Supplement to April 2021 Draft Expanded Environmental Notification Form Nauset Estuary Dredging Project for Towns of Orleans & Eastham, MA

The following document provides supplemental information to the Draft Expanded Environmental Notification Form (EENF) prepared for the Towns of Orleans and Eastham for the Nauset Estuary Dredging project. The April 2021 Draft EENF was sent to the Towns of Orleans and Eastham for review and comment prior to formally filing with the Massachusetts Environmental Policy Act (MEPA) Unit. A copy of the Draft EENF can be found on the Towns web sites by using the following links:

https://www.town.orleans.ma.us/select-board/pages/nauset-estuary-dredging-project

https://www.eastham-ma.gov/select-board/pages/nauset-estuary-dredging-project

The following document provides supplemental information to the Draft EENF in response to questions and comments received from Town staff, Select Boards, and members of the Nauset Estuary Stakeholders Group. Public forums are currently scheduled for June 22 and 29, during which additional questions and comments will be addressed. Prior to filing with MEPA at the end of July, and as appropriate, the EENF will be revised to include the supplemental information included in this document.

Sediments

1. Sediment dredged from the Town Cove and Eastern Main Channel areas is planned for mechanical dredging with offloading to trucks at Goose Hummock public landing. Where will be sediment be trucked to?

Response: The proposed dredge material from Town Cove and the Eastern Main Channel is predominantly sand with some silt (i.e., clean silty sand). As such, the material is suitable for beneficial reuse as beach nourishment; however, the dredge areas are too far from available beaches using a conventional hydraulic pipeline dredge so mechanical dredging was identified as the best method of dredging. The sediment also has elevated red tide cyst concentrations and is not suitable to be pumped directly onto a beach for nourishment purposes. Several materials handling facilities on Great Western Rd. in South Dennis have been identified that can take the material. The South Dennis sites are permitted to take dredged materials and will be listed as potential disposal locations on the Nauset Estuary permit applications.

2. Sediments from the Priscilla and Mill Pond channels that are proposed for dune enhancement at the north end of Nauset Beach are not compatible with the existing dunes because they have a higher percentage of fine-grained material than the dunes.

Response: Sediment cores collected from the Priscilla channel show layering, with finer-grained material near the surface and coarser-grained sandy material below (EENF Section M). The cores also show coarser-grained sandy material in the northern portion of the Priscilla channel and more fine-grained material towards the south end of the channel. Grain size data for composited sediment samples (i.e.,

mixture of entire sediment core) show percentages of fines ranging from 10% in the north end of the channel to 21% in the south end of the channel. The remaining sediment is medium to fine-grained sand. These composited sample results are representative of what will be deposited in the dewatering basin. During dredging the sediments will be combined into a homogenous mixture of sediment containing between 79% and 90% sand and 21% to 10% fines.

Coastal dunes typically contain finer-grained sediments than coastal beaches and high energy marine environments. However, these Nauset Estuary dredged sediments are somewhat finer than the existing dunes at the dewatering site, which have less than 1% fine-grained material. The project calls for the finer-grained dredged sediment to be buried in the core of the dune where it will help to add resiliency to the dune landform. The dredged sediments will also be covered with 1-3 ft of native dune sediment. For this application, the slightly finer dredged material be used to add to the overall dune volume and elevation, which will improve the natural storm damage protection features of the resource.

Sediment cores from the Mill Pond channel are being collected this summer (summer 2021). The proposed channel extends from the Priscilla channel to the entrance of Mill Pond and does not extend into the deeper parts of the Pond where fine-grained sediments are known to occur. The current assumption is that the Mill Pond sediments in the dredge channel are similar to the Priscilla channel sediments and that the dredged material will be suitable for disposal in the dewatering basin. If the sediment cores show higher percentages of fines, it will be necessary to identify an alternate disposal location or make modifications to the channel design to avoid dredging the finer-grained sediments.

Channel Design

3. A 100-ft wide channel behind the barrier beach is not needed for safety and will have negative impacts on stability of barrier beach and will increase the area of impact.

Response: The project team has spoken with emergency first responders and members of the Fire Dept in Eastham and Orleans. Everyone expressed the need for a safe and navigable channel to ensure that emergency first responders can reach commercial and recreational boaters in distress, regardless of tide, day or night. Both Towns have and continue to work to address safety issues in the estuary. The Town of Eastham purchased additional watercraft that can be used to respond to incidents, and they also adjust the channel markers as needed and establish no wake zones. The Town of Orleans also has watercraft that is used to respond to emergency situations in the estuary. Records of emergency response incidents from both towns since 2016 show between 4 and 11 incidents per year in the estuary (Appendix A).

To evaluate the potential for dredging to adversely impact the stability of the barrier beach, the project team looked at changes in geomorphology (i.e., shape, size, location) of the barrier over the past 240 years. Figures D-1 and D-2 in the Draft EENF shows that the barrier follows a pattern of northerly growth punctuated by periods of inlet breaching to the south. Figure D-2 shows northerly migration between 1938 and 1994. A new inlet formed to the south in 1994 and for several years there were two (2) inlets. By 2001 the northern inlet closed, and the estuary was connected to the Atlantic by one (1) inlet. Since this time the barrier and inlet have steadily migrated to the north.

Westerly migration of the barrier beach and changes in the width of the barrier beach over the past 20 years were also evaluated during development of the Draft EENF. Figure D-3 of the EENF shows the only place with significant western migration of the barrier into the estuary is just north of Nauset Heights near the end of the Priscilla channel. The large overwash feature in this area has caused the barrier to widen and expand into the estuary. All other areas of the barrier so little to no rollover, or migration to the west. Figure D-4 in the Draft EENF shows changes in the width of the barrier beach from 2014 to 2019. The data show some narrowing of the barrier beach caused primarily by erosion along the ocean side of the barrier, rather than from the west side.

The proposed project includes a "no dredge zone" off the back (west) side of the barrier beach to avoid direct impacts to the barrier or the subtidal portions of the landform (see #4 below). This coupled with the evaluation of barrier geomorphology that shows minimal rollover into the estuary, indicates that the proposed project will not adversely impact the stability of the barrier beach.

The 100-ft wide channel behind the barrier beach will result in a greater area of impact than a 50-ft wide channel. The 100-ft wide channel was selected for the channel behind the barrier beach because it is the most dynamic part of the estuary with the strongest currents. The wider channel will take longer to shoal and will provide for greater maneuverability and public safety in areas where commercial and recreational boaters are often operating in the same space.

4. How was the 100 ft "no dredge zone" from the back of the barrier beach determined? Will the proposed channel adversely impact the stability of the barrier beach?

Response: The Draft EENF proposed a 100 ft "no dredge zone" off the west side of the barrier beach as a way to avoid impacts to the stability of the barrier beach. This 100 ft "no dredge zone" was based on the previously described evaluation of barrier beach geomorphology which showed little westerly migration along the northern end of the barrier beach over the past 20 years.

Figure 1 shows the proposed dredge channel in relation to 100-ft, 200-ft, and 300-ft "no dredge zones". In most areas, the proposed channel is more than 300 ft away from the barrier beach. Two exceptions are shown by the red circled areas. As currently proposed, 1.0% of the channel is within 100-ft of the barrier, 6.5% is within 200-ft, and 22.0% is within 300-ft of the barrier. By expanding the "no dredge zone" to 300 ft, which was discussed during earlier phases of the project, it would be necessary to shift the dredge channel further to the west into the shoals, resulting in an increase in the volume of dredging by approximately 25,000 cubic yards (Figure 2). Expansion of the "no dredge zone" from 100 to 200 ft would provide an additional buffer from the back of the barrier beach and would also minimize increases in the required dredge volume to approximately 5,000 cubic yards (Figure 2).

To provide an additional measure of protection for the barrier beach and minimize impacts to the required dredge volume, the EENF will be modified to include a 200 ft "no dredge zone" from the back of the barrier beach. The engineering plans will be revised to reflect the 200 ft "no dredge zone". Dredging within 200 ft of the barrier beach will have no adverse impacts on the stability of the barrier.

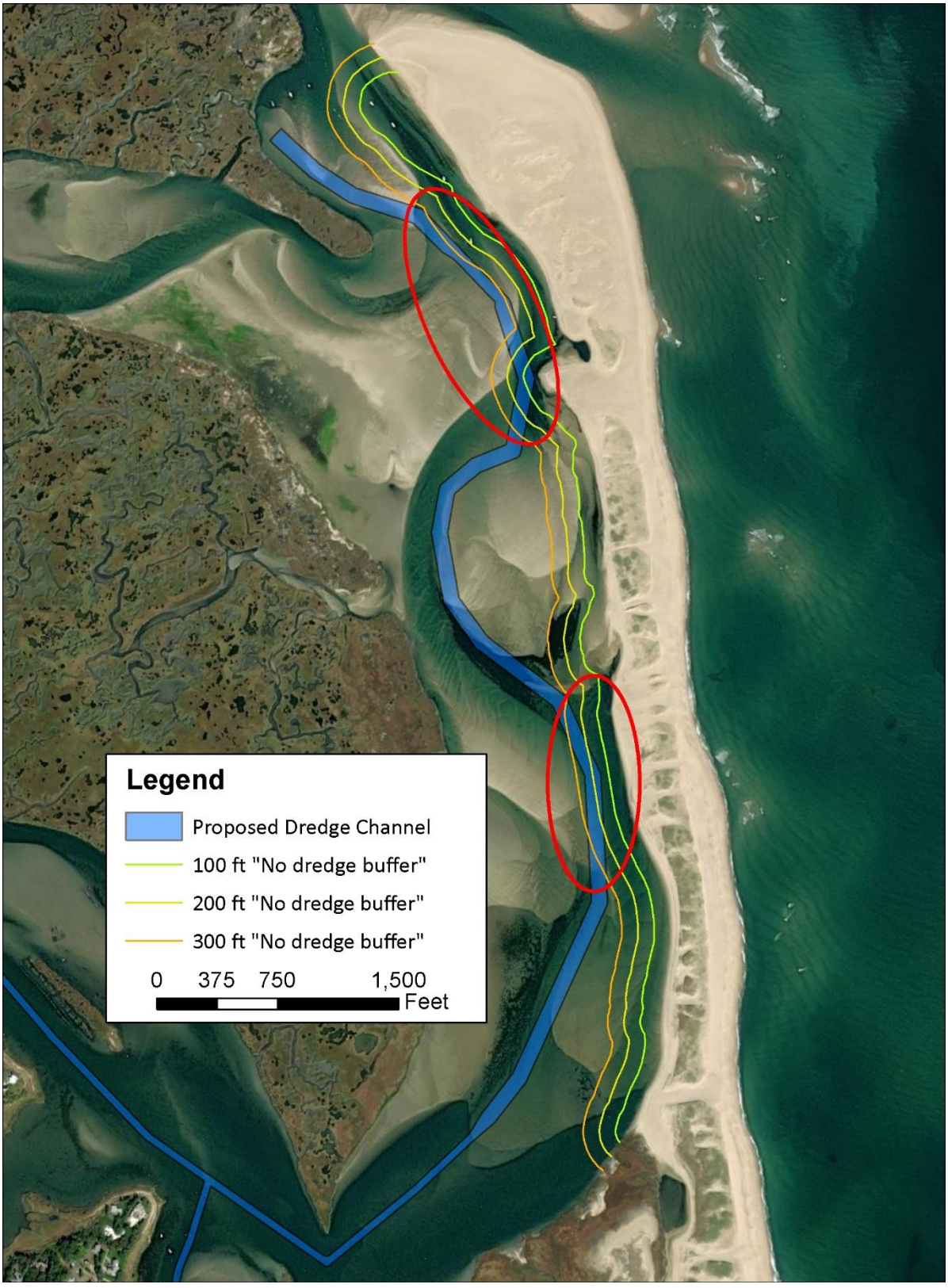


Figure 1. **Proposed dredge channel in relation to "no dredge zones" off the back of the barrier beach.**

Figure 2. Adjustments to dredge channel required with 200-ft and 300-ft "no dredge buffers" off the back of the barrier beach.

Assessment of Alternatives

5. The Do Nothing scenario should be included in the assessment of alternatives for Element #1: Dredge Channel Layout.

Response: The 1-1: Do Nothing alternative was added to the Element #1: Dredge Channel Layout selection matrix (EENF Table F-1). After adding this alternative and adjusting the rating system to address comment #6 below, the 1-1: Do Nothing alternative received a higher score than the other dredge channel layout alternatives. The next highest-ranking layout was the preferred alternative proposed in the Draft EENF (1-2B: Access between Inlet, Town Cove and Priscilla). That the Do Nothing alternative scored highly is not surprising, since there are no costs or environmental impacts associated with maintaining the *status quo*. More importantly however, the Do Nothing alternative does not meet the project goals to improve navigation and public safety within Nauset Estuary. When taking this into consideration, Alternative 1-2B: Access between Inlet, Town Cove and Priscilla, received the highest ranking and was consequently chosen as the preferred channel layout alternative.

6. The rating system for Elements #1, #2, and #3 of the project in the assessment of impacts section of the Draft EENF is flawed. All criteria should be rated on the same scale.

Response: The rating system presented in the Draft EENF was developed based on input from the Eastham and Orleans Select Boards provided in March 2019. The project team received feedback from the Select Boards to weight certain factors higher based on importance to the Towns (i.e. greater weight on # businesses served and less on frequency of dredging and permittability). The rating system is a multi-variable decision tool that uses value judgement to rank and score the variables, and as such more weight can be given to variables that are considered important. With this type of decision tool there is no requirement that the criteria be rated on the same scale.

In response to this comment, the project team switched to a rating system for Elements #1, #2, and #3 that followed a standard 0 to 10 scale for each criteria. Results of the revised assessment of impacts resulted in no changes to the preferred alternatives that were proposed in the Draft EENF. Updated alternatives matrices are provided in Appendix B. That the preferred alternatives received the highest rankings with the revised scoring system, indicates the robust nature of the selected alternative.

Sidecast Dredging

7. Do the calculations for temporary impacts for sidecast dredging include the 60-80 ft area where the sand will be placed/sidecast to?

Response: In the Draft EENF temporary impacts are considered to be those along the pipeline corridor and areas of construction access (i.e., equipment access to bring pipeline out/along beach). Permanent impacts are considered to be anything within the direct footprint of the dredging, sidecast area, or the dewatering basin. Table B-1 of the Draft EENF shows 16.2 to 16.6 acres of permanent impact state protected resources (i.e., land containing shellfish, land under the ocean, land subject to coastal storm flowage, NHESP habitat, and outstanding resource waters) from the proposed sidecast dredging.

8. Sediment sidecast is an improvement over removal from the system, but by placing it 60-80 ft from dredged area, it will be readily available for redeposition by strong currents.

Response: Sidecast dredging is commonly used in other areas of the country and is the preferred method of dredging in shallow inlets and waterways where high current velocities and shallow waters make use of a conventional hydraulic pipeline dredge difficult to operate[1]. Connections to discharge pipelines with a conventional hydraulic pipeline dredge can be difficult in areas with high current velocities. The sidecast dredge method does cast the material back into the waterway rather than remove it, but flow concentration in the deeper dredged part of the channel will help to maintain the channel. The potential for sediment to be transported back into the channel is higher with the sidecast dredge method than it is with a conventional hydraulic pipeline dredge. However, given the absence of viable beneficial reuse sites within reach of a hydraulic pipeline dredge operating behind the barrier beach, the sidecast dredge offers a viable alternative for creating a navigable channel.

9. Sidecast dredging is not appropriate since it doesn't remove material from the dynamic area and is able to migrate back into the channel

Response: See answer to #8.

10. Method of sidecast dredging was briefly discussed and then discarded during earlier discussions

Response: The project team discussed the possibility of sidecast dredging with the Select Boards and the Nauset Estuary Stakeholders Group. Sidecast dredging was identified as a preferred method of dredging for areas behind the barrier beach if it can be approved and permitted by the regulatory agencies.

11. Sidecast dredging should not impact access to Cable Creek

Response: The project team agrees that sidecast dredging should impact access to Cable Creek. The sidecast dredge has the ability to rotate the discharge boom so that dredged material can be directed at different angles to the dredge. In the area where Cable Creek meets the main channel behind the barrier beach, the discharge booms will direct material to the shoals on either side of Cable Creek to avoid impacts to navigation to/from the Creek. The engineering plans will be revised to reflect a zone of no sidecast discharge in the Cable Creek channel.

[1] US Army corps of Engineers, 2015. Dredging and Dredged Material Management. Engineering Manual EM 1110-2-5025.

Shellfish Relay

12. Shellfish relays are proposed as a form of mitigation for project impacts to shellfish resources. Has a plan for the shellfish relays been developed yet?

Response: A shellfish relay plan was not included in the Draft EENF. In response to this comment, the project team has worked with staff from Orleans and Eastham Natural Resources Departments to develop a Shellfish Relay Plan. A copy of the Plan is provided in Appendix C.

13. It will be important to evaluate whether the shellfish relays are sufficient in mitigating impacts to shellfish resources.

Response: Staff from the Natural Resources Departments of both towns will be closely involved with the shellfish relay program. They will maintain records for the relay program including shellfish species and densities prior to dredging, number and type of shellfish relayed, and quantities and species harvested from the relay areas. Regular reports on the shellfish relay program will be reviewed by Town staff, Massachusetts Division of Marine Fisheries, and NOAA National Marine Fisheries to evaluate success of the relay and to adaptively manage the program to ensure a productive mitigation program. Other possibilities for mitigation, such as a contribution towards a shellfish reseeding program or changes to the dredge program, can be adopted through adaptive management if the relays are not sufficient in mitigating impacts to shellfish.

14. How much will the shellfish relays cost?

Response: Costs for the shellfish relays have not been developed yet. Cost estimates will be developed and provided the Towns separately from the MEPA EENF process.

Resource Area Alterations/Impacts

15. The EENF lists permanent alterations to the resources. Is mitigation for these impacts proposed?

Response: Mitigation is proposed in the form of a shellfish relay and dune enhancement in the area north of Nauset Public Beach. Time of year restrictions for all in-water and beach work will be followed to avoid impacts to estimated and priority habitat, finfish, and shellfish resources. These measures will serve to avoid and/or minimize impacts to land containing shellfish, estimated habitats of rare wildlife, coastal dunes, and land under the ocean. Additional mitigation is not proposed at this time.

16. Dredging a 100-ft channel behind barrier beach will impact the stability of the barrier beach.

Response: See response to questions 3 and 4 above.

17. The Draft EENF states that dredging within the estuary is not expected to result in changes in marine productivity, but the evidence for this statement has not been documented.

Response: The Massachusetts Wetlands Regulations 310 CMR 10.25(3)(d) require that improvement dredging for navigational purposes affecting land under the ocean shall be designed and carried out using the best available measures so as to minimize adverse effects on marine fisheries and wildlife habitat caused by changes in marine productivity that result from the suspension or transport of pollutants, the smothering of bottom organisms, the accumulation of pollutants by organisms, or the destruction of marine fisheries habitat or wildlife habitat. As stated in the Draft EENF, changes in marine productivity as a result of these actions are not expected. Supporting evidence includes the following:

- Extensive sediment chemistry testing for volatile organics (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), extractable petroleum hydrocarbons (EPHs), and metals that showed non detect/below threshold levels of these pollutants in the Nauset Estuary sediments proposed for dredging. As such, changes in marine productivity will not be caused by the suspension or transport of pollutants or by the accumulation of pollutants by organisms.
- Changes in marine productivity caused by smothering of bottom organisms could occur by settling of sediments resuspended during the dredging operation or by direct placement of dredged material on the seafloor. Studies of sediment resuspension during dredging show that the vast majority of resuspended sediments resettle close to the dredge within 1-hour, and only a small fraction takes longer to settle.[2] [3] [4] Field studies have also shown that sediments typically settle within 50 meters from the point of dredging. [5] While variables like sediment size and current velocities can impact settling rates and locations, most studies have shown little impact to water quality, benthic organisms, and marine productivity from dredging operations. At Nauset Estuary the coarser-grained sandy material is expected to settle out of suspension in the immediate vicinity of the dredge. The finer-grained sediments in the Priscilla and Mill Pond channels will be dredged using a hydraulic pipeline dredge, which causes less sediment resuspension than mechanical dredges. Sediment resuspension from mechanical dredging in the Town Cove and Eastern Main channels could be managed through the use of an environmental bucket and/or by setting limits on the vertical bucket speeds. Therefore, changes in marine productivity caused by settling of resuspended sediments is not expected to be an issue, and can be further managed through construction protocols, if desired. Sidecast dredging in the channel behind the barrier beach will cast 0.5 to 2 ft of sandy material across the seafloor. Benthic organisms in the area are well suited to living in a dynamic environment

[2] Wright, T.D., 1978. Aquatic Dredged Material Disposal Impacts. Synthesis of Research Results, Dredged material Research Program, Technical Report DS-78-1, U.S. Army Engineer Waterways Experiment Station Environmental Laboratory, Vicksburg, MS.

[3] Van Oostrum,R.W., Vroege, P., 1994. Turbidity and Contaminant Release During Dredging of Contaminated Sediments. Proc. Of the Second International Conference on Dredging and Dredge Material Placement, Dredging, '94.

[4] Grimwood, C., 1983. Effects of Dredging on Adjacent Water. ADCE Journal of Environmental Engineering 109(1):47-65.

[5] MEC Analytical Systems, Inc., 2002. USACE Pilot Capping Project – Phase 1 Water Quality Monitoring Data – Final Report. Prepared for the US Army Corps of Engineers and the Southern California Coastal Water Research Project Authority, Los Angeles,CA.

with shifting sediment and are expected to recolonize rapidly. As such, changes to marine productivity caused by smothering of bottom organisms is not expected with the proposed project.

- Finally, the dredging will be required to adhere to time of year restrictions for in-water work that are designed specifically to avoid and/or minimize impacts to marine productivity.

18. Will changes to channel hydrodynamics impact shellfish habitat and water quality

Response: Numerical modeling conducted during the initial 2016 feasibility study indicated that the dredging will result in a small increase in tide range, but the project is not expected to result in measurable changes in water quality or current velocities that could impact shellfish habitat.

19. Impacts of settling of silts and clays on shellfish beds must be considered

Response: See response to question #17 above.

Restoration of Disturbed Dune Areas

20. What dune areas are anticipated to be disturbed?

Response: Coastal dunes in the area of the dewatering basin north of Nauset Public Beach will be disturbed during dredging of the Priscilla and Mill Pond channels (see Draft EENF Figure E-8). Once the dredging is complete and the sediments have dewatered, grades across the dewatering basin will be restored to their pre-existing conditions and a secondary dune will be established for added resiliency.

21. Have you calculated the areas of dune disturbance?

Response: Construction of the dewatering basin will impact 7 acres of coastal dune. All 7 acres will be restored upon completion of the project by covering the dredged material with a 1-3 ft thick layer of native dune sediment, constructing a secondary dune with a higher elevation that what currently exists, and replanting with Cape American beach grass. Areas of coastal dune between the dewatering basin and the seaward end of Callanan's Pass will be temporarily disturbed during placement and pick up of the dredge pipeline. This work will result in temporary impacts to 0.5 acres of coastal dune. All disturbed areas will be regraded to original elevations and any areas of disturbed vegetation will be replanted with Cape American beach grass.

22. Who will be responsible for regrading and replanting these areas?

Response: It will be the responsibility of the Towns selected contractor to ensure that all coastal dune areas are restored, regraded, and planted according to the plans and specifications for the project.

Post Construction Monitoring & Maintenance Plan

23. Has a Post Constructing Monitoring and Maintenance Plan been developed yet?

Response: Yes, Section J of the EENF contains the Post Construction Monitoring and Maintenance Plan.

Permission of Private Property Owners

24. The dredge pipeline between the Priscilla and Mill Pond channels and the dewatering basin north of Nauset Public Beach will primarily be on property owned by the Town of Orleans. Exceptions to this occur at the north end of Nauset Heights where the pipeline is proposed to cross property owned by the US Government (Cape Cod National Seashore), and two (2) private properties. Have these property owners been notified and has permission been granted for the use of their property?

Response: Staff from the Cape Cod National Seashore (CCNS) are on the Nauset Estuary Stakeholder Group and updates have been provided to the CCNS since the beginning of the project. As a result, the CCNS was informed that the pipeline would cross land owned by the US Government (Figure 3). It is expected that questions surrounding use of US Government property for this use will be reviewed during the National Environmental Policy Act (NEPA) review and permitting process.

The project team has contacted the two (2) private property owners to describe the project and the need to temporarily lay the dredge pipeline on their beaches. Impacts to these beaches will be for approximately 9 weeks during the winter when the Priscilla and Mill Pond channels are being dredged. The project team will continue to coordinate with these private property owners to address their concerns and to request permission to use their beaches.

Figure 3. **Dredge pipeline route between the Priscilla channel and the dewatering basin north of Nauset Public Beach. The dredge pipeline crosses property owned by the Town of Orleans (unshaded), US Government (shaded blue), and two private property owners (shaded green).**

Construction Related Activities/Impacts

25. The dredge, support boats, and booster pumps needed for the dredging, and the excavator and front-end loaders required for the dewatering basin will require regular refueling during the period of construction. Where will fuel for this equipment be stored?

Response: A fuel service company will be contracted to provide regular fuel deliveries to the site for the duration of the project. This will occur much the same as fuel trucks delivering home heating oil.

- For the Town Cove and Western Main Channel dredging work all fuel deliveries will be made from a fuel truck to the primary support boat via the Goose Hummock Town Landing. The fuel will be pumped into a diesel transfer tank located on the primary support boat. The support boat will then pump the fuel into the reserve tanks on the dredge. It is estimated that refueling for the mechanical dredging will be required every other day for the duration of the project.
- For sidecast dredging in the Channel Behind the Barrier Beach and the Eastern Main Channel all fuel deliveries will be made from a fuel truck directly to the dredge superstructure via the Priscilla Rd. Town Landing. The support boats will also be refueled from the Priscilla Rd. Town Landing. It is estimated that refueling form the sidecast dredging equipment will be required on a weekly basis.
- For hydraulic pipeline dredging of the Priscilla and Mill Pond channels fuel deliveries will be made from a fuel truck directly to the dredge superstructure via the Priscilla Rd. Town Landing. It is expected that refueling of the dredge will be required on a weekly basis. Daily fuel deliveries will be made from the Priscilla Rd. Town Landing for the support boats and the first in-line booster pump, and from Callanan's Pass for the second booster pump.
- For the equipment needed for construction and operation of the dewatering basin, all fuel deliveries will be made from the north end of the Nauset Public Beach parking lot.

26. Does the Barnstable County Dredge have equipment that can be used in the estuary? Has it been proven that the equipment can operate in the estuary?

Response: The Barnstable County Dredge (BCD) has two dredge superstructures. The smaller Cod Fish II is an Ellicott 670 and the larger Sand Shifter is an Ellicott 870. The BCD also has one (1) booster pump and a variety of support boats. The project team has been in contact with the BCD regarding work in Nauset Estuary. Use of the Cod Fish II or Sand Shifter has not been completely decided at this point. Maximum current velocities in the channel behind the barrier beach are near the upper limit of safe operations with the Cod Fish II without modifications. If used in this part of the estuary, dredging would likely be shut down during periods of maximum current velocity. The Sand Shifter is capable of operating in higher current velocities than the Cod Fish II and has a greater pumping distance. In either case, a second booster pump would need to be rented to reach the dewatering basin north of Nauset Public Beach from the channel behind the barrier beach or the Priscilla and Mill Pond channels. The BCD does not have a sidecast dredge but they have indicated interest in procuring one as a number of inlets/harbor on the Cape could easily be maintained using this method of dredging. A sidecast dredge is the optimum type of dredge equipment to use for the channel behind the barrier beach because of the shallow water depths, higher current velocities, and extensive pumping distances required with the

conventional hydraulic pipeline dredge. The Ellicott hydraulic pipeline dredges can be retrofitted into a sidecast dredge.

27. The safety of dredge operations in Nauset Estuary where there are high current velocities is a concern.

Response: Because of the challenging operating conditions in Nauset Estuary, primarily in the channel behind the barrier beach, it will be important to utilize an experienced dredge crew. The Town of Orleans Dredge Purchase Feasibility Study recommended that the BCD with their experienced crew be contracted for initial dredging behind the barrier beach to evaluate performance of the dredge equipment in dynamic areas of the estuary.

28. How will the hydraulic/sidecast dredge get into the estuary? Will they have to come in on the highest spring tide of the year and stay in the estuary for 1 entire year?

Response: It is expected that the hydraulic and sidecast dredge superstructures will be brought into the estuary through the inlet, traveling north through the ocean from Chatham Harbor. Passage through the inlet will be restricted to high tide and possibly even a monthly spring high tide. Once the project is complete the dredge equipment will leave through the inlet on a high tide and will not be trapped in the estuary for an entire year.

29. If the dredge has to be brought by truck and launched at Goose Hummock, has the cost for this been factored into the cost estimate?

Response: If depths in the mouth of Nauset Estuary are deemed insufficient to allow the hydraulic/sidecast dredge equipment to enter the estuary through the inlet, the dredge will be disassembled, brough over-the-road, assembled on-site, and launched at Goose Hummock and/or Cove Road landing(s). Costs associated with this method of dredge delivery would be determined by the contractor at the time the project is put out to bid.

30. Will the booster pumps required for the Priscilla and Mill Pond channel dredging be noisy? Can the sound be muffled in any way?

Response: Two (2) booster pumps will be required for the Priscilla and Mill Pond channel dredging. The first in-line booster will be on a barge located near the east end of the Priscilla channel, and the second in-line booster will be located on the beach near the base of Callanan's Pass on Town of Orleans property (see Draft EENF Figure C-7). Working hours for the booster pumps will generally be limited from 7 AM to 3 PM during the period of dredging, which will occur for an approximate 3-week period between mid-October and mid-January. To minimize noise disturbance from the booster pumps, which can be loud, the construction contractor can be required to use residential grade silencers (i.e., mufflers). The silencers would reduce the decibel levels to legal levels.

31. Dredging in the channel behind the barrier beach is estimated to take approximately 50 days. With weather and equipment repair delays it could be considerably longer. Will the time of year restrictions for dredging allow for more than 50 days of work?

Response: Time of year restrictions for all in-water work are expected to allow dredging between mid-October and mid-January. This allows for an additional 40 days of dredging above the estimated 50 days.

32. How many trucks per day will be required to remove dredged sediment from the Goose Hummock Town Landing?

Response: It is estimated that mechanical dredging of the Town Cove and Western Main Channel reaches will take approximately 61 days to complete. Assuming tri-axle roll-off containers with 16 cubic yard capacity are used, it will take approximately 10 truckloads each day to remove the dredged sediment from Goose Hummock. This number could be reduced to 6-7 truckloads each day, if larger, trailer-sized (26 cubic yard) containers are used.

33. Trucking dredged sediment away from the Goose Hummock area will cause an interruption to the mixed residential/commercial area. A traffic study should be performed to evaluate impacts to the area and to assess the maneuverability of trucks entering/exiting the site.

Response: Trucking the dredged sediment away from the Goose Hummock Town Landing will occur over the estimated 61 days of dredging during the period mid-October to mid-January. Businesses in the area are either closed during this period or experiencing a reduction in activity. Owners of the Orleans Inn and Goose Hummock Marine Shop have been apprised of the proposed activity and are in support of the project. The trucking routes to/from the site will not enter any residential areas; however, the Towns could post notices about increased truck traffic associated with the project so that residents can adjust accordingly.

The road layout around the Goose Hummock area does not present any unusual circumstances that would make the trucking operations difficult. In fact, the site and nearby road layout provides an ideal location for trucking. Access to and from the site will likely be from Rt. 6A through the intersection in front of the Orleans Waterfront Inn. It is possible that trucks could also use the road by the Knack to exit the site. The left-hand turn from the intersection is greater than 90 degrees, but there is plenty of room to make the turn onto Old Country Rd if the trucks can use the extra space provided by the parking area at the Inn. The trucks could also pull straight into the Windmill parking area and then back down Old Country Rd. to the Town Landing. The project team does not feel that a traffic study is necessary.

34. Can traffic along Callanan's Pass be minimized?

Response: The Draft EENF indicates that Callanan's Pass may be used as an access point for delivery of the dredge pipeline to the beach and dune areas. To minimize this traffic impact on local residents, alternate routes for delivery of the pipeline have been evaluated and found to be preferable. These

include an access route at the south end of Nauset Public Beach where the pipeline could be transported through the existing beach access path and then north along the beach. Alternatively, the pipeline could be floated into the estuary through the inlet and transported to the beach through the overwash/barrier beach at the eastern end of the Priscilla channel. Since both of these alternatives are preferrable from a logistics standpoint, the access route for the pipeline along Callanan's Pass will no longer be pursued.

Delivery of the second in-line booster pump will be via Callanan's Pass. The work will require one day for delivery and one day for retrieval, with all work taking place between mid-October and mid-January. Fuel deliveries to the booster pump will also take place via Callanan's Pass. It is expected that the booster pump will be fueled once daily from a delivery truck, similar to the trucks that deliver home heating oil.

35. How will work at the dewatering area north of Nauset Public Beach impact the existing footpaths from Nauset Heights to beach?

Response: There are currently two footpaths through the dunes from the southern end of Nauset Heights to the beach. One connects Surf Path to the beach and the other connects areas north of Inlet and Cliff Roads to the beach. A third path runs along the landward/back side of the dune between the north end of Inlet Road and Callanan's Pass. Figure 4 shows the location of the proposed dewatering basin and dredge pipeline in relation to these paths. The location of the dewatering basin will require that the southern footpath between Surf Path and the beach be closed during construction. Access to the beach via the northern footpath will not be interrupted. Similarly, foot traffic along the third path on the back side of the dune will also remain open during construction. The dredge pipeline is proposed to run along the existing footpath south of Callanan's Pass; however, the pipeline can easily be stepped over and should not present an impediment to beach goers.

Closure of the Surf Path access path and all construction in the dewatering area is expected to last approximately 9-12 weeks during the period between mid-October and mid-January. Once construction is complete and the area is restored, the access along the footpath will be restored.

Figure 4. Proposed dewatering basin and dune enhancement area north of Nauset Public Beach.

36. Will the dewatering area be used multiple times? What areas would be used for dewatering if future maintenance dredging of the Priscilla and Mill Pond spur channels is required?

Response: The dewatering area north of Nauset Public Beach is planned for use once during dredging of the Priscilla and Mill Pond channels. Once the dredging is complete and the sediments have dewatered, the primary dune will be restored, and a secondary dune will be constructed along the western edge of the dune. The secondary dune enhancement will help to build resiliency to the impacts of sea level rise and climate change. Alternate plans will be required for dredged materials dewatering if future maintenance dredging of the Priscilla and Mill Pond spur channels is required. Depending on conditions of Nauset Public Beach at the time of the maintenance dredging, it may be possible to dewater the material at the public beach and beneficially reuse it for added resiliency on site.

37. How long will it take to build and restore the dewatering area?

Response: Work at the dewatering basin is expected to take approximately 9-12 weeks. Construction of the dewatering basin is estimated to take 3-4 weeks and the actual dredging is estimated to take 1.5-3 weeks. Restoration of the dune and construction of the secondary dune after the dredging is complete should take an additional 3-4 weeks.

38. Does the proposed project require management of material at the dewatering basin?

Response: During the dredging phase of the project there will be heavy equipment (i.e., excavator, front end loader) managing sediment in the dewatering basin. While it is expected that the material will dewater quickly due to the percentages of sand in the dredged slurry, it may be necessary to move and/or regrade material within the basin to facilitate the dewatering process.

39. The Draft EENF did not address the transportation section of the application, but there will be a significant number of trucks taking material away from Goose Hummock.

Response: The proposed project does not trigger any of the Transportation thresholds for filing an ENF or EIR. Consequently, the Transportation section of the ENF application is not required.

Use of Center for Coastal Studies Data

40. The Town of Eastham has contracted with the Center for Coastal Studies (CCS) to complete studies focused on mapping the future and current form/location of the barrier beach, and evaluation of finfish and macroinvertebrates in the estuary. These studies are due to be completed in late spring 2022. Where do these studies fall into the permitting process?

Response: The project team only recently became aware of the studies that the CCS has been contracted to complete. Assuming the EENF is filed at the end of July, the Secretary's Certificate with a Scope for the EIR will be issued on September 10, 2021. It would be extremely helpful to have the CCS study findings to include in the EIR; however, it is expected that the EIR will be complete and ready to

submit prior to the spring of 2022. The Towns should consider whether they want to delay submitting the EIR to allow the CCS study findings to be included.

Project Need

41. Improvements to public safety should not be considered as a reason to dredge the estuary.

Response: Improvements to public safety have always been one of the goals of the project. As indicated in the response to question #3, emergency first responders and members of the Fire Dept in Eastham and Orleans expressed the need for a safe and navigable channel to ensure that emergency first responders can reach commercial and recreational boaters in distress, regardless of tide, day or night.

42. The need to dredge the estuary in order to support local economies, tourism and natural beauty of area is flawed, since the project will bring more boats to an already busy area and there will be dredge equipment in estuary for much of each year.

Response: The primary goals of the project, to improve navigation and public safety for commercial and recreational users of Nauset Estuary, have been clearly stated in the EENF. Ancillary benefits of the project are that it will support sectors of the local economy that are focused on the marine environment, including a portion of the economy driven by tourism. There is no reasonable indication that the natural beauty of Nauset Estuary will be adversely impacted by the proposed project, nor is there evidence that the project will result in a significant increase in commercial or recreational boaters. Dredge equipment will be in the Town Cove, Western Main Channel, Priscilla, and Mill Pond Channels for up to 3 months every 8 to 15 years, and in the Channel behind the Barrier Beach for up to 3 months potentially every year. The presence of dredge equipment will result in a temporary impact to the natural beauty of the estuary.

Consistency with Local and Regional Planning Documents

43. The assumptions in the Draft EENF regarding Eastham's Strategic Plan (ESP) with regard to improvements to modes of transportation are inaccurate.

Response: When assessing consistency with local and regional plans, the EENF interpreted the proposed project as being consistent with the ESP, which includes "strategies to improve safety for all modes of transportation". Although the ESP does not state that vessel navigation is excluded as a mode of transportation, Town Officials have clarified that this strategy should only apply towards creating "complete streets". As such, the Local and Regional Consistency text of the EENF will be altered to clarify this point. In addition, Town Officials have also noted the ESP "does not view dredging as improving safe travel for all users for all modes of transportation" or as "providing all members of the public access to recreation". These points will be clarified in the EENF.

44. The no dredge alternative also meets the open space objectives of the local plans (to maintain semi-rural character of Town for recreation and to work towards harmony between the natural environment and local culture, as well as protecting coastal and estuary environments).

Response: Agreed, the no dredge alternative does meet the open space objectives of the local plans. However, Section III.B. of the Draft EENF application specifically asks whether the proposed project is consistent with the open space objectives of the local plans. The preferred dredging alternative has been designed to be as consistent as possible with open space objectives, while also achieving the project goals. If all coastal projects were designed only based on open space objectives, there would be no opportunity to consider economic or development interests benefiting coastal residents and businesses.

45. The statement that the proposed project will result in substantial public benefit to the economies of Eastham and Orleans is grossly overstated.

Response: The proposed project will benefit business owners located on the estuary and others in the Towns that provide marine related services. To the extent that these businesses support tourism in the area and employ local residents, the project will also benefit these sectors of the local economy. The EENF will be revised to recognize that the proposed dredging project will benefit these select sectors of the local economy.

46. Benefits of the project on economic activity and employment centers is over-stated. There will be no impact to cultural resources or low-density, sprawling development, but there will be negative impacts to natural resources from increased boat traffic.

Response: Recognizing that the proposed dredging project will benefit select sectors of the local economy that focus on commercial and recreational uses of the estuary, the benefits of the proposed project for the local economies and employment centers will be modified in the EENF.

The proposed project does not aim to increase boat traffic, nor is there a reasonable indication that the proposed project will result in a significant increase of commercial or recreational boaters. Rather, the project is intended to benefit *existing* resource users and boaters. Those who are already familiar with the area, either as a commerce center or as natural environment, are likely to continue use of the area while those who do not utilize the estuary system currently are unlikely to become aware of or seek out the estuary as a result of the proposed project. In addition, a variety of mitigation measures (Section I of the Draft EENF), as well as a Monitoring and Maintenance Plan (Section J of the Draft EENF), have been developed to minimize project impacts on natural resources.

47. Dredging will negatively impact open space areas on the land which will have to watch dredge equipment in the estuary for much of each year.

Response: Although dredging equipment may be present in the channel behind the barrier beach for up to 3 months each year, the inconvenience of a temporary disruption in view during the winter season

should be considered minimal in comparison to the open space benefits of the proposed dredging project, which include increased navigability for recreational users to experience additional viewpoints and open spaces not accessible by land. Due to the varied nature of recreational uses of the estuary, the dredge equipment during fall and winter seasons will only be visible for a relatively low portion of time during resource users' interactions with the beach and estuary. The presence of dredge equipment on the beach, and the effect on open space views, will be added to the Local and Regional Consistency section within the EENF.

48. Statement that the project is consistent with the Eastham Harbor & Waterways Management Plan (TEHWMP) is wrong since that plan refers to Rock Harbor and cannot be extrapolated to Nauset Estuary.

Response: The TEHWMP only specifically mentions Nauset Estuary dredging when mentioning "discussions with Orleans about dredging in Nauset Harbor are ongoing". Town Officials have clarified that dredging goals listed in the plan refer only to Rock Harbor. Language referencing the TEHWMP in the EENF will be revised to clarify that the Dredging Management Plan outlined in the TEHWMP has a "focus on Rock Harbor" and that the priorities outlined therein are not in reference to the proposed Nauset Estuary dredging project, since a plan regarding management of Nauset Estuary has not been formally prepared by the Town of Eastham.

49. There are significant land uses adjacent to the project that have not been considered. These include the estuary environment, Land Under the Ocean, and properties on the western boundary of the estuary that become more vulnerable to storm waves if the project adversely impacts the protective barrier beach.

Response: Information on the estuary environment and on Land Under the Ocean (LUO) including condition of the existing environment (EENF Section D), project impacts (EENF Section F), and proposed mitigation actions (EENF Section I) are discussed in detail throughout the Draft EENF. Additional information related to the natural environment of the estuary, specifically LUO, will be added to the Compatibility with Adjacent Land Uses section of the Local and Regional Consistency document within the EENF. For additional information related to anticipated impacts of the project on the stability of the barrier beach see responses to comments #3 and #4 above.

50. Is the driver for the project the 9 impacted commercial vessels that moor near the entrance to Nauset Estuary?

Response: Section C 1.0 of the Draft EENF provides a detailed description of the commercial and recreational users of the estuary. The project will benefit users of the thirteen (13) town landings, twenty (20) mooring areas, numerous private property owners with marine craft, and businesses at Goose Hummock Marina and Nauset Marine. Benefits of the project extend well beyond the commercial vessels that moor their boats near the entrance to the estuary.

51. Lack of safety incidents in estuary/behind barrier beach means public safety is not a reason to dredge.

Response: As indicated in the response to question #3, emergency first responders and members of the Fire Dept in Eastham and Orleans expressed the need for a safe and navigable channel to ensure that emergency first responders can reach commercial and recreational boaters in distress, regardless of tide, day or night. Records of emergency response incidents from both towns since 2016 show between 4 and 11 incidents per year in the estuary (Appendix A).

52. Data on finfish and lobster landing declines since 2013 provided in the Draft EENF do not definitively indicate that shoaling in the estuary is cause of the decline.

Response: In addition to showing a decline in finfish and lobster landings in the estuary since 2013, the Draft EENF also indicates that the number of permits issued for lobster and finfishing in Nauset Estuary began to decline around 2012 because of the difficulties associated with navigating between the inlet and the town landings and moorings. The EENF acknowledges a likely link between the decline in landings and the reduced number of permits issued. The EENF will be revised to reference other possible causes for the decline in finfish and lobster landings, such as natural fluctuations in populations. However, the data on finfish and lobster permits issued clearly shows a decline since 2012 and interviews with local fishermen indicate that shoaling and difficulties with navigation in the estuary are the reason.

53. Does a greater number of boats from the proposed project drive the need for a 100-ft wide channel, or does the wider channel create a safety problem by bringing too many boats?

Response: The proposed project does not aim to increase boat traffic, nor is there a reasonable indication that the proposed project will result in a significant increase in the number of commercial or recreational boaters. The 100-ft wide channel was identified as the preferred alternative for the channel behind the barrier beach based on a number of logistical and environmental criteria (see Appendix B). Bringing a greater number of boats to the estuary was not one of the criteria; however, benefits to boater safety from a wider channel in an area where strong tidal currents and conflicts between commercial and recreational boaters often present safety hazards was considered.

54. The Draft EENF Section H addresses compliance of the proposed project with Mass Department of Environmental Protection (DEP) regulations 310 CMR 9.06 and 9.07 for discharge of dredged material and improvement dredging in Outstanding Resource Waters (ORWs). This section of the Draft EENF indicates that the project will facilitate enlargement of public landings and mooring fields and makes it clear that the Town of Orleans wants to increase boat traffic in the estuary. The impacts of increased boat traffic must be evaluated.

Response: The Draft EENF indicates that the project "is being proposed to restore safe and navigable waterways to areas that were previously navigable prior to shoaling", and that the work "will facilitate the enlargement of facilities such as public landings and mooring fields". It further states that the

"proposed work is needed to facilitate the enlargement of facilities such as public landings and mooring fields that have been identified as priority actions in both towns". The proposed project clearly complies with the regulations in 310 CMR 9.06and 9.07 for work in an ORW in that it will facilitate the maintenance, repair, replacement, and reconstruction of structures or facilities for water-dependent uses (i.e., public landings and mooring fields). The Draft EENF indicated that the project would also facilitate the enlargement of these facilities; however, there is no indication at this time that either Town has plans to enlarge the public landings and mooring fields that serve Nauset Estuary. The EENF will be revised to clarify this point.

Maintenance of existing infrastructure and support for commercial and recreational uses of Nauset Estuary are consistent with planning efforts by both Towns. Strategic objectives #1 and #2 in the Eastham Harbor and Waterways Management Plan published in February 2020 include:

- **Strategic Objective #1**: Maintain and improve the town's existing infrastructure, access points, and natural resources.
- **Strategic Objective #2**: Create new opportunities to promote and support commercial and recreational uses of the harbor, shoreline, and waterways.

The proposed project will help the Town of Eastham meet these objectives.

55. The Draft EENF should emphasize that a large portion of the commercial fleet has relocated to moorings near the inlet and that refueling of the vessels in this area is placing the estuary at risk for a fuel spill.

Response: The EENF will be updated to reflect these points.

Costs

56. A number of questions were asked about costs associated with the project, and whether costs for construction monitoring, bidding assistance, pre- and post-construction monitoring and surveys have been factored into the cost estimates.

Response: The MEPA EENF review process does not specifically request information on project cost. Updated cost estimates for the project that include all aspects of the work will be prepared and provided to the Towns.

General Comments

57. Who owns land under the ocean?

Response: The Commonwealth of Massachusetts owns land under the ocean in Nauset Estuary.

58. The Draft EENF includes a section on historical permits issued for dredging in the estuary. Despite this information the proposed project must be considered improvement dredging.

Response: Section D 1.12 of the Draft EENF provides information on past permits issued for dredging in the estuary. These permits were issued between 1924 and 1974 for dredging and filling in relation to small and site-specific projects. The information was intended to summarize the history of dredging in the estuary, rather than to make a case that the proposed project should be considered maintenance dredging. The Draft EENF clearly states that the proposed project is considered improvement dredging.

59. Section K of the Draft EENF indicates that the project will be funded by a State (Office of Coastal Zone Management) funded grant. Is the CZM grant going to cover the entire cost of the dredging?

Response: Reference to funding for the project via a State CZM grant was made in error. While it is entirely possible that other sources of State funding may be sought for project construction, it is not likely that the project would be eligible for a grant from CZM.

60. Can the aerial photos in the Draft EENF (i.e., Figures B-2 and C-6) be changed to something more recent?

Response: The aerial photos used for the figures in Draft EENF Sections B and C are the most recent aerial orthoimagery available from the state MassGIS Bureau of Geographic Information. These aerial photos were collected in the spring of 2019.

61. When will the Cape Cod National Seashore provide formal input on the proposed project?

Response: Staff from the CCNS have provided input and comments on the project through their participation with the Nauset Estuary Stakeholders Group. It is expected that the CCNS will submit a formal comment letter during the MEPA comment period on the EENF.

62. Can the EENF be updated to indicate the planned studies in Mill Pond (i.e, sediment coring)?

Response: Additional field investigation in the Mill Pond channel are planned for the summer 2021. These include sediment coring and laboratory testing, red tide cyst counts, eelgrass mapping, and shellfish resource investigations. The EENF will be updated to reflect that the results of these investigations are pending, and will be added to the EIR when it is published.

Appendix A: Water Rescue Records (2016 to 2021)

DATE	INCIDENT NUMBER	TYPE	LOCATION	UNIT	SUMMARY	PERSONNEL
6/8/2021	21-7755	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Assisted Disabled Vessel; No Injuries	Albino, McShera
3/2/2021	21-3141	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	C160	Report of Disabled Vessel/Vessel in distress; Reported to USCG, Vessels found not to be in Distress	Frazier, Reis
8/18/2020	20-13363	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	C160	Report of Lights in Nauset Marsh area, Found USCG performing excersizes outside of Inlet	McGrath, Hilferty
8/4/2020	20-12397	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M154	Assisted Disabled Vessel; No Injuries	Watson, Clark
7/16/2020	20-10956	WATERCRAFT RESCUE	NAUSET INLET	M153	Assisted Disabled Vessel; No Injuries	Hilferty, Reis
7/14/2020	20-10785	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Paddleboarders in distress, No Injuries, Assisted to Land	McGrath, VanBuskirk
12/13/2019	19-18824	WATERCRAFT RESCUE	HEMENWAY LANDING	ATV159	Report of Vehicle in water, Missing person; Party located on Shore, Transported to CCH	Morse, Clark
4/18/2019	19-6176	SEARCH	NAUSET MARSH/TOWN COVE	M602	Report of Victim in Water, OFD/USCG responded to assist; USCG recovered deceased victim	Keane, McGrath
10/16/2018	18-14883	GOOD INTENT CALL	HEMENWAY LANDING	C151	911 Hang Up, GPS Located South of Hemenway; Parties located elsewhere on land	Francke, Watson, Cappello
9/22/2018	18-13611	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Report of Boat in distress, (1) on board, (1) on shore; No injuries, Assisted to land	McGrath, VanBuskirk
9/14/2018	18-13205	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Boat overturned, person in water; No injuries, Assisted to Land	Sprague, Frazier
6/22/2018	18-966	GOOD INTENT CALL	NAUSET INLET	M153	Reported Boat fire; Nothing found on arrival	Piltzecker, Wiley
6/12/2018	18-897	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Rescued (4) Kayakers in Distress; Evaluated, No Injuries	McGrath, Morse, VanBuskirk
5/14/2018	18-716	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	C152	Reported overturned Kayak; Found to be debris in Water - No Injuries/Hazard	Albino, McGrath
3/2/2018	18-268	GOOD INTENT CALL	HEMENWAY LANDING	C160	Report Boat overturned, Boat fell off trailer on launching, no Injuries	Frazier
1/26/2018	18-107	WATERCRAFT RESCUE	NAUSET MARSH/CG BEACH	A163	Reported person lost near Coast Guard Beach; No injuries, Assisted to Land	Frazier, McGrath, Cappello
9/25/2017	17-1372	GOOD INTENT CALL	GOOSE HUMMOCK DOCKS	C152	Reported Fuel Spill in Water; No spill found; Good Intent Call	Keane, Albino
8/19/2017	17-1150	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	M154	Reported Vessel in distress; Found moored boat partially sunk; No injuries	McGrath, Hilferty
8/6/2017	17-1051	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M154	Kayer in distress in Water; No Injuries, Assisted to Land	Sprague, Hilferty
6/12/2017	17-667	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	M153	Report of boat adrift, possibly in distress; Boat not in distress; Good intent call	Frazier, Piltzecker
9/2/2016	16-1201	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	S160	Kayakers in Distress, No Injuries, Party located elsewhere on land	Piltzecker, Morse
8/31/2016	16-1182	SEARCH	NAUSET MARSH/CG BEACH	ATV159	Person stuck in Marsh; Able to retrive from land with ATV	Sprague, Wiley, Callahan
7/22/2016	16-873	WATERCRAFT RESCUE	NAUSET MARSH/TOWN COVE	M153	Kayaker and Sailfish in Distress; No Injuries, Assisted to Land	Hilferty, Reis
7/6/2016	16-771	GOOD INTENT CALL	HEMENWAY LANDING	M153	Report of boat in distress; Found to be under power and no issue; Good intent Call	Albino, Watson, VanBuskirk
7/4/2016	16-754	GOOD INTENT CALL	NAUSET MARSH/TOWN COVE	S160	Boat Off Mooring, No Injuries, Party located elsewhere on land	Albino, McGrath

KEY

C151	COMMAND VEHICLE
C152	COMMAND VEHICLE
S160	COMMAND VEHICLE
A162	AMBULANCE
A163	AMBULANCE
M153	19' RIGID HULL INFLATABLE
M154	17' RIGID HULL INFLATABLE
ATV159	POLARIS RANGER ATV
SURF	INFLATABLE SURF RESCUE BOAT
M602	(ORLEANS) RIGID HULL INFLATABLE

Town of Orleans						
Date	Incident Number	Type	Location	Unit	Summary	Personnel
7/22/2016	2016:1258	Watercraft Rescue	Town Cove/Nauset Harbor/Inlet	M602	Assisted Disable Vessel	Burns, McGrath
9/2/2016	2016:1649	Good Intent	Priscilla Landing	170	Kayaks in Distress	Vogt
6/12/2018	2018:1259	Watercraft Rescue	Nauset Inlet	M602	Kayaks in Distress	Edmunds, Medeiros
6/22/2018	2018:1338	Good Intent	Nauset Inlet	M602	Possible Vessel Fire	Burge, Pires
9/22/2018	2018:2271	Watercraft Rescue	Nauset Inlet	M602	Assisted Disable Vessel	Burge, Pellegrino
6/4/2019	2019:1020	Watercraft Rescue	Snow Shore Landing	M602	Assisted Disable Vessel	Burns, Reynolds
10/3/2019	2019:2076	Good Intent	Tonset Road Landing	170,179	Boat taking on water;Good Intent	Vogt,Deering
5/3/2020	2020:807	Watercraft Rescue	Town Cove/Nauset Harbor/Inlet	M602	Paddle Boarder in Distress	Burge, Delude
7/10/2020	2020:1320	Watercraft Rescue	Town Cove/Nauset Harbor/Inlet	M602	Paddle Boarder in Distress	Burge,Burns
6/8/2021	2021:1109	Watercraft Rescue	Town Cove/Nauset Harbor/Inlet	M602	Assisted Disable Vessel	Burge, Burns

Appendix B: Revised Alternatives Assessment Matrices

F. ASSESSMENT OF IMPACTS AND SELECTION OF PREFERRED ALTERNATIVE

Environmental impacts associated with the range of alternatives considered for this Project are discussed in this section. Both the potential adverse impacts and benefits to the environment from the various alternatives are addressed. Although environmental impacts are unavoidable, the project design has focused on minimizing potential adverse impacts, while achieving project objectives. Improvements to navigation and public safety in Nauset Estuary will have benefits to commercial and recreational boaters, business owners in the community, and to the economies of the Towns of Orleans and Eastham.

1.0 Alternatives for Element #1: Dredge Channel Layout

Fifteen (15) channel layout alternatives were considered for restoring navigation in Nauset Estuary. Identification of a preferred alternative for the channel layout was based on eleven (11) selection criteria which address logistics, benefits, and potential environmental impacts. The channel layout alternatives were assigned scores for each selection criteria and a total overall score was then determined for each alternative (Table F-1). The scoring rationale for each criterion is described below.

1.1 Cost of Dredging

Explanation: The cost for dredging varies depending on method, and the method used is dependent on the location and conditions of each channel reach of Nauset Estuary. The costs per cubic yard of dredging were calculated for each dredge method:

1) Sidecast: $26/cy
2) Mechanical: $50/cy
3) Hydraulic Pipeline: $34/cy

These rates also include mobilization, demobilization, labor, maintenance, repairs, fuel, equipment rental, shoreside transportation of equipment to site, depreciation on equipment, mileage, and post-dredge surveys. These rates do not include operation of the dewatering basin that would be required for the Priscilla Rd. and Mill Pond channel reaches. This criterion considers a weighted average of the per-cubic-yard-cost for each alternative based on 1) which portions of the estuary will be dredged under each alternative, 2) which dredge method is required in each section, and 3) the volume of sediment to be dredged from each area. This allowed the average estimated dredging cost to be compared across alternatives.

Scoring Categories:
10: <$30/cy
5: $30-$35/cy
1: >$35/cy

1.2 Frequency of Maintenance Dredging:

Explanation: This criterion is a qualitative assessment of how frequently the dredge footprint for each alternative would need to be maintained. Due to the dynamic nature of the inlet, the area immediately behind the barrier beach would likely require more frequent maintenance (assumed to be annually), while inner portions of the estuary would likely require less frequent maintenance (every 8 to 15 years depending on location).

Scoring Categories:
10: No maintenance
8: Low frequency maintenance only
5: Alternative includes areas of both Low and High frequency maintenance
1: High frequency maintenance

1.3 Permittability:

Explanation: This criterion evaluates the permittability of each alternative. Although some level of permitting would be required for all alternatives, some alternatives involve dredging in areas of the estuary that would require additional permits or that would be subject to additional regulations (e.g., NEPA, compliance with additional ORW regulations, etc.). For areas within the Cape Cod National Seashore, not only would a NEPA review be required, but it would also be necessary to demonstrate that navigation has been impaired by natural migration of the inlet and barrier beach to comply with the Outstanding Resource Water (ORW) regulations. Overcoming this presumption will be easier for some areas within the CCNS than for others. For example, it will be harder for areas within Hemenway channel and Cable Creek, which are further from the inlet and its effects.

Scoring Categories:
10: Entire alternative is outside the CCNS; No NEPA permit required; No ORW restrictions
8: NEPA permit required; ORW regulations apply, but could possibly be overcome
0: NEPA permit required; ORW restrictions apply, and are likely to preclude portions of footprint

1.4 Improved Access to Landings & Mooring Areas:

Explanation: This criterion addresses the potential improved access to landings and moorings within Nauset Estuary. The 13 landings considered for this comparison include Goose Hummock, Cove Road, Asa's Landing, Gibson Road (a & b), Collins Landing, Tonset Road, Priscilla, Snow Shore, Doane Road, Mill Pond, Robert's Cove and Hemenway. Mooring fields in the Town Cove area (Asa's, Collins Landing, Cove Road, Gibson Road (a & b), Goose Hummock, Prides Path, Rachel's Cove, Snow Point, Town Cove and Yacht Club – a total of 159 moorings), the Priscilla area (Nauset Heights,

Priscilla, Snow Shore and Tonset – a total of 174 moorings), the Central Main Channel area (Stoney Island and Woods Cove – a total of 7 moorings), the Mill Pond area (Doane Road, Mill Pond, Robert's Cove and Sheeps Pasture Point – a total of 71 moorings), and the Hemenway area (17 moorings), as well as the inlet mooring area, were also factored into this comparison. Higher scores were given to alternatives that serviced a greater number of these mooring fields and landings.

Scoring Categories:

10: >400 + inlet moorings, 12 or 13 landings, and improved navigation behind the barrier beach

8: >175 + inlet moorings, 6 or 7 landings, and improved navigation behind the barrier beach

6: >400 moorings and 12 or 13 landings, but no inlet moorings and no improved navigation behind barrier beach

3: >175 moorings and 6 or 7 landings, but no inlet moorings and no improved navigation behind barrier beach

1: <175 moorings, 6 or less landings, may or may not include improved navigation behind barrier beach and/or access to inlet moorings

0: No improvements in access to the town landings or mooring areas

1.5 Improvements to Safety:

Explanation: This criterion evaluates each alternative's ability to improve safety throughout Nauset Estuary. Benefits to safety could be achieved through increasing safe navigation behind the barrier beach and improving emergency access for water-based response by municipal officials in Orleans and Eastham. Emergency response from Orleans was assumed to be improved if access to the main launching area in Town Cove is enhanced, while emergency response from Eastham was assumed to be improved if access to the main launching area at Hemenway is enhanced.

Scoring Categories:

10: Emergency response from both Towns enhanced, and safety behind the barrier beach is improved

8: Emergency response from one Town enhanced, and safety behind the barrier beach is improved

5: Safety behind the barrier beach is improved OR Emergency response from both Towns is enhanced

1: Emergency response from one Town enhanced but no improvements behind the barrier beach are made

0: No improvements in safety

1.6 Businesses Served:

Explanation: This criterion evaluates each alternative's ability to improve access to and from marine-dependent businesses that rely on the ability of their customers to safely navigate the estuary and travel to and from the inlet. There is one main marine-

dependent businesses located in Town Cove (Goose Hummock), as well as numerous commercial fishermen that utilize the estuary.

Scoring Categories:
10: Direct business access improvements and improved access behind the barrier beach
7: Direct business access improvements but no improved access behind the barrier beach
4: Indirect business access improvements through improved access behind barrier beach
0: No business access improvements

1.7 Potential Impacts to Eelgrass:

Explanation: This criterion evaluates each alternative's potential impact to existing eelgrass resources. Although none of the alternatives directly overlaps with mapped eelgrass beds, the further away the proposed dredge footprint is from existing eelgrass resources, the less likely it will be to cause adverse impacts.

Scoring Categories:
10: All portions of the dredge footprint are >50' from mapped eelgrass beds; or no dredging planned
8: Some portions of the dredge footprint are <50' from mapped eelgrass beds

1.8 Potential Impacts to Shellfish:

Explanation: This criterion evaluates each alternative's potential impact to existing shellfish resources. Based on shellfish surveys conducted on September 16 and 17, 2019, areas of shellfish presence and quantities of different various shellfish species have been identified. Alternatives that avoid areas of high-density shellfish populations are ranked higher for this criterion than those that do not. Because the Mill Pond, Hemenway and Cable Creek channel sections were not directly surveyed for shellfish populations, the shellfish densities in these locations are unknown. As a conservative measure, alternatives that contain these channel sections were scored with a lower ranking category for this criterion.

Scoring Categories:
10: Overlaps only with areas of low shellfish densities (<5 shellfish/ft^3); or no dredging planned
8: Overlaps with areas of moderate shellfish densities (5-10 shellfish/ft^3)
4: Areas of unknown shellfish densities
1: Overlaps with areas of high shellfish densities (>10 shellfish/ft^3)

1.9 Potential Impacts to Salt Marsh:

Explanation: This criterion evaluates each alternative's potential impact to existing salt marsh resources. Although none of the alternatives directly overlaps with mapped salt marsh areas, the further away the proposed dredge footprint is from existing eelgrass resources, the less likely it will be to cause adverse impacts.

Scoring Categories:
10: Greater than 50 feet from salt marsh resources; or no dredging planned
8: Within 50 feet from salt marsh resources
0: Within close proximity to salt marsh resources (unlikely to be permittable)

1.10 Impacts to Intertidal Areas:

Explanation: This criterion addresses the potential for dredging activities to directly impact intertidal areas, which can serve as important foraging areas for shorebirds during low tide. Alternatives that do not impact intertidal areas are ranked higher for this criterion than those that do.

Scoring Categories:
10: No impacts to intertidal areas; or no dredging planned
5: Direct impacts to intertidal areas

1.11 Potential for Barrier Beach Impacts:

Explanation: This criterion addresses the potential for dredging activities to weaken the barrier beach. The assumption is that dredging activities immediately behind the barrier beach, and to a lesser extent, dredging activities at the southern end of the Priscilla Rd. channel could increase the likelihood of a human-induced breach in the barrier beach. The percent of the total footprint area located within one of these areas with the potential to cause barrier beach impacts were quantified for each alternative. This criterion was retained as a conservative measure, since a "no dredge zone" is being proposed 100 ft west of the barrier beach to mitigate any potential adverse impacts by not extending the dredge zone too close to the barrier beach.

Scoring Categories:
10: 0-19%
9: 20-29%
8: 30-39%
7: 40-49%
6: 50-59%
5: 60-69%
4: 70-79%
3: 80-89%
2: 90-99%
1: 100%

Scoring for the channel layout alternatives identified the highest overall score for Alternative 1-2B which provides access between the inlet and public landings in Town Cove and the Priscilla Rd. and Mill Pond spur channels, via the main channel behind the barrier beach. Therefore Alternative 1-2B was selected as the preferred channel layout.

Table F-1. Selection Criteria and Overall Scoring for Element #1: Channel Layout Alternatives.

	Logistics						Benefits						Impacts										
Alternatives	**Average Cost of Dredging per CY**		**Frequency of Maintenance Dredging**		**Permittability**		**Improved Access to Landings & Mooring Areas**		**Improvements to Safety**		**Businesses Served**		**Potential Impacts to Eelgrass**		**Potential Impacts to Shellfish**		**Potential Impacts to Salt Marsh**		**Impacts to Intertidal Areas**		**Potential for Adverse Impacts to Barrier Beach**		**Overall Score**
Alternative 1-1: Do Nothing (No Dredging																							
1-1: Do Nothing	$ -	10	No dredging required	10	No permits required	10	No improved access	0	No safety improvements	0	No Business Access Improvements	0	No dredging planned	10	No dredging planned	10	No dredging planned	10	No dredging planned	10	0%	10	**80**
Alternative 1-2: Access Between Inlet and Town Landings Via Channel Behind Barrier Beach																							
1-2A: Access between Inlet, Town Cove, Priscilla and Hemenway	$30.23	5	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	428 Moorings, Inlet moorings, 13 Landings & Improved navigation behind barrier	10	+ Emergency Response (both Towns) +Improved Safety Behind Barrier	10	Direct Business Access Improvements + Behind Barrier	10	Within 75' of Eelgrass	8	Town Cove - High density; Mill & Hemenway - Unknown	1	Within 50' of Salt Marsh	8	Yes	5	49%	7	69
1-2B: Access between Inlet, Town Cove and Priscilla	$31.31	5	Low: Inner High: Outer	5	NEPA Required; ORW requirements	8	411 Moorings, Inlet moorings, 12 Landings & Improved navigation behind barrier	10	+ Emergency Response (Orleans only) +Improved Safety Behind Barrier	8	Direct Business Access Improvements + Behind Barrier	10	Within 75' of Eelgrass	8	Town Cove - High density; Mill - Unknown	1	Within 50' of Salt Marsh	8	Yes	5	55%	6	**74**
1-2C: Access between Inlet, Town Cove and Hemenway	$30.04	5	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	183 Moorings, Inlet moorings, 7 Landings & Improved navigation behind barrier	8	+ Emergency Response (both Towns) +Improved Safety Behind Barrier	10	Direct Business Access Improvements + Behind Barrier	10	Greater than 75' from Eelgrass	10	Town Cove - High density; Hemenway - Unknown	1	Within 50' of Salt Marsh	8	Yes	5	38%	8	70
1-2D: Access between Inlet and Town Cove	$30.77	5	Low: Inner High: Outer	5	NEPA Required; ORW requirements	8	166 Moorings, Inlet moorings, 6 Landings & Improved navigation behind barrier	1	+ Emergency Response (Orleans only) +Improved Safety Behind Barrier	8	Direct Business Access Improvements + Behind Barrier	10	Greater than 75' from Eelgrass	10	Town Cove - High density	1	Within 50' of Salt Marsh	8	Yes	5	53%	6	67

1-2E: Access between Inlet, Priscilla and Hemenway	$28.25	10	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	269 Moorings, Inlet moorings, 7 Landings & Improved navigation behind barrier	8	+ Emergency Response (Eastham only) +Improved Safety Behind Barrier	8	Indirect Business Access Improvements (Behind Barrier)	4	Within 75' of Eelgrass	8	Mill & Hemenway - Unknown	4	Within 50' of Salt Marsh	8	Yes	5	63%	5	65
1-2F: Access between Inlet and Priscilla	$27.43	10	Low: Inner High: Outer	5	NEPA Required; ORW requirements	8	245 Moorings, Inlet moorings, 6 Landings & Improved navigation behind barrier	8	+Improved Safety Behind Barrier	5	Indirect Business Access Improvements (Behind Barrier)	4	Within 75' of Eelgrass	8	Mill - Unknown	4	Within 50' of Salt Marsh	8	Yes	5	82%	3	68
1-2G: Access between Inlet and Hemenway	$27.69	10	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	24 Moorings, Inlet moorings, 1 Landing & Improved navigation behind barrier	1	+ Emergency Response (Eastham only) +Improved Safety Behind Barrier	8	Indirect Business Access Improvements (Behind Barrier)	4	Greater than 75' from Eelgrass	10	Hemenway - Unknown	4	Within 50' of Salt Marsh	8	Yes	5	63%	5	60
Alternative 1-3: Access Between Inlet and Inner Estuary Via Channel Behind Barrier Beach																						
1-3: Access Between Inlet and Inner Estuary Via Channel Behind Barrier Beach	$26.00	10	High	1	NEPA Required; ORW requirements	8	Inlet moorings only, No landings, Improved navigation behind barrier	1	+Improved Safety Behind Barrier	5	Indirect Business Access Improvements (Behind Barrier)	4	Greater than 75' from Eelgrass	10	Behind Barrier - Low density	10	Within 50' of Salt Marsh	8	Yes	5	100%	1	58
Alternative 1-4: Access Between Inlet and Town Landings Via Cable Creek																						
1-4A: Access Between Inlet, Town Cove, Priscilla and Hemenway via Cable Creek	$34.60	5	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	428 Moorings, Inlet moorings & 13 Landings	6	+ Emergency Response (both Towns)	5	Direct Business Access Improvements	7	Within 75' of Eelgrass	8	Town Cove - High density; Mill & Hemenway - Unknown	1	Within 5' of Salt Marsh	0	No	10	15%	10	57
1-4B: Access Between Inlet, Town Cove and Hemenway via Cable Creek	$32.01	5	Low: Inner High: Outer	5	NEPA Required; ORW may preclude Hem	0	176 Moorings, Inlet moorings & 7 Landings	3	+ Emergency Response (both Towns)	5	Direct Business Access Improvements	7	Greater than 75' from Eelgrass	10	Town Cove - High density; Hemenway - Unknown	1	Within 5' of Salt Marsh	0	No	10	0%	10	56
Alternative 1-5: Access Between Town Landings and Back Side of Barrier																						
1-5A: Access Between Town Cove, Priscilla and Hemenway, and the Back Side of Barrier	$35.61	1	Low	5	NEPA Required; ORW may preclude Hem	0	428 Moorings & 13 Landings	6	+ Emergency Response (both Towns)	5	Direct Business Access Improvements	7	Within 75' of Eelgrass	8	Town Cove - High density; Mill & Hemenway - Unknown	1	Within 50' of Salt Marsh	8	No	10	18%	10	61

1-5B: Access Between Town Cove and Priscilla, and the Back Side of Barrier	$43.97	1	Low	5	No NEPA; No ORW Restrictions	10	411 Moorings & 12 Landings	6	+ Emergency Response (Orleans only)	1	Direct Business Access Improvements	7	Within 75' of Eelgrass	8	Town Cove - High density; Mill - Unknown	1	Greater than 50' from Salt Marsh	10	No	10	22%	9	68
1-5C: Access Between Town Cove and Hemenway, and the Back Side of Barrier	$36.31	1	Low	5	NEPA Required; ORW may preclude Hem	0	183 Moorings & 7 Landings	3	+ Emergency Response (both Towns)	5	Direct Business Access Improvements	7	Greater than 75' from Eelgrass	10	Town Cove - High density; Hemenway - Unknown	1	Within 50' of Salt Marsh	8	No	10	0%	10	60
1-5D: Access Between Priscilla and Hemenway, and the Back Side of Barrier	$31.34	5	Low	5	NEPA Required; ORW may preclude Hem	0	269 Moorings & 7 Landings	3	+ Emergency Response (Eastham only)	1	No Business Access Improvements	0	Within 75' of Eelgrass	8	Mill & Hemenway - Unknown	4	Within 50' of Salt Marsh	8	No	10	29%	9	53

2.0 Alternatives for Element #2: Dredge Channel Width

Three (3) channel width alternatives were considered for restoring navigation in Nauset Estuary. Identification of a preferred alternative for the channel width was based on a combination of selection criteria including safe channel width for passage of boats, impacts to natural resources and landforms, and the expected frequency of maintenance dredging. Using the preferred channel layout Alternative 1-2B, the three (3) channel width alternatives were assigned scores for each selection criteria and a total overall score was then determined for each alternative (Table F-2). The scoring rationale for each criterion is described below.

2.1 Boater Safety

Explanation: The criterion focuses on quantifying the potential impacts to boater safety provided by the different channel widths. Improved boater safety is one of the goals of the project, especially in areas of the estuary where high current velocities make it difficult to maneuver and the potential for boater conflicts is high. Alternatives that provide the greatest maneuverability in channels with the highest currents are ranked higher than those that provide the least maneuverability channels with the highest currents.

Scoring Categories:
10: Greatest maneuverability in all channels
5: Lowest maneuverability in all channels
1: Greatest maneuverability in channels with high currents and lower maneuverability in channels with lower currents

2.2 Impacts to Land Under the Ocean

Explanation: This criterion addresses the potential for dredging activities to directly impact land under ocean, which can serve as important habitat for benthic communities. Alternatives that impact smaller areas of land under the ocean resource are ranked higher for this criterion than those that impact greater areas of land under the ocean resource.

Scoring Categories:
10: < 1,500,000 sq
8: 1,500,000 to 2,500,000 sq
6: > 2,500,000 sq

2.3 Impacts to Intertidal Areas

Explanation: This criterion addresses the potential for dredging activities to directly impact intertidal areas, which can serve as important foraging areas for shorebirds during low tide. Impacts to intertidal areas within the dredge footprint are considered. Alternatives that impact smaller areas of intertidal resource are ranked higher for this criterion than those that impact greater areas of intertidal resource.

Scoring Categories:
10: < 1,300 sq
8: 1,300 to 3,500 sq
6: > 3,500 sq

2.4 Impacts to Land Containing Shellfish

Explanation: This criterion addresses the potential for dredging activities to directly impact land containing shellfish, which is important for commercial fisheries and propagation. Alternatives that impact smaller areas of land containing shellfish resource are ranked higher for this criterion than those that impact greater areas of land containing shellfish resource.

Scoring Categories:
10: < 1,500,000 sf
8: 1,500,000 to 2,500,000 sf
6: > 2,500,000 sf

2.5 Impacts to Salt Marsh Resources

Explanation: This criterion evaluates each alternative's potential impact to existing salt marsh resources. Although none of the alternatives directly overlaps with mapped salt marsh areas, the further away the proposed dredge footprint is from existing eelgrass resources, the less likely it will be to cause adverse impacts.

Scoring Categories:
10: All channels > 50 ft from salt marsh
5: One channel reach < 50 ft from salt marsh
1: More than one channel reach < 50 ft from salt marsh

2.6 Impacts to Eelgrass Resources

Explanation: This criterion evaluates each alternative's potential impact to existing eelgrass resources. Although none of the alternatives directly overlaps with mapped eelgrass beds, the further away the proposed dredge footprint is from existing eelgrass resources, the less likely it will be to cause adverse impacts.

Scoring Categories:
10: All channels > 65 ft from eelgrass
5: One channel reach that is 50 ft from eelgrass
1: More than one channel reach within 50 ft of eelgrass

2.7 Frequency of Maintenance Dredging

Explanation: This criterion is a qualitative assessment of how frequently the dredge footprint for each channel width alternative would need to be maintained. Channels

with greater widths were assumed to require less frequent maintenance dredging than channels with smaller widths.

Scoring Categories:
10: Lowest frequency of maintenance
5: Alternative includes areas of higher and lower frequency of maintenance
1: Highest frequency of maintenance

Scoring for the channel width alternatives identified the highest overall score for Alternative 2-3 which includes a 100 ft wide channel behind the barrier beach and a 50 ft wide channel in all other reaches. Therefore, Alternative 2-3 was selected as the preferred channel width.

3.0 Alternatives for Element #3: Placement Areas for Dredged Material

Ten (10) alternatives were considered for placement of the dredged material from Nauset Estuary. Identification of a preferred alternative(s) for placement of the dredged material was based on a combination of selection criteria including the potential for beneficial reuse, distance to the dredge channels, permittability, sediment compatibility, placement area capacity, potential impacts to the barrier beach, potential for redistribution of red tide cysts, and impacts to protected wetland resource areas. Using the preferred channel layout and width alternatives previously selected, the placement areas alternatives were assigned scores for each selection criteria and a total overall score was then determined for each alternative (Table F-3). The scoring rationale for each criterion is described below.

3.1 Potential for Beneficial Reuse

Explanation: This criterion evaluates the potential for dredged material to be beneficially reused at the different placement sites. Given future impacts along the coastline stemming from climate change and sea level rise, the ability to beneficially reuse dredged material for building coastal resiliency is a significant benefit. Dredged material reuse for habitat improvements is also considered a benefit. Placement alternatives that result in the addition of significant quantities sediment to coastal systems (i.e., beach, dune, barrier beach, intertidal) are scored high to moderately high, as they have the potential to improve habitat and storm damage protection and flood control for nearby natural resources and the built environment. Placement alternatives that are considered experimental or not commonly used in Massachusetts are scored as moderate or moderately low.

Scoring Categories:
10: High potential for beneficial reuse
7: Moderately high potential for beneficial reuse
5: Moderate potential for beneficial reuse
3: Moderately low potential for beneficial reuse
1: Low potential for beneficial reuse

Table F-2. Selection Criteria and Overall Scoring for Element #2: Channel Width Alternatives.

	Logistics				Environmental Impacts										
Alternatives	**Boater Safety**		**Frequency of Maintenance Dredging**		**Impacts to Land Under the Ocean (square ft)**		**Impacts to Intertidal Areas (square ft)**		**Impacts to Land Containing Shellfish (square ft)**		**Potential Impacts to Salt Marsh**		**Potential Impact to Eelgrass**		**Overall Score**
2-1: 100 & 80 ft Channel Widths	Greatest maneuverability	10	Lowest frequency of maintenance	10	2,626,300	6	3,720	6	2,639,100	6	Mill Pond channel 35 ft from salt marsh	5	Priscilla Rd. channel < 50 ft from eelgrass	5	48
2-2: 50 ft Channel Width	Least maneuverability	1	Highest frequency of maintenance	1	1,408,070	10	1,250	10	1,414,830	10	All channels > 50 ft from salt marsh	10	All channels > 65 ft from eelgrass	10	52
2-3: 100 & 50 ft Channel Widths	Greatest maneuverability in channels with high currents; lower maneuverability in remaining channels	5	Alternative includes areas of higher and lower frequency of maintenance	5	1,785,110	8	2,540	8	1,793,700	8	All channels > 50 ft from salt marsh	10	All channels > 65 ft from eelgrass	10	**54**

3.2 Sediment Compatibility

Explanation: This criterion assesses the compatibility of sediment dredged from the different channel reaches in the preferred channel layout (Alternative 1-2B) with sediment at each placement site. Finer-grained silty sands from the Priscilla Rd. spur channel, the Central Main Channel and presumed to be in the Mill Pond channel are not considered to be compatible with placement alternatives involving beach nourishment. Because of the relatively low percentages of fines (< 20%) in these three (3) channel reaches, the dredged material is compatible with placement in the coastal dune environment where finer-grained sediments naturally occur. Scoring for sediment compatibility is based on the number of channel reaches with compatible sediment as determined by results of the sampling program described in Section D.1.7 (Channel reaches Behind the Barrier Beach, Eastern Main Channel and Town Cove have sandy sediment; the Central Main Channel, Priscilla Rd. and Mill Pond channel reaches have silty sand sediment). Placement sites having the greatest number of channel reaches with compatible sediment are scored the highest and sites with the lowest number of channel reaches are scored the lowest.

Scoring Categories:
10: Six (6) channel reaches with compatible sediment
5: Three (3) channel reaches with compatible sediment

3.3 Area of Channel Accessible to Placement Site

Explanation: This criterion evaluates the area of dredge channel that is accessible to each placement site when considering the different methods of dredging (i.e., hydraulic cutter suction pipeline and sidecast methods and mechanical dredging). Channel areas were considered accessible only if they passed the sediment compatibility criterion described above in Section F.3.2. Placement sites accessible by the greatest area of dredge channel are scored the highest.

Scoring Categories:
10: > 1,500,000 sq ft
7: 1,000,000 to 1,500,000 sq ft
4: 850,000 to 1,000,000 sq ft
1: < 850,000 sq ft

3.4 Permittability

Explanation: This criterion provides an evaluation of the permittability of each placement alternative. Scoring is based on review of local, state, and federal regulations that govern dredging and dredged material placement (i.e., Wetlands Protection Regulations 301 CMR 10.00; Waterways Regulations 310 CMR 9.00; Water Quality Certification 314 CMR 9.00; Section 10 of the Rivers and Harbors Act of 1899; Section 404 of the Clean Water Act). Consistency of each placement alternative with the 1998 General Management Plan for the Cape Cod National Seashore and the Cape Cod

Commission's Regional Policy Plan is also factored into the scoring. Placement alternatives that comply with the regulations, that are more commonly permitted in Massachusetts, that avoid impacts to sensitive resource areas, that occur on municipal land, and that benefit or enhance the resource area functions are scored the highest.

Scoring Categories:
10: High
7: Moderately high
5: Moderate
3: Moderately low
1: Low

3.5 Site Capacity

Explanation: This criterion provides a quantitative assessment of the volume of dredged material that can be utilized at each placement site. Calculations for placement site capacity only consider dredge material that passes the sediment compatibility and channel accessibility criteria described above in Sections F.3.2 and F3.3. Alternatives that can hold the largest volume of dredged material are ranked the highest, and alternatives that can hold smaller volumes of material are ranked lower.

Scoring Categories:
10: < 130,000 cy
7: 120,000 to 130,000 cy
5: 60,000 to 120,000 cy
3: 20,000 to 60,000 cy
1: < 20,000 cy

3.6 Potential for Impacts to Barrier Beach

Explanation: This criterion addresses the potential for placement alternatives to impact the barrier beach, either through building the elevation and/or width of the barrier, or by adding sediment to the littoral system which can then feed material to the barrier beach via littoral drift. The 1998 General Management Plan for the CCNS seeks to allow natural shoreline processes within the park boundaries to take place without human disturbance. Further, any placement sites that directly strengthen the barrier beach are assumed to reduce the potential for a natural breach, which would be a benefit to navigation and water quality to the Nauset Estuary system. Alternatives that have the potential to enhance the stability of the barrier beach are ranked lower than alternatives that have no impact on the barrier beach.

Scoring Categories:
10: No impacts on barrier beach
7: Low potential for impacts to barrier beach through longshore transport
4: Moderate potential for impacts to barrier beach through longshore transport
1: Direct impacts to the barrier beach

Table F-3. Selection Criteria and Overall Scoring for Element #3: Placement Areas for Dredged Material.

	Logistics										Impacts						
Alternatives	**Potential for Beneficial Reuse**		**Sediment Compatibility**		**Area of Channel Accessible to Placement Site (square ft)**		**Permittability**		**Site Capacity (cubic yards)**		**Potential for Impacts to Barrier Beach**		**Potential for Redistribution of Red Tide**		**Resource Area Impacts (acres)**		**Overall Score**
3-1: Beach Nourishment on Nauset Barrier Beach	High	10	3 channel reaches	5	1,503,144	10	Moderately low	3	130,744	10	Direct impacts	1	Low potential	7	19	5	51
3-2: Beach Nourishment at Nauset Public Beach	High	10	3 channel reaches	5	465,200	1	High	10	128,460	7	Moderate potential for impacts	4	Low potential	7	14	5	49
3-3: Dune Restoration on Nauset Barrier Beach	High	10	6 channel reaches	10	1,503,144	10	Low	1	124,090	7	Direct impacts	1	Moderately high potential	4	21	5	48
3-4A: Dune Enhancement at Nauset Public Beach	High	10	6 channel reaches	10	817,357	1	High	10	27,000	3	Low potential for impacts	7	No potential	10	5	7	58
3-4B: Dune Enhancement North of Nauset Public Beach	High	10	6 channel reaches	10	1,159,105	7	Moderately high	7	26,080	3	Low potential for impacts	7	No potential	10	8	7	**61**
3-5: Land Under the Ocean Adjacent to Dredged Channel	Moderately high	7	6 channel reaches	10	2,466,126	10	High	10	119,830	5	No impacts	10	High potential	1	17	7	**60**
3-6: Subaqueous Placement	Moderate	5	3 channel reaches	5	1,029,906	7	Low	1	11,975	1	No impacts	10	High potential	1	59	1	31

3-7: Marsh Restoration	Moderate	5	3 channel reaches	5	1,029,906	7	Low	1	108,409	5	No impacts	10	Moderately high potential	4	269	1	38
3-8: Beach Nourishment on Nauset Estuary Shorelines	Moderately high	7	3 channel reaches	5	1,029,906	7	Moderate	5	4,896	1	No impacts	10	High potential	1	2.5	10	46
3-9: Upland Stockpile/Beneficial Reuse	Moderate	5	6 channel reaches	10	2,466,126	10	High	10	11,200	1	No impacts	10	No potential	10	0	10	**66**

3.7 Potential for Harmful Redistribution of Red Tide

Explanation: This criterion addresses the potential for placement of dredged material to result in harmful redistributions of red tide to areas that currently have low, or no, red tide concentrations. The scoring is based in part on analyses conducted on the viability of *Alexandrium* cysts in dredged material from Nauset Estuary that is used for dune enhancement (Anderson Consulting Associates, 2020; Section L). The analyses indicate that *Alexandrium* cysts buried in dunes subject to freezing temperatures during the winter and low saline conditions experience mortality within five (5) months. Provided the dredged material remains buried for at least five (5) months through the winter, the risk of spreading the cysts to other areas is avoided. Other factors considered in the scoring include potential for the dredged material to be released to the open ocean or estuarine environments. The Nauset Estuary Dredging Feasibility Assessment (Woods Hole Group, 2016; Section L) indicates there are two types of red tide blooms that can affect Nauset Estuary: (i) widespread blooms along the open coast from the Gulf of Maine to Massachusetts and outer Cape Cod, and (ii) localized blooms that start in the distal ponds of the estuary. Blooms that occur along the open coast, or release of *Alexandrium* cysts to the open ocean from dredge material placement as beach nourishment, are diluted by the large volume of ocean water, and therefore represent lower risk of creating a harmful algal bloom in the estuary. Conversely, localized blooms that start in Nauset Estuary, or placement alternatives that release dredged material with *Alexandrium* cysts directly to the estuary, present a greater risk of harmful blooms in the estuary. Placement alternatives with no, or low potential to redistribute red tide to other areas of the estuary are ranked high, while alternatives with high potential to redistribute the cysts within the estuary are ranked low.

Scoring Categories:
10: No potential for redistribution (burial in dunes/subaqueous that would kill cysts_
7: Low potential to redistribute to estuary via ocean
4: Moderately high potential to redistribute to estuary
1: High potential to redistribute within estuary

3.8 Resource Area Impacts

Explanation: This criterion addresses the potential for the placement alternatives to directly impact wetland resources, including coastal beach, coastal dune, barrier beach, bordering vegetated wetland, land containing shellfish, land under the ocean, land subject to coastal storm flowage, and NHESP protected habitat. Alternatives that impact smaller areas of resource are ranked higher for this criterion than those that impact greater areas of resource.

Scoring Categories:
10: < 1 acre
7: 1 to 18 acres
5: 18 to 25 acres

3: 25 to 50 acres
1: > 50 acres

4.0 Alternatives for Element #4: Dredge Methodology

Three (3) different dredge methodology alternatives were considered for constructing the Nauset Estuary project. The alternatives were evaluated for each channel reach using the preferred channel layout, width, and selected placement alternates. Given the extensive size of the Project area and the use of multiple placement sites, it is possible that a combination of dredge methods can be utilized effectively. The dredge methods were evaluated using the following criteria. Results of the evaluation are summarized in Table F-4.

Selection criteria:

- Channel extent assessable by dredge method – This criterion evaluated the extent of each channel reach that can be dredged by the different methods.
- Suitability of dredge equipment for use in channel reach – This criterion was used to evaluate the suitability of the dredge methods for use in each channel reach based on operational constraints such as high current velocities and environmental conditions such as high red tide cyst concentrations.
- Project duration – This criterion used the volume of material required for dredging in each channel reach in combination with the production rate of the dredging methods to evaluate whether the work can be completed in a single dredging season.
- Materials handling and transportation – This criterion evaluated trucking traffic and materials handing for each channel reach and dredge method.
- Not applicable – Certain combinations of dredge method and placement location were noted as not applicable if it is not feasible to use the placement site with the dredge method.

Table F-4. Selection Criteria and Overall Scoring for Element #4: Dredge Methodology.

Channel Reach & Placement Alternative	Alternative 4-1: Hydraulic Cutter Suction Pipeline Dredge	Alternative 4-2: Sidecast Dredge	Alternative 4-3: Mechanical Dredge
Behind Barrier Beach			
Alt 3-4B: Dune Enhancement North of Nauset Public Beach	Portion of channel	NA	Equipment not well suited for work in areas with high current velocities
Alt 3-5: Adjacent to Dredged Channel	NA	100% of channel; Equipment well suited for work in areas with high current velocities	
Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	
Eastern Main Channel			

Alt 3-4B: Dune Enhancement North of Nauset Public Beach	100% of channel; equipment may experience difficulties operating at maximum currents	NA	Equipment not well suited for work in areas with high current velocities
Alt 3-5: Adjacent to Dredged Channel	NA	100% of channel; Equipment well suited for work in areas with high current velocities	
Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	
Central Main Channel			
Alt 3-4B: Dune Enhancement North of Nauset Public Beach	Portion of channel	NA	100% of channel; trucking impacts between Goose Hummock and Nauset Beach
Alt 3-5: Adjacent to Dredged Channel	NA	Method not appropriate for areas with red tide cysts	Method not appropriate for areas with red tide cysts
Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	100% of channel; minimizes transport of dredged materials
Town Cove			
Alt 3-4B: Dune Enhancement North of Nauset Public Beach	Channel excees maximum pumping distance	NA	100% of channel; trucking impacts between Goose Hummock and Nauset Beach
Alt 3-5: Adjacent to Dredged Channel	NA	Method not appropriate for areas with red tide cysts	Method not appropriate for areas with red tide cysts
Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	100% of channel; minimizes transport of dredged materials
Priscilla Rd. Spur			
Alt 3-4B: Dune Enhancement North of Nauset Public Beach	100% of channel	NA	Multi-year project with trucking impacts between Goose Hummock and Nauset Beach
Alt 3-5: Adjacent to Dredged Channel	NA	Method not appropriate for areas with red tide cysts	Method not appropriate for areas with red tide cysts

Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	Multi-year project with trucking impacts between Goose Hummock and upland storage facility
Mill Pond Spur			
Alt 3-4B: Dune Enhancement North of Nauset Public Beach	100% of channel	NA	Multi-year project with trucking impacts between Goose Hummock and Nauset Beach
Alt 3-5: Adjacent to Dredged Channel	NA	Method not appropriate for areas with red tide cysts	Method not appropriate for areas with red tide cysts
Alt 3-9: Upland Stockpile/Beneficial Reuse	NA	NA	Multi-year project with trucking impacts between Goose Hummock and upland storage facility

5.0 Selection of Preferred Alternatives

A summary of preferred alternatives selected for the Nauset Estuary Dredging Project Table F-5.

Table F-5. Summary of Preferred Alternatives for the Nauset Estuary Dredging Project Elements #1 through #4.

Element #1: Channel Layout
Alternative 1-2B: Access between the inlet and public landings in Town Cove and the Priscilla Rd. and Mill Pond spur channels via the main channel Behind the Barrier Beach
Element #2: Channel Width
Alternative 2-3: 100 ft wide channel Behind the Barrier Beach and 50 ft wide channel for all other channel reaches
Element #3: Placement Areas for Dredged Material
Alternative 3-4B: Dune Enhancement North of Nauset Public Beach
Alternative 3-5: Land Under the Ocean Adjacent to Dredged Channel
Alternative 3-9: Upland Stockpile/Beneficial Reuse
Element #4: Dredge Methodology
Alternative 4-1: Hydraulic Cutter Suction Pipeline Dredge for the Priscilla Rd. and Mill Pond spur channels to Alternative 3-4B Dune Enhancement North of Nauset Public Beach
Alternative 4-2: Sidecast Dredge for channel reaches Behind the Barrier Beach and the Eastern Main Channel to Alternative 3-5 Land Under the Ocean Adjacent to Dredged Channel
Alternative 4-3: Mechanical Dredge for the Town Cove and Central Main Channel reaches to Alternative 3-9 Upland Stockpile/Beneficial Reuse

Appendix C: Shellfish Relay Plan

NAUSET ESTUARY DREDING PROJECT - SHELLFISH RELAY PLAN

1.0 Introduction

Shellfish relays are proposed as a form of mitigation for impacts of the Nauset Estuary dredging project on shellfish species in the estuary.

The purpose of the shellfish relay plan is to:

(1) outline the steps necessary to implement the relay
(2) establish monitoring protocols to document success of the relay program
(3) establish monitoring protocols for shellfish locations/densities so that the relay plan can be adapted over time as shellfish populations change
(4) establish reporting protocols
(5) establish procedure for review of reports

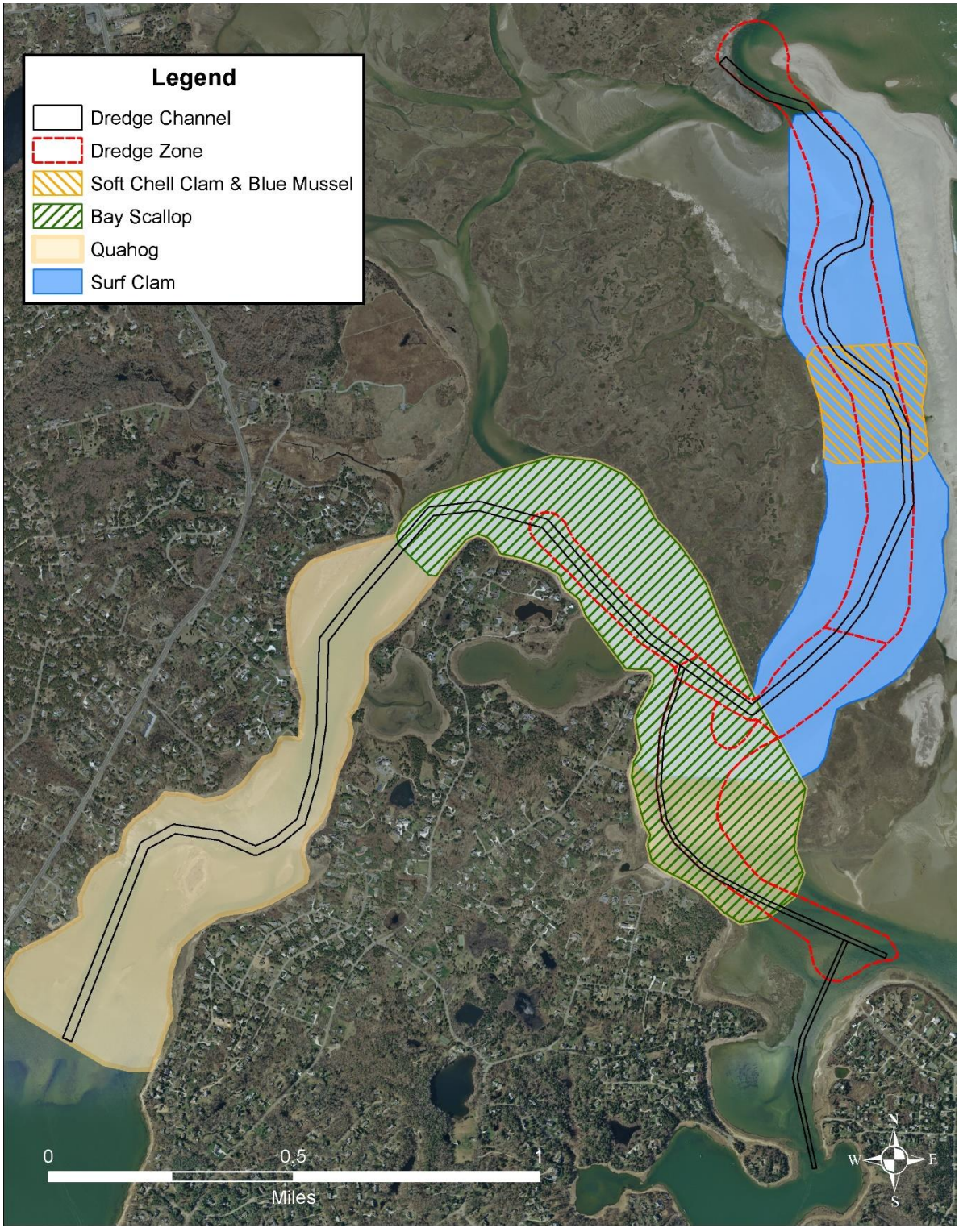
1.1 Site Description

The Nauset Estuary Dredging Project (Project) is located within the Towns of Orleans and Eastham. A portion of the Project is also located within the Cape Cod National Seashore. At 2,200 acres in size, Nauset Estuary is one of the largest estuarine systems on Cape Cod. The estuary is protected from the Atlantic Ocean by Nauset barrier beach, which stretches north from Nauset Heights for more than 2 miles. Tidal waters between the Atlantic Ocean and the estuary are exchanged through a dynamic tidal inlet that is both narrow and shallow. Inside the estuary the system contains large areas of salt marsh with a series of natural channels that lead to open water areas and distal ponds. Ponds in the southern end of the system include Town Cove, Mill Pond, Roberts Cove, Woods Cove and Rachel Cove. Ponds and water bodies at the northern end of Nauset Estuary include Nauset Bay, Salt Pond, and Salt Pond Bay.

Nauset barrier beach and the inlet leading to the estuary are dynamic features of the system that have undergone significant changes over the past 100 years. Since the 1950s the barrier beach and inlet have experienced several periods of northerly growth, punctuated by inlet breaching to the south. The most recent period of northerly migration started in the mid- 1990s. Since this time the inlet has migrated north approximately 1.2 miles to its present location, which represents the most northerly location since early record keeping. The barrier beach and inlet are heavily influenced by longshore sand transport and the hydrodynamics of the estuary are such that sediment moving along the ocean facing beaches tends to be transported into the estuary through the inlet. This net movement of sediment into the estuary has resulted significant shoaling in the estuary channels and mooring areas.

Portions of the estuary are habitat for various species of commercially harvested shellfish. A survey conducted in September 2019 found the following five (5) species (listed in decreasing order of density): quahogs, surf clams, bay scallops, blue mussels, soft shell clams. While shellfish populations are known to vary throughout the estuary, several key trends are seen in the data. Areas behind the barrier beach and in the main channel in the center of the estuary support surf clams. Soft shell clams and blue mussels are found in the center of the channel behind the barrier

beach. Bay scallops occur in the main channel in the center of the estuary between the Priscilla spur channel and the entrance channel to Town Cove. And finally, quahogs are located in many areas of the estuary except behind the barrier beach and the eastern end of the Priscilla spur channel (Figure 1).



1.2 Proposed Project

The Towns of Orleans and Eastham are proposing the Nauset Estuary Dredging Project to improve navigation and public safety for commercial and recreational users of the waterway. During development of the project and selection of the preferred alternative, a number of project Elements were considered. These include the following:

- Element #1: Dredge channel layout
- Element #2: Dredge channel width
- Element #3: Placement areas for dredged material
- Element #4: Dredge methodology

The preferred alternative represents a combination of these project Elements as described below.

Element #1: Dredge Channel Layout - The preferred channel layout extends approximately 4 miles from the inlet to Town Cove via the Channel Behind the Barrier Beach. The Town Cove area supports public facilities at Goose Hummock, Cove Road, Collins Landing, and Asa's Landing, as well as private facilities at the Orleans Yacht Club, Nauset Marine and the Goose Hummock Shop. A spur channel that provides access to Snow Shore and Priscilla Road Landings is also included in the preferred channel layout, as well as a channel leading to Mill Pond. In addition to the channel reaches proposed for dredging, the preferred alternative also includes a dredge zone for channel areas between the inlet and Stoney Island and for the Priscilla Road spur channel. The dredge zone allows for adaptive management of the channel anywhere within the zone at the time of construction, to minimize the area and volume of dredging while still maintaining the navigation channel.

Expected dredging frequencies vary across the proposed dredge channel layout as follows:

- Town Cove Channel – every 15 years
- Central Main Channel – every 8-10 years
- Eastern Main Channel – every 8-10 years
- Priscilla and Mill Pond Spur Channels – every 8 years
- Channel Behind the Barrier Beach – annual spot dredging of shoaled areas

Element #2: Dredge Channel Width – The preferred alternative for channel width is 100 ft wide in the channel reach Behind the Barrier Beach and 50 ft wide in all other channel areas. The channel is proposed to be dredged to -5 ft MLW (-5.5 ft NAVD) with 1 ft of possible overdepth dredging. Channel side slopes are proposed at 1V:3H.

Element #3: Placement Areas for Dredged Material – Because of the size of the proposed dredge area, a variety of placement options are included in the preferred alternative depending on where the dredging is taking place. Dredged material from the Town Cove and the Central Main Channel areas will be stockpiled in the upland within the Towns of Orleans or Eastham and beneficially reused at a later date for other permitted resiliency projects. Sand removed from the channel Behind the Barrier Beach and the Eastern Main Channel will be sidecast approximately

60 to 80 ft from the edges of the dredged channel. Material from the Priscilla Rd. and Mill Pond spur channels will be beneficially reused to enhance the coastal dunes north of Nauset Public Beach.

Element #4: Dredge Methodology – Because of the size of the proposed dredge area and the location of the preferred placement sites, it is not possible to use one dredging methodology. As such the preferred alternatives for dredge methodology are sidecast dredging for the channel area Behind the Barrier Beach and the Eastern Main Channel, hydraulic cutter suction pipeline dredge for the Priscilla Rd. and Mill Pond spur channels, and mechanical dredging for the Town Cove and Central Main Channel areas. Using the preferred channel layout, width, and depth, it is estimated that 119,830 cy will be sidecast dredged, 26,080 cy will be dredged using a hydraulic cutter suction pipeline dredge, and 9,660 cy will be mechanically dredged.

2.0 Pre-Construction Surveys and Reporting

In order to determine which shellfish species are present within the dredge zone in densities high enough to warrant relaying, a pre-construction shellfish survey will be conducted before the start of dredging for the proposed project. The pre-construction survey will confirm the location and species of shellfish present within the dredge zone prior to project activity and will update shellfish data obtained from surveys conducted in September 2019 (refer to Section D for 2019 shellfish survey results). Pre-construction shellfish surveys will occur approximately two (2) months prior to construction in August to September. Surveys will be conducted using the same protocol used in 2019 and was developed in direct consultation with the Massachusetts Department of Marine Fisheries (DMF).

To thoroughly sample the project area, a subset of 35 out of a total of 105 of the pre-established 2-acre hex-bins throughout the project area will be selected for sampling. The selection process will be guided by two primary factors: (i) desire to get full coverage of the project area, and (ii) desire to sample in areas near existing aquaculture operations and shellfish harvest areas. Within each of the selected hex-bins, two discrete sampling locations will be identified using a random point generator, for a grand total of 70 sample locations within the project area. At each sampling point, an underwater camera will be used to capture images of the sea floor. Shellfish sampling will be conducted using a bull rake lined with 0.25-inch oyster mesh operated from either the research vessel or from the water adjacent the vessel. Each location will be raked for 4 minutes, sampling approximately 4 cubic feet of sediment. Once each sample has been washed and sorted, the number, species, and length of all live shellfish will be noted. Raking start and end locations for each sampling point will be recorded using a handheld chart plotter.

Results of the pre-construction shellfish surveys will be compiled into a report that will be distributed to both the Towns of Orleans and Eastham, as well as to DMF. The results of the pre-construction survey will then be used to determine which shellfish species require relocation prior to the onset of dredging based on determinations of significant densities determined by the Towns and DMF.

3.0 Shellfish Relay

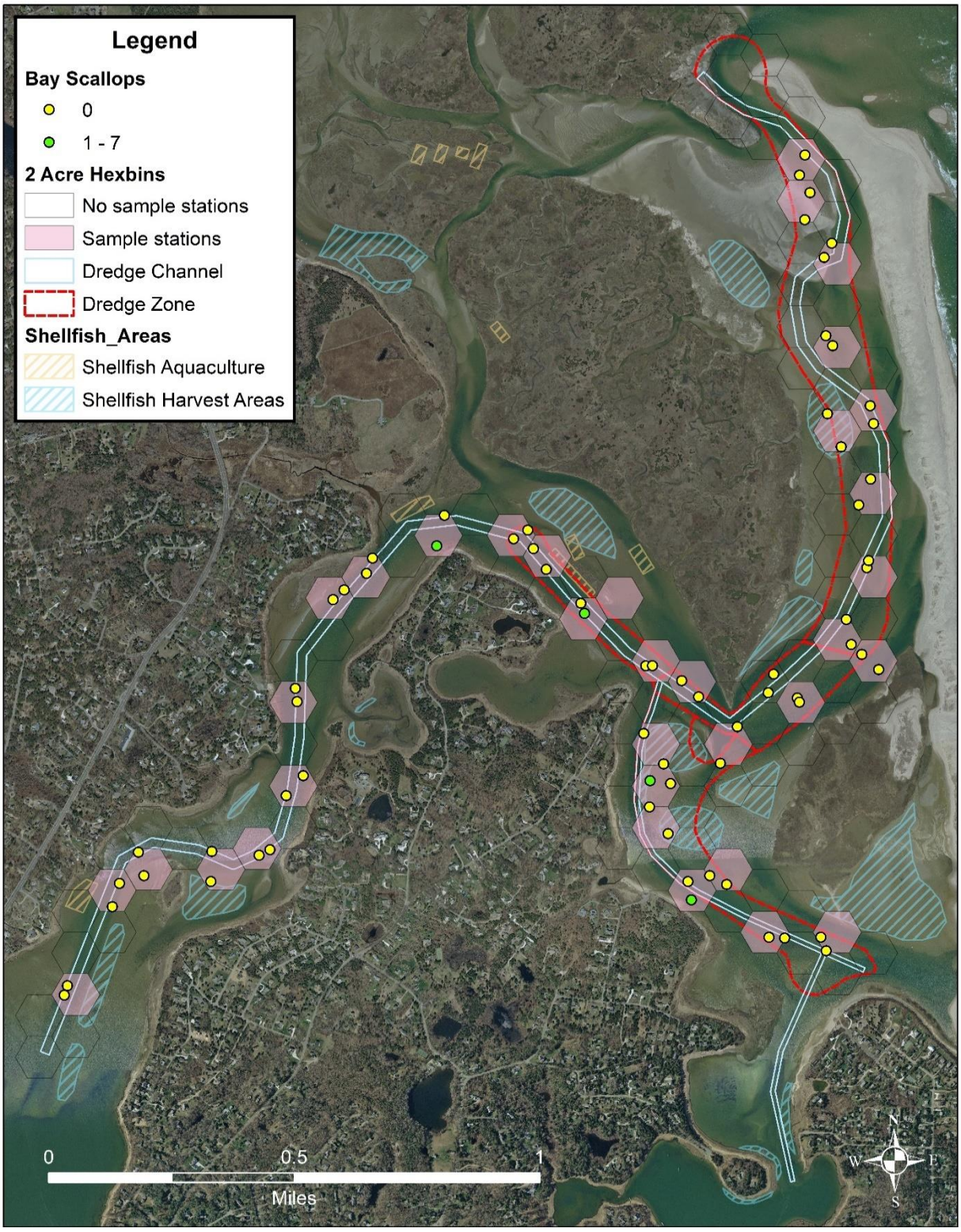
Shellfish species found in densities surpassing significant thresholds identified during the pre-construction survey will be relayed to areas outside of a 50-foot buffer around the proposed dredge zone approximately one (1) month prior to dredging activity. In order to thoroughly capture and relay all necessary shellfish species, including seedlings, a hydraulic dredge will be utilized. When relaying shellfish, a broadcast spreading method will be used to ensure shellfish have adequate space to bury themselves and will be able to survive in their new location. Shellfish will be relocated to mapped DMF shellfish growing areas specific to each species, which provide a suitable environment for relocated shellfish. In addition, shellfish will be relayed to areas within each town in numbers proportional to what was collected form each town, in order to maintain equity for the Towns of Eastham and Orleans, as well as for commercial shellfish harvesters. Collection and relaying of the appropriate shellfish species will cease when a specific number of shellfish can no longer be collected during a tow of a standardized distance. During dredging, existing aquaculture sites will be protected using silt curtains and limits on dredging during outgoing tides will be in place.

Collection and relay of shellfish will be performed by commercial shellfish harvesters or outside contractors, who will be paid a fee for their time. During the relay, an observer will be on board the hydraulic dredge from DMF, AmeriCorps, and/or the Town of Orleans or Eastham. The observer will be responsible for documenting where shellfish are being collected from, the number and species collected, and where shellfish are being relayed to. The proposed relay plan will only apply to areas that will be dredged in the upcoming season. Prior to implementation of the relay plan, approval will be sought from the Towns of Orleans and Eastham, as well as from DMF. The proposed shellfish relay protocol was developed in direct consultation with the Natural Resources Departments of Orleans and Eastham. Cost of the relay will be covered by the Towns of Orleans and Eastham, each town paying for their respective waterways.

Prior to shellfish relay, recreational shellfish harvesters will be permitted to continue shellfishing according to the current regulations and harvest limits in place. After the shellfish relay, the area containing the relocated shellfish will be closed for one (1) week to allow shellfish to set. After this closure, recreational shellfishing will continue according to the existing regulations and harvest limitations. Shellfish Constables from the Towns of Orleans and Eastham will monitor relay sites and address any issues as necessary.

4.0 Reporting

In addition to the pre-construction shellfish survey report, there will be additional reports generated after each shellfish relay. The reports will be distributed to both the Towns of Orleans and Eastham, as well as to DMF. In the event that any of the reports indicate relaying protocols need to be adjusted, the plan will be re-evaluated, and the appropriate changes made, followed by review and approval from both Towns and DMF.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Sample stations
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Dredge Zone
Shellfish_Areas
Shellfish Aquaculture
Shellfish Harvest Areas
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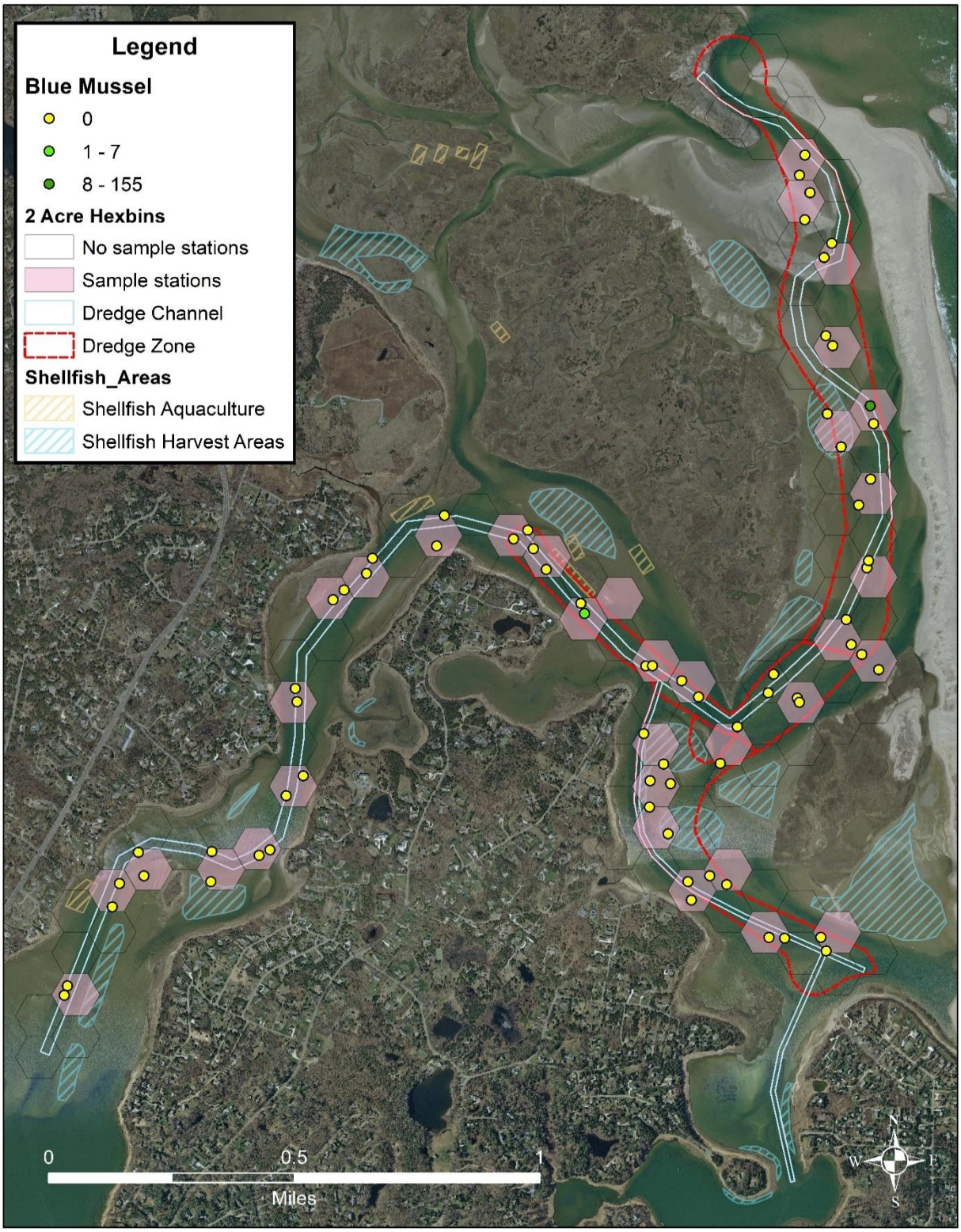
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Sample stations
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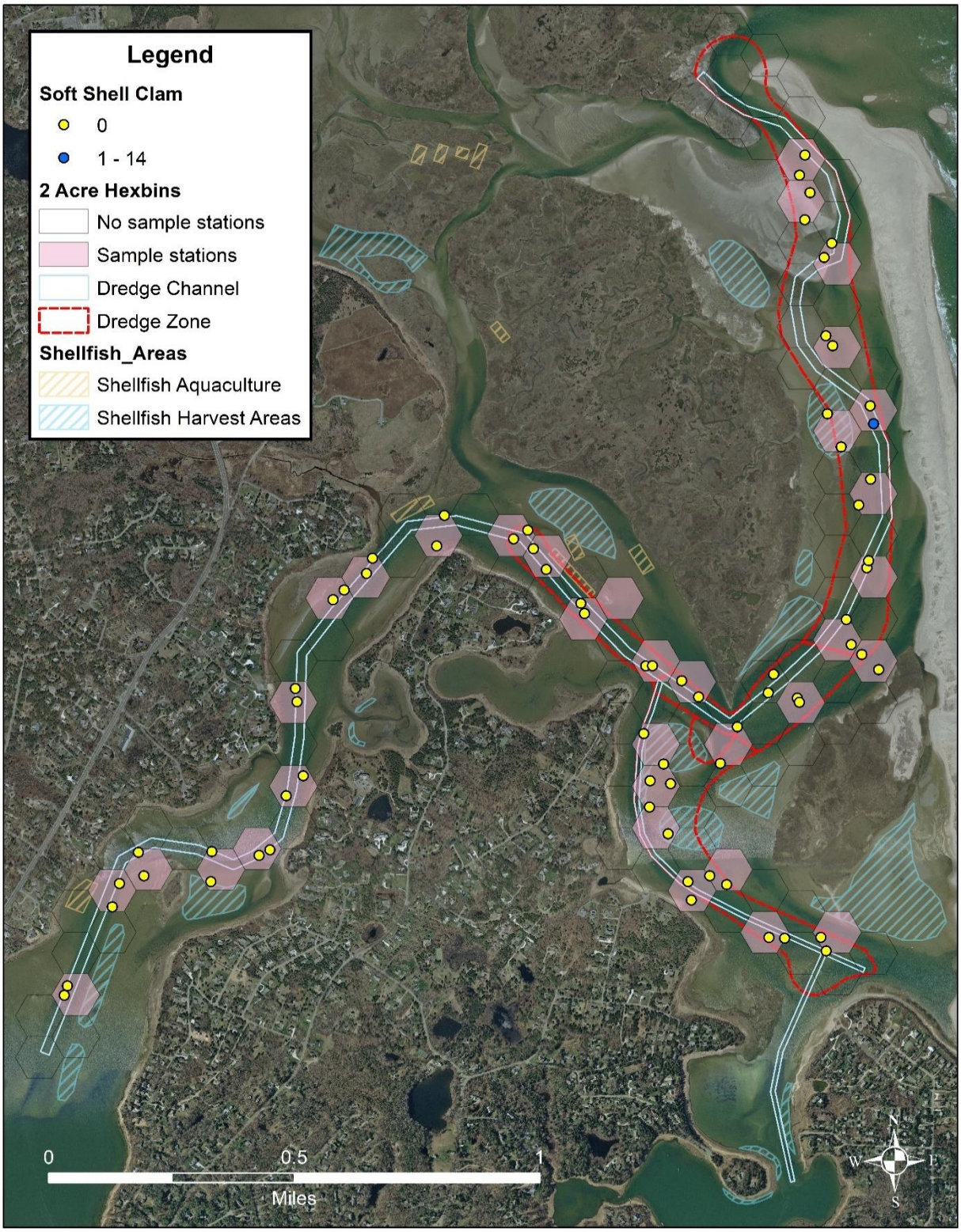
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Sample stations
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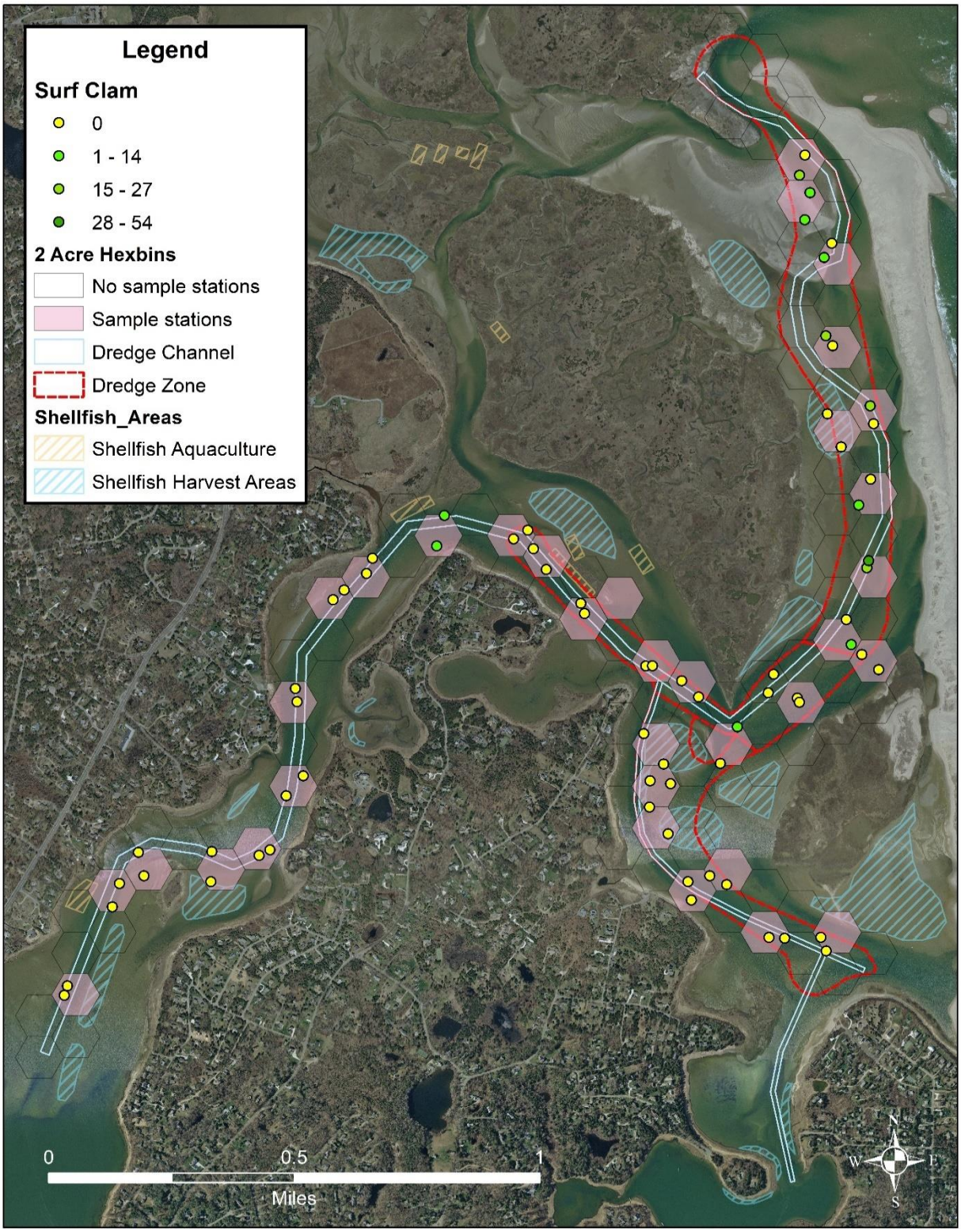
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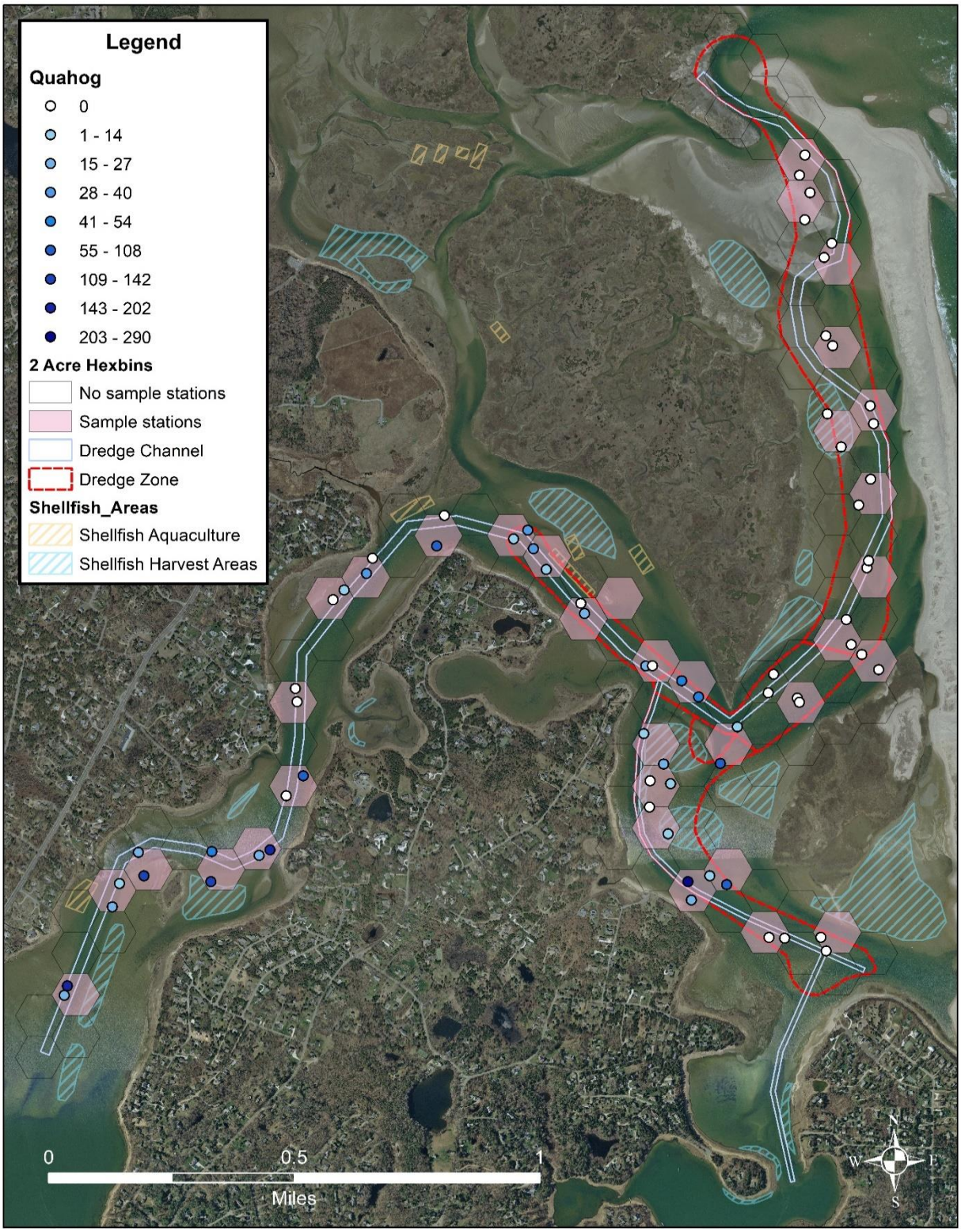
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Sample stations
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Dredge Zone
Shellfish_Areas
Shellfish Aquaculture
Shellfish Harvest Areas
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