the report will provide the Town with the information required to make an educated decision regarding a value judgment on investing more resources, and fundamentally whether and how to move forward with the project.

### **3.0 QUALIFICATIONS AND PROFESSIONAL WORK EXPERIENCE**

#### **3.1 RELEVANT PROJECT EXPERIENCE**

Woods Hole Group and WHOI team members have project and research related experience in coastal estuaries throughout New England, as well as work directly in the Nauset Estuary project area. This work includes geomorphologic analyses of coastal and estuarine change, hydrodynamic modeling of coastal systems, and applied research on the physical and biological controls of harmful red tide algal blooms. We also have extensive experience with the planning, environmental analyses, and permitting for

dredging projects in Massachusetts. The Woods Hole Group has been in the coastal environmental consulting services business for more than 25 years, and the company was originally founded to serve private and municipal clients with coastal erosion, dredging, flooding, and other coastal related problems. The firm's foundation is based on understanding the problem and applying the best science and practical solution to solve or mitigate the problem.

Woods Hole Group has a history of supporting the Town of Orleans. Successful past projects for the Town include:

- Design, permitting and monitoring of beach nourishment at Skaket Beach
- Assessment of erosion and trends at Nauset Beach
- Technical review of Massachusetts Estuaries Project (MEP) report for Pleasant Bay

The company also is currently supporting the Town for an updated planning study related to vulnerability of resources at Nauset Beach.

Additionally, Woods Hole Group has supported various Cape Cod Towns on dredging projects. Some examples include:

- Town of Falmouth 10-year dredging and beach restoration plans and permits
- Town of Edgartown master plans and permits for dredging
- Town of Sandwich beach and inlet management plan
- Town of Chatham shoal evaluation for dredging planning
- Town of Barnstable Centerville River dredging design and permitting
- Town of Barnstable Hyannis Harbor dredge project EIS

Furthermore, Woods Hole Group held a 5-year prime contract with the USACE New England District for Environmental Services, which focused on dredging projects for navigation and restoration. Woods Hole Group completed a variety of Task Orders for the Corps that included sediment sampling, testing, and reporting to support the Federal dredging projects. Specific locations were throughout New England, and ranged from Buttermilk Bay (Bourne, MA), to Greenwich Harbor (CT), Providence River (RI), and Royal River (ME).

This diverse experience for local, Federal, and private clients allows Woods Hole Group unique insight on dredging project requirements and feasibility. We believe this is an advantage for the Town of Orleans. The following section provides a selection of five (5) Woods Hole Group projects and one (1) WHOI project from the past five (5) years that demonstrates relevant and direct experience to the Nauset Estuary Dredging Project by the team members.

**Project Name:** Analysis of Physical Changes and Management Alternatives for the Nauset Beach Area, Cape Cod, MA

**Client:** Town of Orleans, MA

**Project Description:**

Woods Hole Group prepared a comprehensive analysis of physical changes and management alternatives for the Nauset Beach area in Orleans, MA. Nauset Beach serves as the only public beach for the town with access to the Atlantic Ocean. The beach offers excellent swimming, surfing, sunbathing, bass and blues fishing, and other recreational opportunities. Because of its location, the beach is one of the Town's most important natural assets, supporting nearly 1.2 million visitors each year and providing an annual income of nearly 1.1 million dollars for the Town.

To help with future management decisions Woods Hole Group evaluated recent trends in shoreline and dune erosion. The analysis compared rates of shoreline and dune change pre- and post-1996 in an effort to predict future evolution of the barrier spit complex. The data revealed a nearly two-fold increase in the rate of shoreline erosion since 1996. Pre-1996 rates of change at Nauset Beach were on the order of -4 ft/yr, increasing to -5 to -10 ft/yr since 1996.



The study included an analysis of the potential for inlet formation at Nauset Heights and Pochet, including likely time scales and impacts to adjacent shoreline areas. Model simulations of cross shore erosion were coupled with data from existing hydrodynamic analyses to assess the potential for stable inlet formation into Nauset Harbor and Pleasant Bay. Inlet formation at Nauset Heights was determined to be possible, but not likely. The possibility of a stable long-term inlet forming at Pochet was determined to be low.

Information developed as part of the analysis of physical changes was used to develop a series of short- and long-term management recommendations for the Town of Orleans. The recommendations were focused in the following four areas:

- Town beach parking area and support buildings
- Maintenance of the beach and dune resources
- ORV trail to south Nauset Beach
- Pochet overwash and Nauset Heights area

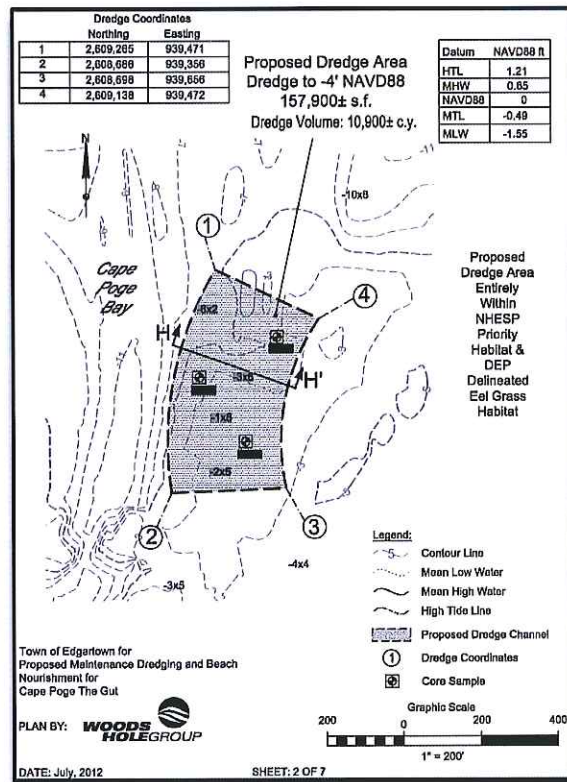
**Project Name:** Field Data Collection, Engineering Design and Permitting for the Town of Edgartown's 10-Year Comprehensive Permit  
**Client:** Town of Edgartown, MA

**Project Description:**

Woods Hole Group, Inc. was contracted by the Town of Edgartown Dredge Advisory Board to collect the necessary field data, perform the engineering design and prepare the application for a 10-Year Comprehensive Permit for dredging and beach nourishment at over forty (40) dredging and nourishment sites in the Towns of Edgartown and Oak Bluffs. Woods Hole Group prepared and obtained approval for a Sampling and Analysis Program (SAP) with the Massachusetts DEP and US Army Corps of Engineers. A total volume of approximately 248,000 cubic yards of sediment was permitted for hydraulic dredging from navigation channels within the two Towns over the next 10 years, with beneficial reuse of the dredged material at various beach nourishment locations.



The Comprehensive Permit was designed to provide flexibility to the Towns by allowing dredge material from any of the dredge sites to be placed at any one of the compatible beach nourishment sites. Woods Hole Group continues to service the Comprehensive Permits as needed to ensure the monitoring and reporting requirements are met and to alert the Towns when permit extensions are needed.



**Project Name:** Menauhant Beach & Dune Nourishment  
**Client:** Town of Falmouth, MA

**Project Description:**

Woods Hole Group worked for the Town of Falmouth to coordinate, design, and permit a beneficial reuse dune and beach restoration project at Menauhant Beach in East Falmouth. Through an exceptional level of interagency coordination and cooperation with NOAA's National Marine Fisheries Science Center, US Army Corps of Engineers, Falmouth Conservation Commission, and DEP, the Town of Falmouth was able to secure sand from a nearby dredging project for beneficial reuse as beach and dune nourishment at Menauhant Beach.

Woods Hole Group collected the necessary field data to document existing conditions (topography, shellfish, eelgrass, wetland resources), and also evaluated a range of alternatives for constructing the project. Ultimately the project utilized a unique nearshore rehandling area where dredge sand was placed in a bottom dump scow, towed to the site, dumped on the seafloor, and redredged by the Barnstable County dredge to nourishment Menauhant Beach. The beneficial reuse of dredged sand resulted in a cost savings for both NOAA and the Town of Falmouth, and culminated in a beach restoration project that was awarded the Best Restored Beaches award by the American Shore and Beach Preservation Association.



**Project Name:** Town of Sandwich Dune and Beach Reconstruction  
**Client:** Town of Sandwich

**Project Description:**

Woods Hole Group is currently working for the Town of Sandwich, MA to design and permit a dune and beach restoration project that addresses long-term erosion caused by construction of the Cape Cod Canal jetties. The project will reduce vulnerability to coastal storms, sea level rise, and flooding by restoring 5,000 feet of beach and dune with 388,000 cubic yards of sand. Emphasis has been placed on beneficial reuse of sand dredged from the Cape Cod



Canal and other nearby sources as potential sediment sources for the project. Woods Hole Group is also conducting an evaluation of a nearshore borrow site near Scusset Beach that could be used as a long-term sediment source for the Sandwich Town beach.

The project required bathymetric and topographic surveys, as well as sediment sampling and wetland resource area surveys including shellfish, eelgrass, and state/federally listed shorebird habitat. A number of alternatives were evaluated for restoring the critically eroded resource, including dune restoration only, different lengths of beach restoration, replenishment coupled with soft and hard engineering structures, and relocation of Sandwich Harbor inlet. The physical, ecological, and economic impacts of each alternative were evaluated. Results from the impact analysis were used to select the preferred alternative. Woods Hole Group worked closely with the local and regulatory stakeholders to identify mitigation measures (time of year restrictions, design modifications, etc.) to avoid adverse impacts to state/federal listed shorebird species. An important part of the project has been to help the Town of Sandwich coordinate with the US Army Corps of Engineers to ensure beneficial reuse of sand dredged from the Cape Cod Canal. Woods Hole Group has been responsible for preparing and filing all of the local, state, and federal permit applications. Initial project construction is planned for the winter of 2015-2016.

**Project Name:** Waterways Assets and Resources Survey Master Plan for Dredging and Beach Nourishment Town of Dennis, MA

**Client:** Town of Dennis, MA

**Project Description:**

Woods Hole Group prepared a report documenting existing conditions and Town of Dennis management practices at the four (4) waterways and eight (8) primary public beach sites within the town's jurisdiction. The report lays the framework for a master plan for dredging activities in the waterways, as well as associated beach nourishment to restore the public coastal resources.

Information developed as part of the waterways and beaches surveys was used to develop a series of short- and long-term management recommendations for the Town of Dennis.



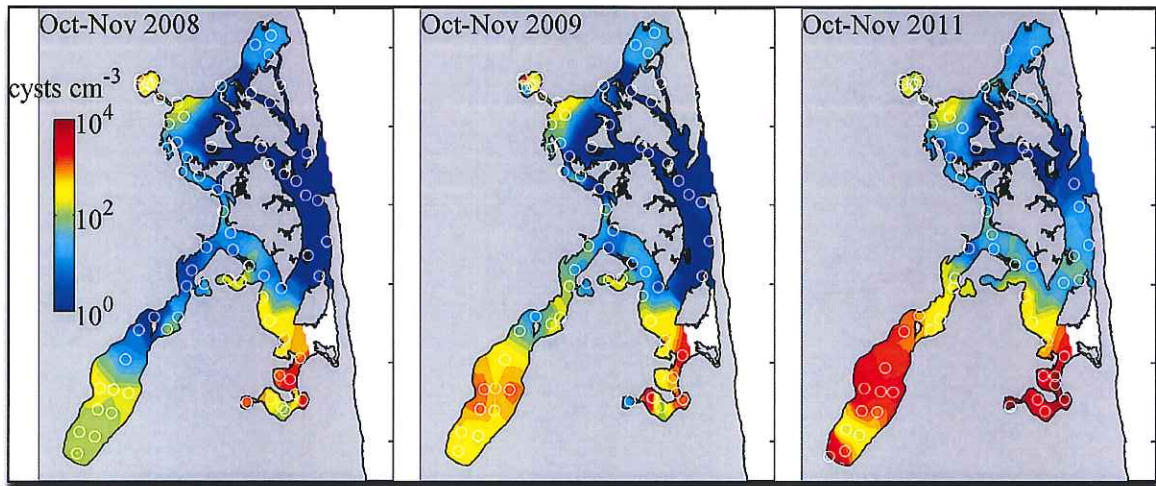
**Project Name:** Temperature and Residence Time Controls on an Estuarine Harmful Algal Bloom: Modeling Hydrodynamics and *Alexandrium fundyense* in Nauset Estuary.

**Supported By:** National Science Foundation, National Institutes of Health through the Woods Hole Center for Oceans and Human Health, and the National Park Service

**Project Description:**

WHOI team members David Ralston and Don Anderson investigated the physical and biological controls on a recurrent algal bloom (*Alexandrium fundyense*) in Nauset estuary using a 3D hydrodynamic model. *A. fundyense*, a dinoflagellate that causes paralytic shellfish poisoning (PSP), is just one of many harmful algal blooms (HABs) frequently impacting the northeast.

The model was calibrated using observations of physical and biological conditions during three years of spring blooms. Weekly sampling was conducted at 30 stations throughout the estuary to collect water samples for *A. fundyense* cell counts and nutrient concentrations. Sediment samples collected over three years were used to map cyst distribution in the estuary. Ralston and Anderson determined that the dominant factors controlling the *A. fundyense* bloom in Nauset estuary were the water temperature, stratification, and cell behavior (diel vertical migration). Unlike similar studies in the Gulf of Maine, they found that the Nauset estuary model results were relatively insensitive to cyst distributions or germination rates. Instead, the high apparent rates of vegetative cell division by retained populations controlled bloom development in Nauset estuary. Also, cyst germination occurred earlier in the year than in the Gulf of Maine, suggesting that cysts in Nauset estuary have different controls on germination timing. The validated model allows a quantitative assessment of the factors that contribute to the development of a recurrent harmful algal bloom in Nauset estuary, in addition to providing a framework for assessing similarly impacted coastal systems.



More detailed project descriptions for relevant Woods Hole Group projects are provided in Appendix B.

3.2 GENERAL COMPANY PROFILE



The Woods Hole Group, Inc. addresses environmental problems worldwide with a focus on solving engineering and environmental problems along the coast, in the ocean, and in wetland and terrestrial environments. Relying on service, excellence and leadership, Woods Hole Group employs dedicated and highly qualified scientists and engineers recognized in their respective technical fields. Woods Hole Group's growing staff is based at the home office in Falmouth, Massachusetts, and at client-centered offices in Dover Delaware, Jacksonville, FL, and Houston, Texas. Woods Hole Group works globally through a representative network in 20 countries, providing breadth of experience and exposure to benefit our clients and teaming partners in the government, industrial, private, and architectural/engineering (A&E) sectors. Consulting services and products are offered through our three technical Teams described below:

The **Coastal Sciences, Engineering & Planning** team focuses on:

- Modeling of coastal/oceanographic processes and water resources infrastructure
- Engineering planning and design for coastal and civil works projects
- Studies of coastal geology and coastal processes
- Habitat restoration
- Climate change/sea level rise vulnerability assessments

Representative projects include planning, permitting, design and construction oversight for dredging, beach nourishment, coastal structures, and salt marsh habitat restoration. Scientifically-based studies also include assessment of climate change risks and adaptations, coastal and oceanographic hydrodynamic and sediment transport processes, and pollution transport/fate, along with historical landform change, and data collection/analysis. Our work addresses the multi-disciplinary physical, geological, biological, and chemical aspects of these sensitive systems. Problem analysis, solution identification, and cost-effective implementation all contribute to client satisfaction. Our staff is composed of a diverse group of specialists, including Ph.D. and M.S. level scientists and engineers, field personnel, technicians, and computer data processing specialists. Project managers have strong management skills and are experienced at designing, budgeting, and implementing complex interdisciplinary projects.

The **Applied Ecology** team focuses on:

- Environmental impact statements (EIS) and permitting
- Contaminated sediment management and remediation
- Risk assessments
- Industrial discharge mixing zones and impacts
- Sustainable design solutions

Our environmental staff provides consulting services for monitoring, assessing, and restoring pollutant-impacted environments, principally marine and aquatic environments. The team also specializes in managing contaminated sediments in marine waters (including dredge material management), environmental baseline studies and assessments in global waters, risk assessments, and environmental policy. We offer strategic environmental planning and ecological assessment services for domestic and international clients. Areas of expertise include: monitoring and assessing impacts from point-source discharges and non-point sources into coastal and estuarine environments, assessing baseline environmental conditions and impacts from accidental spills, assessing damage to natural resources and ecological risk from pollutants, and evaluating restoration or remedial alternatives.

The **Oceanography & Measurement Systems** team focuses on:

- Port, harbor, and coastal monitoring systems
- Offshore metocean systems and moorings
- Physical oceanography and ocean engineering
- Software, products, and system integration

Specialties include shallow through ultra deep water real-time marine environmental information systems, moorings, and buoys to support drilling and ship operations for oil companies, port and harbor navigability, weather and ocean forecasting, and ocean resource management. Our Ph.D. and M.S. level ocean engineers and oceanographers focus on specialized system design and construction, as well as physical oceanographic analysis and modeling (e.g., design criteria studies). Standard products include the **WatchDog-1000** integrated buoy and mooring package (<http://woodsholegroup.com/brochures/watch-dog-1000.pdf>). WatchDog is a rugged, moored metocean monitoring system independent of oil platforms that is open-ocean survivable and reconfigurable to provide ocean current data from the near-surface to deep-water. Our Integrated Real-Time Monitoring Software (IRMS) software provides the backbone for real-time monitoring systems, including data processing, archiving, networking, and displaying real-time data in client-specified formats. We integrate these products with other manufacturer's equipment to provide cost-effective monitoring solutions to the worldwide oil and gas industry, power and wastewater utilities, ports and harbors, and the scientific community. Woods Hole Group also has a supply of metocean equipment available for lease.

The synergy between these teams allows Woods Hole Group to provide a wide range of services while minimizing infrastructure. Over-arching capabilities that support the organization include **Field Services** (i.e., surveys and deployments, site inspection, operation & maintenance services), **Geographic Information Systems** (GIS) (i.e., data management, database development, graphics and mapping), as well as **Expert Services** (i.e., peer review, expert witness testimony, strategic planning and program management). Shared corporate, administrative, and marketing resources translate into cost effective/cost-competitive project management for our clients. For more information, visit us at [www.woodsholegroup.com](http://www.woodsholegroup.com).

#### **4.0 PROJECT STAFFING**

Successful completion of the *Nauset Estuary Dredging Project* will require the dedicated efforts of experienced personnel with a range of skills that include coastal geology, estuarine hydrodynamics, marine ecology, coastal engineering, GIS mapping, and environmental permitting.

The project will be managed by M. Leslie Fields. Ms. Fields is a multi-disciplinary Coastal Scientist/Geologist and Certified Floodplain Manger with experience in coastal processes analysis, floodplain management, and dredging management. Since joining the company in 1989, she has a long history of overseeing large dredging and permitting projects. She has completed dredge material management plans for Towns, Municipalities, and the US Army Corps of Engineers. She served as the Project Manager for the 2006 Town of Orleans study at Nauset Beach, and is currently managing the Town's project to evaluate vulnerability of resources at Nauset Beach. Ms. Fields was Project Manager for the Centerville River dredging project that involved beach nourishment, as well as a creative solution for sediment dewatering and upland beneficial reuse. She also led development of an EIS for the Hyannis Harbor channel dredging. Ms. Fields was also responsible for securing the Comprehensive Permits for the Town of Falmouth's dredging and nourishment activities. She also was the project manager for the Long Island Sound Dredge Material Management Plan (DMMP) for the US Army Corps of Engineers, New England District. This project evaluated alternatives for dredged material management including open-water placement, beneficial use, upland placement, and innovative treatment technologies. The project included detailed characterizations for sites previously identified as potentially suitable for dredged material placement. A total of 111 sites were investigated across the Rhode Island, Connecticut, and New York LIS study area. Leslies' project experience has provided her with strong working relationships with the Orleans Conservation Commission, DEP Southeast Region, Chapter 91, CZM, and the US Army Corps of Engineers.

Ms. Fields will be supported by a targeted project team that includes Ms. Elise Leduc, a Coastal Scientist that has been with Woods Hole Group since 2012. Elise has extensive training in geospatial mapping, geomorphologic analysis, and ecological studies of estuarine systems. She will be responsible for resource area mapping, shoal migration analyses, and field investigations of eelgrass. Ms. Elizabeth Hays will lead the environmental permitting task. She has over 14 years experience with permitting for coastal projects in the Commonwealth of Massachusetts. Mr. David Walsh, Senior Coastal Scientist with Woods Hole Group for 11 years, specializes in the acquisition, processing, and interpretation of coastal survey data for investigate of subaqueous sedimentary environments. He will be responsible for collection of the hydrographic survey and sediment core data. Publications and administrative services will be provided by Ms. Nadine Sweeney.

Team members Don Anderson and Dave Ralston from WHOI have years of experience with red tide research, and specifically in Nauset Estuary with hydrodynamic modeling of the physical and biological controls on harmful red tide blooms. Mr. Anderson will be responsible for evaluating the distribution of red tide cysts in the estuary, analyzing the

sediment cores for cysts, and providing recommendations for controlling red tide blooms during implementation of the dredging program. Mr. Ralston will provide expertise in applying results of the hydrodynamic modeling to development of the Town's dredging program.

A project organization chart is shown in Figure 2. Qualifications and experience for the Woods Hole Group team members is illustrated in the resumes in Appendix A.

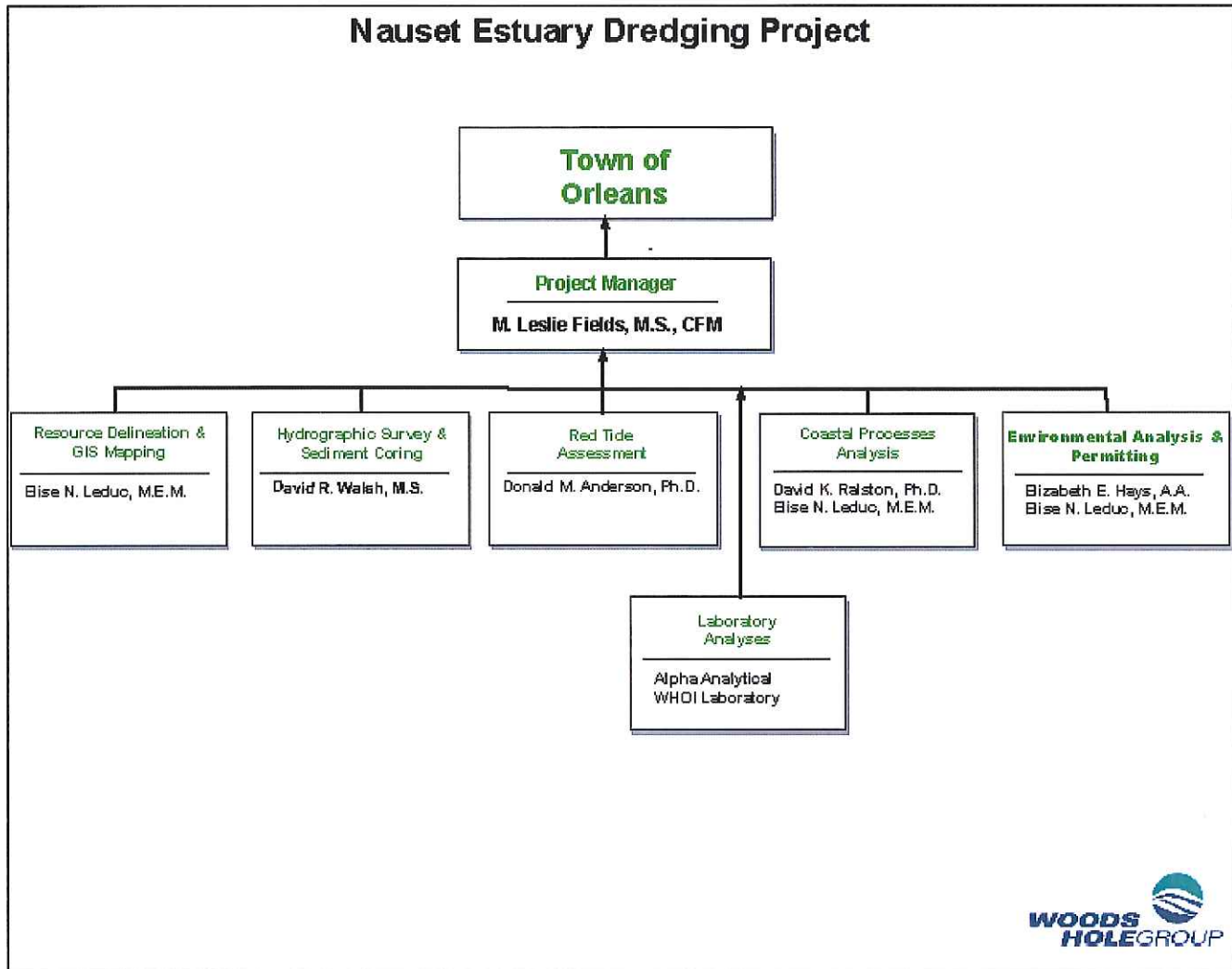


Figure 2. Project Organization Chart.

## 5.0 PROJECT SCHEDULE/FUNDING

Woods Hole Group has assumed a project start date of October 1, 2015, and is committing to delivery of the Final Report by January 15, 2016. Completion dates for Tasks 1-5 are scheduled as follows:

- Task 1: October 21, 2015
- Task 2: November 6, 2015
- Task 3: November 27, 2015
- Task 4: November 20, 2015
- Task 5: January 15, 2016

A project schedule showing completion dates for each Task and delivery dates for interim deliverables is provided in Figure 3. The Woods Hole Group Project Manager can be available to present the findings of the study at the May 2016 Town Meeting.

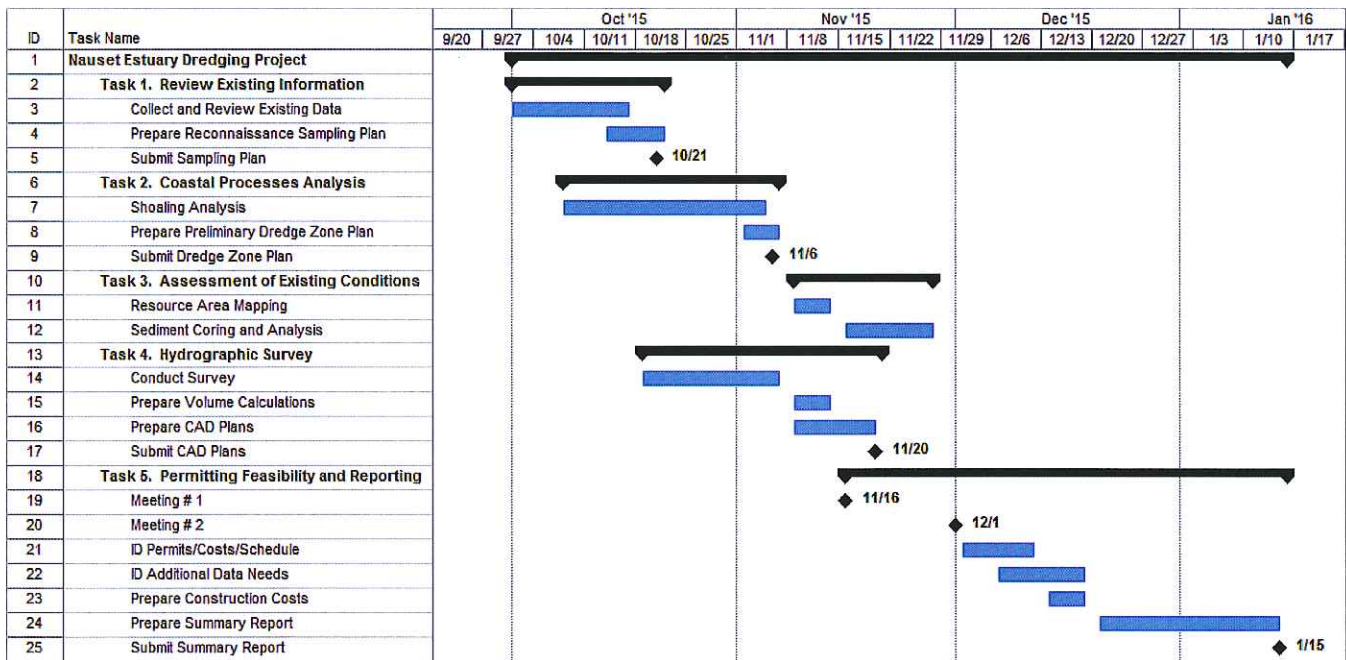


Figure 3. Project Schedule.

## 6.0 DELIVERABLES

The following deliverables will be provided to the Town of Orleans during execution of the project.

- Reconnaissance sampling plan upon completion of Task 1
- Preliminary dredge zone plan upon completion of Task 2
- Plans of existing conditions and proposed project upon completion of Task 4
- Summary report upon completion of Task 5

The Town will also be provided with electronic files containing the bathymetric survey data, AutoCAD plans, aerial photographs, GIS shapefiles and projects, and laboratory results.

In addition to the deliverables listed above, Woods Hole Group will conduct two meetings with local stakeholders and regulatory agencies to present the project and gather input. The meetings will be scheduled in coordination with Town officials at the early stages of Task 5.

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**APPENDIX A**  
Personnel Resumes

WOODS HOLE GROUP, INC.

**Qualifications Summary**

- Over 25 years of experience in multi-jurisdictional environmental studies
- Specializes in environmental studies of coastal and marine projects, including resource and existing conditions surveys, impact analyses, flood zone mapping, and mitigation/restoration planning for climate change
- Experience with field data collection of sediments, water, plants, fish, and benthic infauna for environmental studies, and with laboratory services required to analyze such samples
- Skilled at utilizing GIS and database technology to display and analyze spatially related data for coastal and marine projects
- Extensive experience with local, state, and federal permitting of coastal projects
- Strong written, communication, and organizational skills, including expert testimony

**M. LESLIE FIELDS, CFM, M.S., B.S.**

Coastal Geologist/Marine Environmental Analyst

**Professional Affiliations**

Association of State Floodplain Managers (2014)  
Marine Outreach Guidance Group, Woods Hole Oceanographic Institution Sea Grant Program (June 1999 – present)  
Member Falmouth Conservation Commission (1990 – 1997)

**Fields of Expertise**

Shoreline change analyses, coastal hazard evaluation, GIS development, environmental impact analyses, coastal wetland delineation, sediment transport analyses, tidal inlet hydrodynamics, nearshore wave propagation analyses, storm surge analyses, and permitting (local, state, and federal).

**Higher Education**

M.S. Coastal Geology-Rutgers University (1984)  
B.S. Geology-Southern Methodist University (1981)

**Professional Licensing**

CFM Certified Floodplain Manager, US, Certificate#  
US-14-07618

**Employment History**

1989-Present Woods Hole Group, Inc.  
2003-2004 Massachusetts Coastal Zone Management  
1984-1989 U.S. Army Corps of Engineers, CERC  
1981-1984 Rutgers University  
1980-1981 Sun Energy and Development Co.

**Key Projects**

**Technical Evaluation of Preliminary 2013 FEMA FIRMs for the Towns of Scituate, Marshfield, and Duxbury, MA – Project Manager**

Managed projects for the Towns of Scituate, Marshfield, and Duxbury to perform coastal hydrologic and hydraulic evaluations of preliminary FEMA FIRMs released in May 2013. The work included assessment of 100-yr stillwater elevations, offshore wave conditions, and wave setup criterion utilized by FEMA in the coastal modeling. Woods Hole Group worked with the

## **Key Projects (continued)**

communities to select specific transects for detailed evaluation using FEMA's models and methods for erosion, PFD delineation, overland wave transformation, wave runup, and overtopping. Results from the analyses were used to update the flood zone and BFE mapping shown on the preliminary FIRMs. The work was performed on an accelerated schedule and resulted in an appeal to FEMA for revisions to the FIRMs. The appeal is currently under review by FEMA.

### **Technical Evaluation of Preliminary 2013 FEMA FIRMs for areas in Barnstable County, MA – Project Manager**

Managed three (3) separate projects in Barnstable County to perform coastal hydrologic and hydraulic evaluations of preliminary FEMA FIRMs released in May 2013. The work included sites in the Towns of Chatham, Barnstable, and Falmouth. Elevations for the 100-yr stillwater conditions, offshore wave conditions, and wave setup criterion utilized by FEMA in the coastal modeling were evaluated. FEMA's models and methods for erosion, PFD delineation, overland wave transformation, wave runup, and overtopping were used to assess the 100-yr flood conditions at each site. Results from the analyses indicated that an appeal of the preliminary FIRMs was warranted for the Chatham site, but not for the sites in Barnstable or Falmouth. An appeal was filed with FEMA by the necessary deadline showing revisions to the flood zone and BFE mapping in Chatham. Upon review, the appeal was accepted by FEMA and the map revisions will be reflected in the effective maps when they are released.

### **Risk and Vulnerability Assessment for the Martha's Vineyard Hospital, Oak Bluffs, MA; Board of Trustees MV Hospital and MV Commission - Project Manager/Floodplain Analyst**

Managed and conducted an extensive risk and vulnerability assessment for reconstruction of the Martha's Vineyard Hospital. The analysis considered risks of the existing hospital site to various natural hazards including storm surge, flooding, wind, snowfall, wildfire, coastal erosion, sea-level rise, and earthquakes. Vulnerability of the site and impacts to critical hospital services were considered. Results from the risk and vulnerability analysis were used to provide recommendations for reconstruction of the hospital facilities.

### **Town of Palm Beach Technical Review of Proposed Coastal Management Program; Town of Palm Beach – Coastal Geologist**

Worked on the WHG team to conduct a technical review of the Palm Beach CCMP. Reviewed a broad range of reference documents and data describing the history of coastal management and coastal processes at Palm Beach. Developed island-wide recommendations for inlet management, evaluation of beach nourishment project performance and feeder beach strategies, sand source alternatives, maintenance of coastal structures, and protection of hardbottom resources. A selection of shore protection alternatives were also evaluated in terms of performance and value to help formulate recommendations for improved coastal management.

### **Investigation of Upland, Beneficial Reuse, and Sediment Dewatering Sites for Dredged Materials Management in Long Island Sound; US Army Corps of Engineers – Environmental Scientist**

Conducted investigations at 104 upland, beneficial reuse, and sediment dewatering sites for potential dredged materials management in the Long Island Sound area. Site summaries provided information on general location, ownership, surrounding land use, zoning, wetland resources,

## Key Projects (continued)

proximity to habitat for rare and endangered species, sediment type, site access, and staging areas. Conceptual engineering designs were evaluated and site capacities were determined.

### **Management of the New Bedford Harbor Superfund Site Environmental Management Information System; US Army Corps of Engineers – Project Manager**

Served as project manager for the New Bedford Harbor superfund site information system containing environmental measurements and geographic information generated for contaminant identification, delineation, and regulatory compliance during the Corps remediation activities. The information management system incorporates an Oracle environmental database, a web-based front-end that provides data access for project team members, and data management methods and procedures for quality assurance and data validation. The database holds over 300,000 analytical, biological, toxicological, and geotechnical results generated by a team of field and laboratory contractors.

### **Comprehensive 10-Yr Permitting for Town of Falmouth Dredging and Beach Nourishment Projects; Town of Falmouth – Project Manager**

Managed a project for the Town of Falmouth Harbormaster and Department of Public Works offices to secure comprehensive 10-yr permits for dredging and beach nourishment throughout the town. The purpose of the project was to consolidate and manage environmental permits for 25 dredging and beach nourishment sites associated with maintenance of the Town's waterways, harbors, salt ponds, and public beaches. The work involved sediment sampling and analyses, wetland delineation, impact analyses, plan preparation, and permitting. Applications were secured from the appropriate local, state, and federal agencies.

### **Coordination, Design, and Permitting for the Vineyard Haven Harbor Dredging and Beach Nourishment Project; Town of Tisbury- Project Manager/Coastal Scientist**

Coordinated, designed, and permitted a dredging and beneficial reuse beach restoration project in Vineyard Haven Harbor, Martha's Vineyard. Shoaling at the western entrance to Vineyard Haven Harbor created problems for navigation and threatened water quality in the Inner Harbor. Sandy dredge material was permitted for restoration of critically eroded beaches. Work on the project included preparation and filing for the full range of environmental permits from local, state, and federal agencies.

### **Evaluation of Beach Replenishment Alternatives for Narragansett Beach, Rhode Island; Town of Narragansett – Project Manager/Coastal Scientist**

Managed a project to evaluate a range of alternatives for beach replenishment at Narragansett Town Beach. Erosion of the beach has historically been managed by trucking in small quantities of sand immediately prior to the summer beach season. The Town was interested in identifying longer-term solutions that would enhance the recreational resource and provide improved storm damage protection. This project evaluated quantities of sand needed for various beach nourishment scenarios involving different berm widths, elevations, nearshore slopes, and beach lengths. Levels of storm protection and project performance were evaluated. Potential sand sources and associated construction costs were also identified, and permitting requirements were addressed.

## **Key Projects (continued)**

### **Development of a Plan to Address Beach Erosion at Chapin Beach, Dennis, MA; Town of Dennis – Coastal Geologist**

Worked to develop a plan addressing long-term erosion at the Town of Dennis public beach area known as Chapin Beach. Concern over high erosion rates along the barrier beach prompted the Town to commission a study of causes and potential remedial actions. The work involved mapping of critical resources, analysis of historical shoreline change, investigation of site specific erosion processes, as well as an analysis of alternatives for mitigating the erosion. Planning level cost estimates and regulatory requirements for a series of recommended solutions were identified.

### **Preparation of a Waterways Asset and Resources Master Plan for Dredging and Beach Nourishment for the Town of Dennis, MA; Town of Dennis – Project Manager/Coastal Scientist**

Documented existing conditions and management practices at the four waterways and eight primary public beach sites within the Town of Dennis. The project resulted in a master plan for dredging activities in the waterways, as well as associated beach nourishment to restore the public coastal resources. Available information from town records and permit documents was used to evaluate dredging needs and environmental resources in the different waterways. The beach sites were evaluated using a combination of information from town records, permit documents, State and Federal agencies, and survey data collected specifically for this study. Recommendations were developed and prioritized for improved management of the Towns waterways and beach resources.

### **Beach Management Plan for Town of Falmouth Public Beaches; Office of the Town Manager and Falmouth Beach Committee - Project Manager/Coastal Scientist**

Managed and prepared a comprehensive Beach Management Plan for 10 public beaches in the Town of Falmouth. The project involved collection of beach profile data, sediment analyses, resource area delineations, and infrastructure assessments. Dominant coastal processes, directions of sediment transport, historical shoreline change, and history of human alterations were all addressed. Recommended management activities were provided for infrastructure maintenance, beach monitoring, routine maintenance, restoration activities, education, enforcement, and fund raising. Results from the Beach Key Projects Management Plan were used to file for and secure a local permit from the Falmouth Conservation Commission for a number of the recommended management activities.

### **Coordination, Design, and Permitting for the Menauhant Beach and Dune Restoration Project, East Falmouth, MA; Town of Falmouth - Project Manager/Regulatory Specialist**

Coordinated, designed, and permitted a beneficial reuse dune and beach restoration project at Menauhant Beach in East Falmouth. Through extensive interagency coordination and cooperation, the Town of Falmouth was able to secure sand from a nearby dredging project that created a deepwater port in Great Harbor Woods Hole for a new NOAA research vessel. Dredged sand was dumped at a temporary, nearshore rehandling site offshore of Menauhant Beach, and then hydraulically pumped to Menauhant public beach to form a protective dune. The project required the full range of environmental permits from local, state, and federal agencies. Coordination

**Key Projects (continued)**

between local Town of Falmouth representatives, DEP regulatory officials, the Barnstable County Dredge office, NOAA, and USACE project managers was required to construct this beneficial reuse project.

**Environmental Impact and Risk Assessments for Proposed Natural Gas Pipelines Offshore of Trinidad and Tobago; National Gas Company of Trinidad and Tobago Limited - Project Manager/Environmental Analyst**

Managed a large-scale environmental impact and risk assessment project for two proposed natural gas pipelines offshore of Trinidad and Tobago. The work involved extensive field data collection and laboratory analysis of oceanographic, coastal, and terrestrial data. Detailed descriptions of the projects were provided along with alternatives analyses, existing conditions reports, and environmental impact analyses. Recommendations were provided to the project applicant and the regulatory agencies of Trinidad and Tobago for minimizing adverse impacts and for long-term monitoring.

**Analysis of Historical Shoreline Change and Management Alternatives for Nauset Beach, Orleans, MA; Orleans Parks and Beaches Department - Project Manager/GIS Analyst**

Managed and performed a comprehensive analysis of shoreline change and management alternatives for Town of Orleans public beach areas located on Nauset Beach. The project involved a quantitative analysis of historical shoreline change using ArcGIS, as well as an analysis of barrier breaching and inlet formation. Results from the study were utilized to develop recommendations for short- and long-term management of the public beach facilities and the extensive off-road vehicle trails and barrier spit to the south.

**Design, Environmental Impact Analysis and Permitting for Chapoquoit Beach Replenishment, West Falmouth, MA; Chapoquoit Associates - Project Manager/Coastal Geologist**

Managed a large private/public partnership project to replenish eroding beaches along the Chapoquoit Beach section of West Falmouth, MA using sand dredged from the Cape Cod Canal by the US Army Corps of Engineers. The project involved detailed design computations for the replenishment, as well as wave and sediment transport modeling to evaluate spreading and potential impacts of the project. Extensive project management was required to facilitate permitting on a fast track basis and to coordinate construction with the USACE's schedule.

**Design, Environmental Impact Analysis, and Permitting for the Centerville River Dredging Project, Centerville, MA; Town of Barnstable - Project Manager/Coastal Geologist**

Managed a large-scale municipal project to dredge the Centerville River for the purposes of improving navigation. This project involved extensive field investigations of the physical environment, biology, wetland resources, and sediments within the river. The nature of the sediments required identification of two types of reuse sites for the dredged material. The design included beach replenishment at the adjacent barrier beach for the sand sized material, and a variety of upland reuse sites for the fine-grained sediments. The project required the full range of environmental permits from local, state, and federal agencies.

## Key Projects (continued)

### **Design, Environmental Impact Analysis, and Permitting for the Mashpee River Dredging Project, Mashpee, MA; Town of Mashpee - Project Manager/Coastal Geologist**

Managed a large-scale municipal project to dredge the Mashpee River for the purposes of improving navigation. This project involved extensive field investigations of the physical environment, biology, wetland resources, and sediments within the river. A detailed alternatives analysis was performed to identify potential dewatering and beneficial reuse sites. The fine-grained nature of the proposed dredge sediments coupled with the lack of nearby staging sites for dewatering and storage has presented a number of unique and difficult challenges to this project. The WHG is currently working with the Town of Mashpee to identify and scope several alternative technologies for dredging and dewatering the sediments.

### **Federal Emergency Management Agency (FEMA) Flood Insurance Restudy for the Town of Hampton, NH, FEMA - Project Manager/Coastal Geologist**

Performed and managed a Flood Insurance Restudy (FIS) for the Town of Hampton, NH. This project involved updating the FEMA Flood Insurance Rate Maps (FIRM) for the Town of Hampton by re-establishing the flood zone boundaries. Numerical models were utilized to simulate nearshore wave transformation and wave runup, and were combined with estimates of erosion potential to determine the location of the flood zones. The FIRMs were updated using quantitative information on waves, wave runup, and flooding, and were graphically displayed using GIS techniques.

### **Assessment of Sand Resources in Northern and Central San Francisco Bay, CA; Hanson Aggregates - GIS Analyst**

Worked with a team of WHG professionals to assess sand resources in Northern and Central San Francisco Bay, and to evaluate Hanson Aggregate and RMC leased sand borrow regions to determine their viability as a renewable sand resource. The work was accomplished using available hydrodynamic, geophysical, sediment, and geological data as well as digital terrain modeling tools available with the GIS software ArcInfo. Historical changes in bottom topography were evaluated using an acoustic survey of the bedrock surface, coupled with NOS bathymetric surveys and a high resolution multibeam survey collected by the USGS. Isopach maps showing changes in sediment thickness were generated and used to compute variations in sediment volume within specified borrow sites.

### **Historical Shoreline Change Analysis: Western Town Line to Horton Point, Southold, NY, Town of Southold - Project Manager/Coastal Geologist**

Managed and performed a comprehensive historical analysis of a 10-mile segment of shoreline within the western portion of the Town of Southold, NY. The analysis was performed using historical T-sheets, traditional aerial photography, and low-altitude, high-resolution digital photography. Rates of shoreline change were computed at 100-ft intervals throughout the study area. The impacts of shoreline protection structures and storms on the historical rates of shoreline change were evaluated. Estimates of longshore sediment transport rates were obtained from the shoreline data.

## Key Projects (continued)

### **Beach Nourishment Design, Permitting, and Oversight at Long Beach, Centerville, MA, Long Beach Association, Inc. - Project Manager/Coastal Geologist**

A beach nourishment project was designed and permitted at Long Beach, Centerville, MA to alleviate long-term erosion of the shoreline and to provide improved storm damage protection and flood control. The beach was designed with a berm elevation of +9 ft MLW and a width of 100 ft. Sediment was dredged from shoals seaward of the East Bay tidal inlet, and hydraulically pumped to Long Beach. Approximately 2,100 ft of beach was nourished with 60,000 cubic yards of clean, compatible sand. This was a multi-disciplinary project involving analysis of coastal processes, environmental sensitivity, coordination with regulatory officials and marine contractors, and management of project funds.

### **Federal Emergency Management Agency (FEMA) Flood Insurance Restudy for the Town of Greenwich, CT, FEMA - Project Manager/Coastal Geologist**

Performed and managed a Flood Insurance Restudy (FIS) for the Town of Greenwich, CT. This project involved updating the FEMA Flood Insurance Rate Maps (FIRM) for the Town of Greenwich by adding the effects of wave runup to the designation of flood zone boundaries. Numerical models were utilized to simulate nearshore wave transformation and wave runup, and combined with estimates of erosion potential to determine the location of flood zones. The FIRMs were updated using quantitative information on waves, wave runup, and flooding, and were graphically displayed using GIS techniques.

### **Sediment Transport Study - Evaluation of Causeway on Coastal Processes, Westport, MA, Massachusetts Department of Environmental Management - Coastal Geologist**

Team member involved in a comprehensive evaluation of regional sediment transport processes along Horseneck Beach, Gooseberry Neck, East Horseneck Beach, and Little Beach in the Towns of Westport and Dartmouth, MA. Sediment transport patterns and alternatives for beach stabilization were evaluated along with various management and engineering alternatives for the causeway connecting Gooseberry Neck to the mainland. The historical evolution of the coastal system was evaluated, and an analysis of shoreline change was performed using historical maps and aerial photography. A combination of field data and numerical modeling was used to provide a detailed evaluation of the littoral processes. Nearshore wave transformation was modeled to provide the necessary data to drive the longshore sediment transport model. Cross-shore sediment transport was also modeled and combined with the longshore sediment transport model results to provide an estimate of the net annual longshore sediment transport.

## Technical Reports

54

## Publications and Presentations

11

### Qualifications Summary

- Adept at spatial data acquisition and geospatial analysis using ESRI's ArcGIS to analyze and display data for coastal and marine projects.
- Experience conducting shoreline change analyses.
- Experience with field data collection of sediments, water, plants, fish, and invertebrates for environmental studies.
- Experience with local, state, and federal permitting of coastal and environmental projects.
- Experience developing beach management plans, and coastal management and conservation documents.
- Strong written and verbal communication skills, and the ability to engage diverse groups of stakeholders.
- ESRI ArcGIS; ETGeowizards; MATLAB; Microsoft Office; Adobe Photoshop and Illustrator

## ELISE LEDUC, M.E.M.

Coastal Scientist

### Fields of Expertise

Coastal environmental management, coastal planning, geospatial analysis, shoreline change analysis, wetland and resource area delineation, environmental impact analyses, ecological risk assessment, conservation prioritizations, field and water quality sampling, Massachusetts environmental regulations.

### Higher Education

M.E.M., Coastal Environmental Management, Duke University (2011)  
B.A., Biology, Williams College (2006)

### Employment History

2012-Present Coastal Scientist, Woods Hole Group, Inc.  
2011-2012 Watershed Management Fellow, Charles River Watershed Association  
2011 Coastal Conservation Planner, North Carolina Division of Coastal Management  
2010 Conservation GIS Analyst, Great Land Trust  
2009-2010 Wetland Laboratory Technician, Duke University Wetland Center  
2006-2008 Rural Aquaculture Extension Agent, Peace Corps Zambia

### Certificates of Training

OSHA 40-Hour HAZWOPER

### Key Projects

#### Dredge Disposal Analysis, Chatham, MA

Developed selection criteria to choose areas that are best suited for disposal of dredge material. Calculated fill capacity and designed potential nourishment templates for 14 potential disposal sites in Chatham, Harwich and Orleans. Potential dredge disposal site rankings were based on physical logistics (i.e. location, volume, equipment access, etc.), as well as each site's potential benefits (i.e. erosion protection, habitat restoration, coastal resiliency, etc.) and potential permitting and regulatory constraints (i.e. shellfish resources, presence of salt marsh or eelgrass, etc.). Compiled final rankings, analyses, maps, and fill cross-sections into a final report for the Town.

## **Key Projects (continued)**

### **Town of Sandwich Beach Management Plan**

Conducted a review of historical documents, maps, and existing data for Sandwich public beaches. Reviewed, mapped and described existing conditions and historical shoreline change through site visits and geospatial analysis. Performed historical shoreline change analysis for Sandwich public beaches. Documented existing activities being undertaken by the Town as on-going management of the public beaches. Identified and proposed new management activities that could improve the recreational or conservation functions of the public beaches. Compiled all existing management practices and new recommendations into a final Beach Management Plan document.

### **Modeling the Effects of Sea Level Rise on Coastal Wetlands, MA**

Working for the Massachusetts Office of Coastal Zone Management to model the effects of sea level rise on coastal wetlands statewide. Evaluated multiple candidate models and selected Sea Level Affecting Marshes Model (SLAMM) to assess impacts to wetlands in the state. Data inputs required by SLAMM, such as topographic data, mapped wetlands, accretion and erosion rates, salinity, tide levels and ranges, percent imperviousness, and freshwater inputs, are being identified, compiled and processed in order to run the model. The North Shore's Great Marsh was chosen as a sub-site for pilot testing and sensitivity analysis due to the amount of data available for the system. Final model simulations will be run for both the sub-site and state-wide simulations, for three out-year scenarios and three projected sea level rise rates based on IPCC predictions. These results will aid CZM in identifying areas along the Massachusetts coast where wetlands can and cannot migrate and adapt to sea level rise, given current elevations and development.

### **Newtown Creek CERCLA Environmental Risk Assessment, New York City, NY**

Review and comment on ecological risk documents, such as the RI/FS Work Plan, Screening Level Ecological Risk Assessment (SLERA), Baseline Ecological Risk Assessment (BERA), Risk Analysis Plan (RAP), etc. Conduct data synthesis and analysis, calculations and research to support CERCLA comments and recommendations. Provide technical review and recommendations on toxicity tests, site selection, benthic community analysis, weight-of-evidence method, and technical documents. Create presentations, figures, maps and comments to submit to EPA on behalf of the City.

### **Chilmark Pond Property Evaluation, Chilmark, MA**

Served as project manager for a coastal property evaluation along the southern coast of Martha's Vineyard. Researched and investigated the historic and potential future shoreline changes, and how they might impact a new house to be built on site. Conducted a site visit to evaluate the existing conditions at the site. Acquired and georeferenced historical aerial photographs and charts from the 1800s to the present, and utilized these to document the location of mean high water over time along 2 miles of the southern Martha's Vineyard coastline. Performed a shoreline change analysis using the digitized shorelines to compute a historical shoreline change rate, and help inform projections of future shoreline change rates. Compiled data and wrote a summary report of findings to provide guidance for future planning and construction on the property.

### **New Jersey Alternative Long-Term Nourishment Study**

Researched historical beach nourishment and dune enhancement projects and federal navigation dredging activities along the entire New Jersey coastline. Developed and compiled recommendations for improved performance in future dune enhancement and dredge projects.

## Key Projects (continued)

### **Coastal Pond Management Plan, Chilmark, MA**

Managed a project for a private client to develop a comprehensive pond management plan for a coastal salt pond on Martha's Vineyard. Conducted a site visit to evaluate existing conditions, investigate pond depth and sediment type, and make observations about the stability of the nearby barrier beach. Performed a shoreline change analysis for the southern barrier beach, a critical component to the future management of the pond and the rest of the property. Gathered background information on past and current practices for *Phragmites* control and pond management activities, as well as on general geology and soil conditions in the area, flood zone designations, and ecology of the pond to accurately identify and understand the problems facing the pond, and to develop alternatives for managing the pond. The Pond Management Plan will address preserving and/or restoring the open water pond habitat, and minimizing erosion on the barrier beach, which is necessary for the longevity of the pond. Alternatives considered for preserving and/or restoring the open water pond habitat included mechanical *Phragmites* removal, seasonal targeted herbicide use, and dredging to increase the depth of the pond. Alternatives considered for reducing erosion along the barrier beach included installation of sand fencing, localized dune restoration or reconstruction after major storms, and restoration of current dune footpaths. The plan provided background and reasoning, estimated effectiveness, estimated cost, and projected time frame for each proposed alternative.

### **Comprehensive Plan for Docks, North Haven, NY**

Conducted field reconnaissance to characterize existing docks, public access, shoreline aesthetics and nearshore habitat. Wrote a Comprehensive Plan for Docks in North Haven, which highlighted existing dock policies, detailed the potential dock impacts on public access, aesthetics, water quality, and nearshore habitat, and documented the physical environment present along the coast of North Haven, including wave heights and flood elevations during storm conditions. Provided a series of recommendations for the Village to consider when approving new dock regulations. Attended a Village Meeting where the plan was presented to the public, approved and adopted by the Village.

### **Technical Evaluation of Preliminary 2013 FEMA FIRMs for the Towns of Scituate, Marshfield, and Duxbury, MA**

Evaluated draft FEMA maps, and identified errors and inconsistencies in FEMA's analyses, such as oversights along a particular transect or a flawed assumption. Reanalyzed flood area delineations along FEMA's existing transects, and created additional transects to document and accurately map the flooding potential around location-specific topography. Utilized a geographic information system (ArcMap) to adjust and reclassify mapped flood zones and Base Flood Elevations (BFEs) to reflect updated modeling. Produced updated flood maps.

### **Town of Palm Beach Technical Review of Proposed Coastal Management Program**

Worked on the Woods Hole Group team to conduct a technical review of the Palm Beach CCMP. Quantified and analyzed volumetric changes to the Palm Beach shoreline. Created final maps, figures and graphs to illustrate and summarize key findings and recommendations concerning inlet management, evaluation of beach nourishment project performance and feeder beach strategies, sand source alternatives, maintenance of coastal structures, and protection of hardbottom resources.

## Key Projects (continued)

### Status and Resilience of the Westport Harbor Barrier Beach, Westport, MA

Compiled and georeferenced aerial photography and historical charts to perform a shoreline change analysis for the Westport Harbor Barrier Beach system. Used the data generated through the shoreline change analysis to projected future shoreline change with and without sea level rise. To incorporate sea level rise into future estimates, LiDAR elevation data in conjunction with the predicted sea level rise scenarios in *Global Sea Level Rise Scenarios for the United States National Climate Assessment* were used. Developed projections for 25, 50 and 100 years into the future.

### Shoreline Change Analysis for Saco Bay, ME

Acquired and georeferenced historical aerial photographs and maps for use in project analyses. Analyzed multiple historical aerial photographs to digitize the shoreline and to calculate long-term rates of shoreline change along transects through the beach and dune. Utilized MATLAB to compute annual rates of shoreline change between all available time periods between 1864 to 2010 using the end point method, as well as the linear regression method. Contoured LiDAR data from three time periods to compare to contemporary shoreline positions and incorporate into the shoreline change analysis. Performed error analyses for shorelines derived from aerial photos and LiDAR data.

### Newtown Creek CERCLA Environmental Risk Assessment, New York City, NY

Review and comment on ecological risk documents, such as the RI/FS Work Plan, Screening Level Ecological Risk Assessment (SLERA), Baseline Ecological Risk Assessment (BERA), Risk Analysis Plan (RAP), etc. Conduct data synthesis and analysis, calculations and research to support CERCLA comments and recommendations. Provide technical review and recommendations on toxicity tests, site selection, benthic community analysis, weight-of-evidence method, development of Preliminary Remediation Goals (PRGs), and technical documents. Create presentations, maps and comments to submit to EPA on behalf of the City. Developed a sediment sampling plan for toxicity testing.

## Publications and Presentations

Leduc, E. 2011. "An Evaluation of GIS Prioritizations for Selecting Wetland Mitigation Sites: Cook Inlet Case Study" Master's Project, Duke University's Nicholas School of the Environment, Durham, NC.

Leduc, E., K. Price, and T. Miller. 2011. "State of North Carolina 2011 Coastal and Estuarine Land Conservation Program (CELCP) Plan" NC Department of Environment and Natural Resources, Division of Coastal Management.

"A Prioritization of Land Parcels for Wetland Mitigation around Knik Arm" prepared for Great Land Trust, Anchorage, AK. 2011.

"A Prioritization of Land Parcels for Conservation in the Matanuska-Susitna Borough" prepared for Great Land Trust, Anchorage, AK. 2010.

Leduc, E. 2006. "Effects of the invasive ant, *Myrmica rubra*, on the local ant-treehopper mutualism" Senior Thesis, Williams College Biology Department, Williamstown, MA.

**Qualifications Summary**

- Fourteen years of professional experience in coastal and marine permitting
- Strong knowledge and understanding of Wetlands and Waterways regulations and By-Laws regarding permitting requirements and interpretations
- Excellent communicative skills with clients, project managers, engineers and regulatory agency personnel
- Excellent organizational and coordinating skills ensuring timely and accurate application filings within prescribed deadlines
- Excellent skills and experience in researching, organizing and maintaining a myriad of permits for municipalities, private marinas and individual clients
- OSHA Hazardous Waste Operations and Emergency Response Certification, 2009 to 2014

**ELIZABETH E. HAYS, A.A.**

Environmental Permitting Specialist

**Fields of Expertise**

- Prepares various permitting documents such as Notice of Intent, Chapter 91 License, Army Corps Permit, Water Quality Certification, Massachusetts Coastal Zone Management Certification, Environmental Review filing, as well as associated filings such as Extensions, Amendments, Certificates of Compliance, etc.
- Establishes close working relationships with Program Regulators at various Regulatory Agencies. Attend meetings with these individuals and coordinate project actions.
- Assists Engineers and Coastal Geologists in formulating, developing and prioritizing work to ensure a full understanding of agency requirements and project deadlines.
- Performs Registry of Deeds research for Engineers and Coastal Geologists, and reviews various recorded documents for any potential issues that may impact a project, for example, ownership, restrictive easements, etc.
- Assists Engineers and Coastal Geologists in field data collection, perform site evaluations and construction progress inspections.
- Maintains direct contact with clients on behalf of the Project Managers, insuring that clients are fully informed and updated on project status.
- Maintains database for Woods Hole Group permitting projects.
- Performs research, organizes and maintains permitting records for complex and/or multiple facilities for various clients including municipalities and marinas, as well as individual homeowners.
- Independently establishes goals that must be accomplished for projects, involving complex knowledge and reference to various local, state and federal regulations, as well as, local politics, and agency agendas.
- Assists Biologists with shellfish and eelgrass surveys, sediment sampling, field data collection, and report writing.

**Higher Education**

A.A., Applied Science-Paul Smith's College (1981)

## **Employment History**

2007-Present The Woods Hole Group, Inc.  
2001-2007 Coastal Engineering Co., Inc.  
1999-2001 Kinlin Grover/GMAC Real Estate  
1995-1999 The Hartford Insurance

## **Key Projects**

### **Comprehensive Permitting for Dredging and Beach Nourishment Projects for the Towns of Edgartown and Falmouth, MA – Permitting Specialist**

Worked with Engineers/Coastal Geologists/Project Managers to prepare Comprehensive Permit applications for dredging and beach nourishment at 19 sites in Edgartown and 24 sites in Falmouth. The work involved collection of bathymetric and topographic survey data, sediment sampling and analysis, and wetland resource delineations. Engineering plans were prepared showing dredge footprints and depths, dewatering areas, and beach nourishment locations. Complete permit applications were filed with all necessary local, state, and federal agencies.

### **Dredge and Beach Nourishment Permitting for Harbors, Channels and Beaches, Towns of Chatham, Truro and Harwich, MA – Co-Project Manager**

Worked as Co-Project Manager with the Engineer/Project Manager researching and analyzing the various regulatory permits for maintaining the Towns' harbors, channels and beaches. Evaluated and assisted in developing strategies, and worked directly with the regulatory agencies to accelerate permitting requirements to meet the Towns' needs within limited environmental windows and dredge availability.

### **Dredge and Beach Nourishment Permitting for Harbors, Channels and Beaches, Towns of Dennis, Orleans, Tisbury and Sandwich, MA – Permitting Specialist**

Worked with Engineers/Coastal Geologists/Project Managers researching and analyzing the various regulatory permits for maintaining the Town's harbors, channels and beaches. Evaluated and assisted in developing strategies, and worked directly with the regulatory agencies to accelerate permitting requirements to meet the Towns' needs within limited environmental windows and dredge availability.

### **Private Marina Permitting – Co-Project Manager**

Worked as Co-Project Manager with the Engineer/Project Manager researching and analyzing the various regulatory permits for maintaining the private marinas. Evaluated and assisted in developing strategies, and worked directly with the regulatory agencies, Engineer Project Manager and clients to affectively achieve the appropriate permits for their operations.

### **Shorefront Protection Permitting for Private Homeowners in all Cape Cod & Islands towns including Falmouth, New Seabury in Mashpee, Sandwich, Barnstable, Dennis, Chatham, Eastham, Wellfleet, Provincetown, Edgartown, Chilmark, Tisbury, West Tisbury and Nantucket – Permitting Specialist**

Worked with Engineers/Coastal Geologists/Project Managers researching and analyzing the various regulatory permits for dredging, beach nourishment and shorefront protection projects including bulkheads, rock revetments, coir fiber rolls, sand filled geotubes, bank stabilization, and dune reconstruction. Evaluated and assisted in developing strategies, and worked directly with the

**Key Projects (continued)**

regulatory agencies, project managers and the clients to affectively achieve the appropriate permits for their individual situations.

**Army Corps of Engineers, New Bedford Harbor Superfund Site Cleanup – Sample and Document Control Custodian**

Worked with Project Managers and Biologists to prepare and conduct sediment sample collection as part of a long-term environmental monitoring plan. The objective was to assess the effectiveness of the Superfund remediation efforts. Responsibilities included preparation of multiple data entry sheets and chain of custody forms, ordering and distribution of supplies, receipt of sediment samples from field technicians, processing and preparation of samples for laboratory pickup, quality assurance/quality control checks on samples and documentation processes, and the seamless integration of new data into historical databases.

### **Qualifications Summary**

- 16 years of experience in the marine sciences
- Coastal and deep-water research experience
- Sediment budget analysis
- Sediment core collection and characterization using various methodologies and standards
- Geochronological analysis of sediment cores using radioisotopes activities and contaminant histories
- GIS geospatial analysis applications, cartographic transformations, and digital terrain modeling of topographic and bathymetric data
- Bathymetric and shoreline change analysis
- Geophysical survey data acquisition, processing, and interpretation (bathymetric, side-scan, sub-bottom)
- Extensive field/shipboard operations and logistics management of geologic and oceanographic sampling programs
- Experienced in the deployment/recovery of oceanographic mooring systems, instrumentation, and data processing
- Specializes in oceanographic data collection program management and operational logistics for both surface and subsurface systems.
- Use of ADCPs for temporal (moorings) and spatial (vessel surveys) oceanographic studies

### **DAVID R. WALSH, M.S.**

Senior Project Manager / Coastal Scientist  
(Coastal Sciences, Engineering and Planning Division)  
Field Party Chief / Field Oceanographer  
(Oceanography and Measurement Systems Division)

### **Fields of Expertise**

Expertise and research interests in coastal geomorphology and sedimentology. Application of field and laboratory research to resolve and evaluate geologic processes within coastal, estuarine, and oceanic environments. Utilization of GIS and other geospatial software packages to map and define geomorphological processes and sediment characteristics, including the presence of contaminants. Design, acquisition, and interpretation of bathymetric, side-scan sonar, and sub-bottom sonar surveys. Implementation of sediment sampling strategies to ground-truth geophysical survey data (physical properties, sediment stratigraphy, layer thickness) and estimate sedimentation rates.

Oceanographic data collection systems. Coastal and deep-water mooring system instrumentation and deployment techniques. Field operations logistics, efficiency, safety, and shipboard deck operations. Programming, deployment, and data analysis of oceanographic instruments including the ADCP, ADV, and CTD. Mooring design, floatation/hardware components, and acoustic releases.

### **Higher Education**

M.S. Marine Studies - Oceanography, Univ. of Delaware (2004)  
B.S. Geoscience, Hobart College (1999)

### **Employment History**

2012-Present Woods Hole Group, Inc. (Sr. Project Manager)  
2004-2012 Woods Hole Group, Inc. (Coastal Scientist)  
2001-2004 University of Delaware (Research Assistant)  
1999-2001 USGS Coastal and Marine Geology Program  
(Mooring Systems Technician)

### **Certificates of Training**

OSHA 40-Hour HAZWOPER  
Offshore/HUET Survival

## Key Projects

### **Field Data Collection and Historic Chart Digitization, Merrimack River, Newburyport, MA. USACE-New England District. 2012–2013. Project Manager**

This multidisciplinary study was performed to assess historic and present conditions within the dynamic Merrimack Estuary and Newburyport Harbor, and to develop long term maintenance strategies. The project was comprised of three tasks. The field program, consisting of Tasks 1 and 2, had the objective to collect current, water level, and salinity data at discrete locations within the project area over a 60-day period. To accomplish this, Woods Hole Group deployed five (5) current meters and four (4) multi-parameter data loggers. The objective of Task 3 was historic chart digitization; to this end, Woods Hole Group processed 27 historic navigation charts or maps of the Merrimack River Estuary. Most charts represent yearly progress maps depicting the depth conditions during the time the jetties at the river inlet were being constructed. Some of the oldest charts (i.e. 1851 and 1880) show the condition of the area prior to the installation of the jetties. All field and chart digitization data were provided to the NAE for internal analysis.

### **Sediment Boring Collection and Analysis Offshore the Former Aerovox Property, New Bedford Superfund Site, New Bedford, MA. USACE-New England District. 2012–2013. Project Manager**

The primary objective of this project was to obtain a vertical profile of contaminants along the former Aerovox Site facility shoreline, from the sediment water interface to bedrock. The secondary goal was to identify potential pathways for contaminant transport within the sediment using analytical data and geotechnical data. The objectives of the project were achieved with twelve (12) sediment borings using a barge mounted sonic drill rig as the sampling platform. One hundred twenty-three (123) analytical field samples were collected from the boring sections. Each sample was collected from a half-foot (0.5) interval of sediment and was submitted for analysis of PCBs (Aroclors), VOCs, and SVOCs, and an archive sample for possible PCB 209 Congeners analysis. All split sediment boring sections were measured, photographed, described, and logged by a trained soil scientist. In all cases, boring collection ceased at bedrock, whether verified with the recovery of a plug of stone, or through drill rig characteristics and feedback provided by the driller. A group of seven (7) site specific contaminants-of-concern were chosen by the USACE-NAE and USEPA for detailed reporting based on: 1) historical usage of these compounds by the Aerovox Corporation and respective degradation compounds, and 2) observations of high concentrations in New Bedford Harbor sediment from this area.

### **Delaware Estuary Regional Sediment Budget. USACE-Philadelphia District. 2009–2012. Coastal Scientist, Project Manager**

The objective of this project is to identify sediment sources, transport pathways, and sinks in the Delaware Estuary with application towards a regional sediment budget, with emphasis placed on fine-grained (cohesive) sediments. The budget is being derived from the most up-to-date data available from federal and state government agency sources and the University of Delaware. The final sediment budget is intended to provide a framework for managing sediment and related resources in the estuary. This work is being performed in concert with the Delaware Estuary Regional Sediment Management (RSM) initiative of the United State Army Corps of Engineers Philadelphia District.

## Key Projects (continued)

### **New Bedford Harbor Environmental Monitoring Program, New Bedford Superfund Site, New Bedford, MA. USACE-New England District. 2009–2014. Project Manager**

In support of the remediation efforts for the New Bedford Harbor Superfund Site (NBHSS), the Woods Hole Group is performing various types of environmental monitoring. The project includes monitoring, sampling, and chemical analysis as necessary to support ongoing remedial actions and compliance with project remediation requirements. Water quality monitoring was performed in support of dredge operations, and included both vessel based monitoring crews and the use of four (4) real-time telemetry buoys equipped with sensors to monitor temperature, conductivity, turbidity, and DO. The telemetry systems supplemented on-site monitoring, collected a comprehensive data set for the client, and provided alerts to management personnel if water quality parameter thresholds were exceeded. Other environmental monitoring efforts at the NBHSS included groundwater monitoring to support ongoing O&M at the Sawyer Street Confined Disposal Facility, sediment sampling to assist in determining the extent of contamination within the harbor sediments, installation/sampling of sediment traps throughout the upper harbor and support compliance with project goals and objectives, and post-remediation sampling and monitoring.

### **Long-term Measurements of Hydrology, Meteorology, and Sediment Oxygen Demand in the Delaware Estuary. Philadelphia Water Department. 2012–Present. Project Manager**

The Philadelphia Water Department (PWD) is in the process of developing a hydrodynamic water quality model of the tidal Delaware Estuary between Trenton, NJ and Delaware City, DE. As part of this process, the PWD contracted the Woods Hole Group (WHG) and their subcontractors to collect data that will be used to calibrate and validate the PWD model. The contract's project is split into two parts: 1) the collection of hydrodynamic and meteorological time-series, and 2) seasonal and spatial characterization of sediment oxygen demand, and other important biogeochemical processes in the model domain.

Hydrodynamic data (current magnitude and direction, conductivity) have been collected at three long-term stations that consisted of an acoustic Doppler current profiler (ADCP), conductivity sensor, data logger, and a surface buoy telemetry system. Data collected at each system were transmitted to the Woods Hole Group base station at 6-minute intervals. In addition to the three long-term systems, multiple short-term (30-day) data collection stations were deployed to characterize currents at specific locations of interest to the PWD modeling team.

The seasonal and spatial characterization of sediment oxygen demand (SOD) is being performed via direct measurements, along with other relevant sediment parameters. Samples have been repeatedly collected at over 88 stations in the model domain during four separate sediment collection surveys. Additionally, two water quality surveys have been performed since it has since been determined that the water column is a major contributor to the biogeochemical cycling of nutrients and oxygen.

### **WatchDog-1000 Real-time Metocean Mooring System. BP America. 2013–Present. Field Party Chief**

Woods Hole Group has successfully deployed the prototype of the WatchDog-1000 ocean monitoring systems in the deep Gulf of Mexico in Green Canyon 782 for over one year, having just performed the system's annual service. The WatchDog monitoring system is a rugged, moored metocean monitoring system that is open-ocean survivable and adaptable for use from

## Key Projects (continued)

coastal to deepwater locations. The WatchDog system is designed to operate without servicing for up to one year and independent of deepwater vessels or facilities. WatchDog-1000 is customizable to offer a wide variety of data acquisition solutions including wind, wave, and current profiles in real-time (for example, every twenty minutes 24/7/365) in a variety of environments. The WatchDog-1000 is designed to meet and exceed the data collection and reporting requirements of the BOEM Notice to Lessees (NTL) 2009-G02 during deepwater drilling and producing operations. The basic WatchDog system consists of three primary components – a surface buoy, a subsurface float and an anchor system – deployed as a compound mooring. A taut mooring connects the subsurface float to the anchor. A compliant, S-tether mooring connects the surface buoy and the subsurface float.

### **Mixing Zone Evaluation, Lake Erie. Reserve Environmental Services. 2012–2013. Project Manager**

In order to comply with permitting requirements from the state of Ohio, a mixing zone study, dilution monitoring, and effluent diffusion modeling were performed for the client's discharge outfall into Lake Erie. In support of this goal, the Woods Hole Group performed three tasks: 1) characterization of the wave and current environment in the vicinity of the outfall, 2) a 60-day *in situ* monitoring and total dissolved solids (TDS) data acquisition, and 3) dilution modeling at the outfall site, calibrated with field observations. The results of this study revealed that the mixing zone boundary previously imposed on the outfall diffuser was improperly defined and that the application of a different model, Cormix 2, was more technically applicable for the system design and provided a more accurate representation of mixing. The application of the comprehensive field data set with the Cormix 2 model resulted in the recommendation that the area of initial mixing (AIM) boundary be extended. This revised AIM boundary would ensure that performance of the diffuser could be evaluated with a greater degree certainty for a wide range of likely conditions, which in turn provided a realistic operational requirement for the client's permit.

### **Tisbury Great Pond Transport Study, TGP Munitions Response Site, Martha's Vineyard. UXB International. 2011–2012. Project Manager**

One of the more unique projects that Woods Hole Group has worked on in recent time, this project was performed to evaluate the potential for historic UXO (unexploded ordnance) transport from burial in the Tisbury Great Pond barrier beach. The location had been a former aerial bomb training site for the military and contains a number of buried UXO in need of disposal. The WHG evaluation included a field data collection program and development of a calibrated hydrodynamic model to accurately assess the potential for transport of the historic munitions if uncovered by coastal processes. Calibration to a prospective inlet breach of the barrier beach, the most likely cause for acute exposure and transport, was accomplished through comprehensive measurement program scheduled around the actual excavation of a trench through the barrier beach – which quickly developed into a tidal inlet. The field data collection program consisted of three components: 1) deployment of an instrument platform to measurement offshore waves over a 60-day period, 2) deployment of instruments to measure water levels within Tisbury Great Pond and in the Atlantic Ocean over 30-days, and 3) measurement of inlet current velocities during the 48-hours following inlet excavation. Through incorporation of the observed field data, the calibrated hydrodynamic model was able to confidently identify areas of potential exposure and/or transport of UXO at the site, and these

## Key Projects (continued)

results were used to define the search pattern for remaining UXO in need of disposal by the client.

### **Sampling and Analysis in Support of the Greenwich Harbor Federal Navigation Project, Greenwich, CT. USACE-New England District. 2011–2012. Project Manager**

The objective of this work was to acquire data for the analysis of environmental impacts associated with the proposed maintenance dredging of approximately 300,000 cubic yards of sediments from the Greenwich Harbor Federal Navigation Project (FNP), with proposed disposal of the dredged material at either the Central (CLIS) or Western (WLDS) Disposal Site in Long Island Sound. The environmental sampling consisted of collecting sediment cores from 34 locations and water samples from eight locations within the Greenwich Harbor FNP, as well as sediment grab and water samples from the CLIS and WLDS reference locations. Samples were delivered to the laboratory for analysis of physical, chemical, and toxicological parameters as required by the EPA and NAE Regional Implementation Manual. The results were used to characterize the sediment in order to determine whether it is suitable for offshore disposal at either CLIS or WLDS.

### **Currents and Sediment Dynamics Studies for the Raritan Bay Slag Superfund Site, Old Bridge, NJ. 2010–2011. Coastal Scientist/Project Manager**

The Woods Hole Group performed a one-month field data collection program to characterize the nearshore current, wave and sediment dynamics in the vicinity of the Raritan Bay Slag Superfund Site, as well as quantify the hydraulic and particle exchange between Raritan Bay and Chessequake Creek. The site shoreline is fronted by sandy beaches and engineered structures such as seawalls, groins, and jetties. A major physiographic feature of the site is the Cheesequake Creek Inlet; the construction material of the inlet's western jetty is a known source of contamination at the site. Woods Hole Group quantified the tidal exchange through Cheesequake Creek Inlet, in addition to characterizing the littoral wave and current regime along the shoreline. These data will be used to help understand the wave and current regime and sediment transport dynamics. Estimates of water volumetric flux, as well as suspended sediment flux were calculated, and when coupled with dissolved and particulate contaminant concentrations, the flux estimates were used by the client to refine the conceptual site model (CSM) and to estimate contaminant flux.

### **Hydrodynamic Analysis and Alternatives Design Assessment for the Restoration of Bride Brook, Rocky Neck State Park, East Lyme, CT. 2007–2010. Coastal Scientist/Project Manager**

This project investigated the hydrodynamic characteristics of the degraded Bride Brook estuary and provided an assessment of the potential alternatives designed to restore more natural conditions to the system. The estuary has been structured since the early 20<sup>th</sup> century by twin elliptical culverts located at the mouth of the estuary on Long Island Sound. Since that time, alewife numbers in Bride Brook have declined and the estuarine salt marsh surface is noticeable degraded with pockets of vegetation die back; these present conditions have spurred a restoration effort. The WHG investigation was performed by collecting field observation data and incorporating the data into a 1-D hydrodynamic model. The model was calibrated and verified using the field observations for existing conditions, and subsequently modified to conceptual design specifications for two proposed alternatives. The model was used to assess hydrodynamic conditions (water level and velocity) for the two alternatives during typical conditions and extreme event conditions. Model output was used in a channel scour analysis for both

## Key Projects (continued)

alternatives to determine whether scour was likely to occur in the channel. A recommended alternative was chosen by the client based on the WHG investigation report and construction plans for the restoration were provided as final products.

### **Evaluation of Sedimentation and Associated Contaminant Transport Processes in a Shallow Estuarine Cove, Southeastern, MA. 2004–2006. Coastal Scientist/Interim Project Manager**

Woods Hole Group, Inc. executed a comprehensive investigation of the transport processes of sediments and associated contaminants in a shallow estuarine cove located in southeastern Massachusetts. The purpose of this investigation was to provide quantitative results that will assist in the development of required remedial alternatives for this location. The investigation involved: 1) field data collection to quantify and rank transport processes more accurately, 2) laboratory analysis to constrain contaminant “hot-spots” and quantify contaminant mass, and 3) a quantitative characterization of certain hydrodynamic and sediment transport processes, and their associated rates. This investigation was intended to provide a detailed understanding of contamination history and transport processes to aid in determining the possible need for remediation and, as appropriate, provide input for evaluating possible remedial alternatives.

### **Environmental Assessments and Impact Evaluation of Hammonasset Beach State Park, Madison, CT. 2007–2008. Coastal Scientist/Field Technician Lead**

In this multi phase project, Mr. Walsh led the field data collection program, performed a shoreline change analysis, and assisted in writing several report chapters pertaining to the coastal geology and morphology of Hammonasset Beach, and beach nourishment sand sources. In preparation for the wave modeling phase of this project, Mr. Walsh performed a nearshore bathymetric survey and successful deployment of two trawl resistant bottom mounted ADCP moorings (near-shore, offshore) to collect wave and current data over a 60-day time period. A subaqueous sediment sampling program (using a petite ponar grab) was also completed to delineate potential beach nourishment resources.

### **Historical Shoreline Change Analysis. South Shore, Suffolk County, Long Island, NY. 2004–2008. Coastal Scientist**

Woods Hole Group, Inc. (WHG) was contracted to perform an evaluation of historical shoreline change and sediment transport modeling of Long Island’s southern shoreline in support of legal proceedings for Suffolk County, New York. The study evolved over a five year period into a comprehensive morphological evaluation of the Suffolk County shoreline. A primary area of focus for this investigation was the vicinity of three groins near Georgica Pond. To that end, a shoreline change analysis, spanning 113 years, 30 miles of shoreline, and 24 data sources, revealed that the background variability of shoreline position to either side of the groins has not changed markedly since the construction of the groins in the early 1960’s. Additionally, this work was supported by the development of a process-based analytical model that included time-variable wave spectra (wave heights, periods, and directions) from a linked wave model, and use of the actual bathymetry and shoreline data. The model withstood rigorous legal review and results indicated the three groins have a small, localized zone of influence on sediment transport. It was found that the natural bathymetric features in the vicinity of Georgica Pond produce changes in the rate that are larger than those caused by the groins. Therefore, the natural features of the regime have just as much influence on the shoreline as the groins. The application of the

**Key Projects (continued)**

comprehensive shoreline change analysis, coupled with the advanced technical approach that WHG took with this investigation provided valuable, objective results that assisted the County in their successful legal defense.

**Oceanography Measurement Program, New York Bight. 2008–2009. Field Operations Manager**

WHG designed, deployed and maintained two long-term monitoring locations in the New York Bight. Each location contained a complex array of instrumentation designed to fully characterize the oceanographic properties of the water column at the two specific sites over the course of a year. Surface and internal waves, currents, and water column stratification are of primary interest. The effort has included instrumentation mounted to surface buoys, subsurface moorings, and bottom platforms, with all positions monitored by satellite tracking. Quarterly service visits, reports, and data are deliverables to the client.

**NOAA CO-OPS National Current Observation Program, Penobscot River and Bay, Maine. 2006. Field Technician Lead**

Mr. Walsh managed the WHG field operations during the Penobscot Current Observation Program in 2006, participating in all three cruises. The program consisted of data collection at nine stations using TRDI ADCPs mounted in both SUBS buoys and TRBM platforms. During this project Mr. Walsh received experience working directly with NOAA CO-OPS personnel, policies, and equipment. GFE instrumentation consisted of TRDI ADCPs, ORE CART, Benthos 875-A PUB, Benthos UAT-376 transponders, and RBR XR-420 CTD. In addition to preparing, maintaining, and deploying the GFE, Mr. Walsh assisted with CTD casts, and prepared the final NOAA formatted log sheets. The experience that the Penobscot Current Observation Program has provided WHG and Mr. Walsh with a working knowledge of NOAA operations and requirements that will prove invaluable to the success of future projects.

**Oceanographic Investigation of the Brazilian Shelf and Slope, Southern Atlantic Ocean, Brazil. 2008–2009. Field Technician Lead**

The objective of this project is to collect a two-year time-series of oceanographic data at various locations off the Brazilian coast. Mr. Walsh was the lead field technician during the project's initial deployment. Six deepwater moorings are deployed on the continental shelf and slope in water depths ranging from 300 to 2,200 meters. Contour normal CTD transects are also performed at each 90-day turnaround for data recovery and instrument maintenance. Current magnitude/direction and water physical properties are measured using TRDI 75 kHz ADCPs, Nortek Aquadopp ADVs, and Seabird 37-SMPs.

**Offshore Current Observations via a Deepwater Mooring Array, Caribbean Sea, Colombia. 2007–2008. Field Technician Lead**

Mr. Walsh was a key participant in six research cruises performed to collect a continuous year-long time-series of oceanographic data at three deepwater locations off the Caribbean coast of Colombia, South America. Mooring water depths ranged between 750 and 1500 meters. Current magnitude/direction and water physical properties are measured using TRDI 75 kHz ADCPs, Nortek Aquadopp ADVs, and Seabird 37-SMPs.

**Key Projects (continued)**

**Regional Current Velocity Mapping and Long-Term Observations, Strait of Gibraltar.**

**2007. Field Technician Lead**

Managed the planning and design of a field survey of tidal currents offshore Europa Point, Gibraltar and Ceuta, Spain. The vessel based survey was performed using a TRDI 150 kHz Quartermaster ADCP with bottom-tracking in order to profile currents out to a depth of approximately 350 meters and collect bathymetric soundings. Subsequent to a rigorous spatial survey mapping current magnitude and direction over a 6 day period, the current meter was deployed in a subsurface mooring to collect a time-series of the complete lunar cycle of tidal currents over 30 days.

**Hydrodynamic Observations of the Merrimack River, Manchester, NH. 2006. Coastal Scientist/Field Technician Lead**

WHG was contracted to collect a 30-day time series of current velocity and water level in the Merrimack River at Manchester, NH. Mr. Walsh was the lead scientist and field technician for this project that required a unique approach to ensure the successful collection of data. Data collection was performed at two locations across a transect normal to river flow using the Nortek 2 MHz ADP. One instrument was located in the thalweg, and the other was jetted into the river bottom on the shallow (<1 meter) flats flanking the thalweg. Despite the difficulties caused by the riverine water turbulence, water column debris, and shallow water levels, a complete data record was recovered and provided to the client.

**Hydrodynamic Observations at the Former Callahan Mine Property, Brooksville, Maine.**

**2006. Coastal Scientist/Field Technician Lead**

Mr. Walsh led the field data collection program for this project located in this interesting coastal Maine estuary. At the project site, a complex interaction between the strong Penobscot Bay tides, an inlet restriction, the flooded former mine pit (>300 feet deep), and the extremely shallow upper estuary created an exceptional hydrodynamic situation and required a unique data collection plan. A time series of currents, turbidity, water level, salinity, and temperature were collected for 60-days at three locations in the estuary in order to characterize these complex hydrodynamics. Subsequent to collection, data were applied to calibrate and verify a 3-D model that was used to estimate the effects of extreme events on the system's hydrodynamics, and to estimate sediment transport potential.

**Reverse Osmosis Concentrate Dilution Analysis and Ambient Water Quality**

**Characterization, Melbourne, FL. 2005. Coastal Scientist/Field Technician Lead**

Completed collection and processing of field data for application in an analytical model to characterize the dilution of a reverse osmosis (RO) plant discharge in the Eau Gallie River. The field data collection program consisted of measurements of tide, salinity, and temperature over a 45-day period using four strategically placed CTD sensors, a high resolution bathymetric survey, water quality sampling, and additional CTD surveys to account for spatial variability. River flow and discharge data were obtained from the City of Melbourne and other sources to complete the comprehensive data set required for the dilution analysis. The field data was processed and used in an analytical model to simulate the existing discharge and determine if a mixing zone could be achieved and permitted under existing water quality regulations and both the State and Federal level.

## Key Projects (continued)

### **Mixing Zone Evaluation, BP Products North America, Whiting Business Unit, Lake Michigan. 2005. Field Technician Lead**

Conducted study to support the review of a permit renewal application for a discharge into Lake Michigan. The study included a literature review on Lake Michigan currents to help characterize receiving waters in the vicinity of the discharge. Observations of currents in Lake Michigan were also collected over a 45-day period using two TRDI ADCP systems in order to better determine the discharge site-specific ambient conditions. The current data were processed and an attempt was made to correlate the currents with wind observations obtained from nearby locations in order to model long-term conditions. This data was then analyzed to define the appropriate ambient water input conditions to use in modeling the discharge's dilution and mixing zone.

### **NOAA CO-OPS, Physical Oceanographic Real-Time Systems (PORTS), Narragansett Bay, RI. 2004–Present. Field Technician**

Over his tenure with WHG, Mr. Walsh has been assisting with the operation and maintenance of sensors comprising the Narragansett Bay PORTS. Duties included on-site service and maintenance, and reporting. Mr. Walsh is knowledgeable with PORTS measurement systems, including current meter, water level, meteorological stations and data telemetry.

### **Instituto Mexicano del Petroleo Deepwater Oceanography Enhancement, Bay of Campeche, Gulf of Mexico. 2005. Instrument Specialist/Field Technician**

Mr. Walsh facilitated and assisted with classroom and field training in the maintenance, programming, and deployment of oceanographic instruments. Specifically, these instruments comprised a 1,500 meter deep-water mooring system. Mooring components included the TRDI 75 kHz ADCP, TRDI 300 kHz ADCP, Nortek Aquadopp ADV, and Benthos 865-A acoustic releases. A one-month training deployment was successfully performed in the May of Campeche, Gulf of Mexico.

### **Investigation of Sediment Shoaling in Hyannis Harbor, Hyannis, Massachusetts. 2004–2005. Coastal Scientist/Field Technician**

Mr. Walsh assisted with the design and implementation of a one-month oceanographic instrument deployment in order to identify processes responsible for the observed shoaling of Hyannis Harbor. The deployment consisted of two TRBM instrument platforms, each housing a Sontek ADV current meter and D&A OBS-3A turbidity sensor. Subsequent to a successful deployment, Mr. Walsh performed the data processing, analysis, and reporting of the time-series data and assisted with reporting.

## Publications and Presentations

- Walsh, D. R. 2004. Anthropogenic influences on the morphology of the tidal Delaware River and Estuary: 1877–1987. Master's Thesis. University of Delaware. Newark, DE.
- Walsh, D. R. and C. K. Sommerfield. 2004. Anthropogenic influences on the morphology of the tidal Delaware River and Estuary. Geological Society of America Abstracts with Programs 36(2).

***Qualifications Summary***

- 22 years of professional experience supporting project managers and engineers on a variety of technical projects
- Strong written and verbal communication skills
- Excellent organizational and coordinating skills
- Excellent communicative skills with clients and project managers

**NADINE A. SWEENEY**

Executive Assistant

**Fields of Expertise**

Ms. Sweeney has been with Woods Hole Group since 1993, and has a complete understanding of the corporate management systems and procedures. She also is primarily responsible for the publication of high-quality deliverables, including layout, formatting, and production. She has a wide range of publication software skills, including expertise with MS Word, Excel, and PowerPoint, as well as graphics software experience with Adobe Photoshop and Illustrator. For operations management support, Ms. Sweeney is a MS Project specialist, including applications for individual project scheduling and planning, as well as program roll-ups for resource tracking across multiple projects, clients, and departments within Woods Hole Group. She also helps define and track work breakdown structures in support of Project Managers for individual projects. In support of financial management, Ms. Sweeney acts as the Project Manager's liaison with the Woods Hole Group accounting and finance department. Ms. Sweeney creates project and client files within the Vision corporate financial management system, including entry and tracking of budgets for individual tasks and subtasks. With her experience and knowledge of management processes, Ms. Sweeney also has the intangible ability to effectively encourage Project Managers in their duties. Specifically, she helps Project Managers review and produce monthly (at minimum) project budget update reports, client invoices, and progress reports as required.

**Employment History**

1993-Present Executive Assistant, Woods Hole Group

WOODS HOLE OCEANOGRAPHIC INSTITUTION

**DONALD M. ANDERSON**

September 3, 2015

Woods Hole Oceanographic Institution  
Woods Hole, Massachusetts 02543

- B.S. Mechanical Engineering, Massachusetts Institute of Technology, 1970  
M.S. Civil and Environmental Engineering, Massachusetts Institute of Technology, 1976  
Ph.D. Aquatic Sciences, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, 1977

Director, Cooperative Institute for the North Atlantic Region, 2009-present  
Director, Coastal Ocean Institute, Woods Hole Oceanographic Institution, 2004-2008  
Director, U.S. National Office for Harmful Algal Blooms (1995-present)  
Senior Scientist, Woods Hole Oceanographic Institution, 1991-present  
Associate Scientist, Woods Hole Oceanographic Institution, 1983-1991; tenure 1987  
Assistant Scientist, Woods Hole Oceanographic Institution, 1979-1983  
Postdoctoral Investigator, Woods Hole Oceanographic Institution, 1978-1979  
Instructor, Massachusetts Institute of Technology Department of Civil Engineering, 1978

**PROFESSIONAL SOCIETIES:**

American Society of Limnology and Oceanography  
Phycological Society of America  
International Society for the Study of Harmful Algae (Member, ISSHA Council)

**NATIONAL AND INTERNATIONAL COMMITTEES, WORKSHOPS, AND  
DISTINCTIONS (SELECTED):**

Recipient, *Stanley W. Watson Chair for Excellence in Oceanography*, 1993  
Recipient, *NOAA Environmental Hero Award* (1999)  
Recipient, *Yasumoto Lifetime Achievement Award*, ISSHA (2006)  
Recipient, Dr. David L. Belding Award, Massachusetts Marine Fisheries Advisory Commission (2005)  
Bruun Memorial Medal, Bruun Memorial Lecture. Intergovernmental Oceanographic Commission (IOC) Assembly, Paris, France, 2005  
Member, National Research Council Committee on the *Causes and Management of Coastal Eutrophication* (1998-1999)  
Director, NATO Advanced Study Institute on the *Physiological Ecology of Harmful Algal Blooms*, Bermuda (1996)  
Chairman, *SCOR Working Group on Harmful Algal Blooms* (1992-1996)  
U.S. Representative, *Working Group on the Dynamics of Harmful Algal Blooms*, International Council for Exploration of the Seas (ICES) (1986-present)  
Member, PICES Working Group #15, *Ecology of Harmful Algal Blooms* (1999-2005).  
U.S. Delegate to the *IOC Intergovernmental Panel on Harmful Algal Blooms* (1992-present)  
Chairman, *Ad Hoc Group of Experts on Harmful Algal Blooms*, Intergovernmental Oceanographic Commission (1989)

Fellow, Cooperative Institute for Climate and Ocean Research (CICOR), a Joint Institute of the Woods Hole Oceanographic Institution and the National Oceanic and Atmospheric Administration (1999-2002)

Member, Scientific Steering Committee, GEOHAB (*The Global Ecology and Oceanography of Harmful Algal Blooms*) (1998-2003)

International Organizing Committees, *Toxic Marine Phytoplankton (now Harmful Algal Bloom) Conferences*, Nos. 3-16 (1985-present)

Testimony before the Subcommittee on Oceans and Fisheries of the Committee on Commerce, Science, and Transportation, United States Senate 105<sup>th</sup> Congress, Second Session, May 20, 1998.

Testimony for US Commission on Ocean Policy, 2002; prepared White Paper on *Harmful Algal Blooms* for inclusion in the Commission's report "Oceans and Human Health".

Testimony before the Committee on Science, Subcommittee on Environment, Technology and Standards, U.S. House of Representatives Hearing on the "*Harmful Algal Bloom and Hypoxia Research Amendments Act of 2003*", March 13, 2003.

Testimony before the Subcommittee on Fisheries Conservation, Wildlife and Oceans, U.S. House of Representatives Hearing on *H.R. 1856, the Harmful Algal Bloom and Hypoxia Research Amendments Act of 2003*, February 26, 2004.

Testimony, Subcommittee on Energy and Environment Hearing, "*Harmful Algal Blooms: The Challenges on the Nation's Coastline*", Washington, DC, July 10, 2008

Testimony, Subcommittee on Energy and Environment Hearing, "*Harmful Algal Blooms and Hypoxia: Formulating an Action Plan*", Washington, DC, September 17, 2009.

Testimony, Ocean Policy Task Force Public Meeting, Providence, RI, September 24, 2009.

Testimony, Subcommittee on Energy and Environment Hearing, "*The Harmful Algal Blooms and Hypoxia Research and Control Amendments Act of 2011*", Washington, DC, June 1, 2011.

Briefing before the House Science Committee, "*Coastal Nutrient Pollution and Harmful Algal Blooms*", September 24, 2003.

Briefing before New England congressional staffers, "*The 2005 New England red tide*", June 14, 2005.

Congressional briefings, "*Harmful Algal Blooms (Red Tides) and Ocean Health*", House of Representatives, and U.S. Senate, June 23, 2005.

Briefing for Senate Subcommittee on Oceans Atmosphere, Fisheries and Coast Guard, October 2007

U.S. Representative, *WESTPAC Task Team on Red Tides*, Intergovernmental Oceanographic Commission (1985 – 1989).

Editorial Board member, *Journal of Phycology* (1986-1989)

Associate Editor, *Journal of Phycology* (1993-1996)

Editorial Board: *Protist* (1999-2004)

Editorial Board: *Harmful Algae* (2001-present)

Editorial Board: *Marine Biotechnology and Molecular Biology* (1990-1995)

**PATENTS:**

Genetic markers and methods of identifying *Alexandrium (Dinophyceae)* species. U.S. Patent No. 5,582,983. 12/10/96

**COURSES TAKEN:**

“Energetics and Transport in Aquatic Plants,” J. Raven. Marine Biological Laboratory (1982).

“Workshop on Temperate Dinoflagellates,” F.J.R. Taylor. Friday Harbor Laboratories (1983).

“Quantitative Light Microscopy in Biology, Medicine, and Materials Science,” S. Inoue. Marine Biological Laboratory (1986).

“Molecular Biology and Biotechnology,” New England Biolabs Foundation; Smith College (1987).

Sabbatical - Department of Cellular and Molecular Biology, Laboratoire Arago, University of Paris 6, Banyuls-sur-mer, France (1989-90).

“Individual Cell and Particle Analysis in Oceanography,” NATO Advanced Study Institute, (October 1990).

“Exon-Intron Molecular Biology” course at Marine Biological Laboratory.

“The Physiological Ecology of Harmful Algal Blooms”, NATO Advanced Study Institute (Director) (May 1996).

**PUBLICATIONS AND JOURNALS:**

1976 Morel, F. M. M. and D. M. Anderson. On the subject of red tide predictions from temperature patterns. *Limnology and Oceanography* 21(4): 625- 627.

1978 Anderson, D. M. and F. M. M. Morel. Copper sensitivity of *Gonyaulax tamarensis*. *Limnology and Oceanography* 23: 282-295.

1978 Anderson, D. M. and D. Wall. Potential importance of benthic cysts of *Gonyaulax tamarensis* and *G. excavata* in initiating toxic dinoflagellate blooms. *Journal of Phycology* 14: 224-234.

1979 Anderson, D. M. and F. M. M. Morel. Toxic dinoflagellate blooms in the Cape Cod region of Massachusetts. In: D. Taylor and H. H. Seliger, (Eds.), *Toxic Dinoflagellate Blooms, Proc. 2nd Int'l Conf.*, Elsevier-North Holland. pp. 145-150.

1979 Anderson, D. M. and F. M. M. Morel. The seeding of two red tide blooms by the germination of benthic *Gonyaulax tamarensis* hypnocysts. *Estuarine and Coastal Marine Science* 8: 279-293.

1979 Morel, F. M. M., J. G. Rueter, Jr., D. M. Anderson, and R. R. L. Guillard. Aquil: A chemically defined phytoplankton culture medium for trace metal studies. *Journal of Phycology* 15: 135-141.

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- 1982 Anderson, D. M., D. M. Kulis, J. A. Orphanos, and A. R. Ceurvels. Distribution of the toxic dinoflagellate *Gonyaulax tamarensis* in the southern New England region. *Estuarine, Coastal and Shelf Science* 14: 447-458.
- 1982 Anderson, D. M., D. G. Aubrey, M. A. Tyler, and D. W. Coats. Vertical and horizontal distributions of dinoflagellate cysts in sediments. *Limnology and Oceanography* 27(4): 757-765.
- 1982 Tyler, M. A., D. W. Coats, and D. M. Anderson. Encystment in a dynamic environment: deposition of dinoflagellate cysts by a frontal convergence. *Marine Ecology Progress Series* 7: 163-178.
- 1982 Watras, C. J., S. W. Chisholm, and D. M. Anderson. Regulation of growth in an estuarine clone of *Gonyaulax tamarensis* Lebour: salinity-dependent temperature responses. *Journal of Experimental Marine Biology and Ecology* 62: 25-37.
- 1983 Anderson, D. M., S. W. Chisholm, and C. J. Watras. The importance of life cycle events in the population dynamics of *Gonyaulax tamarensis*. *Marine Biology* 76: 179-183.
- 1983 Turner, J. T. and D. M. Anderson. Zooplankton grazing during dinoflagellate blooms in a Cape Cod embayment, with observations of predation upon tintinnids by copepods. *Marine Ecology* 4: 359-374.
- 1984 Anderson, D. M. Shellfish toxicity and dormant cysts in toxic dinoflagellate blooms. In: E. Ragelis (Ed.). *Seafood Toxins*, ACS. Symposium Series. No. 262. pp. 125-138.
- 1984 Anderson, D. M., J. S. Lively, and R. F. Vaccaro. Copper complexation during spring phytoplankton blooms in coastal waters. *Journal of Marine Research* 42: 677-695.
- 1984 Anderson, D. M., D. M. Kulis, and B. J. Binder. Sexuality and cyst formation in the dinoflagellate *Gonyaulax tamarensis*: Cyst yield in batch cultures. *Journal of Phycology* 20: 418-425.

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- 1984 Stoecker, D. K., L. H. Davis, and D. M. Anderson. Fine scale spatial correlations between planktonic ciliates and dinoflagellates. *Journal of Plankton Research* 6: 829-842.
- 1984 Schrey, S. E., E. J. Carpenter, and D. M. Anderson. The abundance and distribution of the toxic dinoflagellate *Gonyaulax tamarensis* in Long Island estuaries. *Estuaries* 7: 472-477.
- 1984 Anderson, D. M. and B. A. Keafer. The distribution, abundance, and fate of nearshore dinoflagellate cyst accumulations. International Council for the Exploration of the Sea, Biological Oceanography Committee, C.M. 1984/C:6: 1-6.
- 1985 Anderson, D. M. Paralytic shellfish poisoning. In: Colwell, R.R. (Ed.), *Nature Toxins and Human Pathogens in the Marine Environment*. University of Maryland, College Park, MD.
- 1985 Anderson, D. M. and N. L. Lindquist. Time-course measurements of phosphorus depletion and cyst formation in the dinoflagellate *Gonyaulax tamarensis* Lebour. *Journal of Experimental Marine Biology and Ecology* 86: 1-13.
- 1985 Anderson, D. M., J. S. Lively, E. M. Reardon, and C. A. Price. Sinking characteristics of dinoflagellate cysts. *Limnology and Oceanography* 30: 1000-1009.
- 1985 Anderson, D. M., D. W. Coats, and M. A. Tyler. Encystment of the dinoflagellate *Gyrodinium uncatenum*: Temperature and nutrient effects. *Journal of Phycology* 21: 200-206.
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- 1985 Maranda, L., D. M. Anderson, and Y. Shimizu. Comparison of toxicity between populations of *Gonyaulax tamarensis* of eastern North American waters. *Estuarine Coastal and Shelf Science* 21: 401-410.
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- 1986 Garcon, V. C., K. D. Stolzenbach, and D. M. Anderson. Tidal flushing of an estuarine embayment subject to recurrent dinoflagellate blooms. *Estuaries* 9: 179-187.
- 1986 Jacobson, D. M. and D. M. Anderson. Thecate heterotrophic dinoflagellates: feeding behavior and mechanisms. *Journal of Phycology* 22: 249-258.
- 1987 Anderson, D. M. and B. A. Keafer. An endogenous annual clock in the toxic marine dinoflagellate *Gonyaulax tamarensis*. *Nature* 325: 616-617.
- 1987 Anderson, D. M. and P. S. Lobel. The continuing enigma of ciguatera. *Biological Bulletin* 172: 89-107.
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## DAVID K. RALSTON

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### EDUCATION

Ph.D., Civil & Environmental Engineering, University of California, Berkeley, CA	2005
M.S., Civil & Environmental Engineering, Stanford University, CA	1998
B.S., B.A., Civil & Environmental Engineering, <i>summa cum laude</i> , Rice University, TX	1996

### PROFESSIONAL EXPERIENCE

<i>Associate scientist</i> , Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution, Woods Hole, MA	2011 – present
<i>Assistant scientist</i> , AOPE, WHOI, Woods Hole, MA	2007 – 2011
<i>Postdoctoral scholar</i> , AOPE, WHOI, Woods Hole, MA	2005 – 2007
<i>Graduate researcher &amp; instructor</i> , University of California, Berkeley, CA	2000 – 2005
<i>Environmental engineer</i> , Defense Nuclear Facilities Safety Board, Washington, DC	1996 – 2000

### RESEARCH INTERESTS

Fluid mechanics and transport in estuaries and the coastal ocean, including estuarine exchange, dispersion, and residence time, sediment transport, stratified turbulence, bathymetric effects on tidal flows, frontal processes, and physical-biological coupling; numerical modeling and field observations.

### SELECTED CONSULTING ACTIVITIES

Consulted on hydrodynamics and transport processes in the San Francisco Bay and Delta including evaluating salt pond reclamation effects on salinity, quantifying estuarine transport of juvenile fish, and improving parameterizations of dispersion in tidal models for management agencies (2003-2014).

Collected and analyzed field data (surveys and moorings to measure velocity, suspended sediment, and bed sediment) in a highly stratified estuary (Penobscot River, ME) to assess sediment transport as part of a study of mercury contamination (2010-2012).

Evaluated observational and modeling data on current and historical sediment transport in a highly contaminated estuary (Passaic River, NJ) (2011-2012).

### PROFESSIONAL AFFILIATIONS AND HONORS

Professional Engineer (Civil), California  
Office of Naval Research Young Investigator Award (2008)  
Woods Hole Oceanographic Institution Postdoctoral Scholar fellowship (2005)  
American Geophysical Union, Coastal and Estuarine Research Federation

### SELECTED PUBLICATIONS

Ganju, NK, MJ Brush, B Rashleigh, AL Aretxabaleta, P del Barrio, M Forsyth, JS Grear, LA Harris, SJ Lake, G McCardell, J O'Donnell, DK Ralston, RP Signell, JM Testa, and JMP Vaudrey, 2015. Progress and challenges in coupled hydrodynamic-ecological estuarine modeling. *Estuaries and Coasts*, 10.1007/s12237-015-0011-y.

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**APPENDIX B**  
Relevant Experience

# Analysis of Physical Changes and Management Alternatives for the Nauset Beach Area, Cape Cod, MA

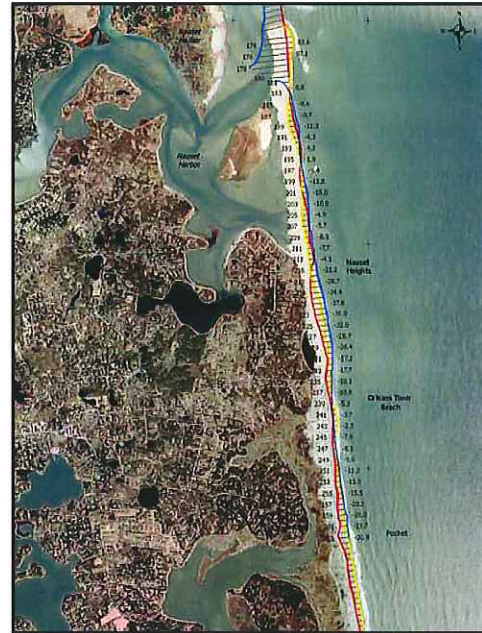
## Project Characteristics:

- *Beach Management Planning*
- *Analysis of Historical Shoreline Change*
- *Analysis of Barrier Breaching & Inlet Formation*

Woods Hole Group prepared a comprehensive analysis of physical changes and management alternatives for the Nauset Beach area in Orleans, MA. Nauset Beach serves as the only public beach for the town with access to the Atlantic Ocean. The beach offers excellent swimming, surfing, sunbathing, bass and blues fishing, and other recreational opportunities. Because of its location, the public beach is one of the Town's most important natural assets, supporting nearly 1.2 million visitors each year and providing an annual income of nearly 1.1 million dollars for the Town.

To help with future management decisions for the public beach area, Woods Hole Group was asked to evaluate recent trends in shoreline and dune erosion. The analysis compared rates of shoreline and dune change pre- and post-1996 in an effort to predict future evolution of the barrier spit complex. The data revealed a nearly two-fold increase in the rate of shoreline erosion since 1996. Pre-1996 rates of change at Nauset Beach were on the order of -4 ft/yr, increasing to -5 to -10 ft/yr since 1996.

Woods Hole Group also performed an analysis of the potential for inlet formation at Nauset Heights and Pochet, including likely time scales and impacts to adjacent shoreline areas. Model simulations of cross shore erosion were coupled with data from existing hydrodynamic analyses to assess the potential for stable inlet formation into Nauset Harbor and Pleasant Bay. Stable inlet formation at Nauset Heights was determined to be possible, but not likely. The possibility of a stable long-term inlet forming at Pochet was determined to be low.



Information developed as part of the analysis of physical changes was used to develop a series of short- and long-term management recommendations for the Town of Orleans. The recommendations were focused in the following four areas:

- Town beach parking area and support buildings
- Maintenance of the beach and dune resources
- ORV trail to south Nauset Beach
- Pochet overwash and Nauset Heights area

Location: Orleans, MA  
Client: Town of Orleans  
Contact: Paul Fulcher  
Town of Orleans  
Parks & Beach Superintendent  
139 Main Street  
Orleans, MA 02653  
Telephone: (508) 240-3700 x465



# Regional Dredging and Beach Nourishment Planning, Design, Permitting and Oversight Edgartown, MA

## Project Characteristics:

- *Private/Municipal Partnership*
- *Beneficial Re-use of Dredged Material*
- *Dune and Beach Nourishment Design*
- *Habitat Restoration*
- *Environmental Permitting*
- *Construction Oversight*
- *Awarded Best Restored Beach of 2013 by the ASBPA*

The Edgartown Beach and Dune Restoration project on Martha's Vineyard is an example of a successful private/municipal partnership, where vital private funding revived the Town's dredging and beach nourishment program, to restore local beaches. With much needed economic support provided by the private Cow Bay Corporation to the Town of Edgartown, a public/private partnership between the two entities was established in 2007, and a \$4M regional nourishment project began to restore the badly eroded County, Town, and private beaches located in Edgartown. The project was designed to beneficially reuse dredged sediments from local navigational projects to provide safe boating in navigable waterways within the Town and to keep the private beaches private by using municipal navigation dredge spoils for nourishment.

As no single navigational source would provide sufficient sand volume necessary for the regional program, and with very narrow dredging windows due to marine fisheries restrictions, the project was phased and a detailed investigation of navigational sources of sand for the beach nourishment ensued. Phase I of the Edgartown Beach and Dune Restoration project was initiated in October of 2009 and included dredging, dewatering, barging, trucking and grading of 30,000 cubic yards of sand. The beach compatible sand was placed along a 3,140-foot stretch of shoreline to reconstruct the almost non-existent dunes on the public Bend in the Road and private Cow Bay Beaches.



During the summer of 2010, the neighboring Town of Oak Bluffs, undergoing financial hardship and anxious to perform dredging within their navigation channel in Sengekontacket Pond, joined the municipal/private partnership with the Town of Edgartown and the Cow Bay Corp. The partnership expedited Phase II of the project by allowing use of a combination of dredged sand from both Towns and upland sand barged from off-Island to meet the design template. Construction commenced in October of 2010 and the 100,000 cubic yard regional beach nourishment project was finished in March 2011.

Each Phase of this multi-faceted project required daily communication with various Town of Oak Bluffs and Edgartown departments, the Edgartown Dredge Advisory Board, numerous contractors and project stakeholders, and various state and federal regulatory agencies. The complexities associated with design, permitting and coordination of this project were complex, but the results greatly benefit storm protection, recreation, and wildlife habitat.

Location: Edgartown, MA  
Client: Edgartown Dredge Committee/  
Cow Bay Beach Association  
Contacts: Mr. Norman Rankow  
Edgartown Dredge Committee  
(508) 627-6815  
Mr. Ed Cerullo  
Cow Bay Beach Association  
(718) 797-3206

# Beach Nourishment and Inlet Stabilization at Sandwich Town Beaches, Sandwich, Massachusetts

## Project Characteristics:

- *Beach Management Plan*
- *Wave and Sediment Transport Modeling*
- *Environmental Permitting*
- *Inlet Stabilization*
- *Beach Replenishment*
- *Bathymetric Data Collection*
- *Environmental Impact Report (EIR)*

The beaches in the Town of Sandwich, including Town Beach and Springhill Beach, have a history of erosion. In 1909, two jetties were constructed at the east end of the Cape Cod Canal causing an interruption in the natural longshore sediment transport from northwest to southeast. This interruption is the primary source of coastal erosion along Sandwich beaches. By taking dredged material from the east end of the Canal and placing it on downdrift beaches, a portion of the sediment that would have been transported naturally will be restored to the “starved” littoral system of the Sandwich shoreline. Woods Hole Group is currently developing a detailed, long-term, comprehensive beach management plan for the Town of Sandwich to implement this, as well as additional, solutions to the historic erosion.

The primary goal of the beach management plan is to reestablish a naturally sustainable beach/inlet system that includes an adequate storm buffer as well as a source of sediment for downdrift beaches. The plan includes an evaluation of the physical processes, a conceptual design for the preferred alternative(s), permitting of the selected alternatives, and appropriate beach maintenance and usage. Beach nourishment design is based on the historical shoreline change information and an evaluation of local wave and sediment transport patterns in the nearshore zone. An alternatives analysis is being performed to consider engineering aspects, as well as environmental impacts, of each possible solution. The alternatives analysis focuses on producing the most viable and most appropriate solution for each section of the Sandwich shoreline.



In addition, the Sandwich Harbor inlet breached immediately east of the historic channel. Stabilization of the inlet is required to reduce the potential for upland flooding, minimize downdrift erosion, and stabilize inlet migration. Woods Hole Group performed a bathymetric survey, an inlet stability analysis, and a hydrodynamic model to assess the present stability of the inlet and evaluate potential alternatives. Based on the results of the inlet alternative analysis, an engineered solution will be designed and implemented.

Communication and close coordination with numerous agencies, local officials, sub-contractors, and multiple clients is essential to the successful completion of this project. Our scientists and engineers regularly meet with the key officials and proactively participate in public forums where the interests of Sandwich beaches are addressed.

Location: Sandwich, MA  
Client: Town of Sandwich  
Contact: Mr. George Dunham  
Town Administrator  
130 Main Street  
Sandwich, MA 02563  
Telephone: (508) 888-5144

# Menauhant Beach & Dune Nourishment

## Project Characteristics:

- *Beach Nourishment Design*
- *Nearshore Disposal Site with Onshore Rehandling*
- *Environmental Permitting*
- *Interagency Coordination*
- *Awarded Best Restored Beach of 2011 by the ASBPA*

Woods Hole Group worked for the Town of Falmouth to coordinate, design, and permit a beneficial reuse dune and beach restoration project at Menauhant Beach in East Falmouth. Through an exceptional level of interagency coordination and cooperation, the Town of Falmouth was able to secure sand from a nearby dredging project for beneficial reuse as beach and dune nourishment. NOAA's Northeast Fisheries Science Center (NEFSC) planned a new entrance channel to Great Harbor in Woods Hole to homeport NOAA's new class of research vessel. Woods Hole Group worked closely with the Town of Falmouth, US Army Corps of Engineers, and NOAA representatives to identify a suitable site for beneficial reuse of the 20,000 cy of dredged material from the new channel. The project involved a unique blend of construction methodologies that provided sand for shore protection, reduced overall costs, and prevented loss of beach compatible sand to the offshore Rhode Island Sound Disposal Site.

As part of NOAA's project, the dredged sand was transported via scow to the Menauhant Beach area and dumped in a nearshore disposal site located 2,200 ft off the beach. The Town of Falmouth utilized the Barnstable County Dredge to hydraulically remove the sand from the nearshore disposal area and pump it to Menauhant Beach as nourishment. Woods Hole Group designed and permitted the beach portion of the project to help prevent loss of an important public beach resource, and to minimize storm damages to Menauhant Rd. and associated public utilities. The design called for increasing the crest elevation and width of the existing dunes, and building new dunes across the unprotected parking areas on the barrier beach.



*Before*



*After*

Environmental impact analyses were conducted to assess project impacts on eelgrass and shellfish resources, as well as potential shoaling within the nearby entrance to Bournes Pond. Monitoring and mitigation plans were also developed to track project performance and ensure protection of resources.

Woods Hole Group worked on a tight time schedule to permit the project prior to the start of NOAA's channel dredging. The project was successfully constructed during the fall of 2008 and monitoring is on-going.

Location: East Falmouth, MA  
Client: Town of Falmouth  
Contact: Heather Harper  
Town of Falmouth  
Assistant Town Manager  
59 Town Hall Square  
Falmouth, MA 02540  
Telephone: (508) 495-7320

# Field Data Collection, Engineering Design and Permitting for the Town of Edgartown's 10-year Comprehensive Permit, Edgartown, MA

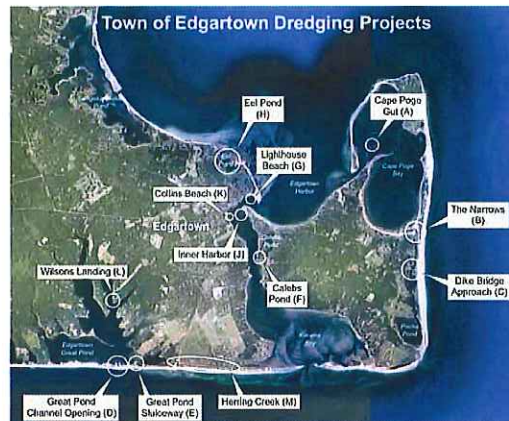
## Project Characteristics

- *Hydrographic Data Collection*
- *Real Time Kinematic (RTK) Topographic Data Collection*
- *Sediment Coring and Analysis*
- *Dredging, Beach Nourishment, and Dune Design*
- *Environmental Permitting*

Woods Hole Group, Inc. was contracted by the Town of Edgartown Dredge Advisory Board to collect field data, perform engineering design, and prepare the application for a Ten-Year Comprehensive Permit for dredging and beach nourishment at over forty (40) dredging and nourishment sites in the Towns of Edgartown and Oak Bluffs. A total volume of approximately 248,000 cubic yards of sediment will be hydraulically dredged from navigation projects within the two Towns over 10 years, with beneficial reuse of the dredged material at various beach nourishment locations. The Comprehensive Permit is designed to provide flexibility to the Towns by allowing dredge material from any of the dredge sites to be placed at any one of the compatible beach nourishment sites.

Bathymetric surveys were performed at fourteen (14) different dredging locations using a single beam echo sounder and DGPS navigation. Engineering drawings of the survey area bottom (depths referenced to the North American Vertical Datum of 1988) were produced for each site. An engineering design and volume calculation was performed for each of the dredge sites.

Topographic surveys were conducted at twenty five (25) beach nourishment locations using a Trimble real-time kinematic (RTK) instrument, and the survey points were referenced to the same vertical datum as the bathymetric data. Beach nourishment designs were produced for each of the 25 sites,



many of which incorporated special requirements for rare and endangered species habitat. Approximately 50 vibracores and 40 grab samples were collected within the various dredging and beach nourishment footprints. Grain size analyses were performed on over 100 samples to characterize the depositional environments and to determine compatibility.

This multi-faceted project required daily communication with the Towns of Edgartown and Oak Bluffs, the Edgartown Dredge Advisory Board, Dukes County, project stakeholders, and various state and federal regulatory agencies. The process of design, permitting and coordination has been complex, but the results will greatly benefit the municipalities, public stakeholders, and private stakeholders for years to come.

Location: Edgartown, MA  
Client: Edgartown Dredge Committee  
Contacts: David Nash  
Edgartown Dredge Committee  
P.O. Box 3413  
Edgartown, MA 02539  
Telephone: (508) 627-6185

# Waterways Assets and Resources Survey

## Master Plan for Dredging and Beach Nourishment

### Town of Dennis, MA

#### Project Characteristics:

- *Dredging Needs Assessment*
- *Beach Condition Surveys*
- *Environmental Resource Mapping*
- *Regional Sediment Management*

Woods Hole Group prepared a report documenting existing conditions and Town of Dennis management practices at the four (4) waterways and eight (8) primary public beach sites within the town's jurisdiction. The report lays the framework for a master plan for dredging activities in the waterways, as well as associated beach nourishment to restore the public coastal resources. Available information from town records and permit documents was used to evaluate dredging needs and environmental resources in the 4 waterways. The beach sites were evaluated using a combination of information from town records, permit documents, State and Federal agencies, and survey data collected specifically for this study.

Findings of the study showed that annual dredging is needed to maintain Sesuit Harbor and Bass River, while Swan Pond requires dredging approximately every 5 to 7 years. Average annual shoaling rates for the waterways were computed to be 13,000 cy, 8,700 cy, and 2,500 cy, respectively. Sediments dredged from the waterways were found to be clean beach compatible sands. Most of the public beach sites in the Town of Dennis show slightly eroding to stable conditions with long-term rates of change on the order of -1.0 ft /yr. One notable exception is Chapin Memorial Beach that has significantly higher rates of erosion between -3.6 and -9.6 ft/yr. The erosion threatens to undermine the entrance road to the beach.



Information developed as part of the waterways and beaches surveys was used to develop a series of short- and long-term management recommendations for the Town of Dennis. The recommendations were focused on planning and operational measures that can be taken to improve dredging practices, beach maintenance, and regional sediment management practices.

Location: Dennis, MA  
Client: Town of Dennis  
Contact: Michael Whalen  
Town of Dennis  
Dennis Police Department  
90 Bob Crowell Road  
South Dennis, MA 02660  
Telephone: (508) 394-1313



# Town of Falmouth 10-Year Comprehensive Dredging and Beach Nourishment Permit

## Project Characteristics:

- *Dredging and Beach Nourishment Design*
- *Sediment Sampling Analyses*
- *Key Species & Time of Year Restrictions Summary*
- *Shorebird Monitoring & Site Protection Plan*
- *Environmental Permitting*
- *Environmental Notification Form (ENF)*

Woods Hole Group, Inc. worked for the Town of Falmouth, MA to implement a 10-Year Comprehensive Permit process for their dredging and beach nourishment projects. It is a comprehensive effort to consolidate and manage 25 dredging and beach nourishment sites associated with maintenance of the Town's waterways, harbors, and salt ponds. The overall project is designed to provide the Town with more effective ways to manage their municipal coastal projects that require ongoing maintenance dredging and beach nourishment. The combination of all projects under the Comprehensive Permit process will facilitate environmental review of the Town's activities by the various regulatory agencies, reduce administrative burden to the Town, and provide flexibility to optimize coastal zone management. The work is required to provide safe navigation, adequate tidal flow and water quality, and to maintain resource area values for coastal sites and marine species.

The Town of Falmouth desires the flexibility to beneficially reuse sand from the dredging projects on any of the beaches included in the project. Although placement generally will be at the beach site closest to the dredging project, the Town wants to incorporate the flexibility to nourish critically eroded beaches with dredged sediment when it becomes available.

During initial design, Woods Hole Group identified characteristics of the project areas through review of bathymetric survey data, vibra cores, sediment grab samples, beach profiles, and benthic species and distribution information. The bathymetric data was used to calculate the quantities of proposed dredge material. Detailed grain size and chemical analyses were utilized to identify the sediment compatibility and disposal site options.



Woods Hole Group is working closely with project proponents and local, state and federal environmental regulatory agencies to permit the project. An Environmental Notification Form was prepared addressing concerns regarding impacts to shellfish, fish runs, finfish, winter flounder, horseshoe crabs, shorebirds, endangered species, time of year restrictions, beach stability and wetland resources. The full range of local and state permits has been filed.

The proposed project offers the following benefits: streamlined regulatory approval, improved public access to coastal waters, improved public safety, enhanced storm damage protection and flood control, addition of sediment to the littoral system, and enhanced wildlife habitat for nesting shorebirds.

Location: Falmouth, MA  
Client: Town of Falmouth  
Contact: Gregg Fraser  
Harbormaster  
Town of Falmouth  
180 Scranton Ave.  
Falmouth, MA 02540  
Telephone: (508) 457-2550

# Vineyard Haven Harbor Dredging and Beach Nourishment

## Project Characteristics:

- *Dredging & Beach Nourishment Design*
- *Aquatic Resource Area Surveys*
- *Analysis of Grain Size Characteristics*
- *Analysis of Alternatives*
- *Environmental Permitting*
- *Environmental Notification Form (ENF)*

Woods Hole Group, Inc. worked with the Town of Tisbury, MA to design and permit dredging of Vineyard Haven Harbor. The project objective is to improve safety, avoid the need for small boats to utilize the main entrance channel where large ferries navigate, improve tidal circulation, and minimize the frequency of maintenance dredging while also providing environmental benefits to two nearby public beaches. The project design includes maintenance and improvement dredging within the Back Channel and North Groin areas. A maximum of 28,880 cubic yards of sandy material may be dredged.

Beneficial reuse of the dredged material as beach nourishment will occur on Owen Little Way and Grove Avenue beaches, which are on the west side of Vineyard Haven Harbor. Additionally, a temporary dewatering and/or stockpile area is designed immediately adjacent (west) to the Back Channel dredge footprint. This site will be used if mechanical dredging is required, with all sediment trucked to the beach nourishment locations.

During initial design, Woods Hole Group identified characteristics of the project area through collection of vibra cores and sediment grab samples. Detailed grain size and chemical analyses were utilized to identify the sediment compatibility and disposal site options. The core samples were visually compared for homogeneity, and up to three cores were composited for analysis at the laboratory. A thorough analysis of disposal site alternatives was completed prior to developing the final design.



Woods Hole Group is working closely with project proponents and local, state and federal environmental regulatory agencies. An Environmental Notification Form was prepared addressing concerns regarding impacts to shellfish, eelgrass, beach stability, endangered species, and wetland resources. The full range of local, state, and federal permits have been or are in the process of being filed.

The proposed project offers the following benefits: improved public access to coastal waters, improved public safety, enhanced storm damage protection and flood control, addition of sediment to the littoral system.

Location: Tisbury, MA  
Client: Town of Tisbury  
Contact: John (Jay) M. Wilbur III  
Tisbury Harbormaster  
Town of Tisbury  
51 Spring St.  
P.O. Box 1239  
Tisbury, MA 02568  
Telephone: (508) 696-4249

# Long Island Sound Dredged Material Management Planning

## Project Characteristics:

- *Long-Term Regional Dredged Material Management Planning (DMMP)*
- *Upland Disposal Alternatives*
- *Cultural Resources Inventory*
- *Economic Benefit Analysis*
- *Programmatic Environmental Impact Statement (EIS) Support*



Woods Hole Group worked with the US Army Corps of Engineers (USACE) on a set of projects related to management of dredged material in Long Island Sound (LIS).

## LIS Literature Review

A review of literature was done to support the USACE's efforts to formulate alternatives for the management of dredged material in Long Island Sound. Woods Hole Group compiled, reviewed, and catalogued information related to dredging and dredged material management in the region. The project included an extensive literature search to locate recently published reports and data related to dredging and dredged material management. Information sources were summarized in an ACCESS database, with information on the document source, type of work product (field investigation, summary report, modeling, monitoring, etc.), major and minor topics, time period covered, GIS compatibility, availability online, and points of contact for further information.

The database and literature library developed for this project can be used to quickly locate information on various topics relevant to dredged material management in the LIS region.

## LIS Upland, Beneficial Use, and Sediment Dewatering Site Investigations

Woods Hole Group investigated potential alternatives for dredged material handling, including upland disposal, sediment dewatering, and beneficial use including beach nourishment in LIS region.

The work was conducted in support of a regional DMMP for LIS that laid out alternatives for dredged material management, including general engineering design and analysis of the capacity for material at each site.

The project involved detailed, site-specific investigation of over 100 sites previously identified as potentially suitable for dredged material placement. Information was gathered from the site owners/operators regarding the acceptability of dredged material for placement or dewatering, types and volumes of material that could be accepted, general engineering design for beach nourishment and dewatering sites, and operational constraints.

Field investigations were done to document site conditions including current uses, abutting property conditions, site access, proximity to wetlands and other sensitive habitats, shoreline conditions and adjacent water depths, and sediment/soil characteristics. The site reports included plot plans, aerial photography of the delineated sites, ground photographs, and a summary of information gathered from the owner interviews and field investigations.

Spatial information was stored in ArcGIS database and Google Earth file formats. Results of the site investigation work were used to determine the volume of dredged material each site can accommodate, feasibility of material placement at each site, the extent and cost of site preparation, regulatory requirements for site use, potential impacts to critical resources, and costs associated with site use.

# Long Island Sound Dredged Material Management Planning (continued)

## LIS Cultural Resources Inventory

In support of the overall LIS DMMP process, Woods Hole Group, in association with PAL, prepared a cultural resources inventory that identified historic properties including archaeological sites, and identified the location of prehistoric and/or historic sensitive areas along the shores of LIS. The presence of archeological sites in or near a potential disposal site can limit or eliminate the site as a potential dredge disposal site. The study area along the coast of LIS is a sensitive region for terrestrial archaeological resources dating from temporal/cultural periods of documented human occupation, approximately 12,000 years ago to present.

- The cultural resources inventory identified historic properties including archaeological sites and sensitivity of 57 coastal communities in Rhode Island, Connecticut, and New York, located along the LIS.
- The archaeological sites inventory for the terrestrial portion of the study area consists of 3,146 recorded archaeological sites, of which 195 are identified as National and State Register (NR/SR) listed or eligible sites, either within a historic/archaeological district or individually listed. Additionally, there were five National Register-listed or eligible archaeological districts (or historic districts with archaeological significance).
- A total of 847 shipwrecks and obstructions were reported within the study area. Just four of these shipwrecks and obstructions are NR-listed or eligible historic properties.
- A total of 2,032 historic resources, including 914 in Connecticut, 927 in New York, and 118 in Rhode Island, were identified within the study area. The resources include buildings, sites, structures, objects, and districts that are listed, determined eligible, or potentially eligible for the National Register and/or State Register within the respective states in which they are located.

The study produced a series of GIS overlays that identified the resources and will allow the LIS Study Team to evaluate the potential viability of potential disposal sites within the study area.

## LIS Economic Data Update

Woods Hole Group, in association with Industrial Economics, Inc., prepared an economic evaluation of navigation-dependent industries in LIS, and the regional economic impacts of a No Open-Water Disposal Alternative for the LIS Dredged Material Management Plan.

The analysis used input-output modeling to assess the regional economic significance of navigation-dependent activity including marine transportation (commercial shipping, scenic water transportation, and shipbuilding), commercial fishing, recreational boating, ferry-dependent tourism, and activity related to the Naval Submarine Base in Groton, CT.

The impact of the No Open-Water Disposal Alternative was evaluated over a 20-year period, and effects on economic output, gross state product (GSP), employment, and taxes were estimated. Results can be used to evaluate regional economic implications for dredged material management in LIS.

## LIS Environmental Data Update

The US Army Corps of Engineers (USACE) needed to compile baseline environmental data to formulate alternatives for the management of dredged material in LIS. Woods Hole Group worked with USACE to develop an environmental data summary for LIS. The project identified and summarized environmental data developed in the LIS region between 2002 and 2009. The main work product for this project was an annotated EXCEL database summarizing environmental data sources for LIS. Data sources were categorized by topic, sponsoring agency, spatial extent, time period covered, and relevance to LIS dredged material management. The searchable database developed for this project can be used to quickly access information on natural resources and environmental conditions in LIS and surrounding upland areas.

Location: Northeast USA, Long Island Sound  
Client: USACE - NAE  
Contact: Michael Keegan  
Telephone: (978) 318-8087

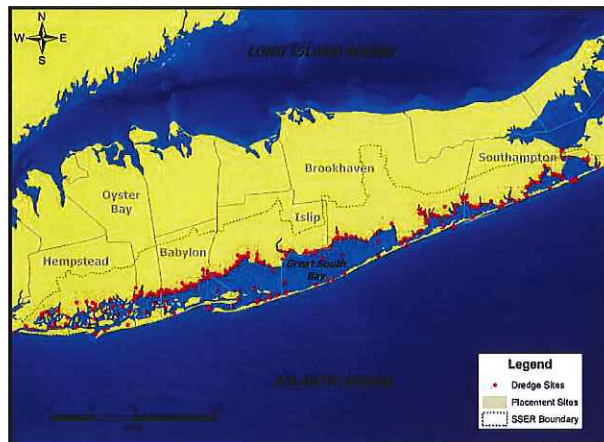
# Dredged Material Management Planning: Long Island South Shore Estuary Reserve

## Project Characteristics:

- *Assessment of Current Dredging Conditions and Future Needs*
- *Inventory and Distribution Assessment of Contaminated Sediments*
- *Investigation of Opportunities for Improved Sediment Management*
- *Investigation of Beneficial Use Opportunities*
- *Recommendations to Facilitate Implementation*

Woods Hole Group worked during 2008-2010 under contract to the New York State Department of State, Division of Coastal Resources to prepare components of a Dredged Material Management Plan for the Long Island South Shore Estuary Reserve (SSER). The SSER was designated in 1993 by the New York State Legislature as a resource of unparalleled biological, economic, and social value. In 2001 a *Long Island South Shore Estuary Reserve Comprehensive Management Plan* was adopted laying out actions to protect and manage the Reserve. As part of the Management Plan, a regional dredging and dredged material management plan was recommended to provide a strategy for ensuring future navigability within the SSER for commercial and recreational vessels.

Information describing current and future dredging needs was developed through a study of navigation dependent facilities, as well as an extensive review of state and federal permit records issued for navigation related dredging projects. Spatial and attribute information for each dredging and placement site were cataloged in an ArcGIS geodatabase. Relevant information included project ID, applicant type and name, placement location, sediment type, permitted volume, dredge frequency, dredge methodology, as well as future planning level dredge estimates. Where available, data on environmental permits, time of year restrictions, and past dredging activity were also cataloged. A detailed summary of the environmental permitting process for dredging and placement projects in the SSER was generated, including requirements for sediment sampling and analytical testing as a function of placement alternatives.



Data describing the physical and chemical properties of dredged sediments in LISSER were obtained and summarized to show potential areas of concern for future work. Opportunities for improved sediment management to reduce channel infilling were investigated, such as watershed erosion/runoff controls, shore protection structures, and optimized channel designs. A range of beneficial use opportunities for dredged material were identified, including beach and dune nourishment, landfill placement, site remediation, aggregate processing, and environmental enhancement. Parcel level data within the LISSER were also used to screen potential dredged material dewatering sites. Study findings were used to develop a series of recommendations for further investigations and steps necessary to prepare and implement a DMMP for the LISSER.

Location: Long Island South Shore  
Client: New York State Department of State,  
Division of Coastal Resources  
Contact: Barry Pendergrass  
Telephone: 518-474-6000

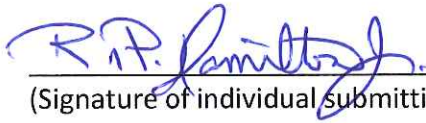
APPENDIX C  
Forms

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TOWN OF ORLEANS  
CERTIFICATE OF NON-COLLUSION

Project Name: **NAUSET ESTUARY DREDGING PROJECT**

Pursuant to M.G.L. Ch. 30B Section 10, the undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.



\_\_\_\_\_  
(Signature of individual submitting bid or proposal)

Woods Hole Group, Inc.

\_\_\_\_\_  
(Name of business)

STATEMENT OF STATE TAX COMPLIANCE

Project Name: **NAUSET ESTUARY DREDGING PROJECT**

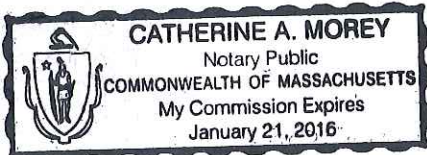
Pursuant to Ch. 233 of the Acts of 1983, §49A(b),

I, J. Luke Sabella, acknowledge that I am the authorized signatory for Woods Hole Group, Inc., whose principal place of business is at 81 Technology Park Drive, East Falmouth, MA 02536, and as such, do hereby certify under the pains of penalties of perjury that this company has complied with all laws of the Commonwealth relating to taxes.

Social Security or Federal ID Number 04-3408801

Subscribed and sworn to this 3<sup>rd</sup> day of September, 2015.

Catherine A. Morey  
Notary Public



**ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION:**


State of Massachusetts

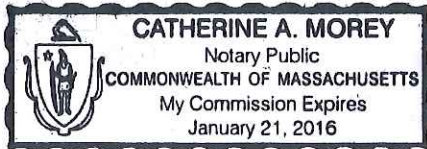
County of Barnstable SS:

On this 3rd day of September, 2015, before me personally came and appeared Robert P. Hamilton, Jr. to me known, who, being by me duly sworn, did depose and say to me that he resides at Garrison Road, Falmouth, MA, that he is President Woods Hole Group, Inc., the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was so affixed by the order of the directors of said corporation, and that he signed his name thereto by like order.

  
Contractor's Signature

(Seal)

  
Notary Public Signature  
My Commission expires on: 1-21-16 Dated: 9-3-15



---

**TOWN OF ORLEANS  
INSURANCE REQUIREMENTS FOR INCLUSION  
IN ALL SPECIFICATIONS AND CONTRACTS**

**PROJECT: NAUSET ESTUARY DREDGING PROJECT**

Insurance. The Contractor shall carry and maintain in effect during the entire currency of the contract, at his own expense, the following kinds and minimum amounts of insurance in a company or companies approved by the Town of Orleans. Such insurance shall cover claims and suits which arise out of or result from the Contractor's execution of the contract work whether such execution by the Contractor himself or by any Subcontractor.

- 1)  Worker's Compensation as required by the Worker's Compensation Laws of the Commonwealth of Massachusetts and, in conjunction therewith, Employer's Liability with a minimum limit of \$500,000.00.
- 2)  "Broad Form" Comprehensive General Liability including, but not limited to, Bodily Injury, Personal Injury and Property damage Liability, Full Contractual Liability and liability arising from Explosion, Collapse and Underground Damage and all other applicable insurance necessary to carry out the contractual obligation to proceed under the contract. Minimum limit of liability \$2,000,000.00.
- 3)  Automobile Bodily Injury and Property Damage Liability for all owned, non-owned and hired automobiles operated in connection with the performance of the contract. Minimum limits of liability: Single limits of Property Damage and Bodily Injury \$ \$1,000,000.00
- 4)  Builder's Risk - Amount of the Contract
- 5)  Professional Liability in the amount of \$ 1,000,000.00.
- 6)  Errors and Omissions

Certificate of Insurance. Prior to beginning work under the contract, the Contractor shall furnish the Town of Orleans a Certificate of Insurance naming the Town as 1)  an additional insured or 2)  certificate holder acceptable to said Town evidencing the existence of the foregoing insurance coverage. Such Certificate also shall provide that the Town of Orleans will be notified at least 30 days in advance of the cancellation or non-renewal of any insurance covered by the Certificate.





Hand Delivered

September 10, 2015

John F. Kelly  
Town Administrator  
Town of Orleans  
19 School Road  
Orleans, MA 02653

**Re: Technical Proposal – Nauset Estuary Dredging Project**

Dear Mr. Kelly,

Woods Hole Group, Inc. is pleased to submit this Technical Proposal to the Town of Orleans for engineering services in support of the Nauset Estuary Dredging Project. This Technical Proposal is submitted in response to the Request for Proposals (RFP) received by electronic mail on August 24, 2015. One (1) bound signed original and seven (7) bound copies of the Technical Proposal are being submitted. As required by the RFP, a separately sealed envelope containing the Cost Proposal is also being submitted.

We would welcome an opportunity to meet with Town of Orleans representatives to present and discuss our Technical Approach and to introduce the Woods Hole Group and Woods Hole Oceanographic Institution team members. We appreciate the opportunity to offer this proposal, and look forward to working together. If there are questions and/or requirements for additional information, please do not hesitate to contact me directly.

Sincerely,

The Woods Hole Group, Inc.

A handwritten signature in blue ink, appearing to read "R.P. Hamilton", written in a cursive style.

Robert P. Hamilton  
President and Coastal Engineer

Enclosed: One (1) bound signed original and seven (7) bound copies of the Technical Proposal.

www.woods holegroup.com

FAX: 508.540.1001

TELEPHONE: 508.540.8080

Woods Hole Group 81 Technology Park Drive E. Falmouth, MA 02536 USA



Hand Delivered

September 10, 2015

John F. Kelly  
 Town Administrator  
 Town of Orleans  
 19 School Road  
 Orleans, MA 02653

**Re: Cost Proposal – Nauset Estuary Dredging Project**

Dear Mr. Kelly,

Woods Hole Group, Inc. is pleased to submit this Cost Proposal to the Town of Orleans for engineering services in support of the Nauset Estuary Dredging Project. This Cost Proposal is submitted in response to the Request for Proposals (RFP) received by electronic mail on August 24, 2015. One (1) original Cost Proposal is included herein. As required by the RFP, costs are provided for each task in the Technical Proposal, including costs for labor and direct expenses. A breakdown of staff hours by task is also provided.

**Woods Hole Group Cost Proposal**

Task	Labor Cost (\$)	Direct Expenses (\$)	Staff Hours
Task 1: Review Existing Conditions	\$6,593	N/A	39
Task 2: Coastal Processes Analysis	\$5,245	N/A	39
Task 3: Assessment of Existing Conditions	\$8,920	\$183 (supplies/mileage/shipping) \$2,300 (cyst analyses) \$1,725 (grain size analyses) \$1,720 (boat rental)	82
Task 4: Hydrographic Survey	\$7,270	\$2,635 (boat/equipment rental)	51
Task 5: Project Feasibility and Reporting	\$13,190	\$158 (mileage/shipping)	96
<b>Total</b>	<b>\$41,218</b>	<b>\$8,721</b>	<b>307</b>

**Project Total: \$49,939**

www.woods holegroup.com

FAX: 508.540.1001

TELEPHONE: 508.540.8080

Woods Hole Group 81 Technology Park Drive E. Falmouth, MA 02536 USA

We would welcome an opportunity to meet with Town of Orleans representatives to present and discuss our Technical Approach and to introduce the Woods Hole Group and Woods Hole Oceanographic Institution team members. We appreciate the opportunity to offer this proposal, and look forward to working together. If there are questions and/or requirements for additional information, please do not hesitate to contact me directly.

Sincerely,

The Woods Hole Group, Inc.



Robert P. Hamilton  
President and Coastal Engineer

Enclosed: One (1) original signed Cost Proposal.

www.woods holegroup.com

FAX: 508.540.1001

TELEPHONE: 508.540.8080

Woods Hole Group 81 Technology Park Drive E. Falmouth, MA 02536 USA

## **REQUEST FOR PROPOSALS**

### **Permitting Efforts for Nauset Estuary Dredging Project Orleans, MA**

The Town of Orleans through its Town Administrator is seeking proposals for engineering services to develop permits for dredging within the channel known as the Nauset Estuary located in Orleans. The work shall include a hydrographic survey, coastal processes analysis, permitting and planning work related to dredging a navigable channel in the Nauset Estuary from Town Cove to Nauset Inlet as shown on Attachment "A". The proposal submittal requirements and intended work program are described within this Request for Proposals (RFP). Consulting firms are requested to submit proposals to the Office of the Town Administrator, Attn.: Mr. John F. Kelly, 19 School Road, Orleans, MA 02653 by NO LATER 3:00 PM, Thursday, September 10, 2015.

The goal of this project is to determine the feasibility of developing a dredging program as described within, all of its related costs and permitting timelines for inclusion in the Town's five year Capital Improvements Plan to be presented to the voters at the May, 2016 Town Meeting.

#### **A. BACKGROUND**

Significant shoaling effects in Nauset estuary over the last few years, together with a lack of maintenance of prior historical dredging from Town Cove to the harbor entrance have caused major changes in navigation and mooring abilities in both Orleans and Eastham. Since 2013, the commercial lobster fleet has left the Orleans landings at Snow Shore, Priscilla and Goose Hummock. These commercial boats are currently mooring out in the back beach channel nearer to Nauset Inlet in Eastham, in order to bypass the shoals that are restricting traditional navigation paths.

Safe passage of Nauset Inlet is typically 2½ - 3 hours on either side of low water for these boats. The inability to leave and return to the landings until 4½ hours on either side of low water has caused the move. Smaller recreational boats have also been experiencing navigation problems, resulting in numerous groundings. The need for more commitment to navigational buoys and their maintenance, in the two towns, has also increased.

Importantly, the fact that rescue boats will be hampered by the adverse shoaling has now brought these conditions to a head. The need for dredging of a portion of the estuary is now a serious concern.

#### **B. PROJECT DESCRIPTION**

The Town is seeking permits for potential dredging of the waterway between Town Cove and Nauset Inlet (Attachment "A"). This waterway is relatively wide, shoal waterway with a naturally meandering narrow channel. This channel serves as the principal access between Town Cove and Nauset Inlet. There is growing concern that depths in the estuary may degrade to the point where boating access could become severely limited and tidally restricted.

The permits which are being sought would allow for dredging within this waterway as shown on Attachment “A”. The dredging may be considered “maintenance dredging” since the Town believes that it has been dredged in the past. A portion of this scope is to research this issue if it could help this project move forward.

It is uncertain where specific dredging may be required given the relatively dynamic natural movement and variability of the shoals and channels in this area. Therefore, it is assumed that a “zone” of potential dredging should be permitted to provide flexibility to dredge in the most appropriate location. This approach should also minimize both the quantity and frequency of dredging activities by working in conjunction with the natural water flow in this dynamic environment. Permits should include the potential for dredging by a private contractor using either a hydraulic or mechanical dredge.

The design width of a dredge cut channel would likely be about 100 feet wide with a depth of approximately -5 feet MLW. Final dimensions would be refined following coordination with the consultant.

The location of the proposed dredging lies primarily within the Cape Cod National Seashore. Accordingly, there may be additional steps to the permitting process in order to be compliant with the National Environmental Policy Act (NEPA). However, the authority of the Cape Cod National Seashore for requiring further NEPA coordination and the potential need for an Environmental Assessment and possibly other federal permitting efforts is uncertain at this time. Therefore, the scope of this RFP only includes initial scoping meeting(s) with the Cape Cod National Seashore, Town staff and others as necessary to further identify the potential level of involvement and additional permitting efforts, if any, required by the Cape Cod National Seashore for project implementation.

### **C. PROJECT SCOPE**

The Town of Orleans is seeking a consultant to review the proposed project areas and conceptual dredging/disposal options and to assess the necessary timeline, permits and costs to perform the work.

The detailed Scope of Work is contained in Attachment “B”.

### **D. CONTENT OF PROPOSAL**

The Town will consider a variety of approaches to accomplish specific tasks provided the proposal clearly demonstrates the advantages of the proposed approach or methodology.

Selection will be based primarily on the qualifications of the firm and the technical approach. While cost is a consideration, it will not be the sole factor in determining the selection of the Consultant to perform this work. Respondents to the RFP will be required to submit a Technical Proposal that includes a Qualifications Statement that identifies the Consultant’s specific capabilities and expertise to conduct each task defined within the Scope of Services. A Cost Proposal will be sent in a separate sealed envelope along with the Technical Proposal.

---

### **Technical Approach**

The Consultant should fully describe its Technical Approach to completing the requested Scope of Services. Explain the selection of methodologies for each proposed task, and thoroughly describe the methodology used to complete each task. Any proposed additional/optional tasks, or potential contingency items, which a Consultant deems appropriate to include with a proposal, shall be described separately. Any innovative approaches/solutions which a Consultant may be considering or which you have used on past projects should be presented in your response.

### **Qualifications**

The Consultant shall provide a Qualifications Statement and professional work experience attesting to capacity to perform the required Scope of Services. Resumes are required for all project personnel. The Qualifications Statement shall detail relevant experience and past performance of the Consultant and members of the team on comparable work (i.e., similar scope and size) for government and/or private entities. The statement should cover, as a minimum, the substantive nature of comparable engagements, the experience of members of the team in working successfully in matters of similar complexity and the record of members of the Consultant's team for timely performance. Consultants are requested to give sufficient information of their experience to permit the Town to understand and verify the exact nature of contribution to other projects and entities.

The proposal should briefly describe the background of the Consultant, services provided, years in business, and type of organization (corporations, partnership, etc.). Similar descriptions of any subcontractors should also be presented. The proposal should demonstrate the Consultant's capacity to successfully undertake and complete the project's tasks within the proposed time-frame by listing current commitments and describing personnel resources of the Consultant available for the project.

### **Project Staffing**

The proposal should provide the identity and describe the project organization and roles of key individuals. Include resumes of key individuals. The proposal should briefly describe the Consultant's management approach to directing the technical work and for maintaining project schedule.

### **Project Schedule/Funding**

The Final Report is due on January 15, 2016. The schedule must allow for sufficient public input at key intervals, and the ability to work cooperatively with Local, County, State and Federal agencies as necessary.

The Consultant shall present an overall project schedule, describing in words and presenting in graphical form the interrelationships of proposed tasks. All deliverables and key milestones shall be identified, along with estimated times for Town and regulatory reviews as necessary.

The schedule shall be presented in calendar days, with an assumed October 1, 2015 Notice to Proceed.

The Town may require presentation of the study's findings in conjunction with any project funding article at the May, 2016 Annual Town Meeting.

**Deliverables**

The proposal should describe all project deliverables including, as appropriate, reports, maps, presentations, digital files, or other proposed deliverables.

**Prices**

Price proposals should include a separate cost for each proposal task, including a breakdown of staff hours by task. Price proposals should specify all costs and expenses (copying, mileage, graphics, laboratory analysis, etc.) to complete the scope of work.

Any proposal that fails to include all the above information will be rejected as unresponsive, and will not be afforded a complete review.

**E. EVALUATION CRITERIA**

The selection process will include an evaluation procedure based on the criteria identified below. Finalists **may** be required to appear for an interview.

**Technical Approach:** Proposals will be evaluated based on the Consultants understanding of the Scope of Services, thoroughness of the proposed work, innovative solutions and clarity of the work program.

**Qualifications:** Professional qualifications of the respondent (training/educational background appropriate to the project described herein) and all project personnel; including professional experience above and beyond the minimum qualifications.

Consultant must have demonstrated experience with coastal processes and dredging projects. The Consultant must have specific experience in successfully permitting these types of projects within the Commonwealth of Massachusetts. Consultant must have experience dealing with municipalities, and a minimum of seven (7) years experience in consulting on similar projects. Consultant must have successfully permitted a project of similar scope for a Massachusetts municipality within the past five (5) years.

**Strength and Credibility of Client References:** Reference checks may be done to evaluate the special skills and abilities needed by the Consultant for this activity, including timeliness of performance.

A minimum of three (3) references for related work shall be provided and include references with complete address and recently verified telephone number, including name and title of individual who is familiar with the firm's performance on the project. Provide examples and/or samples of the firm's work relating to such activities performed in the last three years. Project experience will be ranked according to relevance, location (Cape Cod, in Massachusetts), and completion date (recently completed).

**Project Schedule:** Proposal demonstrates that the Consultant will have sufficient resources and time to complete the project within the proposed project schedule given other commitments.

**F. INSTRUCTIONS AND PROPOSAL SUBMITTAL REQUIREMENTS**

1. **Proposal Submission:** - One bound signed original, seven (7) bound copies of the Technical Proposal, including all required forms and applicable supporting documentation, must be submitted in a sealed envelope with the respondent's name and contact information clearly indicated on the outside. The envelope must be marked with the following legend: **"TECHNICAL PROPOSAL – Orleans – Nauset Estuary Dredging Project"**
2. Under separate sealed cover, respondents must submit one (1) original of a price proposal clearly marked **"COST PROPOSAL – Orleans – Nauset Estuary Dredging Project"** with the respondent's name and contact information clearly indicated on the outside.

This is a fixed fee for all services to be provided under this RFP.

The Cost Proposal shall include an estimated cost for each task in the technical proposal. Where additions or subtractions to the Scope of Services in this RFP are proposed, the difference in costs associated with each proposed change shall be shown separately

If the proposal includes modifications to the Scope of Work, only the associated costs of the modifications will be negotiated. The remaining fixed fee is fixed.

The Town will negotiate the final compensation with the selected consultant.

The total fee for all services shall not exceed \$50,000.

3. Proposals must be received by 3:00 pm on Thursday, September 10, 2015 at the following address:

John F. Kelly, Town Administrator  
Orleans Town Hall  
19 School Road  
Orleans, MA. 02653

Postmarks will not be considered as meeting the deadline. Proposals submitted by fax or email will not be considered.

Completed Non-Collusion Certificate, Statement of Tax Compliance, Acknowledgement of Principal and an insurance certificate that meets the Town's minimum requirements (attached) must be included in the proposal.

4. The Town of Orleans assumes no responsibility for late or misdirected delivery of proposals. Any proposals received after 3:00 pm on Thursday, September 10, 2015 will be returned unopened to the proposer. No exceptions will be allowed.
5. Faxed proposals will not be accepted.
6. No cost data shall be contained within the Technical Proposal. Failure to comply with this requirement will result in immediate disqualification. The Town of Orleans uses Qualifications Based Selection to short-list its engineering consultants, and the Cost Proposals will not be opened until after the Nauset Estuary Study Committee has submitted a recommendation to the Office of the Town Administrator. The Cost Proposal may then be considered in the final ranking of firms, with the award based upon all factors and not just the lowest price.
7. The Town of Orleans reserves the right to reject any or all proposals that are not in the best interest of the Town.

G. **Pre-Bid Meeting:**

None required. However, based on the nature of questions received it may be found to be in the Town's interest to hold an informational meeting for clarification of the proposed project. All recipients of the RFP will be notified as to time and place of the meeting. Attendance at this meeting would not be mandatory.

H. **Inquires:**

No oral interpretations will be made to any potential respondent as to the meaning of any requirement specified with this Request for Proposal. In preparing its proposal, the Consultant shall rely only on what has been communicated in writing, and no oral communication shall become the basis for any subsequent protest of the selection process. No questions, written, faxed, or emailed, will be answered after the close of business on September 3, 2015. Any technical questions pertaining to this RFP should be directed to:

Thomas E. Daley, P.E., Director of Public Works & Natural Resources  
Town of Orleans  
139 Main Street  
Orleans, MA 02653  
FAX (508) 240-3711

Following the closure of questions on September 3, 2015, a single response will be prepared for all questions received, and circulated to all recipients of this RFP.

I. **General Conditions:**

The successful respondent shall comply with all applicable federal, state, and local laws and regulations. All words, signatures, and figures submitted on the proposal shall be in ink. Proposals that are conditionally obscure, or which contain additions not called for in the specifications, erasures, alterations, or irregularities may be rejected.

The Town Administrator shall have final approval of the recipient of the contract. The Town reserves the right to reject all proposals, to waive technicalities, to advertise for new proposals, and to make awards as may be deemed to be in the best interests of the Town.

Reports and materials developed by the successful consultant, after awards are made and submitted to the Town, are considered public information and may not be copyrighted.

All proposals become the property of the Town. The Town has the right to disclose information contained in the proposals once awards have been made.

J. **Basis of Award:**

Contract award(s) will be based on the most advantageous combination of technical and price proposals. The technical proposal receiving the best evaluation will then be evaluated for price considerations. The Town will select the most responsive and responsible consultant submitting the most advantageous proposal.

K. **Miscellaneous:**

Any correction or amendment may be submitted in writing prior to the time the RFP is due in a sealed envelope appropriately labeled.

The Consultant shall be solely responsible for all claims of whatever nature arising out of the rendering of services by the Consultant during the term of this proposal.

The selection of the successful respondent shall be made without regard to race, color, sex, age, religion, political affiliation, or natural origin.

The Town is an Affirmative Action/Equal Opportunity Employer and it encourages proposals from qualified minority and women owned business firms.

The Consultant may not subcontract the work without prior written approval of the Town of Orleans provided the subcontractor has not been identified in the Consultants original proposal. The Consultant may not substitute for the person identified to undertake the work without the prior written approval of the Town of Orleans.

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## ATTACHMENT “B” SCOPE OF SERVICES

### **Tasks:**

The consultant shall perform, at a minimum, the following tasks. Additional or alternative tasks and/or the supplemental use of standard accepted technical computer models to complete the objectives and effectively present the results are encouraged.

1. Review proposed project areas and conceptual implementation that the Town has identified for dredging efforts and make recommendations as to the technical appropriateness of pursuing the proposed work.
  - a. Review available historical information including past dredging information as available and develop recommendation for the footprint of a proposed “zone of dredging” to account for natural variability of the channel system.
  - b. Review all available documentation available regarding the Nauset Estuary such as the Town of Orleans’ GIS (<http://gisdemo1.cdmsmith.com/orleansma/>), Town of Eastham’s GIS (<http://www.mapsonline.net/easthamma/index.html>), the Army Corp of Engineers’ May, 2010 topobathylidar data (<http://maps.ngdc.noaa.gov/viewers/bathymetry/>), etc.
2. Perform a coastal processes analysis to provide an assessment of current and future projected conditions in Nauset Estuary to help determine the feasibility and viability of a project to dredge the Nauset Estuary. It is uncertain where specific dredging may be required given the relatively dynamic natural movement and variability of the shoals and channels in this location. Therefore, it is assumed that a “zone” of potential dredging should be permitted to provide flexibility to dredge in the most appropriate location when/if the need arises. This approach should also minimize both the quantity and frequency of dredging activities by working in conjunction with the natural water flow in this dynamic environment. The assessment should address the following issues:
  - a. The benefits of dredging should be assessed including an estimate of how long would a dredged channel in the estuary last?
  - b. Investigate dredged material options, based on quality of material to be removed.
  - c. Investigate whether new endangered species habitat creation is a viable option with the dredged material within or out of the Cape Cod National Seashore.
  - d. Determine the effect of “red tide” contamination of dredged material, impact on disposal, the potential for dredging operations to re-distribute/transport algal cysts to areas not historically impacted by red tide and the project as a whole.
  - e. The consultant shall evaluate the potential for erosion of abutting properties, marsh areas, structures such as revetments, or barrier beach due to the potential increase in volume of water/tidal currents, potentially changing as a result of the proposed project.
3. The Consultant shall document the existing conditions within the proposed footprint of dredging including, but not limited to:
  - a. Resource areas and habitat.
  - b. An eelgrass assessment in vicinity of potential dredged areas.

- c. Shellfish resource assessment including potential project impacts on commercial clam harvesters and aquaculture grants.
    - d. Perform sediment sampling and grain size analysis (include as line item cost):
      - i. Full dredge depth cores from twelve (12) representative locations within dredge footprint.
4. The consultant will undertake a hydrographic survey of the approximate navigation section of Nauset Estuary as shown on Attachment "A" and develop a dredging plan with full cost estimate. Attachment "A" also indicates particular shoals of concern. The Town is seeking a 100' wide channel with a minimum 5' depth at low water. The study would need to include an analysis and projected quantity of dredged material to be removed. It must also describe location(s) and method(s) of transport for disposal. The shoals outside of Town Cove (Attachment "A") are in the National Seashore and must have any dredged material sent out of that jurisdiction. Development of existing condition and proposed base plans at an appropriate scale and accuracy for environmental permitting and design are required.
5. Based on the above tasks, the consultant shall determine and develop a list of required permit applications for the potential dredging and disposal scenarios. Anticipated permit applications will consist of, at a minimum:
  - a. Notice of Intent
  - b. Environmental Notification Form
  - c. U.S. Army Corps of Engineers Sec. 404 Permit
  - d. Water Quality Certificate
  - e. Chapter 91
  - f. MCZM Consistency

Given the potential for overlapping jurisdiction of the project area with the Cape Cod National Seashore, the consultant shall identify what, if any, further steps and permitting efforts (including possible requirement for development of an EA, EIS, FONSI etc) may be required in order to satisfy the need for potential compliance with NEPA. This effort shall, at a minimum, entail coordination with the Cape Cod National Seashore, Town staff and others as necessary in order to clarify the level of compliance required.

The potential requirement of an Environmental Impact Report (EIR), and level of effort and cost associated to develop an EIR may modify the permitting approach undertaken. The costs to prepare either an EIR or a Development of Regional Impact (DRI) assessment would be an additional cost, not included in this scope of work, and would be developed after appropriate scoping with the regulatory agencies. However, the consultant shall provide as a line item estimate the potential cost to complete both a DRI and an EIR. This information would be used for planning purposes of additional appropriations.

An analysis of Essential Fish Habitat may be required by the regulatory agencies, and a separate cost estimate for this effort should be provided as a line item additional cost. The Town's Shellfish Department will prepare and provide a written Shellfish Assessment of the shellfish resources within the potential project area. A separate line item cost should

be included to perform a more formal shellfish survey if required by the regulatory agencies.

This scope does not require the consultant to progress with the actual implementation of the above listed potential permits, but rather to determine what the potential scope, timeframe and costs that would be to obtain these permits.

6. Any other dredging requirements necessary, lacking in the town of Orleans' request, are expected to be noted and included in the Study Report.

### **Deliverables**

A Draft Report of all of the findings shall be generated and submitted to the Town. Eight (8) hard copies and one PDF file format.

After review and comment the Consultant shall generate eight (8) hard copies and one PDF file format. All files including powerpoint presentations, autocad files and other electronic reports shall be submitted in their original file format on three (3) CD-ROMS or DVD's.

### **Meetings/Public Participation**

The Consultant will be expected to attend an initial scoping meeting with Town officials and subsequent working meetings with Town staff as necessary. The Consultant shall provide a brief (one page) monthly written update of project status.

The Consultant will be expected to attend and present The Final Study Report to the Board of Selectmen in a public meeting.

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**TOWN OF ORLEANS  
CERTIFICATE OF NON-COLLUSION**

**Project Name: NAUSET ESTUARY DREDGING PROJECT**

Pursuant to M.G.L. Ch. 30B Section 10, the undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

\_\_\_\_\_  
(Signature of individual submitting bid or proposal)

\_\_\_\_\_  
(Name of business)

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STATEMENT OF STATE TAX COMPLIANCE

Project Name: **NAUSET ESTUARY DREDGING PROJECT**

Pursuant to Ch. 233 of the Acts of 1983, §49A(b),

I, \_\_\_\_\_, acknowledge that I am the authorized signatory for \_\_\_\_\_, whose principal place of business is at \_\_\_\_\_, and as such, do hereby certify under the pains of penalties of perjury that this company has complied with all laws of the Commonwealth relating to taxes.

Social Security or Federal ID Number \_\_\_\_\_

Subscribed and sworn to this \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_  
Notary Public

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**ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION:**

State of

County of \_\_\_\_\_ SS:

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me personally came and appeared \_\_\_\_\_ to me known, who, being by me duly sworn, did depose and say to me that he resides at \_\_\_\_\_, that he is \_\_\_\_\_ of \_\_\_\_\_, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was so affixed by the order of the directors of said corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Contractor's Signature

(Seal)

\_\_\_\_\_  
Notary Public Signature

My Commission expires on:

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**ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP:**

State of

County of \_\_\_\_\_SS:

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me personally came and appeared to me known, and known to me to be one of the members of the firm of described in and which executed the foregoing instrument and he acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Contractor's Signature

(Seal)

\_\_\_\_\_  
Notary Public Signature  
My Commission expires on:

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**TOWN OF ORLEANS  
INSURANCE REQUIREMENTS FOR INCLUSION  
IN ALL SPECIFICATIONS AND CONTRACTS**

**PROJECT: NAUSET ESTUARY DREDGING PROJECT**

Insurance. The Contractor shall carry and maintain in effect during the entire currency of the contract, at his own expense, the following kinds and minimum amounts of insurance in a company or companies approved by the Town of Orleans. Such insurance shall cover claims and suits which arise out of or result from the Contractor's execution of the contract work whether such execution by the Contractor himself or by any Subcontractor.

- 1)  Worker's Compensation as required by the Worker's Compensation Laws of the Commonwealth of Massachusetts and, in conjunction therewith, Employer's Liability with a minimum limit of \$500,000.00.
- 2)  "Broad Form" Comprehensive General Liability including, but not limited to, Bodily Injury, Personal Injury and Property damage Liability, Full Contractual Liability and liability arising from Explosion, Collapse and Underground Damage and all other applicable insurance necessary to carry out the contractual obligation to proceed under the contract. Minimum limit of liability \$2,000,000.00.
- 3)  Automobile Bodily Injury and Property Damage Liability for all owned, non-owned and hired automobiles operated in connection with the performance of the contract. Minimum limits of liability: Single limits of Property Damage and Bodily Injury \$ \$1,000,000.00
- 4) \_\_\_\_\_ Builder's Risk - Amount of the Contract
- 5)  Professional Liability in the amount of \$ 1,000,000.00.
- 6) \_\_\_\_\_ Errors and Omissions

Certificate of Insurance. Prior to beginning work under the contract, the Contractor shall furnish the Town of Orleans a Certificate of Insurance naming the Town as 1)  an additional insured or 2) \_\_\_\_\_ certificate holder acceptable to said Town evidencing the existence of the foregoing insurance coverage. Such Certificate also shall provide that the Town of Orleans will be notified at least 30 days in advance of the cancellation or non-renewal of any insurance covered by the Certificate.

