

## SCONSET BEACH NOURISHMENT PROJECT:

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### Proponent Responses Following Conservation Commission Meeting #2

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The information included herein is intended to directly respond to questions asked at the Nantucket Conservation Commission meeting held on September 17, 2007 regarding the Sconset Beach Nourishment Project. At that meeting the Proponent, the Siasconset Beach Preservation Fund, provided a document with written responses to questions raised at the Commission's September 10<sup>th</sup> hearing. The Proponent will be providing a subsequent document, resembling this submission here, that in addition to the written responses already provided will contain a record of the verbal responses to questions asked at that first hearing as well as some corrections to the written responses already provided.

For the 2<sup>nd</sup> Commission meeting, as was the case at the first meeting, the Proponent and Project team members were able to respond directly to many questions from the Commissioners. Time constraints, however, prevented the Proponent from directly responding to many questions asked by the public and some of the questions from the Commission itself. Although many answers could have been provided at the meeting had there been sufficient time available, the Proponent hopes that these responses are helpful and informative.

In an effort to be thorough and comprehensive, this document includes questions and responses provided at the meeting itself as well as responses to questions that were left unanswered or required follow-up information. This information is organized according to the order in which questions were raised at the meeting. Where possible, the Project Team has identified the individual asking the question; we apologize if any names are incorrectly recorded here.

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#### PRESENTATION 1: Fisheries Resources & Impacts

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##### **1. Question (Bennett): You mentioned you were working with Woods Hole?**

Response (Barrett): We were working with Woods Hole Group, a coastal engineering consultant; I was not referring to the Woods Hole Oceanographic Institute.

##### **2. (Oktay): Do I understand you only had two sites for ichthyoplankton studies, one nearshore and one at the borrow site?**

(Barrett): Yes; we felt that one nearshore site was sufficient. It is always possible to argue that more sites would be better, but the researchers we worked with (Normandeau Associates) felt, based on their professional judgment, that a single site would be sufficient.

##### **3. (Oktay): DMF's letter posed many questions about your survey methods, including spatial and temporal resolutions. My concern is that you are drastically limited by the trawling gear you are using. I do not want to reiterate DMF's questions... do you have responses to the agency's letter?**

As provided at the meeting, the Proponent worked closely with DMF for a year to formulate the Fisheries Sampling Program. The Project Team is in the process of formulating comprehensive responses to all written comment letters submitted to the Conservation Commission regarding this Project, including DMF's letter.

Specifically relating to the survey methods used in the sampling program, the Project Team contends that DMF's portrayal of pre-construction impact assessments is inaccurate. Since November 2005, the Project's fisheries consultant, Normandeau Associates, has collected an impressive volume of comprehensive fisheries data; Normandeau Associates is a highly-respected fisheries consulting firm in this field. These data include more than 30 days of field surveys performed on behalf of the Proponent to characterize sportfish, groundfish, shellfish, and early developmental stages of marine life and benthic habitat. More than 15,000 fish were caught during these survey efforts, and data have been collected at the Borrow Site using otter trawl, mid-water trawl, and rod-and-reel sampling. These data, combined with the large volume of benthic recovery data from other beach nourishment projects, formed the statistical base for conclusions regarding fish occurrence and the Project's impact assessment.

Permitting delays have pushed the proposed start of dredging to summer 2008, enabling the Proponent to collect an additional year of data. A typical sampling plan, including the one for this Project, is designed to assess seasonal variability in habitat and marine resources. A single year of sampling is commonly accepted as providing a reasonable baseline of data, which is followed by multiple years of monitoring to assess actual recovery. Benthic habitats are relatively stable environments that are not typically characterized by dramatic annual variability. Experts in the field of assessing beach nourishment impacts agree that measuring actual changes in benthic communities as a result of construction is the best way to gauge habitat impacts and recovery (Saloman, Naughton and Taylor, 1982; Johnson and Nelson, 1985).

**4. (Oktay): What were the depths for ichthyoplankton sampling? There can be a gradient change in turbidity through the water column, which means that sampling programs can benefit by breaking out the samples collected at different depths.**

At the Borrow Site, the water column was divided into the upper half (surface to 25 feet deep) and bottom half (25 feet deep to near-bottom [50 to 55 feet]). The net was towed obliquely through the upper or lower portion of the water column for 5-6 minutes, filtering approximately 100 cubic meters of water. At the nourishment area, the water column was not split and the tows filtered the entire water column (water depths were 18-22 feet).

Turbidity data collected for this Project show no significant turbidity gradient relative to water depth. Nevertheless, to identify fish eggs and larvae and to better understand the assemblage of fish in the Project area, the Proponent has conducted duplicate oblique

ichthyoplankton sampling in the nourishment area and at the proposed Borrow Site. Samples were collected twice monthly, weather permitting, from late March-November 2006, which encompasses the proposed construction schedule; 2007 sampling is currently underway. This sampling occurs separately in the upper and lower halves of the water column, and the Proponent has also collected duplicate oblique samples from the surface and near-bottom in the nearshore area. Samples were collected with a 60-cm-diameter bongo net fitted with 0.333-mm mesh nets. The net was fitted with a General Oceanics 2030R flowmeter to estimate the volume of water filtered through. Samples were preserved in 10% formalin/seawater solutions, delivered to the laboratory, and sorted. Based on flowmeter data, counts were converted to densities per 100 cubic meters of water. Samples were sorted in their entirety for lobster larvae because of this species' recreational and commercial importance.

**5. (Oktay): Did your NOI include any specifics regarding mesh size, net size, etc.?**

(Barrett): Yes.

**6. (Oktay): Your nearshore trawl detected 210 species, or 210 individuals?**

(Barrett): Individuals.

**7. (Oktay): What sampling will continue this year?**

(Barrett): We are continuing all sampling until the project is permitted.

**8. (Oktay): Have you performed any capture-and-release sampling?**

(Barrett): We felt that the likelihood of recapturing fish was too low to make that method effective.

**9. (Oktay): For your artificial reef plan, do you know if your preliminary plans mesh with state guidelines?**

(Barrett): Yes, they are consistent with state guidelines.

**10. (Oktay): Are you planning to present more information on the Exclusion Zone?**

(Barrett): Yes; plans presented thus far are preliminary. As we have explained, the exclusionary boxes presented thus far are merely possibilities, and we are trying to balance engineering requirements with input from fishermen who feel that an exclusion box is necessary to protect important fisheries habitat.

**11. (Rudin): It sounds as though the mitigation plan isn't really a "plan" yet.**

(Barrett): I would disagree with your characterization. We will be using approximately 20,000 clean concrete railroad ties supplemented with rocks to provide a total of 11 tons of structure material. This will offer complexity in surface structure and also in the arrangement of the structure itself. As far as mitigation sites, we are close to selecting final sites but want to be sure that we receive enough public input before finalizing the concept; based on our best professional judgment, however, we already have a fairly firm concept of where the best mitigation sites are located. The final site will likely be close to the impact area, since that is what regulatory agencies would prefer; our sense is that state and federal agencies would not prefer the sites located further away.

**12. (Okta): Regarding prop scour, do you have an estimate for how deep prop scour could occur below the dredges?**

(Barrett): We do not have a detailed engineering analysis for how energy is dispersed from the propellers, but we do have graphs showing how much energy is directly behind the propeller versus the energy at depth. Based on these data and input from dredge contractors, the best professional judgment we have found is that five feet is sufficient to prevent prop scour of a magnitude that could damage habitat. Minor suspension of sediment could occur as a result of propeller operation, but maintaining the 5-foot buffer will prevent prop scour damage to the seafloor and will limit "scour" effects to those comparable to natural conditions in this dynamic environment.

**13. (Okta): Have you done any work with the actual railroad ties to confirm they are not contaminated?**

As presented at the meeting, the Proponent has sampled the railroad ties to confirm they are not contaminated; samples were taken from the surface of the ties as well as from the center, and no priority pollutants were detected. We have not taken the ties and submerged them, but we have done quite a bit of research on using concrete as mitigation structure.

Studies suggest concrete is at least equal to, if not better than, using rock for mitigation structure. Concrete is considered to be a suitable, high-quality material for use in artificial reef creation. The authoritative publication on artificial reef creation, "Guidelines for Marine Artificial Reef Materials," states: "*Concrete, either in fabricated units specifically designed for artificial reefs or imperfect concrete manufactured products, such as culvert or rubble from razed buildings, sidewalks, roadways and bridges, has a demonstrated high success rate as artificial reef material in both marine and estuarine environments. The obvious reason for this high rate of success is the strong compatibility of the material with the environment in which it is placed, and for the purpose for which it*

*is placed. Concrete is generally very durable and stable in reef applications.*<sup>1</sup> The draft Massachusetts Marine Artificial Reef Plan prepared by the Massachusetts Division of Marine Fisheries<sup>2</sup> concurs with the findings of the Guidelines for Marine Artificial Reef Materials that concrete is a suitable material for artificial reef creation.

Existing regional and state guidance documents for artificial reef creation do not require chemical testing of concrete prior to use in the marine environment.<sup>3</sup> Environmental professionals involved in concrete artificial reef creation in New Jersey, Maryland, Rhode Island, and Virginia focused their inspection of concrete on visual characteristics, to confirm the absence of oil or grease, rather than on chemical evaluation.

For this Project, the Proponent performed visual and chemical examinations of the concrete ties proposed for artificial reef creation. The thorough visual inspection demonstrated that the ties are clean and safe for use in the marine environment. It is important to note that the railroad ties were never used, and therefore do not have any chemical residues such as oil or grease present on their surface. The results of the chemical evaluation, discussed below, confirm the ties are suitable for use in the marine environment.

As regulatory agencies have not developed chemical standards specific to concrete, the following comparison provides context for the results of the chemical analyses:

- ◆ Petroleum Hydrocarbons were not detected.
- ◆ PCBs were not detected.
- ◆ Cadmium, Mercury, Selenium, and Silver were not detected.
- ◆ Arsenic, Chromium, Lead, and Barium were detected at low levels below screening criteria:
  - These values are well below the criteria for determining if a solid waste requires further toxicity testing. If values exceed the criteria, a test called Toxicity Characteristic Leaching Procedure (TCLP) is required to assess whether toxic contaminants could leach out of the solid waste. (The TCLP analysis was

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<sup>1</sup> Gulf and Atlantic States Marine Fisheries Commissions, 2004. *Guidelines for Marine Artificial Reef Materials, second edition*, Number 121, p. 6.

[http://www.gsmfc.org/pubs/SFRP/Guidelines\\_for\\_Marine\\_Artificial\\_Reef\\_Materials\\_January\\_2004.pdf](http://www.gsmfc.org/pubs/SFRP/Guidelines_for_Marine_Artificial_Reef_Materials_January_2004.pdf)

<sup>2</sup> Massachusetts Division of Marine Fisheries, 2006. *Draft Massachusetts Marine Artificial Reef Plan*, Policy Report PR-1, p. 27.

[http://www.mass.gov/dfwele/dmf/programsandprojects/draft\\_ma\\_artificial\\_reef\\_plan\\_ii\\_111706.pdf](http://www.mass.gov/dfwele/dmf/programsandprojects/draft_ma_artificial_reef_plan_ii_111706.pdf)

<sup>3</sup> *Guidelines for Marine Artificial Reef Materials*, *ibid* and *Draft Massachusetts Marine Artificial Reef Plan*, *ibid*.

developed to assess the possibility of contaminants leaching out of materials disposed in a sanitary landfill.) The values in the railroad ties are below the lowest levels at which a material may be toxic. (See 310 CMR 30.125.)

- These values are clearly below all marine sediment screening criteria. The National Oceanic and Atmospheric Administration publishes a broad range of criteria, called Screening Quick Reference Tables (SQuiRTs), and the ties are below even the most conservative screening levels.
- Values for arsenic, chromium, and lead (no criteria are available for barium) are well below (by a factor of 10) the landfill reuse criteria, which are levels at which soil can be used as cover in a landfill.

The most relevant screening criteria is likely the TCLP test, as it pertains to the potential for contaminants to leach out of solid waste. As demonstrated by a comparison to the TCLP standards, the railroad ties values are below the lowest levels at which a material may start to be toxic.

**Comparison of Chemical Composition of RR Ties and Screening Criteria (mg/kg or ppm)**

	RR Ties	EPA TCLP Threshold <sup>4</sup> (Solid Waste)	NOAA SQuiRTs <sup>5</sup> (Sediment)	MA Landfill Reuse (Soil) <sup>6</sup>
<b>Arsenic, total</b>	4.2	100	7.2-70	40
<b>Barium, total</b>	30	2000	48	
<b>Chromium, total</b>	20	100	52.3-370	1000
<b>Lead, total</b>	5.3	100	30-400	1000-2000

All chemical analyses were conducted by a state-accredited laboratory in accordance with established guidelines. All Quality Control analyses (method blanks, duplicate analyses, and laboratory control samples) were within the stipulated Quality Control limits. The results of the chemical evaluation confirm that the railroad ties are suitable for marine reef creation.

**14. (Bennett): EOEAs letter last year suggested your computer models did not run the “full range of potential wave conditions at the site”; were the models re-run?**

(Spadoni): We ran models for 20- and 50-year storm events, and presented this information to EOEAs. In our professional opinion, this modeling covers the full range of wave conditions.

**15. (Gray): You commented that this habitat is specific to this area. Is that because of the size of the cobble?**

(Barrett): This habitat is relatively unique because Nantucket is an island that has eroded, which is not a common scenario in this area. Erosion has winnowed away fine-grained material, leaving behind cobble, whereas much of the marine environment is typically dominated by sand. The active tidal currents contribute to these sedimentary characteristics.

**16. (Gray): The video survey appears to be entirely north of Sesachacha Pond; is there a reason the video survey has not been performed further south?**

<sup>4</sup> See 310 CMR 30.125; values in the regulations are presented for liquid. To obtain corresponding values for solid material subjected to a total constituent analysis (as is the case with the concrete), multiply listed values by 20 per EPA guidance.

[http://www.epa.gov/epaoswer/hazwaste/test/faqs\\_tclp.htm#Total](http://www.epa.gov/epaoswer/hazwaste/test/faqs_tclp.htm#Total)

<sup>5</sup> Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle, WA, Coastal Protection and Restoration Division, National Ocean and Atmospheric Administration, 12 pages. Updated November 2006.

[http://response.restoration.noaa.gov/book\\_shelf/122\\_squirt\\_cards.pdf](http://response.restoration.noaa.gov/book_shelf/122_squirt_cards.pdf).

<sup>6</sup> Massachusetts Department of Environmental Protection. 1997. Policy #COMM-97-001: Reuse & Disposal of Contaminated Soil at Massachusetts Landfills. Table 1.

<http://www.mass.gov/dep/recycle/laws/97-001.htm#table1>

(Barrett): The video survey shown in that specific slide was for the purpose of identifying a suitable mitigation site. We have conducted video dive surveys in the Project area as well. In addition, we decided to proceed with a recognized oceanographic sampling program for characterizing marine bottoms that involves taking photographs along a systematic grid. This survey is proceeding this week.

**17. (Smith): How will you choose a dredge company, and what type of vessel will they use?**

(Spadoni): We usually do not go to bid for contractors until all approvals are in place, so right now we do not know specifically which contractor will construct the Project. Great Lakes, Weeks Marine, and Manson are the most likely possibilities. In terms of equipment, we have given a range of possible dredge sizes: either a 3,000 or 6,000-CY hopper dredge. The contractor may use one, two, or even three dredges. Permit conditions and market conditions will determine the actual equipment. Thus far, the Proponent has engaged with all three likely bidders to ensure that they understand Project-specific issues and environmental conditions. These contractors have visited the site and participated in fishing trips in the area to gain insight into fisheries concerns.

**18. (Smith): How would the mitigation structure be placed? Will railroad ties and rocks be dumped randomly, or placed with a crane?**

(Barrett): Construction details for the mitigation structure have yet to be finalized due to on-going outreach with the public and regulatory agencies. Conceptually, the Proponent intends to barge the railroad ties and rock to pre-determined locations identified by GPS. Material will be pushed off the back of the barge in the pre-selected mitigation areas while the barge is moving. The result of this will be to scatter the material in a relatively low-relief, but concentrated, manner. The Proponent will also select several locations where rock and ties will be placed in piles up to 5 feet high, which will enhance habitat diversity. We expect the mitigation information will be finalized before the conclusion of the Conservation Commission review process.

**19. (Gray): Where does the 60-acre mitigation total come from?**

(Barrett): Initial Project nourishment will cover 10 acres of cobble bottom. The additional 50 acres comes from the dynamic cover-and-exposure cycle of approximately 105 additional acres. After the beach equilibrates, the toe will begin to erode landward, re-exposing some of the buried cobble. Due to the temporal component of this zone of coverage, therefore, we are proposing a 50% mitigation scenario.

**20. (Gray): For the surf clam harvest at the borrow site, how do you re-plant them?**

(Barrett): We would work with DMF on that program; DMF does not have much experience re-seeding surf clams, and the agency has expressed interest in taking advantage of the research opportunity this effort will provide. We will be using harvest-and-reseeding techniques used regularly for quahogs on Cape Cod. It is important to understand that surf clams prefer shoal areas, whereas this Project is not affecting a shoal. Any surf clams harvested from the borrow site will be transported to shoal areas.

**21. (Okta): How will you assess habitat values?**

(Barrett): We will be using standard techniques. For the mitigation site, vegetation is a prime indicator for good habitat; percent vegetation cover will provide a useful proxy.

**22. (Okta): Will you be looking at diversity or species composition to determine recovery?**

(Barrett): We will replicate surveys (bottom trawl, shrimp trawl, etc.) and assess data relative to pre-construction surveys.

**23. (Andrews): Somewhere in the NOI, does it list what the "other" species are?**

(Barrett): One of the appendices should list all species.

**24. (Andrews): Could you speak to the post-construction seasonal impacts? Diving ducks (harlequin ducks) and thousands of gulls use the nearshore habitat in the winter season.**

We agree that gulls are present in large numbers in the nearshore area during the winter season. The gulls are feeding on amphipods, and the amphipod population should not be impacted by Project construction. Therefore, we do not anticipate any significant impacts to gulls.

Waterfowl (e.g., diving ducks, Northern Gannets, and others) are also present in the nearshore. These birds are not present in the surf zone, but are present several hundred yards offshore with numbers generally increasing seaward. Thus, the birds are present in highest numbers seaward of the construction and equilibration areas. Relatively lower numbers of birds utilizing the nearshore area may incur limited post-construction impacts associated with a reduction in cobble habitat and potentially reduced fish prey.

As we explained at the Commission hearing, the Project will have some unavoidable impacts to cobble habitat; birds that feed above the impact area will have to feed in adjacent areas. We also presented results from sidescan surveys showing more than 2,000 acres of cobble habitat compared with an impact area from the Project on the order of approximately 105 acres; results from an additional cobble survey will further refine the extent of this habitat. Thus, although these habitat impacts are unavoidable, species dependent upon cobble habitat will have abundant alternative areas to utilize nearby. Overall, we do not anticipate significant adverse impacts to waterfowl, as they

can utilize adjacent areas and are generally present in greater numbers farther offshore (i.e., seaward of areas impacted by the Project).

**25. (Andrews): How was the mitigation area calculated: in plan view, or 3-dimensional?**

(Barrett): We are using a vertical approach because looking only at the footprint does not give you the full value of that habitat. Thus, we are using surface area for the structure rather than solely the footprint. The surface area estimate was calculated using the assumption that the bottom of each railroad tie would be in contact with the seafloor and therefore unavailable for colonization in the water column. Given that ties will, in some locations, be piled on top of each other, these surfaces may be exposed. Therefore, the mitigation area calculation is a conservative estimate.

**26. (Andrews): Typically the Commission requires 2:1 mitigation; is your justification for 50% mitigation based on modeling?**

As we explained at the meeting, the extent of proposed mitigation is predominantly based on equilibration modeling. The modeling shows that the construction fill will permanently impact 10 acres and the equilibrium fill will impact 105 acres. A portion of the equilibration area will only be temporarily filled, however, since it will erode; thus, we have estimated that only 50% of that area will be permanently impacted. Therefore, we propose 1:1 mitigation for areas of permanent impact, which comprise 60 acres.

Mitigation ratios of greater than 1:1 are commonly required for inland wetlands mitigation because those projects are often less successful at creating the necessary hydrology for wetlands growth. In the case of marine projects, the necessary hydrology is present and thus mitigation efforts are usually more successful.

We feel it is important to reiterate, however, that the adequacy of mitigation will be based on post-construction monitoring results; thus, the Project will be held accountable for actual impacts and will be required to provide sufficient, successful mitigation. In addition, consistent with the U.S. Army Corps of Engineers' guidance, our mitigation plan is designed with a practical basis to enhance habitat functions and values rather than simply construct a specific area of habitat.

**27. (Andrews): How do you know what the extent of the project area really is, given the strong currents? I would like more hard data regarding projected turbidity and what actually occurs. Also, if you run into finer-grained sand when dredging, what would occur to your projected range of turbidity?**

(Barrett): The potential impact area is based on modeling.

(Spadoni): We did model turbidity at the Borrow Site; we modeled 10% silt/clay, whereas the composition of borrow site material is only 1% silt/clay. Thus, we have provided an extremely conservative approach with the modeling.

**28. (Andrews): Your turbidity sampling was in April, when background turbidity is perhaps greatest. If you are constructing in the summer, when background is lower, would there be greater impacts?**

(Spadoni): As I mentioned, even with the very conservative assumption of 10% silt/clay, modeled turbidity was still below 30 NTUs.

(Barrett): Easterly winds and events that might produce elevated turbidity are not unheard of during the summer season. If there were some evidence that some high natural turbidity event occurred and there was some type of related impact, then I might have some indication there could be a seasonal effect; however, there does not appear to be a seasonal aspect to turbidity-related impacts.

Nonetheless, the Proponent is performing additional turbidity sampling at the Borrow Site, and will present results to the Commission.

**29. (Andrews): When you mentioned the dredge vessel's draft, did you figure in the tides along with your weather concerns?**

(Barrett): We presented bathymetry and depths based on Mean Low Water, so our evaluation factors in the worst-case scenario regarding tides.

### **PUBLIC COMMENTS**

**30. (Edie Ray): I have heard no mention of impacts to marine mammals or sea birds; I am wondering if you have gathered any data.**

We will be presenting information related to waterbirds during the Borrow Site presentation.

As presented in the FEIR, marine mammals (cetaceans and seals) and sea turtles occur seasonally along the eastern shore of Nantucket and in the vicinity of the Borrow Site. None of the marine mammals or sea turtles normally use Nantucket's eastern shoreline for nesting or haul-out. Potential impacts relate to collisions with vessels and equipment, exposure to turbidity, and avoidance behavior induced by noise and vibration; potential habitat impacts include direct removal of habitat features and loss of prey species.

Despite the fact that sea turtles are not overly common in the Project area but tend to travel through during the summer and fall, the Project plans to use mitigation and avoidance measures including trained observers and rigid sea turtle deflectors. Marine

mammals possess a heightened level of intelligence and a strong swimming ability, and the slow operating speed of the dredging equipment should provide them with sufficient reaction time to adapt to Project activities and avoid impacts. In addition, marine mammals and sea turtles breathe at the water's surface, not through gills like fish, so they are less susceptible to impacts from suspended sediment. The relatively minor levels of turbidity, noise, and vibration generated by dredging will provide warnings to any marine mammals in the area, further increasing the likelihood they will be able to avoid the dredging activities.

In summary, potential impacts to marine mammals and sea turtles are minimal. No impacts are expected in the nourishment area since seals which may use this area are able to avoid Project equipment, and this area is not used by sea turtles. At the Borrow Site, impacts will be minimal because the area is utilized only for transit and foraging, and the mobility of the species in question will enable them to avoid dredging activities and locate comparable foraging opportunities nearby.

**31. (Edie Ray): I see no mention of sound impacts to predators or prey, which may be impacted by machinery.**

Sound levels emitted by the proposed dredging operation will be similar in magnitude to typical dredging and ocean construction projects which have not produced negative effects for marine mammals. The relatively minor levels of noise and vibration generated by dredging will provide warnings to marine mammals that may be present in the area, further increasing the likelihood that they will be able to avoid the dredging activities.

Consultations with NMFS have included a comprehensive Biological Assessment, which the Proponent submitted to the agency regarding endangered species and potential Project impacts. Various protected marine species, including sea turtles and whales, could occur in the Project area; however, based on data from the North Atlantic Right Whale Consortium, the North Atlantic right whale was the only endangered whale species sighted within three miles of the Project shoreline between 1995 and 2006. Three adult right whale sightings were reported during this period, with single sightings occurring in 2002, 2004, and 2005 (the right whale observed in 2002 was dead).

Although Northern right whales could conceivably be present in the Project area during the construction season, the Project's construction schedule (from June through November) avoids times when this species is most abundant (February through April). Moreover, neither the Project area nor Nantucket Shoals are critical habitat for this species; the closest critical habitat for the northern right whale is approximately 22 miles east and northeast of the Borrow Site. Leatherback turtles may also occur in the Project area, although no sea turtles have been sighted within three miles of the Project shoreline for the past 11 years (1995-2006; Right Whale Consortium, 2006). In addition, conversations with experienced local fishermen and boat captains who spend

considerable time in the waters off of Siasconset have indicated that sea turtles and whales occur only rarely.

Assessing potential noise-related impacts is extremely difficult and limited by scientific uncertainty. Nonetheless, as the Proponent presented in the DEIR, the Project has sought to use the best available scientific information to evaluate possible impacts. Until recently, NMFS used a straight-forward approach to gauge noise-related harm and disturbance to cetaceans and sea turtles: (a) 180 dB (re: 1 $\mu$ Pa RMS) represented exposure consistent with injury for cetaceans; (b) 160 dB was the threshold for behavioral disturbance for all species emitting impulsive and intermittent sounds; and (c) 120 dB was the behavioral disturbance threshold for "continuous" sound. Advancements in scientific knowledge made it clear that this simplistic threshold system had substantial limitations and did not account for considerations such as sound frequency, duration, and peak pressure.

Expert scientific panels are currently developing exposure criteria for marine mammals and distinct criteria for fish and sea turtles. Neither set of criteria has been published, although the set for marine mammals is under review (B. Southall, pers. comm.).

As we have explained, the specific dredge equipment for this Project remains to be determined. However, the Proponent has obtained sound information for dredge units comparable to those that may be used for the Project. Generated sound data relating to two separate trailing suction hopper dredges are helpful: (1) the *Taccola*, with a capacity of 4,400 m<sup>3</sup>, produced sound at 180.4 dB while dredging (re 1  $\mu$ Pa, 1/3 octave source levels recorded broadside, Langworthy et al., 2004); and (2) the *Gerardus Mercator*, with a capacity of 18,000 m<sup>3</sup>, produced sound at 188.3 dB (re 1  $\mu$ Pa, www.sakhalinenergy.com). A study documented by Clarke, Dickerson, and Reine (2002) indicated that a typical hopper dredge (capacity unknown) produces sounds ranging from 70-1,000 Hz and 120-140 dB.

Due to the wide range in sound generation data (120-188.3 dB for hopper dredges), it will be important to determine the actual sound generated by the dredge. Only then can the appropriate mitigation measures be implemented, if needed. These data will be necessary because, while the lower levels are considered to have relatively low impacts, upper levels could potentially cause injury or death to marine animals in the Project area.

Due to the differing sound emissions values and uncertain biological impacts presented in the literature, the Proponent is conservatively assuming the highest sound emissions are applicable and could employ a "soft start or ramp up" method of noise reduction. This method consists of using harmless but increasingly louder sound pulses in the dredge area, allowing any nearby whales, dolphins, seals, and sea turtles sufficient warning and time to move away. This strategy would further minimize chances for adverse noise-related effects.

Moreover, recognizing the importance of protecting threatened and endangered species in accordance with state and federal laws, the Proponent will post a trained marine endangered species observer onboard the dredge during operation and on-shore offloading to minimize the chances for adverse interactions.

**32. (Edie Ray): I see no sampling adjacent to your Project; how can we possibly know what impacts will be to adjacent areas if we do not know what is there in the first place?**

Impacts related to construction activities will be limited to the construction area. After construction, sand will be distributed to adjacent beaches as presently occurs through natural coastal processes. Because Project material will be transported and reworked by these natural conditions to which marine animals have adapted, there is no reason to believe there will be any permanent impacts as a result of the Project nourishment.

**33. (Edie Ray): What is the turnaround time for the barges? This has implications for turbidity impacts. I would be interested in knowing whether there will be a constant plume.**

The turnaround (i.e., cycle) time for hopper dredges is approximately 4.5 hours. The contractor will dredge for approximately 2 hours, transit to the pump-out location in approximately 30 minutes, and then spend roughly 1.5 hours pumping the nourishment material to the receiving beach before transiting back to the Borrow Site. Modeling results suggest that the turbidity plume will disappear within 30 minutes of each dredge event, which means that each dredge cycle for an operation using a single hopper dredge will consist of a 2-hour period of no turbidity.

Since the lowest silt content that can be modeled is 10%, it is extremely important to note that the turbidity modeling has overestimated the amount of potential turbidity and residence length. This modeling is especially conservative given that the silt content of material at the Borrow Site is only 1%. Even though these conservative modeling results do not suggest any significant detrimental impacts, actual Project-induced turbidity should be even less than presented. Furthermore, the Proponent will monitor turbidity at each pumpout location, and if turbidity levels exceed the regulatory threshold established in Project permits, then the contractor will stop operations and make the necessary adjustments.

**34. (Edie Ray): What is the projected habitat recovery time? In a 25 or 50-year period, for how many years will the habitat be in a fully-recovered state?**

As presented at the meeting, a considerable body of research shows that full recovery of the benthic community (abundance and species diversity) typically occurs within 1-3 years of disturbance (National Research Council, 1995). Benthic communities exposed to regular disturbance under natural conditions, like those in Sconset's high-energy environment, will recover more quickly than benthic communities in more stable

environments because they are more adapted to dynamic conditions. Post-construction monitoring will determine the impact area's specific recovery period. Several studies in soft-sediment habitat suggest that the 1-to-3-year recovery occurs through the migration of motile adults, vertical migration of infauna living deep within underlying substrate, and movement of infaunal organisms through sediment bedload transport. Hard substrate is typically recolonized by sessile organisms through the dispersal of eggs and larvae from adjacent areas during the winter and spring months.

**35. (Edie Ray): In Cape May during World War II, there was a ship constructed of concrete, and that ship was sunk as an artificial reef. The concrete is now breaking down, and the aggregate is deposited on the beach in the form of large, smooth pebbles which the locals call Cape May diamonds. I am wondering if you have tested the grain size of the aggregate used in the concrete railroad ties, and whether that is compatible to the native beach.**

(Barrett): Our judgment is that the railroad ties, which will be placed in 20-30 feet of water, will not be subject to high-energy pounding and will be long-lasting; please refer to our response to Question 53 for additional information.

**36. (Edie Ray): You have portrayed this Project as a great "research opportunity." How can we be assured that this "big experiment" will actually work?**

Research opportunities are not mutually exclusive to carefully-designed, informed projects using well-understood technologies. All projects and activities affected by environmental issues inherently contain a degree of uncertainty. However, careful research and planning can minimize risks while optimizing a project's chance of successfully achieving its objectives. The Proponent has invested in considerable technical, academic, and scientific research to ensure the proposed design reflects the best available information and expertise; this level of commitment means that despite the inevitable risks involved, those risks have been reduced to a level normally associated with well-managed construction projects.

In terms of the Project design, accepted and proven coastal engineering principles were applied. The Project's engineers recognize that Nantucket presents a more rigorous oceanographic scenario than may exist where many other beach nourishment projects have been constructed, and this knowledge is reflected in the variables considered for design. To provide an example, variables such as wave events (height, duration, direction, number) and sediment composition on the beach and in the Borrow Site (mean, median, sorting, fines content) have been considered in developing the Project-specific design. The result of these considerations has been to design a much more robust project than may have been constructed in less vigorous environments. The Proponent has located nourishment sediment which matches the existing beach sediment quite well, and the volume of nourishment material per linear foot and berm and dune construction elevations are all in response to site-specific conditions.

**37. (Josh Eldridge): How does the Applicant explain species that are entirely missing from the surveys (e.g., albacore, oceanic sunfish, mola, mullet, leatherback sea turtles)?**

For a number of reasons, the absence of these species from the ichthyoplankton samples indicates that they are not spawning in the area. These species are not readily captured in the sampling gear, but if they were observed during the sampling program then those observations would be recorded in field logs. Albacore are likely to out-swim any of the prescribed fishing gear used in the sampling program but tend to be surface-feeders circling their prey, and thus are easily noticed. Mullet may also swim faster than the gear used, if they happen to pass through the Project area. The sampling team sighted ocean sunfish (*Mola mola*) on at least one occasion, but the species is too large to be caught in the fishing gear; this fish is often seen close to the surface and is usually solitary. The sampling program did not target the capture of leatherbacks or any other sea turtles, and none were observed during the numerous surveys. There are other species of fish noted in the literature as occurring in the Project area that were not collected in the surveys. None of these species, however, is unique to the Project area, and none have populations at risk from the proposed Project.

**38. (Bam Lafarge): I am interested that no mention has been made of the Magnuson Act or Essential Fish Habitat, despite the fact that the USACE spoke extensively to EFH. I am also interested in the fact that mitigation in another area will essentially be covering up other natural habitat. I also understand that the borrow site contains ~400 acres of EFH; the USACE has said there will be a grave impact there. If you will be using all of the railroad ties to mitigate for nourishment area impacts, what will you use for mitigating borrow site impacts?**

All marine waters off New England are designated as Essential Fish Habitat (EFH) for fish species and life stages. As presented in the NOI, the Borrow Site and nourishment area are designated as EFH for a variety of commercially-important species including winter flounder, for which the population has declined dramatically. Data from the ichthyoplankton study performed as part of the Proponent's Fisheries Sampling Plan supports this EFH designation. Accordingly, the Proponent will adhere to a time-of-year restriction between February and the end of May, during which no Project dredging will occur within the Borrow Site. This restriction will protect winter flounder spawning.

The Project will impact 492 acres of seafloor, of which approximately 105 acres will be a permanent impact due to cobble burial under nourishment material. The remaining 387 acres of impact will be within portions of the Borrow Site and nourishment area where cobble is not present; the existing sandy habitat will incur temporary impacts but will fully recover within 1-3 years of disturbance. Excavation activities at the Borrow Site will account for 195 acres of this temporary impact. It is true that the USACE public notice states that the Project will impact these habitats; however, the Proponent is not required to mitigate for temporary impacts that do not result in a habitat conversion. Therefore, mitigation for Borrow Site impacts is unnecessary.

**39. (Jennifer Eldridge): You are assuring us that the mitigation plan is not just a concept; I would like more details about the process of permitting the mitigation plan. Hopefully you have begun the permitting process? We would have a lot more confidence if we knew that you have permits in place to perform the mitigation and that these reefs have been found effective. Hopefully the mitigation will be happening at the same time as the project?**

(Smith): Our goal is to present the mitigation site at the fourth Conservation Commission meeting. Permitting for the proposed mitigation will proceed along with the nourishment Project. The only difference is with Chapter 91 Waterways permitting: we will be applying for a Chapter 91 Waterways License for the mitigation, since it involves a structure, whereas the nourishment effort has applied for a Chapter 91 Permit.

**40. (Jay Starr): You say the toe will equilibrate 1,200 feet within 2 years; will the sand extend farther offshore prior to renourishment at 5 years?**

No. Based on modeling results, Project engineers estimate that sand will extend a maximum distance of 1,200 feet offshore in one relatively narrow area, while the average distance to the equilibrated toe of fill is only 920 feet. This is the farthest offshore that the toe of fill is expected to move, and it was assumed that it requires one year to reach cross-shore equilibrium. In the years following equilibration, natural longshore losses of sediment from the Project area will decrease the volume of material and reduce the offshore extent of the toe.

Furthermore, Project engineers have used a conservative method for determining the location of the toe of fill. This method is from the Coastal Engineering Manual<sup>7</sup> that is based on equilibrium profile translation. Alternate methods, such as Dean's Equilibrium Profile Theory<sup>8</sup>, suggested that the proposed fill would toe-in closer to shore. Despite these results, the Proponent has chosen to present the conservative modeling results to avoid understating any possible impacts.

**41. (Jay Starr): Where have artificial reefs been used successfully?**

According to the Gulf and Atlantic States Marine Fisheries Commissions, artificial reefs have been used successfully in a number of states including Delaware, New Jersey, Florida, Alabama, Texas, and California. Successful deployment of artificial reefs has been accomplished throughout the world. The Project engineers have worked on a number of successful artificial reef projects in Florida, including those in the Town of Palm Beach, North Boca Raton, South Boca Raton, Broward County, Collier County, Anna Maria Island, and Pinellas County.

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<sup>7</sup> U.S. Army Corps of Engineers. 2001. *Coastal Engineering Manual*. Engineer Manual 1110-2-1100, U.S. Army Corps of Engineers, Washington, D.C. (6 volumes).

<sup>8</sup> Dean, R.G. 2002. *Beach Nourishment, Theory and Practice*. Advanced Series on Ocean Engineering – Volume 18. World Scientific, New Jersey.

Additionally, according to the Massachusetts Division of Marine Fisheries' Draft Artificial Reef Plan, several artificial reefs have been deployed in Massachusetts: Yarmouth (1978), Dartmouth (1997), Boston – Sculpin Ledge and Brewster Island Reef (1999). Each reef system in Massachusetts has demonstrated structural stability, colonization by marine hard-bottom organisms, and usage by pelagic species.

**42. (Josh Eldridge): All of the modeling we have seen depicts one barge; how will turbidity plumes, etc. change with the use of two barges?**

Hopper dredge modeling assumes there is a stationary point surface source of sediment, which will not actually be the case since the dredge will be moving; relative to modeling results, this will decrease the peak magnitude of turbidity but increase the area over which the plume occurs. Furthermore, modeling results show there is an approximately 45-60-minute time lag between the initiation of hopper dredging and the peak of turbidity. There will be a similar decrease in turbidity immediately following cessation of loading operations.

It is true that the dredge contractor may choose to utilize two dredges for this Project. If this is the case, there would be a lag between the stop and start of dredging between the two dredges, and the dredges would not be operating in the same portion of the Borrow Site. Due to these operational logistics, the use of two hopper dredges would not increase the maximum turbidity value. While the use of two dredges would generate a continual turbidity plume within the Borrow Site, such an operation would also shorten the time required for construction by about one half.

**43. (Doug Smith): Ten years ago I applied for an aquaculture permit. Part of the regulatory process required surveys, and I was told at the time that if one clam or blade of grass was present every square foot, then that area would be deemed "commercial". What is the difference between an aquaculture project and a nourishment project?**

The development of aquaculture has been rife with controversy because aquaculture projects involve leasing areas of public water for private use with the exclusion of all competing uses. The nourishment Project will not be an exclusive use. Presently, competing public uses can utilize the Borrow Site and nourishment area for lawful activities; this will also be true post-construction. The proposed nourishment will not take private control over public resources like an aquaculture project would.

**44. (Doug Smith): I have noticed a change in natural turbidity of the water column since SBPF began dumping sand over the bluff; is this sand compatible to native material, or have these efforts changed natural conditions?**

(Rits): 100% of the material used for the terraces is beach-compatible.

**45. (Doug Smith): I see 105 acres of hard bottom impacts, but you are only offering 60 acres of mitigation; what about the mitigation for 400 acres of Borrow Site impacts?**

The Proponent is providing mitigation for unavoidable permanent impacts associated with habitat conversion. The 60 acres of mitigation relates to a 1:1 ratio of cobble habitat area that will be permanently converted to sand. Existing sand habitats disturbed during construction will fully recover within 1-3 years, and therefore do not represent permanent impacts. The temporary impacts which will occur within the Borrow Site will leave a seafloor area composed of sand, a habitat essentially similar to existing conditions which will be re-colonized within 1-3 years of excavation. This area and the temporarily-covered portion of the nourishment area will not represent areas of habitat conversion.

**46. (Doug Smith): As far as your rod-and-reel sampling, your efforts were inadequate.**

The purposes of rod-and-reel sampling were two-fold. The first purpose was to collect data on sportfish species landed in the Project area including location, size, and preferred prey. This information produced a dataset on species and optimal landing locations that allowed for a comparison with information collected on habitats in the Project area. The second purpose was as a useful tool to reach out to and engage with fishermen. The sampling events enabled the Proponent to directly provide fishermen with technical information regarding the Project while also gaining insight from their first-hand knowledge of fishing in the area. In both respects, the information collected greatly enhanced the Proponent's ability to design a Project that could best protect fisheries and fishermen.

**47. (Doug Smith): I heard you characterize this area as "unique, challenging, dynamic, and valuable." I am against this project.**

Indeed, the Project area is unique, challenging, dynamic, and valuable. It is for these reasons that the Project is necessary, and it is also for these reasons that the Proponent has shown a consistent commitment to pursuing a design that will achieve Project objectives while protecting valuable environmental resources and mitigating for unavoidable impacts.

**48. (Emily Moulden): We have some concerns regarding the adequacy of the benthic surveys regarding macrobenthic organisms. Perhaps some underwater quadrant sampling would capture more of these organisms and provide a more accurate baseline.**

As presented before the Conservation Commission, the shrimp trawl sampled macroinvertebrates. Primary species collected included squid (*Loligo sp.*), Lady crabs, and Cancer crabs.

**49. (Emily Moulden): We need to know about the existing habitat at the potential mitigation sites.**

The Proponent has conducted video surveys at several of the potential mitigation sites being considered. The purpose of these surveys is to locate unvegetated, sandy habitats that would gain an ecological benefit from the placement of structure as part of the proposed mitigation. Video surveys have been completed at potential mitigation sites north of the Project area to document the habitat. Once suitable sites are selected, infauna sampling and sediment grain size analyses will determine how these sites compare with the habitat that will be covered by the Project. It is important to select sites that, once hard structure is placed, will closely replicate the functions and values of the lost habitat. Survey results and additional mitigation details will be presented at the upcoming Commission meeting on mitigation.

**50. (Ernie Steinauer): Regarding the mitigation proposal, I am curious why you are replacing a unique cobble bottom with a vertical habitat structure that may not be comparable. Will this change the spatial distribution and composition of species frequenting the area? Would it be better to try to replicate the characteristics of the actual habitat being impacted?**

We believe that the mitigation is an opportunity to increase the abundance of predatory sportfish in the area, which can enhance fishing opportunities while accomplishing the mitigation requirements. In many discussions with fishermen, they described the change in structure and relief in specific areas off of Sconset as a primary characteristic of striped bass habitat. These locations are referred to as the "whale's tale" and the "nursery", among others. Fortunately, the Project will not be impacting any of these areas. It will, however, cover some low-relief cobble which is good fish habitat but does not provide shelter, diverse feeding opportunities, or ambush opportunities for striped bass. Our intention to include some higher-relief structures was initiated through discussions with local fishermen and supported by research into artificial reef projects in New York, New Jersey, North Carolina, and Florida; fishermen support for higher-relief reefs is often a catalyst for these projects. Final design for the mitigation effort is still being refined, and the Proponent will take this comment under advisement. It is our hope that the final design will increase habitat diversity to the benefit of the marine environment and fishermen as well.

**51. (Trey Ruthven): You mentioned you are calculating mitigation area by surface area (i.e., all six surfaces of railroad ties); this could result in an over-estimate of mitigation area provided.**

The surface area estimate was calculated using the assumption that the bottom of each railroad tie would be in contact with the seafloor and therefore unavailable for colonization in the water column. Given that ties will, in some locations, be piled on top of each other, these surfaces may be exposed. Therefore, the mitigation area calculation is a conservative estimate.

**52. (Larry Cronin): How many endangered species have been identified in the area, and how will you protect them? I know of 4-5 species that use the area on a regular basis (summer and winter).**

There are no endangered species in the Project area. Two shorebird species, the piping plover (Threatened on federal and state lists) and least tern (only on state list as Special Concern) occur in the Nourishment area of the Project. The Common Loon (only state listed as Special Concern) was only found once in seven surveys of the Borrow Site and this area is not considered a significant habitat for this species.

The Proponent's Shorebird Management Plan proposes to monitor the beach for potential nesting areas for piping plovers and least terns and, if nests are found, these areas will be isolated from construction activities to ensure that they are not impacted.

Five species of sea turtles could potentially transit through the Project area, as well as several species of whales and porpoise. A NOAA-certified marine protection observer will be onboard the dredge to monitor the area for these species during construction. Should a protected species be identified and deemed threatened by the Project activities, this specialist can halt the construction. In addition, the dredge contractor will install a turtle deflector on the dredge to prevent turtle impacts.

**53. (Larry Cronin): You keep speaking about the railroad ties as if they are the only option. The particular MBTA ties you speak about have been deemed "toxic material", and this seems like a windfall for MBTA. I think you ought to investigate the content of these ties, since they are toxic. EPA has determined these ties as "hazardous waste".**

We responded to this question in some depth at the meeting, but feel it is critical to reiterate a few salient points to dispel some misinformation that is apparently circulating. The Proponent has tested samples from the surface and interior portions of the railroad ties and has confirmed they do not contain any toxic material. The concrete railroad ties are clean and have never been used, and the MBTA is not disposing of them because of any toxicity issues; rather, the MBTA is disposing of the ties because they do not satisfy engineering requirements related to train traffic. As a result, the proposed mitigation is an opportunity to beneficially reuse a large amount of clean material that would otherwise end up in a landfill to create a structure with real, tangible environmental benefits. Respected scientific sources have demonstrated the viability of using concrete for marine mitigation in terms of vegetation growth and complex structure; these resources include the following:

Walker, B.K., Henderson, B., Spieler, R.E., 2002. Fish assemblages associated with artificial reefs of concrete aggregates or quarry stone offshore Miami Beach, Florida, USA. Aquatic Living Resources. 15, 95-105.

- Pondella, D.J., Allen, L.G., Craig, M.T., Gintert, B., 2006. Evaluation of Eelgrass Mitigation and Fishery Enhancement Structures in San Diego Bay, California. *Bulletin of Marine Science*. 78(1) 115-131.
- Glasby, T.M., 2000. Surface composition and orientation interact to affect subtidal epibiota. *Journal of Experimental Marine Biology and Ecology*. 248, 177-190.
- Figley, B., 2003. Marine Colonization of Experimental Reef Habitat in Temperate Ocean Waters of New Jersey. *Unpublished*.

**Follow-up questions: It would be helpful to look at the composition of the ties themselves so we could assess any issues related to dissolution. The ties will also have reinforced steel in them, so you could be creating an iron-rich benthos.**

The ties are concrete comprised of aggregate (sands, stones, gravel) and cement. Cement is made from naturally-occurring materials such as limestone, marl, shale, iron ore, and clay, which contain calcium, silica, alumina, and iron oxide. Concrete cures over time and actually increases in strength, and it is very resistant to fresh and saltwater corrosion which is why it is used for bridge piers, bulkheads, and causeways. This characteristic, coupled with the fact that the ties will not be placed in an environment where they are subjected to high-energy impacts, means they should remain intact. The railroad ties from the MBTA are several years old and have been exposed to weathering conditions which have chemically neutralized their surface. The railroad ties are reinforced with steel rods, but only the ends are exposed; the concrete will effectively isolate the rods and prevent additional exposure.

**54. (Larry Cronin): What will happen to the currents on either side of the site, and could this cause a domino-effect within the shoal?**

Modeling results have consistently shown the Project will not have any detrimental effects on sediment transport, wave transformation, or currents in or adjacent to the Project area. Please also note that Project activities will be located in areas entirely distinct and separate from the shoals, and as a result the shoals off of Nantucket will not be materially altered.

**55. (Larry Cronin): Who will be monitoring the equipment coming into the area? Any one of the 20-30 vessels coming into the area could be carrying dangerous species or pathogens.**

We are not aware of any cases where dredge equipment has transported dangerous species or pathogens to a project site. We are aware that zebra mussels were introduced into the Great Lakes by vessels transiting from the ocean. This Project, however, is located adjacent to the ocean and as a result no introductions of ocean-derived invasive species from dredge equipment would be anticipated.

Nonetheless, to more specifically address the question, dredge contractors typically stage their equipment from the closest project site to minimize mobilization costs. Whichever contractor has the necessary equipment located most proximal to the Project area will likely have the low bid, since mobilization costs are a large portion of the work. Therefore, it is likely that equipment will be brought to the site from a project located within a few hundred miles of the Nantucket, which further minimizes any potential of contamination.

Lastly, it is unlikely that more than 4-6 vessels will be mobilized to Nantucket. The contractor will likely bring a survey vessel, 1-2 hopper dredges, and 2-3 tugboats to assist with locating the submerged line. The tugboats will likely be on-site only when the submerged line is floated and moved.

**56. (Bob Rank): I disagree that the majority of fishing is farther offshore; the majority is in close to shore in about 18 feet of water.**

The Proponent conducted regular shore observations of fishing boats during summer 2007, and resulting data support the statement that the majority of fishing activity occurs at least 0.5 miles from the shore where bathymetric charts indicate the water depths are greater than 25 feet.

**57. (Bob Rank): Have you considered water temperature as one criterion for mitigation site selection? Some of your sites in Nantucket Sound are characterized by warmer waters.**

We have considered this and agree that water temperature, among others factors, makes the potential mitigation sites in Nantucket Sound ecologically-distinct from the habitats that will be impacted by the Project.

**58. (Bobby DeCosta): When did WHG perform the bathymetry survey? The lines drawn on your chart are not accurate.**

Woods Hole Group performed the bathymetric survey in August 2006 in association with preliminary Project-related coring and surface sediment sample collection. The survey was conducted per standard surveying methodology using RTK (real time kinetic) equipment, which is tied in through GPS equipment and set up over a known monument location. The accuracy on the survey is  $\pm 0.5$  feet horizontal and  $\pm 0.2$  feet vertical. This survey was checked against a preliminary survey conducted by CPE in May 2006, and the two surveys showed excellent agreement. Contours were created using Surfer 8 (Golden Software®).

**59. (Bobby DeCosta): Option 2 for your Exclusion Zone, which you said would not work, appears feasible to me. How do you know it cannot be done if you have not selected the dredge contractor?**

We have discussed these boxes with the three potential dredge contractors, each of whom has visited the site and met with some of the fishermen. Each contractor has indicated that they cannot pump the entire length of beach that would be necessary with the exclusion zone proposed by the fishermen. To pump the gap, the contractors would have to install a booster pump in the water within the exclusion zone.

**60. (Bobby DeCosta): How did you calculate the percent cobble coverage?**

Estimated percent cobble coverage is based on data from sidescan sonar surveys and subsequent diver surveys using video cameras performed along six shore-perpendicular transects. The Proponent is currently conducting a photographic grid survey to further refine this estimate.

**61. (Bobby DeCosta): I would like to see extensive video coverage of the area that will actually be buried; video surveys should be conducted at the same time of year as the proposed construction schedule.**

As explained at the meeting, the Proponent has already collected some video data, and is performing an additional photographic survey this month.

**62. (Bobby DeCosta): You have not put any ties in the water yet, and you have not tested your mitigation concept. Striped bass stay above and around structure, they do not hide within it like the grouper shown in your photograph. I want to see rock-for-rock and cobble-for-cobble mitigation, with the same habitat put back that is going to be covered up. What grows on structure depends a lot on water depths.**

The Proponent considered placing a small number of railroad ties in the Project area in summer 2007 to test the mitigation concept, but it was determined that the permitting of even such a limited pilot deployment could not be achieved in a period of less than three months. As a result, the Proponent abandoned this deployment.

**63. (Bobby DeCosta): The fish studies I was involved in were a joke.**

We disagree with this statement and suggest that data collected during the studies and site-specific information provided by Mr. DeCosta run contrary to this statement. See the answer to question #46 for details on the value of the studies.

**64. (Bobby DeCosta): There is no way to avoid prop scour; you talked about monitoring the pumpout site, but there are also hummocks between the borrow site and the pumpout site.**

The contractors will perform their own survey of the navigation routes, pipeline corridors, and pump-out stations even though they are given all available survey information. The contractors have a significant incentive to accurately survey these locations because they do not want to endanger their equipment by sailing too close to shallow areas. It is

well known that one of the potential dredge contractors already performed a survey of the Project area as due diligence for the preparation of a bid. This survey was specifically intended to identify deeper areas suitable for pump-out.

All potential contractors have universally indicated they do not think this Project will have an issue with prop scour of a magnitude that could damage habitat; furthermore, the contractors have not encountered it as an issue on previous projects. Minor and temporary mobilization of surface sediment as a result of propeller operation can be expected, but maintaining a 5-foot buffer between the dredge and seafloor will prevent scour-related habitat damage.

**65. (Bobby DeCosta): You have not spoken at all to how the Project will deal with fog. One of the dredge contractors told me they will not operate in the fog. If you start in June, you will have many down-days.**

The Proponent has met with potential dredge contractors to discuss this issue, and the hopper dredges are equipped to operate in foggy conditions. Two of the potential contractors have specifically discussed dredging the Columbia River bar, which is well known for heavy fog and extremely active fishing activities (on the order of hundreds of fishing vessels); they have successfully performed dredging in those conditions without any incidents.

The contractors indicated that when visibility drops below 0.5 miles, it is likely they will temporarily cease operations. The vessel captain is responsible for operating the dredge and making the decision to shut down due to hazardous conditions. Contractors have indicated they are aware of the issues with fog, and they are building potential down-time into the Project cost.

The Proponent can also post a given week's hopper dredge sailing routes at Nantucket Harbor and in the US Coast Guard's Notice to Mariners. In addition, the Proponent has discussed hiring local vessels to act as patrol boats during foggy conditions.

Based on discussions with the dredge contractors, Project construction will likely span approximately five months. As we have made clear in the presentations, wave and weather data indicate that dangerous operating conditions are frequent during the late fall and winter months, negating construction during that season. Therefore, initiating construction early in the summer is necessary to complete the Project in a single season. It is true that the contractor will likely lose some operating days in June/July to fog, but that down-time does not eliminate the logistical benefits of beginning construction in June.

**66. (Pete Kaiser): To make a computer model, you usually use data from a prior similar project; there are no similar projects from areas that are this dynamic. Where do your model**

**inputs come from? I spoke to the Project Manager in Islip and asked him about the duration of the renourishment period; he told me that in such a dynamic area (and the area is less dynamic than Sconset), predictions were difficult. It turns out the nourishment fill lasted only four days.**

Delft-3D, which was used to perform some of the modeling for this Project, is a state-of-the-art model that has been applied to projects all over the world. For design purposes, Project engineers used the Storm Induced Beach Change model to develop the cross-shore portion of the design model. The Proponent's modeling effort did not use data from a "similar project", but rather calibrated the model with Project-specific bathymetry and actual wave height and current data from within the Project area. The parameters used were for a one-in-fifty-year storm event east of Nantucket Island. The advanced nourishment portion of fill was also developed using site-specific information which included a review of existing conditions on Sconset Beach. Beach profiles suggest that a berm height of +12 feet MLW is appropriate. The beach slope of the design Project is a bit steeper than the natural beach, for purposes of constructability, but waves will reshape the slope so the post-construction profile will resemble the existing 1:10 (vertical:horizontal) slope. Project engineers evaluated longshore losses of the existing beach as well as diffusion losses and predicted sea level rise for the life of the Project. The FEIR includes an engineering appendix which provides engineering design detail.

The project in Islip (Smith's Point) was composed of two parts: one was 4,000 feet long and contained 150,000 cubic yards, while the second was only 2,000 feet long and contained 75,000 cubic yards. These are very small, low-density nourishment efforts, and short projects are quite susceptible to losses since diffusion loss is related to the square of the project length. However, these projects were not washed away in the storm. Post-storm surveys, which only extended down to Mean Low Water, showed that only 23,000 cubic yards were lost from the template in the larger section and 46,000 cubic yards were lost from the smaller section. If the surveys extended further offshore, it is highly likely the "lost" sand volume would be located in the submerged portion of the profile, which is just as important as the emergent section.

Predicting beach performance is, in fact, quite complex and expensive, and modeling was not performed for this Project due to the limited budget available for design and construction.

**67. (Pete Kaiser): I beg to differ that prop scour will not be an issue. A small prop can make a 5-foot hole trying to get out of shallow areas. Scouring the bottom will stir up silt. Have you collected any core samples in the potential pumpout areas where prop scour could occur?**

Offshore sediment samples were collected out to -25 feet MLW along 10 profile lines. The sampling shows that the average percent silt in the offshore samples was 0.9%, with a maximum of 1.1%. The samples indicated that the sediment grain size is generally coarse

sand. Offshore samples show a high degree of uniformity, so even though samples have not been collected specifically at the potential pumpout locations, we would expect a similar silt content.

**68. (Pete Kaiser): Regarding the comment about the lack of cobble within 300 feet of the beach, my own experiences (which I have on video) contradict you.**

Transects T4 and T5 show cobble as close as 50 feet from shore. North and south of this area, however, cobble is limited within 300 feet of shore. A more detailed cobble survey is underway, and the results will be presented at a future meeting of the Commission.

**69. (Pete Kaiser): The sand that is put on the beach is essentially pressure-washed. You cannot compare that sand to sand that has been on the beach for thousands of years.**

Coastal beaches are highly dynamic environments continually subjected to wave energy and coastal storms. It is typical for the elevation of the beach at Sconset to be as much as 6-10 feet lower immediately after a winter storm when compared to pre-storm conditions. Coastal beaches tend to accrete sediment during the relatively calm summer months and lose sediment during the stormier winter season, and Sconset Beach is typically significantly wider and higher in the early fall than it is in early spring. Thus, sediment on the beach is constantly moving and being re-worked. Every time a wave breaks on the beach, individual sand grains are suspended, transported, bumped into other grains, and abraded. In fact, this constant motion and abrasion is what causes the overall smooth, rounded appearance of each individual grain. While the general width and height of the beach remains relatively consistent from year to year, individual sand grains are constantly moving in both longshore and cross-shore directions. Individual grains of sand do not have a long residence time on any given portion of the beach. Numerous studies using dyed or radioactively-tagged sand grains indicate that sediment is constantly moving along a beach on a daily, and in fact hourly, basis.

The sand in the Borrow Site is located in 30-50 feet of water and is extremely compatible with the native beach. Bathymetric survey data provided in the presentation's Borrow Site Cross-Section slides show that this material is not flat-lying but instead is found in elongated bedforms known as sand waves or mega ripples. These bedforms are naturally-occurring features formed as wave and tidal currents sculpt the bottom sediments, and they are constantly reconfigured in response to waves and/or tidal current direction. Thus, these grains of sand at the Borrow Site are subjected to the same transportation and abrasion processes as the sand found on the beach. Similar to the beach material, sand grains at the Borrow Site are rounded and polished as a result of these processes.

To mobilize sediment into the hopper dredge, the trailing arm entrains both sand and surrounding water. Once the material enters the hopper, it is dewatered and transported to the pumpout station. At the pumpout station, native water is once again added to

the sediment to re-suspend individual grains and form a slurry which is pumped to the beach. This process involves the same suspension, transport, and abrasion processes that the sand is naturally subjected to on a continuous basis.

**70. (Pete Kaiser): There is a thing called "site fidelity", which means small crabs and other organisms return to the sites where they were born. This Project, by burying habitat, has potentially significant implications.**

Site fidelity is well understood for animals such as mammals and birds, but less so for fish. Anadromous fish species, including striped bass, show clear site fidelity when they return to spawning grounds. Stripers return to spawning grounds in the Hudson River Estuary and Chesapeake Bay where they are born, but they do not exhibit fidelity to summer feeding grounds off of New England where their movements are guided by food availability. Crabs and other smaller organisms are geographically constrained by their size and inability to swim long distances in the water column. Marine animals that are likely to exhibit any site fidelity in the Project area are limited to those that move to and utilize the cobble habitat for reproducing. However, since there is a large area of similar habitat immediately adjacent to the impact area, the Project will not exclude organisms may have been born in the impacted cobble area.

A number of recent studies investigated "site fidelity" in the Asian shore crab, *Hemigrapsus sanguineus*, and *Cancer* crabs, such as rock crabs and Dungeness crabs, and found low site fidelity in these species. Evidence suggests a seasonal shift in abundance does occur, where adults and juveniles move into shallow waters during the warmest summer months (August-September) and remain further offshore during the remainder of the year. In 2002, a study on Cape Cod observed seasonal shifts in abundance of fishes and decapod crustaceans in an estuarine system with a variety of benthic habitat types, but found site fidelity to be rare. More specific to Sconset, calculations of invertebrate taxa abundance from the nearshore environment indicate dominance by soft-sediment species. These species re-colonize newly-deposited sand throughout the process of equilibration. The two decapod species most frequently encountered, lady crabs and rock crabs, as well as anomuran crabs (such as the long-wristed hermit crab), are also typical of soft-sediment habitat due to their affinity for burying behavior; these will likely utilize newly-deposited sediment following nourishment.

**71. (Edie Ray): In the wintertime, if you stand on Sconset Bluff you can see thousands of common eider, three varieties of scoter, and many seabirds. I know you employed Bob Kennedy to perform some counts; I had some reservations regarding his methodology, but am wondering why you have left all of this data out of your presentation.**

As we explained at the meeting, we will be discussing waterbird information and survey data during the Borrow Site presentation.

**72. (Okay): I was curious to see whether any surf clams were found in any benthic grab samples north of your site or within your nourishment area. We might be missing some species we need to know about (including lobsters, potentially migrating through the area). We may have an issue with pipe placement regarding the movement of macrobenthic species.**

It is highly unlikely that surf clams would be collected in the benthic grab due to the size of the sampling device. For this reason, the Proponent is performing a nearshore shellfish survey to determine the density of surf clams in the nourishment area. DMF's shellfish habitat suitability mapping suggests that the nourishment area is not suitable habitat for surf clams, and the agency has confirmed that the area is not critical lobster habitat. Pipelines extending from the pumpout location to the Project shoreline will not impede the movement of benthic macroinvertebrates in cobble bottom areas because they will be equipped with collars that create a buffer between the bottom of the pipe and the seafloor. Furthermore, since pipeline placement is primarily perpendicular to shore, the nearshore to offshore migration of macrobenthic species will not be affected.

**73. (Okay): Trying to establish mitigation areas is quite complicated. DMF, with their limited experience, has indicated it could take 6-10 years for some areas to recover. We need some data, with references, regarding how quickly some of these areas might recover. We must think about organisms that may move through these areas, not just those organisms that may reside there more permanently.**

Hard structure habitats in high-energy areas are likely to exhibit rapid colonization since waves and currents can import organisms that take advantage of the characteristics of the hard structures. A study of reef colonization in New Jersey showed that the largest number of new taxa to colonize a reef structure occurs in the first year and drops off dramatically after year 3, at which time 80% of the community had developed (Figley, 2003). Organisms that move through the area will fulfill their biological requirements in adjacent cobble habitats, which will remain largely unaffected by the Project; the Project will impact only 5% of the total cobble complex in the area. Since 50% of the benthic community can be expected to colonize the mitigation area within one year, the mitigation habitat will quickly begin to provide biological services to the species present. The mitigation area can be expected to provide mature, developed habitat conditions typical of natural areas after three years.

**74. (Andrews): I would like more weather data. You mentioned that you modeled for 20-year and 50-year storms. I would like to know how many days had waves over 5 feet and how many days the winds blew 40 mph or greater.**

The USACE provides wave and wind statistics collected every hour for a 20-year period beginning January 1, 1980 and extending through December 31, 1999. The Proponent obtained these data for a location approximately 15 miles east of the Project area. It is important to note that waves approaching the Project area are actually smaller than

these data suggest, since waves approaching Sconset from the east break on Bass Rip Shoals (east of the Borrow Site) and then reform and move landward toward Sconset Beach as smaller waves. As described in the FEIR, a Weibull distribution was performed to develop the 50-year storm conditions.

This record includes 50,759 hours (2,115 days) when the wave height exceeded 5 feet, which represents approximately 29% of the survey period. Out of this subset, 20,356 hours (40%) contained waves moving west to east.

Winds exceeded 40 mph for 60 days within the survey period, and exceeded 35 mph for 188 days.

**75. (Larry Cronin): Will binders be used for binding the sand? If this Project has any chance of succeeding, the sand will need to be bound.**

(Smith): There will be no binding agents, and there have never been any binding agents used for this project; that includes the beach dewatering effort.

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## PRESENTATION 2: Coastal Bank Terraces

**1. (Rudin): The purpose of the terracing is to keep the top of the bank from eroding back to its angle of repose?**

(Rits): The main purpose is to prevent loss along the exposed surface from wind and runoff. Terracing and native vegetation plantings will stabilize the material. If the toe is stabilized (by nourishment), then over time the jute fabric will decompose, vegetation will root into the face of the bank, and the currently vulnerable, over-steepened portions of bank will be stabilized.

**2. (Rudin): If you did not create a terrace, the bank would eventually reach its natural angle of repose and become vegetated. If you performed the nourishment and not the terracing, could you show which structures would still be lost?**

As we explained at the meeting, further collapse from the top of the bank will threaten existing structures. Bank terracing is a critical component of the Project which will work in concert with the proposed nourishment placed at the toe of bank. We will provide the Commission with additional information showing which structures would be lost without the proposed terracing.

**3. (Rudin): The total sediment contribution values do not appear to relate to the terraces.**

(Rits): With the nourished beach fronting the terraces, the terraces will not be providing sand; what we are showing is the nourished beach will be supplying *more* sediment

volume than the bank terraces do at this time. At the Commission hearing, we explained that the nourished beach would supply 300-400% more sand to the littoral system than the existing bank terraces, eroding dunes, and eroding bank; however, this figure must be considered in context. To elaborate, while at first glance this figure appears large, the nourished beach will only provide roughly 40% more sand to the system (due to diffusion) than the complete existing eroding shorefront, inclusive of areas from the top of the bank, across the dunes, and out to the depth of closure.

**4. (Okta): Were you originally proposing vegetated terraces?**

(Rits): Yes, we were initially proposing vegetated terraces.

**5. (Okta): You are saying we can expect triple, if not quadruple, the volume of sand into the littoral system than currently exists. This is potentially an impact from the project. I don't know that we want to drastically enhance the sand supply for the system.**

At the Commission hearing, we explained that the nourished beach would supply 300-400% more sand to the littoral system than the existing bank terraces, eroding dunes, and eroding bank; however, this figure must be considered in context. To elaborate, while at first glance this figure appears large, the nourished beach will only provide roughly 40% more sand to the system (due to diffusion) than the complete existing eroding shorefront, inclusive of areas from the top of the bank, across the dunes, and out to the depth of closure.

**6. (Okta): Will some sand move offshore, create shoaling, and thus alter currents and sediment transport?**

(Rits): Detailed modeling, which has incorporated sediment transport, wave conditions, shoreline morphology, etc., has shown slow diffusion of sand to the north and south that will not generate any detrimental impacts.

**7. (Okta): Do you have specific volume calculations?**

(Rits): Over 5 years, 1.4 million CY is expected to diffuse north-south and seaward of the nourishment toe.

**8. (Bennett): What type of sediment source will you use for the terrace fill?**

At the hearing, it was presented that terraces would likely be constructed using sand from a terrestrial source; in fact, it is more likely that the Project's dredged material will be used to supply the terrace sand. If necessary, the contractor will be able to stockpile sand for terrace construction by building a slightly higher berm.

**9. (Bennett): You will have approximately 21,000 CY of fines being dumped back into the water column.**

(Rits): The post-nourishment beach will have slightly lower silt content relative to existing conditions.

**10. (Rudin): Do you intend to address any modeling of longshore movement of sand? I know neighboring communities have concerns. Have you done any modeling of sand transport north and south?**

(Rits): Yes, CPE has performed extensive modeling of sand movement out of the Project area; we have already presented some of these results, including those near Sesachacha Pond. At the Pond, diffusion from the Project area could widen the beach by perhaps 40 feet over a period of 5 years. Farther from the Project area, the strip of accretion will taper off.

**11. (Andrews): Most vegetated banks around the island have reached their angle of repose. How will this bank retain its steepness?**

As presented at the meeting, the Proponent has surveyed the actively-eroding slope as well as adjacent vegetated slopes. We will provide the Commission with additional information regarding the proposed terrace profile and vegetation plan, and will demonstrate how the terraces will achieve bank stability.

#### **PUBLIC COMMENTS**

**12. (Ernie Steinauer): How many of the homes are pre-1978, and could any be relocated rather than protected by terraces?**

Many homes have been moved landward from the bank in the past. Additional opportunities to retreat from the eroding bank by relocating homes are constrained by the lack of available landward lots. Figure 3-6 in the DEIR shows all pre-1978 structures, which are scattered along the Project area. We can provide additional information, if necessary, regarding more precise numbers.

**13. (Ernie Steinauer): It looks like posts will be penetrating through your upper terrace layers?**

At this time, posts will not be penetrating through subsequent layers. The Project team will provide the Commission with more detailed information regarding the terrace design.

**14. (Ernie Steinauer): Are you going to plant right on top of the jute?**

(Rits): Sand will be placed over the jute, and plantings will be placed on top.

**15. (Ernie Steinauer): Are the fine-grained materials the nutrient source for the system, whereby depriving the system of fines could generate impacts?**

(Rits): We found very few fines going out to 3 miles; this fine-grained material is significantly stirred up and kept in suspension for a period of time so that it is moved out of the system.

**16. (Ernie Steinauer): I question the stability of the design. If you have a similar angle of repose, you have a top layer of beach sand, which is relatively loose material. Even with overlying vegetation, you have other factors that could be detrimental to bank stability. Could you let the bank get back to a natural angle of repose and just plant into the natural bank material without adding fabric and overlying sand?**

The proposed nourishment will protect the toe of bank and prevent its further erosion, while the proposed jute fabric terraces will reduce runoff erosion and allow vegetation to root through the terrace fill material and into the bank face. After approximately 1-3 growing seasons, the jute fabric will decompose and vegetation will be rooted into the native bank and fill material.

The terraces are designed to reduce the slope of the Coastal Bank in extremely localized, over-steepened areas where the existing slope will result in inevitable collapse. Essentially, the terraces will provide flat-lying areas 1-2 feet wide which will support the planting of native vegetation. A thin layer of sand, 2-6 inches thick, will cover each terrace, and this sand will resemble the grain size and other characteristics of the bulk of the Coastal Bank. The Proponent will provide more detailed design characteristics and engineering specifications related to the terraces.

**17. (Bobby DeCosta): I'd like to see a study that shows how long it takes jute to decompose.**

(Rits): We have been using jute for 3-4 months; prior to that, we were using a longer-lived COIR material that we have moved away from based on a request from the Commission. We have not lost any jute material whatsoever from the terraces, and we have already provided the Commission with data showing jute decomposition.

**18. (Bobby DeCosta): The worst-case scenario will be 520,000 CY of sand moving into the littoral system. This could bury more cobble.**

(Rits): That is the equilibrium toe. The worst-case scenario is not realistic.

**19. (Bobby DeCosta): How often is the terrestrial sand tested to ensure compatibility?**

Sediment currently delivered to the Project site is analyzed every time that a new sediment source is used or when a different excavation area is used at one of the existing sediment sources. Additionally, each load of sediment delivered to the site is inspected visually to confirm it is coarse sand and does not contain a significant amount of fine material. In the past, sediment from several sources was also screened to ensure it was within a compatible size range.

**20. (Josh Eldridge): Right now we only deal with turbidity during storm conditions; with the numbers you present, we will be dealing with turbidity on a daily basis.**

This coastal environment is characterized by constant cross-shore and longshore sediment transport. Storms certainly introduce sediment to the system, but every time a wave breaks, sand moves; thus, suspended sediment is a natural condition. Not only is Project-related material coarse sand comparable to the native beach, but it also has a silt content less than that of the eroding bank, which currently contributes material to the nearshore. Furthermore, Project-induced turbidity will be localized to discrete areas where the contractor is engaged in active dredging or pumpout.

**21. (Josh Eldridge): Do you have a trucking schedule, a total volume of material, etc.?**

The terraces proposed for the upper Coastal Bank will require approximately 8,000 cubic yards of clean, beach-compatible sand. Contrary to the information presented at the hearing, the Proponent will construct the terraces with dredged nourishment material; therefore, sediment for terrace construction will not be delivered to the Project area by truck. The Proponent will provide more detail regarding the final terrace design and construction methodology.

**22. (Edie Ray): Have you given any thought to mitigating for the colony of bank swallows that nest in the exposed bank area below the bluff?**

The majority of the upper portion of exposed Coastal Bank is composed of stiff glacial clays and/or clay-rich sands. As a result, this portion of bank is capable of maintaining a nearly vertical slope and offers habitat for bank swallows. The Proponent is still refining the final terrace design, but subject to engineering modifications the intent is to vegetate up to the top of the bank in those sections where vegetated terraces are proposed. However, this would still leave very substantial portions of unvegetated bank face untouched and available for bank swallows.

**23. (Edie Ray): What changes in soil pH could occur as a result of decomposing jute?**

We will investigate this issue and provide any information we are able to obtain.

**24. (Edie Ray): You mentioned modeling suggests the drastically higher sand volume will spread out all over the place; what would happen if it began to deposit on existing shoals that protect other communities? Could this cause erosion in other locations by altering waves or currents?**

No. Modeling results have consistently shown the Project will not detrimentally impact sediment transport, wave transformation, or currents. These results apply to the Project area itself as well as adjacent shores and waters. Sand transport will occur along the shoreline, and will not affect wave patterns or currents; this transport may widen the

beach slightly, but will not increase the erosion stress. On the contrary, the added beach width will enhance protection for upland property.

Also, to provide additional clarification, longshore sediment transport is expected to remain the same. The expected increase in sediment provided to areas north and south of the Project is solely due to diffusion losses; the fill volume to account for diffusion loss is 15% of the total nourishment.

**25. (Trey Ruthven): If you are applying for a Chapter 91 License for mitigation and a Chapter 91 Permit for the rest of the Project, could you perhaps not get the mitigation approved but get the Project approved?**

(Smith): That is conceivable. However, to proceed with the Project, the Proponent would need to provide mitigation.

**26. (Trey Ruthven): Are you expecting any change in bluff profile due to a change in median grain size?**

(Rits): Median grain sizes were within 0.01mm between source and native material. There is a finer contribution as the bank erodes, but that material only enters the system during higher-energy events and is washed out of the system.

**27. (Pete Kaiser): Are there different models that could be used for modeling sand transport?**

(Spadoni): We used the DELFT3D model; this is the best existing model and was developed by coastal experts in the Netherlands. Other models exist, but this model has built on previous models and is state-of-the-art.

**28. (D. Anne Atherton): My recollection is the terraces were initially in the DEIR and were then removed. The Town's independent consultants concluded this Project would not save the top of the bluff; is that contradictory?**

Terracing has consistently been a component of the Project and was included in the proposal reviewed by Applied Technology & Management (ATM), the independent consultants hired by Nantucket's Board of Selectmen. In its review of the FEIR, ATM concluded that due to over-steepening along portions of the bank face, the Coastal Bank will "remain vulnerable to slope failure. This vulnerability requires additional stabilization efforts independent of the beach project." Rather than contradicting the Proponent's position, ATM's conclusion validates the inclusion of coastal terraces in the Project design. These terraces are intended to stabilize over-steepened portions of the bank and work in concert with the toe protection provided by the beach nourishment component.

**29. (Andrews): Will keeping the angle of the bluff unnaturally steep prevent it from receiving an amount of sunlight sufficient for vegetation (since it is north-facing)?**

The existing Coastal Bank is east-facing and receives significant sunlight during the early portion of the day. The amount of sunlight received by the bank face will remain unchanged as a result of the proposed terracing. It is important to note that this portion of Coastal Bank was previously vegetated with dense shrubs and grasses. Immediately south of the Project, portions of the bank with essentially identical orientation and configuration currently exhibit dense vegetation.

**30. (Rudin): You said mean grain size is compatible between the borrow site and beach; your chart shows that fines from the bank are removed more quickly, as expected. At the moment, you are getting finer sediment from the bank than you will be getting; you will be starving the system of the finer-grained contributions.**

(Rits): The majority of fine-grained materials ultimately end up moving significantly seaward and off into the abyssal plain. Given the sediment contribution into deeper water, the 13% of 87,500 CY of material is a very small fraction of fine-grained material in the system. Fine-grained material does not linger in a system as active as this one; that material moves far offshore and ultimately settles in very deep water.

**31. (Emily Moulden): Did tonight's presentation include a figure showing where along the Project area the terraces will actually be constructed?**

The Proponent will provide a figure specifically identifying the limited areas where terracing is proposed; unfortunately, time constraints have precluded the Proponent from providing the figure with this submission. The terraces would be constructed where properties are particularly vulnerable to collapse of unvegetated bank between 55-57 Baxter Road and Sankaty Head Lighthouse.

**32. (Pete Kaiser): The tide here runs 6 hours one way, then slacks, followed by 6 hours the other way; therefore, the fine-grained material does not get carried away.**

(Rits): Extensive sediment sampling and coring efforts have shown that within 3 miles we do not have any significant percentage of fine-grained silts and clays. The closest core samples were, I believe, 1-1.5 miles offshore; a number of grab samples were performed in the intermediate area, and nearshore grab samples were also collected. Extensive coring occurred at the Borrow Site as well.

**33. (Brian Bergenson): Is there a definition for "high-wave event"?**

(Rits): There are several continuums for analyzing wave height compared to tidal range and tidal currents. The eastern Nantucket shoreline falls into all of them; I can provide

specific numbers for the next meeting (Mr. Bergenson responded this would not be necessary).

**34. (Oktay): I appreciate the Proponent's responses to the questions posed at Meeting #1. Do these responses include questions posed from the Commission?**

The Proponent's previous written responses pertained to the questions left unanswered at the close of Meeting #1, and included responses to questions originating from the public and from the Commissioners themselves. If you feel that we have neglected to adequately respond to any of the questions raised, please inform us of that fact so we can provide follow-up information. Our intent is to promptly and thoroughly respond to the issues of interested parties, and it is in our collective best interest to ensure that all questions are adequately addressed.