



MEMORANDUM

Date: November 3, 2016

To: Maria Hartnett, Epsilon Associates, Maynard, MA

From: J. Ryther/C. Cogswell, CR Environmental, Inc., E. Falmouth, MA

Re: Intertidal Benthic Invertebrate Sampling, Sconset Bluff Geotextile Project, MA

On August 16-18, 2016, CR Environmental, Inc. (CR) of East Falmouth, MA collected twelve benthic grab samples from four areas within the intertidal zone of Siasconset Beach, Nantucket, Massachusetts for Epsilon Associates (Figure 1). The four sampling zones included the Project Area (91, 91.2, 91.5) in the vicinity of the geotubes, south of Codfish Park (82, 83, 84), between the Project Area and Hoick's Hollow (93, 94, 95) and north of Hoick's Hollow (96, 96.5, 97). The study site has direct exposure to the Atlantic Ocean and the beach is a very high energy environment. The purpose of the benthic grab sampling effort was to evaluate if the intertidal benthic invertebrates closest to the geotubes were markedly different than those found to the north and south of the Project Area.

Methods

Samples were collected in the intertidal zone at low tide by a two-man team, and the sample coordinates recorded using an IX Blue sub-meter GPS. An 8-inch x 8-inch aluminum frame was inserted into the substrate at the designated sampling locations, and all of the material in the frame removed down to approximately four inches below the mud line. The resulting volume sampled was approximately one gallon for each of the two samples. The sampler footprint (0.04 m²) and volume is equivalent to that taken by a Ted Young benthic grab, the standard grab used extensively for subtidal studies in the New England area. The sediment samples were sieved, and preserved on-site using a 10% formalin solution. Samples were then transferred to 70% alcohol and delivered to AMA's laboratory in Magnolia, MA to document the presence and abundance of invertebrate species. At AMA's laboratory the samples were stained with rose bengal which dyes the organism's protein pink making them easier to detect.

While no grain size analyses were performed for each benthic sample, the residue after screening through a 1 mm sieve was used to give an approximation of the sediment type. The volume of material remaining after 1 mm sieving was compared to the sample volume prior to sieving. The missing material would be smaller than 1 mm.

Results

There was no fine material such as silt/clay or very fine sand visible in the intertidal sediment samples before sieving. Sediments were of a coarse texture due to wave action, and the median grain size at each sampling station likely changes somewhat with the season or due to storms. Sediment grain size was finer at the Project Area (Stations 91, 91.2, and 91.5), and more southerly stations (Stations 82, 83 and 84 south of Codfish Park). The majority ~95-99% of the sediment at these stations passed through a 1 mm aperture sieve and the dominant grain size was likely in the medium to coarse sand range (Table 1). In contrast, at the more northerly sampling stations the dominant grain size was predominantly very coarse sand and gravel. Fifteen to 75% of the material did not pass through a 1 mm sieve at Stations 93, 94, 95 between the Project Area and Hoick's Hollow, and at Stations 96, 96.5 and 97, north of Hoick's Hollow.

The high energy environment of Siasconset Beach is reflected in the faunal results. Only eight species were found in this harsh environment, and with the exclusion of the mole crab *Emerita* and the beach flea *Talorchestia*, only single specimens of the six other species were found (Table 2). All of the species are types of crustaceans commonly found in sandy intertidal environments (i.e. amphipods, skeleton shrimp, hooded shrimp, mole crabs, isopods). Organisms in samples within the Project Area were not markedly different from those found to the north or south. Species number (richness) within the Project Area ranged from 1 to 3. At other sampling sites species richness ranged from 0 at Station 97 to the north of Hoick's Hollow to 4 at Station 93 between the Project Area and Hoick's Hollow. Mole crabs were the dominant species at all locations.

Individuals of the megalopa stage of the mole crab *Emerita megalothalma* were present in significant numbers in the three samples within the Project Area and south. One hundred and thirteen (113) individuals were found at Station 84 south of Codfish Park; and twenty eight (28)

at Station 91, thirteen (13) at Station 91.5 and eleven (11) at Station 91.2 within the Project Area. These sites had sand as the median sediment type rather than gravel. The variation in density and absence/low abundance of *Emerita* in samples at other southerly sandy stations (82 and 83) is typical of the contagious (clumped) distribution of this species.

At the coarser-grained more northerly intertidal sampling stations mole crab abundance was generally lower ranging from 0 to 8 individuals (Table 1).

Mole crabs are crustaceans of the intertidal zone. This species is very mobile, and moves up and down the tidal zone with changing tides. After reproduction the species goes through several planktonic zoeal phases before settling in the intertidal zone as megalopae. Several weeks later they molt into juveniles and then adults. Adults feed by burrowing backwards into the sand holding antennae above the surface to filter plankton out of the passing water. When a mole crab is exposed as waves wash over a burrowed individual it can re-bury itself in about 1.5 seconds in an attempt to avoid predation. The species is believed to be a source of food for some species of birds and fish. It is not uncommon to find megalopa stages of this species in the intertidal areas in September.

The low density and diversity of marine fauna in the various samples from Sicaonset Beach is not surprising given the coarse sediments. Tidal and wave action continuously moves the intertidal sediments providing a very hostile environment for marine fauna. The continual movement and reworking of sediments hinders the establishment of most species. There was no evidence of harm to intertidal invertebrates in the Project Area, proximate to the geotubes, compared to the other sampling stations. In addition, no representatives of a resource species were found at any of the twelve sampling stations. Additional monitoring may not be warranted given the low species diversity, low abundance and lack of noteworthy species found within the sandy intertidal beach habitat of Sicaonset Beach.

**TABLE 1. Estimate of Sediment Sample Grain Size – Benthic Invertebrate Samples
Sconset Bluff Geotextile Tube Project (reference Figure 1 for sample locations)**

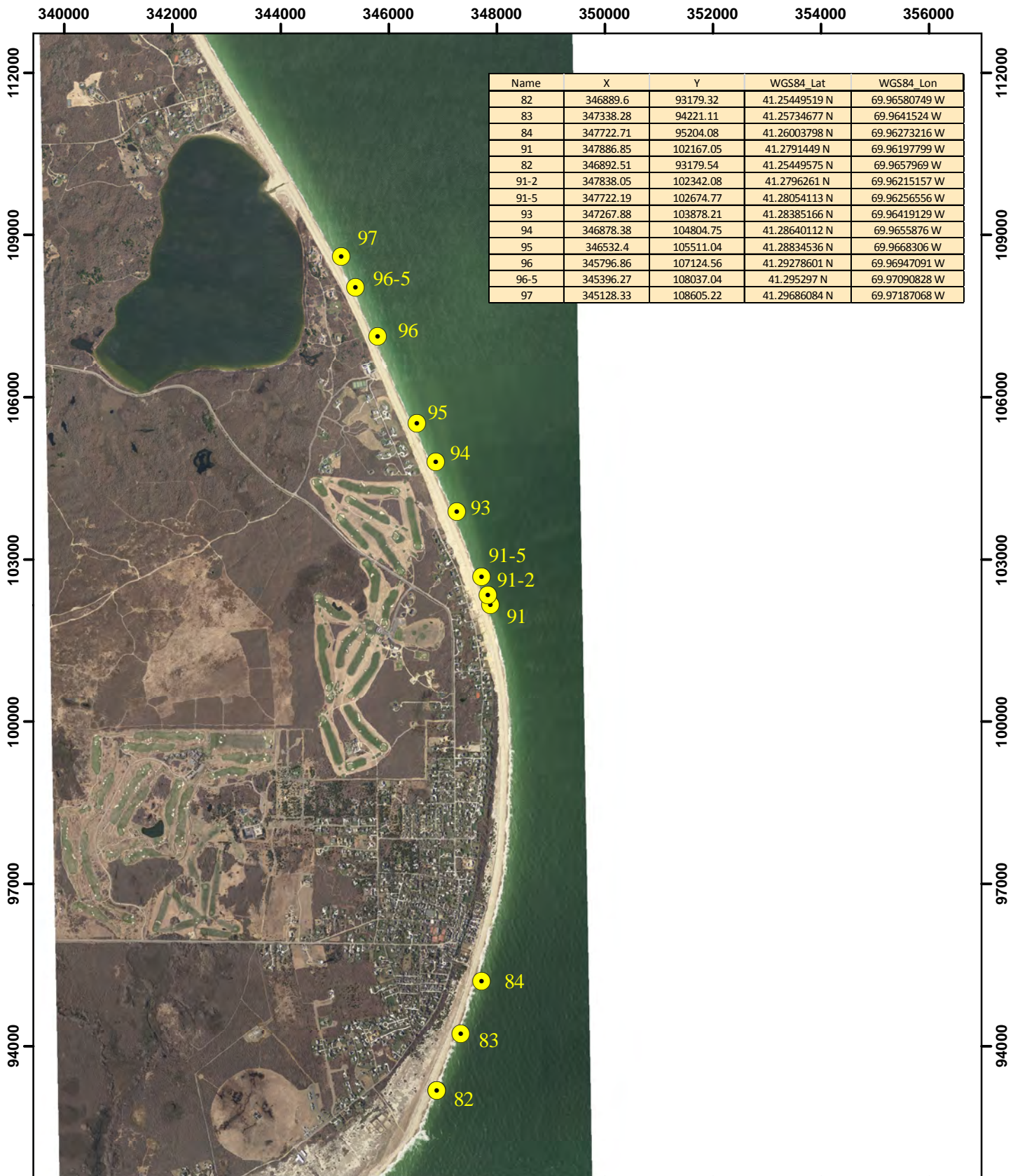
Station	Percentage volume compared to non-sieved sample (approximate)¹
South of Codfish Park	
82	< 1%
83	< 1%
84	< 1%
Project Area	
91	< 5%
91.2	< 5%
91.5	< 5%
Between Project Area and Hoick's Hollow	
93	20%
94	50%
95	75%
North of Hoick's Hollow	
96	33%
96.5	50%
97	15%

NOTES:

¹ Those samples with a higher % of sediment retained following sieving are coarser grained.

TABLE 2. SUMMARY OF INTERTIDAL BENTHIC INVERTEBRATE DATA - Sconset Bluff Geotextile Tube Project, Nantucket, MA - August 2016

	Sample Number											
SPECIES	82	83	84	91	91.2	91.5	93	94	95	96	96.5	97*
	South of Codfish Park			Within Project Area			Between Project & Hoick's Hollow			North of Hoick's Hollow		
Amphipoda												
<i>Corophidae</i> sp. (juv.)				1								
<i>Lysianassidae</i> sp. (juv.)							1					
<i>Parametopella cypris</i>						1						
<i>Talorchestia megalopthalma</i>	1	1										
Caprellidae												
<i>Caprella penantis</i>							1					
Cumacea												
<i>Cumacea</i> sp. (juv.)							1					
Decapoda												
<i>Emerita talpoida</i> (megalopa stage)	1		113	28	11	13	1	4	8	1	1	
Isopoda												
<i>Edotia montosa</i>						1						
SPECIES RICHNESS	2	1	1	2	1	3	4	1	1	1	1	0
* No organisms found at sample station 97.												



Benthic Samples Siasconset Beach, Nantucket, MA

NOTES:
 1) Survey conducted 8/17/2016
 2) Grid Massachusetts State Plane NAD 83 Feet

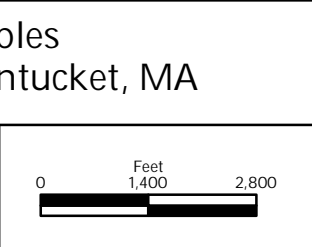


Figure 1