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bcsfd billion cubic standard feet of natural gas per day

°C degrees Celsius (temperature)

cy cubic yard

DO dissolved oxygen

ft foot/feet

g gram

GPS global positioning system

in inch

kt knot

LNG liquefied natural gas

LPIL lowest practical identification level

mg/l milligrams per liter (dissolved oxygen)

Max maximum

MW megawatts

mi mile

min minimum

min minute

mm millimeter

mS/cm microseimens (conductivity)

nm nautical miles

NTU nepthelometric turbidity unit

ppt parts per thousand (salinity)

SAV submerged aquatic vegetation

SD standard deviation

TL total length

## 

## 1.0 Introduction

AES Sparrows Point LNG, LLC (Sparrows Point LNG) proposes to construct, own, and operate a new liquefied natural gas (LNG) import, storage, and regasification terminal (LNG Terminal) at the Sparrows Point Industrial Complex situated on the Sparrows Point peninsula east of the Port of Baltimore in Maryland. LNG will be delivered to the LNG Terminal via LNG marine traffic, offloaded from these ships to shoreside storage tanks, regasified on the LNG Terminal site (Terminal Site), and transported to consumers via pipeline. The LNG Terminal will have a regasification capacity of 1.5 billion standard cubic feet of natural gas per day (bscfd), with potential to expand to 2.25 bscfd. Regasified natural gas will be delivered to markets in the Mid-Atlantic Region and northern portions of the South Atlantic Region, through an approximately 88-mile, 30-inch outside diameter natural gas pipeline (Pipeline) to be constructed and operated by Mid-Atlantic Express, LLC (Mid-Atlantic Express). The Pipeline will extend from the LNG Terminal to interconnections with existing natural gas pipeline systems near Eagle, Pennsylvania. Together, the LNG Terminal and Pipeline projects are referred to as the Sparrows Point Project or Project. Both Sparrows Point LNG and Mid-Atlantic Express (hereinafter collectively referred to as AES) are subsidiaries of The AES Corporation.

The Project footprint is located in the counties of Baltimore, Harford and Cecil in Maryland, and in the counties of Lancaster and Chester in Pennsylvania. The Terminal Site, which is located entirely within Baltimore County, is a parcel located within a former shipyard. The route proposed for the Pipeline (Pipeline Route), which crosses all of the listed counties, includes industrial, commercial, agricultural, and residential lands. Together, the Terminal Site and the Pipeline Route comprise the Project Area.

As described in Section 1.10 of Resource Report 1, *General Project Description*, The AES Corporation is considering the possibility of building a combined cycle cogeneration power plant (Power Plant) on the Terminal Site. The Power Plant would be configured with one F-Class combustion gas turbine, one steam turbine, and associated auxiliaries. It would operate only on natural gas and would produce approximately 300 megawatts (MW) of clean electric power within an area of high energy demand. The Power Plant would be connected to the local utility electric system via an overhead transmission line.

Two separate biological assessments of aquatic organisms were conducted between June 27 and June 30, 2006 and between October 17 and October 20, 2006 in the Patapsco River, Maryland, in attempt to characterize the distribution of local flora and fauna; this work was performed as part of the survey work being conducted for the LNG Terminal. In order to support berthing operations at the facility, it is proposed that an existing marine channel be deepened and widened to a depth of approximately 44 feet and a width of approximately 650 feet. Additionally, it is proposed that a turning basin be created to allow ships to be turned under tug support and be berthed at the marine terminal. The areas adjacent to each of the berths will also be dredged to a depth of approximately 44 feet. Total dredged material quantities could range from 2.5 million cubic yards (cy) to 4 million cy.

This report documents the collection, processing, and analyses of data collected for the following communities: demersal finfish, benthic/epibenthic macroinvertebrates (including sampling of pier structures), plankton, and submerged aquatic vegetation (SAV). Water quality parameters were also recorded throughout the duration of the survey effort.

## 2.0 Objectives

Data from these surveys will be used to provide both a pre-construction baseline for future monitoring efforts and for comparison in evaluating the environmental impacts of the dredging that is proposed as part of the Project. Further, results of these collection efforts were used to characterize the finfish, planktonic, and benthic communities that are found within the dredge footprint and surrounding areas. SAV surveys were also completed to document the presence or absence of any SAV. Water quality data were collected in conjunction with plankton and finfish trawl sampling in order to establish a biological baseline and for comparison with past studies.

This data documentation report presents and summarizes data that were collected during two sampling events, which were conducted during June 2006 and October 2006.

## 3.0 Methodology

The site location for this study is the Patapsco River in the City of Baltimore, Maryland, approximately four nautical miles west of the main stem of Chesapeake Bay and within the Baltimore Harbor region (Figure 1). Data regarding finfish, plankton, benthic invertebrates, sediment grain size and water quality were collected within the proposed dredge impact area. Reference samples were taken from stations in the vicinity of the proposed Project Area but outside of the proposed Project footprint. Two replicate sampling events were conducted, one during the summer and one during the fall, to better account for seasonal variability. A 42-ft vessel was used to conduct all of the sampling tasks with the exception of the pier sampling effort, in which case, a shore-deployed dive team was used.

### 3.1 Sampling Tasks

#### 3.1.1 Demersal Trawl Fish Sampling

To determine species composition and abundance, 11 finfish trawls were conducted in the proposed Project Area during each sampling event, as shown in Figure 2. A Magellan Global Positioning System (GPS) was used for navigation; GPS coordinates are provided in Table A-1 in Appendix A.

Trawls were conducted within the Project footprint and outside the proposed dredging area in the vicinity of the proposed Project Area. Finfish and benthic macroinvertebrates were collected by towing a 30-foot trawl net (1-1/2 in body mesh and 1-1/4 in bag mesh) from a 42-ft research vessel at speeds between 1.7 and 2.2 knots (kt) for a straight-line distance of approximately 0.3 nautical miles (nm). The tow time for each trawl was approximately 10 minutes (min). The vessel captain, familiar with the safe operation of the research vessel, was responsible for operation of the research vessel. An additional field crew of four, biologists from Northern Ecological Associates, Inc. (NEA), were responsible for trawl deployment and retrieval and processing of trawl contents.

Trawl contents were processed onboard the vessel. The catch was identified and separated to the species level. All species were weighed and enumerated. Total capture abundance was estimated when large numbers of a particular species were caught, by weighing and enumerating random subsamples of 30 individuals per species; only white perch (*Morone americanus*) were subsampled. Lengths were measured for up to 30 individuals per species for all finfish (one exception occurred during the October sampling event where 35 spot (*Leiostomus xanthurus*) were captured and each individual was measured. Length measurement was conducted using a measuring board consisting of a linear metric scale on a flat wooden base with a rigid headpiece. Total length (TL) measurements (the distance from the closed mouth to the extreme tip of the caudal fin) were recorded to the nearest millimeter. Biomass of each species caught was measured in grams using various Pesola® spring scales.

#### 3.1.2 Plankton Sampling

To determine species composition and abundance of the planktonic community, plankton tows were conducted (15 tows during June and 10 tows during October) in the proposed Project Area by towing a 80-micron mesh plankton net, with tows both within and outside the proposed Project footprint (Figure 3). A Magellan GPS was used for navigation. GPS coordinates for the tow locations are provided in Table A-2 in Appendix A. The net was towed from a 42-ft research vessel at a speed of approximately 1.7 to 2.2 kt for a distance of approximately 0.3 nm. The in-water time for each tow was approximately 10 min. The tow locations depicted in Figure 3 include only the beginning and end points of the tows and do not depict any navigational curvature. A dedicated captain, was responsible for operation of the research vessel. A field crew was comprised of four biologists from NEA. Plankton samples were preserved in the field for subsequent laboratory processing with a buffered 10% formalin.

#### 3.1.3 Benthic Macroinvertebrate Sampling

During each sampling event( June 2006 and October 2006), benthic grab samples were collected from randomly selected locations with a Smith McIntyre (0.1 square meter) benthic grab (Figure 4). A Magellan GPS was used for navigation. GPS coordinates are provided in Table A-3 in Appendix A. During June, 20 stations were located within the proposed dredge area and 10 reference stations were selected outside of the proposed dredge footprint. During October, 15 stations were located within the proposed dredge area and five reference stations were selected outside of the proposed dredge footprint. Benthic meiofana samples were sieved through a 0.5 millimeter (mm) mesh screen, stained with Rose Bengal, and preserved with a buffered 10% formalin solution in the field. In the laboratory, all macroinvertebrates were inventoried and subsequently stored in 70% isopropanol alcohol until processing.

#### Epibenthic Pile Sampling

A qualitative assessment of existing finger pier (pile) structures was conducted to determine presence/absence of epibenthic fauna on October 20, 2006. Four piers were selected within the Project Area; samples were collected by scraping the substrate with a 4-in paint scraper (Figure 5). A team consisting of two SCUBA divers, one diver tender, and one senior biologist conducted the effort. Three samples were collected from each side of each pier (north, west and south). Twelve 0.5-liter samples were collected overall by vertically scraping multiple pier segments from top to bottom. Epibenthic meiofana samples were stained with Rose Bengal and preserved with a buffered 10% formalin solution in the field. In the laboratory, all macroinvertebrates were inventoried and stored in 70% isopropanol alcohol until processing. Subsequently, samples were sorted and identified to the lowest practical identification level (LPIL), which, in most cases, was to species. Each sample was weighed for wet weight biomass for the major taxonomic groups identified.

#### 3.1.5 Sediment Analyses

Sediment subsamples were collected from the 30 benthic grabs samples at pre-determined, randomly selected benthic site locations (Figure 4; GPS coordinates in Table A-3 in Appendix A). These samples were placed in whirly-pacs® and sent to a laboratory for analysis. Each sample was sifted through a 3 mm sieve and spread onto a drying tray. Samples were positioned in a 40 C ± 5 C oven for 48 ± 12 hours until dry. Oven-dried samples were cooled before being weighed using a Metter® PC440 scale. Samples were then passed through nested sieves using the Wentworth textural classes (Wentworth 1922). The sieve nest included sieves with openings of 2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.125 mm and 0.0625 mm (sieve No. 10, 18, 35, 60, 120, and 230, respectively). A bottom pan was attached to the bottom of smallest sieve used. The nest of sieves was placed in a reciprocating shaking machine and vibrated for 15 min or until the shaking no longer produced an appreciable change in the amount of material on each sieve. After dispersion, material collected from each sieve was weighed separately using a Metter® PC440 scale to the nearest one hundredth of a gram (0.01 g). Percentage of material (POM) was determined by dividing material per sieve size (g) by total sample weight post drying (g) for each sieve size. All results are expressed as a percentage (%) of total sample dry weight.

#### 3.1.6 Water Quality Measurement

Water quality data were collected at the end of each finfish trawl and each plankton tow during both sampling efforts (Figure 6). At each station, water quality data were collected near the surface, in the middle, and near the bottom of the water column. The water quality parameters observed included pH, temperature in degrees Celsius (°C), dissolved oxygen (DO) in milligrams per liter (mg/l) and percent saturation (%), salinity in parts per thousand (ppt), conductivity in microseimens per cm (mS/cm), and turbidity in nepthelometric turbidity units (NTU). Data were collected using a YSI multi-parameter meter, model 6920.

#### 3.1.7 Submerged Aquatic Vegetation Survey

The presence or absence of submerged aquatic vegetation beds was determined by evaluating a series of transects located within and adjacent to the proposed Project footprint, and extending radially approximately two miles into the Patapsco River estuary (Figure 7). This sampling effort was conducted only during the June 2006 effort. Sampling consisted of visual observations and the towing of a small chain for approximately 0.3 nm per transect at a speed of approximately 2 kt. At the completion of each transect, any vegetation collected was identified to the species level.

## 

## 4.0 Results

### Finfish Sampling

***June 2006***

Finfish species were identified, enumerated, measured and weighed. Additionally, invertebrate species were identified and their presence noted. Data were collected and analyzed to determine species composition and density.

462 individuals representing five finfish species were collected (Table 1). In addition, one crustacean species, the blue crab (*Callinectes sapidus*), was also collected. The total biomass collected was 17,624 g (Table 2), with a mean individual weight of 38.3 g and a mean individual length of 130 mm (Table 3). Averages of three species comprising 43 individuals were captured during each trawl (Table 4).

Overall, white perch represented 84% of the total catch and 88% of the total biomass (Table 1 and Table 2). In total, two blue crabs were captured and accounted for the largest average biomass per species (mean weight of 250 g). Spot (*Leiostomus xanthurus*), croaker (*Micropogonias undulates*), striped bass (*Morone saxatilis*) and Atlantic menhaden (*Brevoortia tyrannus*) made up the rest of the finfish species captured (Table 3), each accounting for less than 10% of the total catch and total biomass. Locations where the highest densities of fish were collected (as indicated in Table 4) were the same as those where white perch was also collected.

Table 1. Trawl Catch Abundance, June 2006 Sampling.

|  |  |  |  |
| --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total** | **Percent of Total** |
| White perch | *Morone americana* | 390 | 84 |
| Atlantic croaker | *Micropogonias undulatus* | 42 | 9 |
| Spot | *Leiostomus xanthurus* | 19 | 4 |
| Striped bass | *Morone saxatilis* | 6 | 1 |
| Atlantic menhaden | *Brevoortia tyrannus* | 3 | 1 |
| Blue crab | *Callinectes sapidus* | 2 | < 1 |
| **Total:** | | **462** | **100** |

Table 2. Trawl Catch Biomass and Individual Means, June 2006 Sampling.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total (g)** | **Mean Length (mm)** | **Mean Weight (g)** | **Percent of Total** |
| White perch | *Morone americana* | 15,563 | 132 | 40 | 88 |
| Atlantic croaker | *Micropogonias undulatus* | 976 | 127 | 24 | 6 |
| Spot | *Leiostomus xanthurus* | 368 | 116 | 19 | 2 |
| Striped bass | *Morone saxatilis* | 162 | 147 | 32 | 1 |
| Atlantic menhaden | *Brevoortia tyrannus* | 105 | 136 | 35 | 1 |

Table 2. Trawl Catch Biomass and Individual Means, June 2006 Sampling (Continued).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total (g)** | **Mean Length (mm)** | **Mean Weight (g)** | **Percent of Total** |
| Blue crab | *Callinectes sapidus* | 450 | 156 | 225 | 2 |
| **Total:** | | **17,624** |  |  | **100** |

Table 3. Combined Species Abundance, Length, Weight, and Diversity Data from Fish Trawls, June 2006 Sampling.

|  |  |
| --- | --- |
| **Parameter** | **Result** |
| Total abundance | 462 |
| Mean individual fish length (mm) | 130 |
| Mean individual fish weight (g) | 118 |
| Mean individual blue crab length (mm) | 156 |
| Mean individual blue crab weight (g) | 225 |
| Total biomass (g) | 17,624 |
| Species diversity | 6 |

Table 4. Number of Species and Individuals per Fish Trawl Location, June 2006 Sampling.

|  |  |  |
| --- | --- | --- |
| **Trawl** | **Number of species** | **Number of individuals** |
| 1 | 1 | 3 |
| 2 | 2 | 5 |
| 3 | 2 | 12 |
| 4 | 2 | 11 |
| 5 | 1 | 1 |
| 6 | 5 | 33 |
| 7 | 5 | 91 |
| 8 | 3 | 43 |
| 9 | 5 | 90 |
| 10 | 5 | 59 |
| 11 | 3 | 119 |
| **Mean** | **3** | **43** |

***October 2006***

Finfish species were identified, enumerated, measured and weighed. Additional invertebrate species were identified and their presence noted. Data were collected and analyzed to determine species composition and density.

The total number of finfish collected during the October sampling effort was 359 individuals that represented 11 finfish species and one crustacean species, the blue crab (*Callinectes sapidus*) (Table 5). The total biomass collected was 14,735 g (Table 6), with a mean individual weight of 56 g and a mean individual length of 144 mm (Table 7). Averages of five species comprising 30 individuals were captured during each trawl (Table 8).

White perch were collected during each trawl and represented the largest percentages of both total abundance and total biomass, accounting for 44% of the total number of individuals caught and 32% of the total catch weight. Spot was the second most abundant species caught, representing 32% of the total number of individuals captured, and was the third most abundant in terms of total biomass (27%). With the exception of blue crab, all of the other species collected (bay anchovy, *Anchoa mitchilli*; weakfish, *Cynoscion regalis*; summer flounder, *Paralichthys dentatus*; alewife, *Alosa pseudoharengus*; Florida pompano, *Trachinotus carolinus*; striped bass, *Morone saxatilis*; bluefish, *Pomatomus saltatrix*; and gizzard shad, *Dorosoma cepedianum*) individually represented less than 10% of the total abundance and total biomass for all 11 trawls combined. Blue crab represented 8% of the total catch abundance and 30% of the total catch biomass when all species were combined (Table 5 and Table 6).

Table 5. Trawl Catch Abundance, October 2006 Sampling.

|  |  |  |  |
| --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total** | **Percent of Total** |
| White perch | *Morone americana* | 158 | 44 |
| Spot | *Leiostomus xanthurus* | 114 | 32 |
| Bay anchovy | *Anchoa mitchilli* | 32 | 9 |
| Blue crab | *Callinectes sapidus* | 30 | 8 |
| Weakfish | *Cynoscion regalis* | 8 | 2 |
| Summer flounder | *Paralichthys dentatus* | 5 | 1 |
| Alewife | *Alosa pseudoharengus* | 3 | 1 |
| Florida pompano | *Trachinotus carolinus* | 3 | 1 |
| Striped bass | *Morone saxatilis* | 3 | 1 |
| Bluefish | *Pomatomus saltatrix* | 2 | 1 |
| Gizzard shad | *Dorosoma cepedianum* | 1 | < 1 |
| **Total:** | | **359** | **100** |

Table 6. Trawl Catch Biomass and Individual Means, October 2006 Sampling.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total (g)** | **Mean Length (mm)** | **Mean Weight (g)** | **Percent of Total** |
| White perch | *Morone americana* | 4,705 | 126 | 30 | 32 |
| Blue crab | *Callinectes sapidus* | 4,448 | 140 | 149 | 30 |
| Spot | *Leiostomus xanthurus* | 3,921 | 146 | 34 | 27 |
| Summer flounder | *Paralichthys dentatus* | 1,048 | 283 | 210 | 7 |
| Weakfish | *Cynoscion regalis* | 110 | 126 | 14 | 1 |
| Striped bass | *Morone saxatilis* | 240 | 205 | 80 | 2 |
| Bluefish | *Pomatomus saltatrix* | 82 | 155 | 41 | 1 |

**Table 6. Trawl Catch Biomass and Individual Means, October 2006 Sampling (Continued).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **Total (g)** | **Mean Length (mm)** | **Mean Weight (g)** | **Percent of Total** |
| Alewife | *Alosa pseudoharengus* | 61 | 132 | 20 | < 1 |
| Florida pompano | *Trachinotus carolinus* | 53 | 74 | 18 | < 1 |
| Bay anchovy | *Anchoa mitchilli* | 47 | 56 | 1 | < 1 |
| Gizzard shad | *Dorosoma cepedianum* | 20 | 135 | 20 | < 1 |
| **Total:** | | **14,735** |  |  | **100** |

Table 7. Combined Species Abundance, Length, Weight, and Diversity Data from Fish Trawls, October 2006 Sampling.

|  |  |
| --- | --- |
| **Parameter** | **Result** |
| Total abundance | 359 |
| Mean individual fish length (mm) | 129 |
| Mean individual fish weight (g) | 47 |
| Mean individual blue crab length (mm) | 140 |
| Mean individual blue crab weight (g) | 149 |
| Total biomass (g) | 14,735 |
| Species diversity | 11 |

Table 8. Numbers of Species and Individuals per Fish Trawl Location, October 2006 Sampling.

|  |  |  |
| --- | --- | --- |
| **Trawl** | **Number of Species** | **Number of Individuals** |
| 1 | 4 | 84 |
| 2 | 6 | 12 |
| 3 | 4 | 4 |
| 4 | 2 | 3 |
| 5 | 5 | 44 |
| 6 | 5 | 29 |
| 7 | 3 | 16 |
| 8 | 9 | 63 |
| 9 | 2 | 5 |
| 10 | 5 | 37 |
| 11 | 5 | 37 |
| **Mean** | **5** | **30** |

### 4.2 Plankton Sampling

***June 2006***

Plankton samples were identified and enumerated in the laboratory. In most cases, organisms were identified to the species level. However, in some cases, the LPIL was used. The term “taxa” is used henceforth to refer to total diversity, including species, unless otherwise noted. Table 9 lists collected plankton from the June 2006 plankton sampling efforts.

Due to the actual size of the individual plankton (microscopic), the sample jars were subsampled to either a ratio of 1/64 or 1/128 of the actual size. For some of the larger specimens, a ratio of 1/1 sample size was obtainable and thus conducted. A total of 22,811 individual vertebrates and invertebrates (number based on 1/64 and 1/1 of actual sample size, depending on specimen) representing 11 plankton species were collected during June sampling event (Table 9). The samples had an abundance of 628 to 2,618 individuals (number based on 1/64 and 1/1 of actual sample size, depending on specimen) and varied in diversity between four and eight species per sample (Table 9).

*Acartia tonsa* (nauplii stage) was the most abundant group collected, accounting for 17,987 individuals (79%) of all individuals collected, and was found in every plankton sample. The second most abundant species was the copepodite stage of *Acartia tonsa*, which accounted for 3,856 individuals (17%) of all collected individuals, and was also present in every plankton sample. The third most abundant species was Spionidae (larval stage), a polychaetae worm that accounted for 732 individuals (3%) of all collected individuals. Similar to *Acartia tonsa*, Spionidae was collected in every plankton sample. The fourth most abundant species was *Rhithropanopeus harrisii* (zoea stage), which accounted for 92 individuals (less than 1%) of all collected individuals. This species was also collected in every plankton sample. The fifth most abundant species collected was the egg stage of bay anchovy, *Anchoa mitchilli*, which accounted for 88 individuals (less than 1%) of all collected individuals; this species was found in all but one plankton sample.

Table 9. Plankton Collected In June 2006 Sampling Event.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Species** | | | | | | | | | | | | | | |
| **Tow Number** | *Acartia tonsa* (copepodite)1 | *Acartia tonsa* (nauplii)1 | Harpacticoida (copepodite)1 | *Balanus* sp. (nauplii)1 | *Rhithropanopeus harrisii* (zoea)1 | Spionidae (larvae)1 | Gastropoda (larvae)1 | Invertebrate eggs1 | **Total No. of Individuals**2 | *Anchoa mitchelli* (eggs)3 | *Anchoa mitchelli* (larvae)3 | Medusae (pieces)4 | **Total No. of Individuals**5 | **Total No. of Species** | **Total No. of Higer Taxa** |
| 1 | 245 | 294 | 2 | 1 | 4 | 78 | - - | - - | **624** | 4 | - - | UK | **4** | 7 | 7 |
| 2 | 254 | 1,632 | 4 | 2 | 2 | 154 | - - | - - | **2,048** | 10 | - - | UK | **10** | 7 | 7 |
| 3 | 159 | 1,190 | 1 | 2 | 8 | 31 | 1 | - - | **1,392** | 3 | - - | UK | **3** | 8 | 8 |
| 4 | 236 | 2,174 | - - | 2 | 5 | 13 | 1 | 1 | **2,432** | 1 | - - | UK | **1** | 8 | 8 |
| 5 | 179 | 968 | 3 | - - | 12 | 44 | - - | - - | **1,206** | 3 | - - | UK | **3** | 7 | 7 |
| 6 | 129 | 1,047 | - - | - - | 4 | 92 | - - | - - | **1,272** | - - | - - | UK | **- -** | 4 | 4 |
| 7 | 176 | 782 | 1 | 1 | 10 | 21 | - - | - - | **991** | 1 | - - | UK | **1** | 7 | 7 |
| 8 | 245 | 1,378 | 4 | - - | 9 | 25 | - - | - - | **1,661** | 1 | - - | UK | **1** | 6 | 6 |
| 9 | 196 | 617 | 1 | - - | 1 | 9 | - - | - - | **824** | 11 | - - | UK | **11** | 6 | 6 |
| 10 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 11 | 390 | 1,608 | - - | - - | 10 | 24 | - - | - - | **2,032** | 17 | - - | UK | **17** | 5 | 5 |
| 12 | 444 | 2,102 | 2 | 14 | 10 | 42 | - - | - - | **2,614** | 4 | - - | UK | **4** | 7 | 7 |
| 13 | 366 | 1,444 | 6 | 2 | 6 | 62 | - - | - - | **1,886** | 1 | 1 | UK | **2** | 7 | 7 |
| 14 | 478 | 1,886 | - - | 8 | 6 | 42 | - - | - - | **2,420** | 16 | - - | UK | **16** | 6 | 6 |
| 15 | 358 | 864 | - - | - - | 4 | 94 | - - | - - | **1,320** | 16 | - - | UK | **16** | 5 | 5 |
| **TOTAL** | 3,855 | 17,986 | 24 | 32 | 91 | 731 | 2 | 1 | **22,722** | 88 | 1 | 0 | 89 | 9 | 8 |

Note:

1 Result of sample was from 1/64 of actual sample size.

2 Number calculated based on the 1/64 sample size.

3 Result of sample was from 1/1 of actual sample size.

4 Result of sample was from 1/1 of actual sample size. However, Medusae present were broken pieces, which were unidentifiable and unable to be counted.

5 Number calculated based on the 1/1 sample size, but does not include Medusae.

***October 2006***

Plankton samples were identified and enumerated in the laboratory. In most cases, organisms were identified to the species level. However, in some cases, the LPIL was used. The term “taxa” is used henceforth to refer to total diversity including species, unless otherwise noted. Table 10 lists collected plankton from the October 2006 plankton sampling efforts.

Due to the actual size of the individual plankton (microscopic), and quantity of sample obtained, the sample jars were subsampled to either a 1/16 or 1/8 ratio of the actual size. For some of the larger specimens, a 1/1 sample size was obtainable and thus conducted. A total of 22,811 individual vertebrates and invertebrates (number based on 1/16 and 1/1 of actual sample size, depending on specimen) representing 10 plankton species were collected during the October sampling event (Table 10). The samples had an abundance of 1,395 to 3,399 individuals (number based on 1/16 and 1/1 of actual sample size, depending on specimen) and varied in diversity between five and eight species per sample (Table 10).

*Acartia tonsa* (nauplii stage) was the most abundant group collected, accounting for 21,081 individuals (90% of all individuals collected), and was found in every plankton sample collected. The second most abundant species was the copepodite stage of *Acartia tonsa*, which accounted for 1,612 individuals (7% of all individuals collected), and was also present in every plankton sample collected. The third most abundant species was *Balanus* sp. (nauplii stage), a barnacle that accounted for 491 individuals (2% of all collected individuals). Similar to *Acartia tonsa*, *Balanus* sp. was collected in every plankton sample. The fourth most abundant species was Harpacticoida (copepodite), which accounted for 264 individuals (1% of all collected individuals) and was collected in every sample. No fish species were collected during the October plankton trawls.

Table 10. Plankton Collected In October 2006 Sampling Event.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Species** | | | | | | | | | | | | | |
| **Tow Number** | *Acartia tonsa* (copepodite)1 | *Acartia tonsa* (nauplii)1 | Harpacticoida (copepodite)1 | *Oithona* sp. (copepodite)1 | *Balanus* sp. (nauplii)1 | *Balamus* sp*. (*cypris*)*1 | Spionidae (larvae)1 | Gastropoda (larvae)1 | *Corophium* sp. (early juvenile*)1* | Bivalvia (larvae)1 | Medusae (pieces)3,4 | **Total No. of Individuals**2 | **Total No. of Species** | **Total No. of Higer Taxa** |
| 1 | 196 | 2,473 | 41 | 2 | 77 | 2 | 4 | - - | - - | - - | UK | **2,795** | 6 | 5 |
| 2 | 142 | 2,111 | 9 | 6 | 47 | - - | 2 | 2 | - - | - - | UK | **2,319** | 6 | 5 |
| 3 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 4 | 161 | 3,127 | 37 | 4 | 68 | - - | 1 | - - | 1 | - - | UK | **3,399** | 6 | 5 |
| 5 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 6 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 7 | 178 | 1,657 | 7 | - - | 52 | - - | 3 | 3 | - - | - - | UK | **1,900** | 6 | 5 |
| 8 | 130 | 2,577 | 22 | 7 | 59 | - - | - - | 3 | - - | - - | UK | **2,798** | 6 | 5 |
| 9 | 158 | 1,681 | 28 | - - | 27 | - - | 2 | 2 | - - | - - | UK | **1,898** | 6 | 6 |
| 10 | 176 | 1,898 | 13 | 3 | 17 | - - | 2 | 1 | - - | 7 | UK | **2,117** | 8 | 6 |
| 11 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 12 | 131 | 1,173 | 18 | 6 | 67 | - - | 1 | - - | - - | - - | UK | **1,396** | 6 | 5 |
| 13 | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |
| 14 | 125 | 1,826 | 57 | 4 | 25 | - - | - - | - - | - - | - - | UK | **2,037** | 5 | 5 |
| 15 | 215 | 2,558 | 32 | 3 | 52 | - - | - - | - - | - - | - - | UK | **2,860** | 5 | 5 |
| **TOTAL** | 1,612 | 21,081 | 264 | 35 | 491 | 2 | 15 | 11 | 1 | 7 | UK | **23,519** | 8 | 6 |

Note:

1 Result of sample was from 1/16 of actual sample size.

2 Number calculated based on the 1/16 sample size.

3 Result of sample was from 1/1 of actual sample size.

4 Result of sample was from 1/1 of actual sample size. However, Medusae present were broken pieces, which were unidentifiable and unable to be counted.

5 Number calculated based on the 1/1 sample size, but does not include Medusae.

### 4.3 Benthic Macroinvertebrate Sampling

***June 2006***

Twenty benthic locations were selected within the proposed dredge area, while 10 locations were reference samples taken within the study area but outside the potential dredge footprint. In most cases, organisms were identified to the species level. However, in some cases, the LPIL was used. Table 11 lists the collected macroinvertebrates from the June benthic sampling efforts.

A total of 2,161 individual macroinvertebrates representing 16 species were collected during the June 2006 sampling event. The samples had an abundance of zero to 277 individuals and varied in diversity between zero and 14 species per sample (Table 11). The amphipod *Leptocheirus plumulosus* was the most abundant species collected, accounting for 814 individuals (38% of all individuals collected) and was found in 17 samples. The second most abundant species was the bivalve *Macoma balthica*, which accounted for 465 individuals (22% of all individuals collected), and was present in 24 of the 30 samples. The third most abundant species was the polychaete *Streblospio benedicti,* which accounted for 276 organisms (13%), followed by the polychaete *Nereis succinea*, which accounted for 238 (11%). The mean abundance for the June sampling effort was 72 individuals per grab, while the mean diversity was six species at each sample location.

##### October 2006

Twenty benthic locations were sampled within the study area in October 2006. In most cases, organisms were identified to the species level. However, in some cases, the LPIL was used. Table 12 lists the collected macroinvertebrates from the October benthic sampling efforts.

A total of 187 individual macroinvertebrates representing 13 species were collected during the October sampling event. The samples had an abundance of zero to 39 individuals and varied in diversity between zero and six species per sample (Table 12). The polychaete *Nereis succinea* was the most abundant species collected, accounting for 87 individuals (47% of all individuals collected);found in 16 samples. The bivalve *Tellina agilis* and the polychaete *Streblospio benedicti* both accounted for 28 individuals (15% of all collected individuals) and were present in two and seven of the 20 samples, respectively. The fourth most abundant species was the polychaete *Eteone heteropoda*, which accounted for 20 organisms (11% of all individuals collected). The mean abundance for the October sampling was nine individuals per grab with a mean diversity of two species at each sample location.

Table 11. Benthic Invertebrates Collected in June 2006 Sampling Event.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Species** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| **Annelida** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | | | |
| Polychaeta |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| *Eteone heteropoda* |  | 1 |  | 2 | 1 |  |  |  |  |  |  | 1 |  |  |  |  |  |  | 1 | 2 |  | 2 | 36 |  | 2 |  |  | 1 | 1 | 1 |
| *Heteromastus filiformes* | 1 |  | 1 | 1 | 6 |  |  | 1 |  |  |  | 17 | 2 | 7 | 7 | 2 |  | 7 | 3 | 9 |  | 2 | 48 | 3 | 8 |  | 3 | 6 | 3 | 12 |
| *Nereis succinea* | 5 | 14 |  | 12 | 14 |  |  | 2 |  |  |  | 17 | 8 | 14 | 21 |  | 1 | 1 | 24 | 15 |  | 14 | 15 | 4 | 23 |  | 5 | 14 | 7 | 8 |
| *Scolecolepides viridis* |  | 2 |  | 2 | 1 |  |  | 9 |  |  |  | 6 | 5 | 1 |  |  |  |  |  | 3 |  |  | 20 |  | 3 |  | 7 | 4 | 2 | 8 |
| *Streblospio benedicti* | 3 | 5 | 5 | 15 | 12 |  |  | 18 |  |  | 4 | 30 | 23 | 1 | 55 | 2 |  | 4 |  | 5 |  |  | 9 | 3 | 16 |  | 1 | 8 | 11 | 46 |
| **Oligochaeta** LPIL | 1 | 1 |  |  |  |  |  |  |  |  |  | 1 |  |  | 3 |  |  |  |  |  |  |  |  | 1 | 1 |  |  |  | 1 | 3 |
| **Mollusca** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| **Bivalvia** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| *Macoma balthica* | 30 | 21 | 8 | 24 | 26 | 9 |  | 30 |  | 4 |  | 37 | 19 | 7 | 17 | 3 | 2 |  | 15 | 26 |  | 18 | 43 | 12 | 24 |  | 26 | 23 | 16 | 25 |
| *Mulina lateralis* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |  |  |  |  |  |  |  |
| *Mya arenaria* |  | 4 |  | 1 | 2 |  |  | 1 |  |  |  |  | 1 |  | 2 |  |  |  | 3 | 1 |  | 1 | 3 |  |  |  | 1 |  |  | 1 |
| *Rangia cuneata* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
| *Tellina agilis* | 2 | 4 |  | 1 | 7 |  |  | 1 |  |  |  |  |  | 2 | 1 |  |  |  |  | 1 |  | 2 | 13 |  | 1 |  | 4 | 2 | 1 | 3 |
| **Cnidaria** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| *Actiniaria* sp. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |  |  |  |  |  |
| **Arthropoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| **Amphipoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| *Leptocheirus plumulosus* |  | 1 |  | 12 | 2 |  |  |  |  |  |  | 79 | 53 | 59 | 155 | 5 |  | 1 |  | 54 |  |  | 12 | 2 | 95 |  | 18 | 35 | 72 | 170 |
| *Monoculodes edwardsi* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
| **Anthurid Isopod** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |
| *Cyathura polita* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
| **Nematoda** LPIL |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5 |  |  |  |  |  |  |  |
| **Osteichthyes** Juveniles |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total No. of Individuals** | 42 | 52 | 14 | 71 | 71 | 9 | 0 | 62 | 0 | 4 | 4 | 188 | 111 | 91 | 262 | 12 | 3 | 13 | 46 | 116 | 0 | 39 | 210 | 25 | 177 | 0 | 65 | 93 | 114 | 277 |
| **Total No. of Species** | 6 | 9 | 3 | 10 | 9 | 1 | 0 | 7 | 0 | 1 | 1 | 8 | 7 | 7 | 9 | 4 | 2 | 4 | 5 | 9 | 0 | 6 | 14 | 6 | 10 | 0 | 8 | 8 | 9 | 10 |
| **Total No. of Higher Taxa** | 3 | 3 | 2 | 3 | 3 | 1 | 0 | 2 | 0 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 0 | 2 | 5 | 4 | 5 | 0 | 3 | 3 | 4 | 4 |
| ***Macoma/Tellina*  WW(g)** | 4.8500 | 3.0300 | 0.5800 | 3.6380 | 4.4800 | 1.1790 | 0 | 5.0300 | 0 | 0.2400 | 0.0830 | 4.7020 | 3.3190 | 1.1630 | 2.3880 | 0.3180 | 0.0 | 0.0 | 1.4860 | 4.2300 | 0 | 5.6600 | 5.9450 | 1.6130 | 2.2590 | 0 | 5.1140 | 3.7200 | 0.0 | 5.4200 |
| ***Mya arenaria*** | 0.0 | 8.4280 | 0.0 | 1.3430 | 7.2500 | 0.0 | 0 | 0.8340 | 0 | 0.0 | 0.0 | 0.0 | 2.2450 | 0.0 | 1.5300 | 0.0 | 0.0 | 0.0 | 6.4260 | 0.1900 | 0 | 1.3360 | 1.9940 | 0.0 | 0.0 | 0 | 1.8970 | 0.0 | 0.0 | 0.0 |
| **Other Organisms WW(g):** | 0.5050 | 0.8630 | <.01 | 0.0 | 0.8600 | 0 .0 | 0 | 0.2050 | 0 | 0 | <.01 | 1.0510 | 0.4830 | 0.4610 | 1.3750 | <.01 | 0.0 | 0.0 | 0.8870 | 0.7100 | 0 | 0.4040 | 0.9470 | 0.3400 | 0.9500 | 0 | 0.4350 | 1.0500 | 0.0 | 1.7400 |
| **Total WW(g):** | 5.3550 | 12.3210 | >.58 | 0.6080 | 12.5900 | 1.1790 | 0 | 6.0690 | 0 | 0.2400 | >.083 | 5.7530 | 6.0470 | 1.6240 | 5.2930 | >.318 | 0.1950 | <.01 | 8.7990 | 5.1300 | 0 | 7.4000 | 8.8860 | 1.9530 | 3.2090 | 0 | 7.4460 | 4.7700 | 3.1400 | 7.1600 |

Table 12. Benthic Invertebrates Collected in October 2006 Sampling Event.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | | | | | | | | | | | |
| **Species** | **1** | **2** | **4** | **6** | **7** | **8** | **9** | **11** | **12** | **13** | **14** | **17** | **18** | **22** | **23** | **24** | **25** | **26** | **27** | **29** |
| **Annelida** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Polychaeta |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Eteone heteropoda* |  | 1 |  |  | 1 |  |  |  |  | 1 |  |  |  |  | 1 | 15 | 1 |  |  |  |
| *Heteromastus filiformes* |  |  | 1 |  |  |  |  |  | 1 |  |  |  |  |  | 1 | 6 |  |  |  | 1 |
| *Nereis succinea* | 1 | 2 | 4 |  |  |  |  | 13 | 3 | 2 | 39 |  | 1 | 1 | 5 | 8 | 4 |  | 1 | 3 |
| *Polydora* sp*.* |  |  |  |  |  |  |  | 6 |  |  |  |  |  |  |  |  |  |  |  |  |
| *Scolecolepides viridis* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |
| *Streblospio benedicti* | 1 |  | 1 |  | 2 |  |  | 17 |  |  |  | 1 |  | 2 |  | 4 |  |  |  |  |
| **Mollusca** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Bivalvia** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Macoma balthica* |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |
| *Mulina lateralis* |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |  |  |
| *Mya arenaria* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Rangia cuneata* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Tellina agilis* |  | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | 27 |  |  |  |  |
| **Arthropoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Amphipoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Corophium* sp. |  |  |  |  |  |  |  |  |  | 1 | 3 |  |  |  |  |  |  |  |  |  |
| **Tanaidacea** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Leptochelia savignyi* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |
| **Total No. of Individuals** | 2 | 4 | 6 | 0 | 3 | 0 | 0 | 36 | 4 | 4 | 43 | 1 | 1 | 3 | 8 | 61 | 6 | 0 | 1 | 4 |
| **Total No. of Species** | 2 | 3 | 3 | 0 | 2 | 0 | 0 | 3 | 2 | 3 | 3 | 1 | 1 | 2 | 4 | 6 | 3 | 0 | 1 | 2 |
| **Total No. of Higher Taxa** | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 0 | 1 | 1 |
| ***Tellina* WW(g)** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.114 | 0.0 | 0.0 | 0.0 | 0.0 |
| ***Macoma balthica* WW(g)** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.361 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Other Organisms WW(g):** | 0.0 | 0.016 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.078 | 0.018 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.093 | 0.076 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total WW(g):** | <.01 | 0.016 | 0.022 | <.01 | <.01 | <.01 | <.01 | 0.078 | 0.018 | <.01 | 0.036 | <.01 | <.01 | <.01 | 0.454 | 0.190 | <.01 | 0.00 | <.01 | 0.015 |

### 4.4 Epibenthic Pile Sampling

##### October 2006

Three epibenthic locations on four piles (a total of 12 samples) were sampled within the proposed Project Area in October 2006. In most cases, organisms were identified to the species level. However, in some cases, the LPIL was used. Table 13 lists the collected invertebrates from the October epibenthic sampling efforts.

Results of the pile scrapings revealed the presence of 175,642 individual macroinvertebrates representing 16 species. The samples ranged in abundance from 9,849 to 21,901 individuals and varied in diversity from nine to 13 species per sample (Table 13). The amphipod *Corophium* *lacustre* was the most abundant species collected, accounting for 131,465 individuals (75% of all individuals collected); *C.* *lacustre* was found in all 12 samples. The second most abundant set of species collected were nematodes, which accounted for 22,395 individuals (13% of all individuals collected);,nematodes were also present in all 12 samples. The third most abundant species was a polychaete in the genus *Polydora, which* accounted for 14,698 organisms (8% of all individuals collected). Eight (8) of the 16 species collected were observed at all 12 sample locations. The mean abundance for each sample was 14,636 individuals per scraping sample and the mean diversity was eight species at each sample location.

Table 13. Epibenthic Invertebrates Collected During the Pile Sampling, October 2006.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample Location | | | | | | | | | | | | |
| **Species** | **1S** | **1W** | **1N** | **2S** | **2W** | **2N** | **3S** | **3W** | **3N** | **4S** | **4W** | **4N** |
| **Annelida** |  |  |  |  |  |  |  |  |  |  |  |  |
| Polychaeta |  |  |  |  |  |  |  |  |  |  |  |  |
| *Eteone heteropoda* | 4 | 58 | 2 | 4 |  |  | 8 |  | 1 | 5 | 1 |  |
| *Nereis succinea* | 38 | 63 | 10 | 22 | 67 | 35 | 57 | 102 | 51 | 90 | 101 | 26 |
| *Polydora* sp*.* | 337 | 963 | 3,621 | 451 | 877 | 417 | 654 | 1,271 | 1,717 | 1,305 | 2,140 | 945 |
| *Streblospio benedicti* |  |  |  |  |  |  |  | 42 |  | 52 |  |  |
| **Oligochaeta** LPIL | 761 | 154 | 29 | 451 | 367 | 10 | 592 | 104 | 98 | 292 | 83 | 21 |
| **Mollusca** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Bivalvia** |  |  |  |  |  |  |  |  |  |  |  |  |
| *Congeria leucophaeata* | 116 | 95 | 67 | 203 | 101 | 58 | 126 | 122 | 47 | 89 | 192 | 14 |
| *Modiolus demissus* | 2 |  | 1 | 1 | 4 | 2 | 8 | 8 |  | 3 |  |  |
| *Rangia cuneata* |  |  |  |  |  |  |  |  |  | 1 |  |  |
| **Arthropoda** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Amphipoda** |  |  |  |  |  |  |  |  |  |  |  |  |
| *Corophium lacustre* | 7,518 | 11,656 | 14,866 | 15,968 | 10,256 | 6131 | 11,635 | 10,227 | 10,550 | 7,557 | 15,440 | 9,661 |
| *Leptocheirus plumulosus* |  |  |  | 1 |  |  |  |  |  |  |  |  |
| *Gammarus palustris* |  |  | 15 |  | 2 | 10 |  |  |  |  |  |  |
| **Insecta** |  |  |  |  |  |  |  |  |  |  |  |  |
| Chironomidae |  |  | 12 |  | 10 | 10 |  |  | 16 |  |  | 63 |
| **Cirripedia** |  |  |  |  |  |  |  |  |  |  |  |  |
| *Balanus sp.* | 51 | 112 | 92 | 67 | 57 | 76 | 58 | 88 | 108 | 67 | 178 | 50 |
| **Decapoda** |  |  |  |  |  |  |  |  |  |  |  |  |
| *Rhithropanopeus harrisii* | 1 | 2 | 1 | 2 |  | 1 | 4 |  | 1 | 1 | 1 |  |
| **Nematoda** LPIL | 1,021 | 1,156 | 3,008 | 535 | 1,570 | 1,271 | 3,146 | 2,249 | 2,797 | 1,563 | 1,475 | 2,604 |
| **Turbellaria** LPIL |  | 117 | 177 | 2 | 21 | 33 | 16 | 167 | 65 | 121 | 146 | 1 |
| **Total No. of Individuals** | 9,849 | 14,376 | 21,901 | 17,707 | 13,332 | 8,054 | 16,304 | 14,380 | 15,451 | 11,146 | 19,757 | 13,385 |
| **Total No. of Species** | 10 | 10 | 13 | 12 | 12 | 13 | 11 | 10 | 11 | 13 | 10 | 9 |
| **Total No. of Higher Taxa** | 7 | 8 | 9 | 8 | 8 | 9 | 7 | 6 | 8 | 8 | 8 | 8 |
| *Balanus, Congeria, Modiolus* **WW(g)** | 179.775 | 287.939 | 405.212 | 500.041 | 299.418 | 204.38 | 320.129 | 358.857 | 299.597 | 419.851 | 501.607 | 256.832 |
| **Other Organisms WW(g):** | 7.225 | 12.061 | 14.788 | 19.959 | 10.582 | 5.62 | 9.871 | 11.143 | 10.403 | 10.149 | 18.393 | 13.168 |
| **Total WW(g):\*** | 187 | 300 | 420 | 520 | 310 | 210 | 330 | 370 | 310 | 430 | 520 | 270 |

1 \*Total weight was measured on scales sensitive to the nearest gram.

2 Grouped organisms were measured on a scale sensitive to 0.001 g.

### 4.5 Grain Size Sampling

***June 2006***

Grain size analysis conducted in June revealed that mud, consisting of silts and clays, dominates the Sparrows Point Study Area. Only trace amounts of coarse, very coarse and gravel-sized sediment were collected in each sample.

Gravel was the dominant sediment in one of the 30 benthic grab samples collected and was present in 28 of the 30 sediment samples. Very coarse size sand was present in 29 of the 30 benthic grabs and was at its highest percentage at site location B19. Coarse sized sand was found in minimal amounts and was present in all 30 benthic grab samples. Medium sized sand was collected in all of the 30 available benthic grabs and was also at its highest percentage at site location B19. Fine sand was collected in all of the 30 available benthic grabs and was the dominant sediment size in one of the 30 available benthic grabs. Very fine sand sediment was collected in all 30 available benthic grabs and was dominant in one of the 30 samples. Mud was present in every sample and dominated the size classes in 28 of the 30 sediment samples. Overall, mud, consisting of silts and clays, dominated the sediment size classes present (Table 14).

Table 14. Grain Size Results From Benthic Sampling, June 2006.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sieve Size** | | | | | | |
| **Gravel** | **Sand** | | | | | **Mud** |
| **Very Coarse** | **Coarse** | **Medium** | **Fine** | **Very Fine** |
| **B1** | 0.07 | 0.27 | 0.14 | 0.20 | 0.78 | 1.43 | 97.10 |
| **B2** | 1.96 | 0.87 | 0.42 | 2.21 | 3.50 | 4.66 | 86.38 |
| **B3** | 0.00 | 0.05 | 0.15 | 0.55 | 0.80 | 0.75 | 97.70 |
| **B4** | 1.10 | 0.98 | 0.16 | 1.02 | 0.98 | 1.43 | 94.34 |
| **B5** | 0.87 | 1.11 | 1.11 | 4.54 | 10.16 | 6.20 | 76.02 |
| **B6** | 0.23 | 0.25 | 0.34 | 0.54 | 1.04 | 0.82 | 96.78 |
| **B7** | 0.02 | 0.01 | 0.01 | 0.02 | 0.14 | 0.23 | 99.56 |
| **B8** | 0.45 | 0.74 | 0.35 | 0.54 | 0.56 | 1.49 | 95.87 |
| **B9** | 0.04 | 0.10 | 0.33 | 0.80 | 0.62 | 0.23 | 97.87 |
| **B10** | 0.05 | 0.14 | 0.39 | 1.61 | 2.29 | 1.11 | 94.40 |
| **B11** | 0.01 | 0.00 | 0.21 | 0.29 | 0.41 | 0.78 | 98.29 |
| **B12** | 0.12 | 0.12 | 0.12 | 0.18 | 1.45 | 0.60 | 97.40 |
| **B13** | 0.34 | 0.75 | 0.84 | 1.47 | 1.79 | 1.41 | 93.40 |
| **B14** | 1.40 | 1.42 | 1.68 | 4.14 | 4.51 | 1.93 | 84.92 |
| **B15** | 1.14 | 0.47 | 0.34 | 0.86 | 0.84 | 0.67 | 95.68 |
| **B16** | 0.08 | 0.15 | 0.04 | 0.14 | 0.26 | 0.16 | 99.17 |
| **B17** | 0.00 | 0.05 | 0.23 | 0.36 | 0.31 | 0.21 | 98.84 |
| **B18** | 0.28 | 0.19 | 0.47 | 2.70 | 3.45 | 2.32 | 90.59 |
| **B19** | 5.35 | 2.83 | 4.65 | 17.10 | 11.21 | 4.85 | 54.01 |
| **B20** | 0.22 | 0.50 | 0.03 | 1.66 | 1.22 | 2.10 | 94.27 |
| **B21** | 0.01 | 0.26 | 0.96 | 1.29 | 0.93 | 1.32 | 95.23 |
| **B22** | 1.62 | 1.09 | 0.74 | 3.51 | 10.51 | 8.55 | 73.97 |
| **B23** | 0.10 | 0.14 | 0.81 | 8.27 | 45.87 | 30.04 | 14.76 |

**Table 14. Grain Size Results From Benthic Sampling, June 2006 (Continued).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sieve Size** | | | | | | |
| **Gravel** | **Sand** | | | | | **Mud** |
| **Very Coarse** | **Coarse** | **Medium** | **Fine** | **Very Fine** |
| **B24** | 0.08 | 0.04 | 0.06 | 0.07 | 0.18 | 0.67 | 98.89 |
| **B25** | 55.87 | 1.28 | 1.31 | 1.99 | 1.58 | 0.85 | 37.13 |
| **B26** | 0.28 | 0.30 | 0.31 | 1.22 | 1.12 | 0.84 | 95.94 |
| **B27** | 0.05 | 0.25 | 0.46 | 1.28 | 1.85 | 1.79 | 94.32 |
| **B28** | 0.78 | 0.47 | 0.67 | 0.85 | 2.03 | 3.27 | 91.93 |
| **B29** | 9.03 | 0.20 | 0.17 | 0.34 | 0.64 | 1.02 | 88.61 |
| **B30** | 0.43 | 0.06 | 0.23 | 0.40 | 0.66 | 0.72 | 97.51 |
| **MEAN** | 2.73 | 0.50 | 0.59 | 2.01 | 3.72 | 2.75 | 87.70 |
| 1 Samples collected in October 2006.  2 na = sample not available. | | | | | | | |

***October 2006***

Grain size analysis for the Sparrows Point Study Area in October revealed that mud, consisting of silts and clays, dominate the area. Only trace amounts of coarse, very coarse and gravel-sized sediment were collected in each sample.

Gravel was present in 18 of the 20 benthic grabs and was at its highest percentage at site location B14. Very coarse size sand was present in all 20 benthic grabs and was not dominant in any of the available samples. Coarse sized sand was found in minimal amounts and was present in all 20 benthic grab samples. Medium sized sand was collected in all of the 20 available benthic grabs and was also at its highest percentage at site locations B14 and B27. Fine sand was collected in all of the 20 available benthic grabs and was the dominant sediment size in one of the 20 available benthic grabs. Very fine sand sediment was collected in all 20 available benthic grabs and was at its highest percentage at site location B24. Mud was present in every sample and dominated the size classes in 19 of the 20 sediment samples. Overall, mud, consisting of silts and clays, dominated the sediment size classes present (Table 15).

Table 15. Grain Size Results From Benthic Sampling, October 2006.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sieve Size** | | | | | | |
| **Gravel** | **Sand** | | | | | **Mud** |
| **Very Coarse** | **Coarse** | **Medium** | **Fine** | **Very Fine** |
| **B1** | 0.32 | 0.35 | 0.63 | 1.98 | 1.83 | 1.93 | 92.97 |
| **B2** | 0.11 | 0.29 | 0.48 | 1.38 | 1.54 | 2.88 | 93.33 |
| **B4** | 1.57 | 0.49 | 0.75 | 1.48 | 2.46 | 3.93 | 89.33 |
| **B6** | 0.17 | 0.19 | 0.36 | 0.60 | 0.88 | 1.00 | 96.80 |
| **B7** | 0.00 | 0.04 | 0.28 | 0.69 | 0.36 | 0.57 | 98.06 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sieve Size** | | | | | | |
| **Gravel** | **Sand** | | | | | **Mud** |
| **Very Coarse** | **Coarse** | **Medium** | **Fine** | **Very Fine** |
| **B8** | 0.15 | 0.68 | 0.85 | 1.40 | 1.70 | 1.63 | 93.59 |
| **B9** | 0.23 | 0.19 | 0.70 | 2.03 | 2.10 | 1.05 | 93.71 |
| **B11** | 0.08 | 0.11 | 0.60 | 1.35 | 1.20 | 1.70 | 94.96 |
| **B12** | 3.04 | 0.31 | 0.27 | 0.55 | 0.96 | 1.32 | 93.56 |
| **B13** | 3.78 | 2.24 | 2.83 | 4.40 | 4.38 | 2.12 | 80.23 |
| **B14** | 19.16 | 3.43 | 4.75 | 8.76 | 5.95 | 2.74 | 55.21 |
| **B17** | 0.31 | 1.07 | 0.94 | 0.99 | 1.28 | 1.29 | 94.13 |
| **B18** | 0.02 | 0.24 | 0.46 | 0.79 | 0.87 | 0.95 | 96.67 |
| **B22** | 0.00 | 0.11 | 0.37 | 1.88 | 1.54 | 1.13 | 94.96 |
| **B23** | 1.12 | 0.46 | 0.51 | 0.79 | 2.17 | 7.28 | 87.68 |
| **B24** | 0.20 | 0.18 | 0.54 | 7.78 | 61.05 | 23.98 | 6.28 |
| **B25** | 0.49 | 1.20 | 1.17 | 2.16 | 8.70 | 7.11 | 79.17 |
| **B26** | 3.09 | 5.97 | 3.52 | 2.74 | 2.40 | 2.10 | 80.18 |
| **B27** | 5.40 | 2.00 | 3.31 | 8.60 | 3.35 | 1.94 | 75.41 |
| **B29** | 0.86 | 1.40 | 0.99 | 1.55 | 3.35 | 3.05 | 88.80 |
| **MEAN** | 2.01 | 1.05 | 1.22 | 2.60 | 5.40 | 3.49 | 84.25 |
| 1 Samples collected in October 2006.  2 na = sample not available. | | | | | | | |

**Table 15. Grain Size Results From Benthic Sampling, October 2006 (Continued).**

### 4.6 Water Quality Sampling

#### 4.6.1 Fish Trawl Water Quality

***June 2006***

Five water quality parameters (temperature, salinity, dissolved oxygen, pH and turbidity) were measured at the end of each trawl at three different depths (bottom, middle, and top) at each fish trawl location; results are presented in Table 16.

Water depth for the bottom samples ranged from 3.18 m to 6.35 m with a mean of 5.16 +/- 1 m. Temperatures on the bottom averaged 25.69 +/- 0.20°C with a minimum value of 25.27°C and a maximum value of 26.0°C. Salinity varied from 6.98 ppt to 7.93 ppt and averaged 7.45 +/- 0.27 ppt overall. DO values were at the low end of acceptable biological ranges with an average of 4.36 +/- 1.02 mg/L, a minimum of 2.97 mg/L, and a maximum of 6.32 mg/L. Only two DO values were greater than 5.0 mg/L. Values for pH were between 5.62 and 7.40 with a mean of 6.80 +/- 0.58. Turbidity was variable, ranging from less than 1 to over 1500 NTU. Note that the high results from the turbidity survey likely could have resulted from fouling of the optics of the turbidity meter.

Water depth for the middle samples ranged from 1.72 m to 3.29 m with a mean of 2.43 +/- 0.5 m. Temperatures in the middle of the water column averaged 25.86 +/- 0.13°C with a minimum value of 25.77°C and a maximum value of 26.16°C. Salinity varied from 6.62 ppt to 6.87 ppt and averaged 6.77 +/- 0.09 ppt overall. DO values were at the lower end of acceptable biological ranges with an average of 4.96 +/- 0.98 mg/L, a minimum of 3.34 mg/L, and a maximum of 6.60 mg/L. Four of the DO values were greater than 5.0 mg/L. Values for pH were between 5.61 and 7.69 with a mean of 6.86 +/- 0.67. Turbidity was less variable than at the bottom, ranging from less than 1 to 9 NTU.

Table 16. Water Quality Data Obtained During Fish Trawls, June 2006 Sampling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **2** | 25.72 | 25.81 | 25.94 | 7.51 | 6.84 | 6.63 | 3.87 | 4.48 | 5.47 | 7.33 | 7.42 | 7.62 | 286.7 | 3.4 | 1.8 |
| **3** | 25.68 | 25.81 | 26.06 | 7.52 | 6.62 | 6.53 | 3.6 | 3.85 | 5.93 | 7.40 | 7.46 | 7.80 | 10.1 | 9.4 | 3.6 |
| **4** | 25.47 | 25.86 | 26.10 | 7.78 | 6.63 | 6.58 | 3.49 | 6.60 | 6.30 | 7.23 | 7.69 | 7.72 | 13.4 | 1.5 | 1.0 |
| **5** | 25.27 | 25.77 | 26.15 | 7.93 | 6.87 | 6.51 | 2.97 | 3.34 | 5.31 | 7.10 | 7.17 | 7.56 | 16.5 | 4.5 | 2.1 |
| **6** | 26.00 | 26.16 | 26.56 | 6.98 | 6.81 | 6.61 | 4.11 | 4.80 | 5.49 | 6.70 | 6.68 | 6.91 | 5.4 | 5.4 | 3.1 |
| **7** | 25.78 | 25.83 | 26.33 | 7.25 | 6.79 | 6.26 | 5.57 | 4.90 | 5.80 | 6.77 | 6.69 | 6.85 | 6.1 | 1.3 | 1.2 |
| **8** | 25.68 | 25.77 | 25.99 | 7.52 | 6.74 | 6.17 | 4.95 | 6.12 | 6.96 | 6.92 | 7.04 | 7.27 | 0.9 | -0.2 | 2.6 |
| **9** | 25.67 | 25.78 | 26.92 | 7.41 | 6.83 | 5.68 | 4.69 | 4.76 | 5.94 | 6.99 | 6.96 | 7.24 | 5.6 | 3.1 | 2.3 |
| **10** | 25.83 | 25.81 | 27.03 | 7.32 | 6.86 | 6.18 | 4.01 | 5.29 | 6.88 | 5.96 | 5.89 | 6.35 | 207.5 | 1.0 | 1.0 |
| **11** | 25.76 | 26.02 | 27.42 | 7.25 | 6.69 | 6.02 | 6.32 | 5.50 | 7.05 | 5.62 | 5.61 | 6.08 | 1518.1 | 0.4 | 0.7 |
| **MEAN** | 25.69 | 25.86 | 26.45 | 7.45 | 6.77 | 6.32 | 4.36 | 4.96 | 6.11 | 6.80 | 6.86 | 7.14 | 207.03 | 2.9 | 1.94 |
| **SD** | 0.20 | 0.13 | 0.51 | 0.27 | 0.09 | 0.31 | 1.02 | 0.98 | 0.65 | 0.58 | 0.67 | 0.59 | 471.63 | 2.9 | 0.98 |

1 - = sample data not available.

2 SD = Standard deviation.

Water depth for the top (near surface) sampling ranged from 0.09 m to 0.57 m with a mean of 0.21 +/- 0.19 m. Temperatures were highest on the surface and averaged 26.45 +/- 0.5°C with a minimum value of 25.94°C and a maximum value of 27.42°C. Salinity varied from 5.68 ppt to 6.63 ppt and averaged 6.32 +/- 0.31 ppt overall. DO values were higher than mid- or bottom-waters and were within acceptable biological ranges with an average of 6.11 +/- 0.65 mg/L, a minimum of 5.31 mg/L, and a maximum of 7.05 mg/L. Values for pH were between 6.08 and 7.80 with a mean of 7.14 +/- 0.59. Turbidity was not as variable as at the bottom or middle of the water column, as it ranged from less than 1 to almost 4 NTU.

***October 2006***

Five water quality parameters (temperature, salinity, dissolved oxygen, pH and turbidity) were measured at the end of each trawl at three different depths (bottom, middle and top) at each fish trawl location; results are presented in Table 17.

Water depth for the bottom samples ranged from 3.25 to 6.25 m with a mean of 5.16 +/- 1 m. Temperatures on the bottom averaged 17.82 +/- 0.59°C with a minimum value of 17.39°C and a maximum value of 19.02°C. Salinity varied from 8.61 ppt to 10.97 ppt and averaged 9.74 +/- 0.69 ppt overall. DO values were at the low end of acceptable biological ranges with an average of 5.66 +/- 1.00 mg/L, a minimum of 3.52 mg/L, and a maximum of 6.74 mg/L. Values for pH were between 7.81 and 8.09 with a mean of 7.98 +/- 0.09. Turbidity was variable, ranging from less than 1 to 193 NTU.

Water depth for the middle samples ranged from 1.72 m to 3.29 m with a mean of 2.43 +/- 0.5 m. Temperatures in the middle of the water column averaged 17.58 +/- 0.12°C with a minimum value of 17.39°C and a maximum value of 17.75°C. Salinity varied from 8.61 ppt to 10.97 ppt and averaged 9.74 +/- 0.69 ppt overall. DO values were at the lower end of acceptable biological ranges with an average of 5.46 +/- 1.02 mg/L, a minimum of 3.49 mg/L, and a maximum of 6.74 mg/L. Values for pH were between 7.91 and 8.25 with a mean of 8.03 +/- 0.15. Turbidity was variable at the bottom, ranging from about 2.9 to over 1000 NTU. Note that the high results from the turbidity survey likely could have resulted from fouling of the optics of the turbidity meter.

Water depth for the top (near surface) sampling ranged from 0.09 m to 0.57 m with a mean of 0.21 +/- 0.19 m. Temperatures were highest on the surface and averaged 17.42 +/- 0.11°C with a minimum value of 17.25°C and a maximum value of 17.58°C. Salinity varied from 6.76 ppt to 7.92 ppt and averaged 7.24 +/- 0.32 ppt overall. DO values were higher than mid- or bottom-waters and were within acceptable biological ranges with an average of 6.07 +/- 1.15 mg/L, a minimum of 3.91 mg/L, and a maximum of 7.87 mg/L. Values for pH were between 7.99 and 8.42 with a mean of 8.21 +/- 0.17. Turbidity was not as variable as the bottom or middle of the water column, ranging from 3.1 to almost 6.1 NTU.

Table 17. Water Quality Data Obtained During Fish Trawls, October 2006 Sampling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **1** | 17.91 | 17.75 | 17.56 | 9.95 | 8.44 | 7.00 | 5.79 | 5.03 | 5.84 | 7.95 | 8.03 | 8.23 | 5.3 | 2.9 | 3.1 |
| **2** | 18.91 | 17.52 | 17.58 | 10.88 | 9.56 | 7.40 | 3.52 | 3.49 | 6.15 | 7.81 | 7.79 | 8.25 | 33.1 | 12.8 | 3.1 |
| **3** | 19.02 | 17.45 | 17.48 | 10.97 | 9.09 | 7.32 | 6.53 | 5.65 | 4.87 | 8.00 | 7.86 | 8.00 | 11.5 | 6.1 | 4.4 |
| **4** | 17.66 | 17.67 | 17.40 | 9.6 | 7.6 | 7.19 | 6.74 | 5.74 | 7.28 | 8.07 | 8.09 | 8.40 | 6.1 | 3.9 | 3.7 |
| **5** | 17.45 | 17.69 | 17.40 | 9.46 | 8.00 | 7.09 | 6.03 | 6.74 | 7.87 | 7.99 | 8.18 | 8.42 | 11.8 | 4.2 | 4.1 |
| **6** | 17.43 | 17.60 | 17.25 | 9.46 | 7.81 | 6.76 | 5.28 | 6.23 | 7.22 | 7.87 | 8.25 | 8.40 | 6.0 | 3.2 | 3.9 |
| **7** | 17.40 | 17.39 | 17.55 | 9.18 | 8.66 | 7.92 | 6.67 | 6.16 | 5.98 | 8.09 | 8.01 | 8.05 | 193.9 | 6.9 | 6.1 |
| **8** | 17.75 | 17.72 | 17.39 | 9.98 | 8.89 | 7.08 | 6.38 | 5.83 | 5.43 | 8.08 | 7.96 | 8.07 | 101.0 | 5.6 | 4.0 |
| **9** | 17.45 | 17.5 | 17.25 | 9.47 | 7.72 | 6.94 | 5.06 | 5.9 | 6.66 | 7.91 | 8.22 | 8.32 | 5.3 | 3.5 | 3.7 |
| **10** | 17.62 | 17.66 | 17.39 | 9.6 | 9.58 | 7.45 | 4.48 | 3.66 | 3.91 | 7.97 | 7.91 | 7.99 | 86.7 | 1099.0 | 4.6 |
| **11** | 17.39 | 17.45 | 17.40 | 8.61 | 7.68 | 7.45 | 5.73 | 5.59 | 5.58 | 8.02 | 8.02 | 8.13 | 3.0 | 3.0 | 3.3 |
| **MEAN** | 17.82 | 17.58 | 17.42 | 9.74 | 8.46 | 7.24 | 5.66 | 5.46 | 6.07 | 7.98 | 8.03 | 8.21 | 42.15 | 14.65 | 4.00 |
| **SD** | 0.59 | 0.12 | 0.11 | 0.69 | 0.75 | 0.32 | 1.00 | 1.02 | 1.15 | 0.09 | 0.15 | 0.17 | 61.05 | 31.42 | 0.85 |

1 - = sample data not available.

2 SD = Standard deviation.

#### 

#### 4.6.2 Benthic Grab Water Quality

***October 2006***

In addition, five water quality parameters (temperature, salinity, dissolved oxygen, pH and turbidity) were measured at the end of each benthic sampling at three different depths (bottom, middle and top) during the October 2006 benthic sampling effort. Results are presented in Table 18.

Water depth for the bottom samples ranged from 5.13 m to 9.02 m with a mean of 6.24 +/- 1.32 m. Temperatures on the bottom averaged 17.34 +/- 0.68°C with a minimum value of 16.85°C and a maximum value of 19.53°C. Salinity varied from 8.46 ppt to 10.60 ppt and averaged 9.19 +/- 0.59 ppt overall. DO values were low with an average of 6.02 +/- 1.83 mg/L, a minimum of 1.52 mg/L, and a maximum of 12.20 mg/L. Values for pH were between 7.90 and 8.24 with a mean of 8.08 +/- 0.16. Turbidity was variable, ranging from less than 1 to approximately 500 NTU. Note that the high results from the turbidity survey likely could have resulted from fouling of the optics of the turbidity meter.

Table 18. Water Quality Data Obtained During Benthic Grabs, October 2006 Sampling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **B1** | 16.92 | 16.78 | 16.67 | 8.86 | 8.33 | 8.35 | 5.96 | 5.67 | 5.65 | 8.16 | 8.10 | 8.12 | 269.3 | 3.9 | 3.8 |
| **B2** | 16.91 | 16.97 | 16.86 | 8.79 | 8.83 | 8.65 | 5.94 | 5.63 | 5.54 | 8.18 | 8.10 | 8.07 | 4.1 | 6.3 | 4.3 |
| **B4** | 17.00 | 16.96 | 16.85 | 8.46 | 8.81 | 8.65 | 6.03 | 5.95 | 5.80 | 8.24 | 8.16 | 8.13 | 10.7 | 7.4 | 5.8 |
| **B6** | 16.85 | 16.85 | 16.75 | 8.81 | 8.72 | 8.42 | 5.79 | 5.60 | 5.50 | 8.17 | 8.11 | 8.10 | 3.1 | 3.2 | 3.4 |
| **B7** | 18.71 | 17.33 | 16.99 | 10.6 | 8.95 | 8.51 | 5.35 | 4.21 | 4.13 | 8.02 | 7.93 | 7.95 | 501.1 | 5.1 | 4.2 |
| **B8** | 17.26 | 17.20 | 16.78 | 9.15 | 8.92 | 8.37 | 5.65 | 5.40 | 5.25 | 8.12 | 8.04 | 8.06 | 14.7 | 4.1 | 3.7 |
| **B9** | 16.90 | 16.77 | 16.73 | 8.57 | 8.55 | 8.38 | 5.8 | 5.61 | 5.48 | 8.19 | 8.11 | 8.10 | 3.0 | 3.2 | 35.6 |
| **B11** | 17.43 | 17.40 | 16.95 | 9.43 | 9.14 | 8.60 | 5.58 | 5.23 | 5.02 | 8.05 | 8.01 | 7.98 | 5.7 | 4.0 | 3.9 |
| **B12** | 16.89 | 17.09 | 16.77 | 8.78 | 8.9 | 8.85 | 5.90 | 5.38 | 5.61 | 8.16 | 8.00 | 8.03 | 7.2 | 7.8 | 9.0 |
| **B13** | 17.20 | 17.57 | 17.07 | 9.34 | 9.41 | 8.98 | 7.79 | 7.09 | 6.82 | 8.09 | 7.99 | 7.99 | 4.9 | 3.4 | 4.2 |
| **B14** | 17.88 | 17.73 | 16.92 | 10.0 | 9.61 | 8.77 | 12.2 | 6.99 | 7.51 | 7.90 | 7.79 | 7.87 | 5.5 | 4.0 | 3.9 |
| **B17** | 17.05 | 17.18 | 16.84 | 8.74 | 8.99 | 8.62 | 6.63 | 6.48 | 6.33 | 8.17 | 8.08 | 8.07 | 3.6 | 3.4 | 3.9 |
| **B18** | 16.95 | 17.22 | 16.81 | 8.84 | 9.03 | 8.59 | 6.01 | 5.85 | 5.69 | 8.17 | 8.06 | 8.06 | 2.5 | 3.9 | 6.3 |
| **B22** | 17.18 | 17.17 | 16.80 | 8.99 | 8.80 | 8.44 | 5.48 | 5.28 | 5.21 | 8.05 | 8.00 | 8.02 | 6.1 | 5.1 | 4.2 |
| **B23** | 17.01 | 17.02 | 16.79 | 8.80 | 8.80 | 8.48 | 5.76 | 5.53 | 5.39 | 8.17 | 8.12 | 8.1 | 33.4 | 3.4 | 3.4 |
| **B24** | 16.90 | 16.90 | 16.74 | 8.77 | 8.74 | 8.55 | 5.76 | 5.58 | 5.55 | 8.17 | 8.13 | 8.12 | 31.7 | 14.1 | 9.7 |
| **B25** | 17.20 | 17.10 | 16.86 | 9.29 | 8.96 | 8.60 | 5.64 | 5.4 | 5.37 | 8.02 | 8.03 | 8.05 | 7.4 | 13.2 | 9.1 |
| **B26** | 17.64 | 17.21 | 16.89 | 9.76 | 9.08 | 8.70 | 5.73 | 4.75 | 5.09 | 8.00 | 8.07 | 8.04 | 114.5 | 3.2 | 3.1 |
| **B27** | 19.53 | 17.20 | 16.87 | 10.3 | 8.99 | 8.38 | 1.52 | 1.06 | 5.28 | 7.52 | 7.65 | 7.96 | -0.5 | 6.2 | 5.0 |
| **B29** | 17.43 | 17.09 | 16.91 | 9.42 | 8.96 | 8.42 | 5.84 | 5.08 | 5.37 | 8.05 | 8.00 | 8.08 | 83 | 3.9 | 4 |
| **MEAN** | 17.34 | 17.14 | 16.84 | 9.19 | 8.93 | 8.57 | 6.02 | 5.39 | 5.58 | 8.08 | 8.02 | 8.05 | 55.55 | 5.44 | 6.53 |
| **SD** | 0.68 | 0.25 | 0.10 | 0.59 | 0.27 | 0.17 | 1.83 | 1.22 | 0.69 | 0.16 | 0.12 | 0.07 | 122.4 | 3.14 | 7.13 |

1 - = sample data not available.

2 SD = Standard deviation.

Water depth for the middle samples ranged from 2.38 m to 4.78 m with a mean of 3.63 m +/- 0.86 m. Temperatures in the middle of the water column averaged 17.14 +/- 0.25°C with a minimum value of 16.77°C and a maximum value of 17.73°C. Salinity varied from 8.33 ppt to 9.61 ppt and averaged 8.93 +/- 0.27 ppt overall. DO values were low with an average of 5.39 +/- 1.22 mg/L, a minimum of 1.06 mg/L, and a maximum of 7.09 mg/L. Values for pH were between 7.65 and 8.16 with a mean of 8.02 +/- 0.12. Turbidity was less variable than at the bottom, ranging from 3.2 to approximately 14 NTU.

Water depth for the top (near surface) sampling ranged from 0.01 m to 0.40 m with a mean of 0.09 +/- 0.10 m. Temperatures were highest on the surface and averaged 16.84 +/- 0.10°C with a minimum value of 16.75°C and a maximum value of 17.07°C. Salinity varied from 8.35 ppt to 8.98 ppt and averaged 8.57 +/- 0.17 ppt overall. DO values were at the low end of acceptable biological ranges, with an average of 5.58 +/- 0.69 mg/L, a minimum of 4.13 mg/L, and a maximum of 7.51 mg/L. Values for pH were between 7.95 and 8.13 with a mean of 8.05 +/- 0.07. Turbidity ranged from 3.1 to approximately 35 NTU.

#### 4.6.3 Plankton Tow Water Quality

***June 2006***

Five water quality parameters (temperature, salinity, dissolved oxygen, pH and turbidity) were measured at the end of each plankton tow at three different depths (bottom, middle and top) during the June 2006 sampling effort. Results are presented in Table 19.

Water depth for the bottom samples ranged from 5.26 m to 9.52 m with a mean of 7.32 +/- 1.46 m. Temperatures on the bottom averaged 24.84 +/- 0.80°C with a minimum value of 23.52°C and a maximum value of 25.29°C. Salinity varied from 7.42 ppt to 9.70 ppt and averaged 8.02 +/- 0.74 ppt overall. DO values were at the low end of acceptable biological ranges with an average of 4.02 +/- 1.10 mg/L, a minimum of 1.80 mg/L, and a maximum of 5.04 mg/L. Only two samples were above 5.0 mg/L and two samples were below 2.0 mg/L. Values for pH were between 7.30 and 7.65 with a mean of 7.52 +/- 0.10. Turbidity was variable, ranging from less than 1 to approximately 600 NTU. Note that the high results from the turbidity survey could likely have resulted from fouling of the optics of the turbidity meter.

Table 19. Water Quality Data Obtained During Plankton Tows, June 2006 Sampling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **2** | 25.29 | 25.37 | 25.46 | 7.64 | 7.49 | 7.40 | 4.16 | 3.06 | 4.69 | 7.49 | 7.49 | 7.56 | 2.5 | 3.6 | 0.6 |
| **3** | 25.24 | 25.35 | 25.44 | 7.55 | 7.47 | 7.44 | 4.14 | 4.22 | 4.78 | 7.56 | 7.57 | 7.63 | 131.1 | 7 | 1.8 |
| **4** | 25.23 | 25.40 | 25.42 | 7.56 | 7.43 | 7.42 | 4.50 | 4.53 | 4.85 | 7.53 | 7.52 | 7.55 | 587.3 | 2.5 | 0.4 |
| **5** | 25.25 | 25.30 | 25.32 | 7.50 | 7.40 | 7.37 | 1.99 | 3.50 | 4.71 | 7.49 | 7.48 | 7.52 | -7.1 | 6.2 | 2.9 |
| **6** | 24.08 | 25.35 | 25.40 | 8.84 | 7.47 | 7.42 | 4.81 | 3.81 | 4.59 | 7.48 | 7.52 | 7.61 | 314.7 | 2.1 | 1.1 |
| **7** | 23.52 | 25.28 | 25.35 | 9.31 | 7.46 | 7.42 | 2.58 | 3.75 | 4.62 | 7.38 | 7.49 | 7.58 | 367 | 4.4 | 1.2 |
| **8** | 25.17 | 25.31 | 25.38 | 7.54 | 7.44 | 7.43 | 4.78 | 4.29 | 4.84 | 7.63 | 7.61 | 7.62 | 536.9 | 4.2 | 2 |

**Table 19. Water Quality Data Obtained During Plankton Tows, June 2006 Sampling (Continued).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **9** | 25.22 | 25.33 | 25.38 | 7.50 | 7.47 | 7.45 | 4.99 | 4.68 | 4.90 | 7.65 | 7.63 | 7.62 | 576.8 | 1.2 | 0.4 |
| **10** | 25.28 | 25.39 | 25.44 | 7.42 | 7.45 | 7.43 | 5.04 | 4.48 | 4.96 | 7.64 | 7.60 | 7.66 | 210.8 | 1.7 | 0.6 |
| **11** | 24.95 | 25.35 | 25.38 | 8.11 | 7.46 | 7.46 | 4.39 | 3.93 | 4.89 | 7.54 | 7.55 | 7.63 | 237 | 18.3 | 7.2 |
| **12** | 25.25 | 25.36 | 25.39 | 7.53 | 7.42 | 7.40 | 4.92 | 4.32 | 4.79 | 7.61 | 7.55 | 7.58 | 602.5 | 6.8 | 2.8 |
| **13** | 22.77 | 25.36 | 25.61 | 9.70 | 7.47 | 7.30 | 1.80 | 3.32 | 5.02 | 7.30 | 7.44 | 7.68 | -0.7 | 1.9 | 0.0 |
| **14** | 25.27 | 25.22 | 25.23 | 7.96 | 7.61 | 7.51 | 4.29 | 4.51 | 4.98 | 7.52 | 7.55 | 7.56 | 29.2 | 10 | 0.1 |
| **15** | 25.28 | 25.26 | 25.24 | 8.06 | 7.80 | 7.76 | 3.94 | 4.41 | 4.92 | 7.48 | 7.48 | 7.52 | 11.2 | 3.6 | 1.1 |
| **MEAN** | 24.84 | 25.33 | 25.39 | 8.02 | 7.49 | 7.44 | 4.02 | 4.06 | 4.82 | 7.52 | 7.53 | 7.59 | 257.1 | 5.25 | 1.59 |
| **SD** | 0.80 | 0.05 | 0.094 | 0.74 | 0.10 | 0.10 | 1.10 | 0.50 | 0.13 | 0.10 | 0.06 | 0.05 | 241.2 | 4.51 | 1.86 |

1 - = sample data not available.

2 SD = Standard deviation.

Water depth for the middle samples ranged from 2.38 m to 4.78 m with a mean of 3.63 m +/- 0.86 m. Temperatures in the middle of the water column averaged 25.33 +/- 0.05°C with a minimum value of 25.22°C and a maximum value of 25.40°C. Salinity varied from 7.40 ppt to 7.80 ppt and averaged 7.49 +/- 0.10 ppt overall. DO values were at the low end of acceptable biological ranges with an average of 4.06 +/- 0.50 mg/L, a minimum of 3.06 mg/L, and a maximum of 4.68 mg/L. Values for pH were between 7.44 and 7.63 with a mean of 7.53 +/- 0.06. Turbidity was less variable than at the bottom, ranging from less than 1 to approximately 18 NTU.

Water depth for the top (near surface) sampling ranged from 0.01 m to 0.40 m with a mean of 0.09 +/- 0.10 m. Temperatures were highest on the surface and averaged 25.39 +/- 0.09°C with a minimum value of 25.23°C and a maximum value of 25.61°C. Salinity varied from 7.30 ppt to 7.76 ppt and averaged 7.44 +/- 0.10 ppt overall. DO values were higher than the bottom or middle of the water column but were still at the low end of acceptable biological ranges, with an average of 4.82 +/- 0.13 mg/L, a minimum of 4.59 mg/L, and a maximum of 5.02 mg/L. One sample was higher than 5.0 mg/L. Values for pH were between 7.52 and 7.66 with a mean of 7.59 +/- 0.05. Turbidity was less variable than at the bottom or middle of the water column, ranging from less than 1 to approximately 7 NTU.

***October 2006***

Five water quality parameters (temperature, salinity, dissolved oxygen, pH and turbidity) were measured at the end of each plankton tow at the surface during the October 2006 sampling effort; results are presented in Table 20.

Water depth for the top (near surface) sampling ranged from 0.01 m to 0.40 m with a mean of 0.09 +/- 0.10 m. Temperatures on the surface averaged 17.61 +/- 0.89°C with a minimum value of 16.90°C and a maximum value of 17.87°C. Salinity varied from 7.71 ppt to 8.56 ppt and averaged 8.33 +/- 0.23 ppt overall. DO values had an average of 6.62 +/- 0.39 mg/L, a minimum of 6.17 mg/L, and a maximum of 7.4 mg/L. Values for pH were between 8.25 and 8.52 with a mean of 8.34 +/- 0.09. Turbidity ranged from 2.8 to approximately 9 NTU.

Table 20. Water Quality Data Obtained During Plankton Tows, October 2006 Sampling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Parameter** | | | | | | | | | | | | | | |
| **Temperature (°C)** | | | **Salinity (ppt)** | | | **DO (mg/L)** | | | **PH** | | | **Turbidity** | | |
|  | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** | **B** | **M** | **T** |
| **1** | - | - | 17.51 | - | - | 8.30 | - | - | 6.86 | - | - | 8.38 | - | - | 2.9 |
| **2** | - | - | 17.17 | - | - | 8.44 | - | - | 6.34 | - | - | 8.25 | - | - | 3.3 |
| **4** | - | - | 17.87 | - | - | 8.35 | - | - | 7.40 | - | - | 8.52 | - | - | 3.3 |
| **7** | - | - | 16.93 | - | - | 8.39 | - | - | 6.35 | - | - | 8.30 | - | - | 3.4 |
| **8** | - | - | 17.96 | - | - | 8.34 | - | - | 6.70 | - | - | 8.34 | - | - | 2.8 |
| **9** | - | - | 17.04 | - | - | 8.56 | - | - | 6.51 | - | - | 8.25 | - | - | 3.1 |
| **10** | - | - | 17.47 | - | - | 8.32 | - | - | 6.17 | - | - | 8.28 | - | - | 9.7 |
| **12** | - | - | 16.90 | - | - | 8.49 | - | - | 6.37 | - | - | 8.30 | - | - | 5.6 |
| **14** | - | - | 19.92 | - | - | 7.71 | - | - | 6.42 | - | - | 8.38 | - | - | 5.5 |
| **15** | - | - | 17.32 | - | - | 8.38 | - | - | 7.11 | - | - | 8.43 | - | - | 3.0 |
| **MEAN** | - | - | 17.61 | - | - | 8.33 | - | - | 6.62 | - | - | 8.34 | - | - | 4.26 |
| **SD** | - | - | 0.89 | - | - | 0.23 | - | - | 0.39 | - | - | 0.09 | - | - | 2.17 |

1 - = sample data not available.

2 SD = Standard deviation.

### 4.7 Submerged Aquatic Vegetation

The SAV surveys were performed in part to determine if SAV was present in the proposed Project Area. The survey results indicated that no SAV were present in the proposed Project Area. Sample locations surveyed outside of the proposed Project Area, but in the proposed Project vicinity, included the eastern side of the Patapsco River. Survey results indicated that no species of SAV were present at those locations.

## 5.0 Conclusion

During both 2006 sampling efforts, no rare, threatened, or endangered finfishes were collected. Finfish trawls resulted in the collection of blue crab, weakfish, summer flounder, striped bass, and bluefish, all of which are of commercial and recreational importance, and all of which were present in extremely low densities (the combined catch of each species for each effort represents less than 7% of the total abundance). Finfish sampling revealed a total diversity of 13 species with a relatively low number of species present during the June effort (6) and a higher diversity during October (11), a trend that can most likely be attributed to higher water temperatures. White perch was the most dominant in terms of abundance and biomass during both sampling efforts, and a four-species overlap (white perch, spot, striped bass and blue crab) was found between both sampling events.

Planktonic surveys indicated very little plankton diversity throughout the project area. The nauplii and copepodite stages of *Acartia tonsa* made up 96% of the total plankton collected. Additionally, only ten taxa were collected throughout the Project Area in June and October. During the June sampling effort, bay anchovy eggs were collected in all but one plankton sample. However, the larval stage of bay anchovy was present in only one of the plankton samples. This, in addition to the lack of bay anchovy collected during the fish trawls, indicates that the eggs may have been deposited in nearby Chesapeake Bay areas and transported into the project area by various water currents.

The results of the benthic invertebrate sampling suggest that the Project Area is populated with species that are (for the most part)\_ indicative of and/or tolerant of relatively polluted environments. The amphipod *Leptocheirus plumulosus* and mollusks (such as *Mulina lateralis* and *Mya arenaria*) are very common in the Chesapeake Bay and are considered to be pollution-tolerant species. Additionally, the annelid *Streblospio benedicti* is a common indicator of relatively polluted sediments.

The water quality results are similar to previous studies of the relatively well-studied harbor (e.g., MD DNR 2005; Hall et al. 2002; Dail et al. 1998), which have indicated that dissolved oxygen is often recorded at levels low enough to inhibit biological productivity.

Grain size analysis indicated that the substrate of the entire area sampled was homogeneous in its make-up. Mud consisting of silts and clays dominates the sediment composition throughout the proposed Project Area.

The results of the SAV surveys confirmed other surveys that have indicated a lack of SAV in the Project Area. The nearest SAV location recently reported by Orth et al. (2005) is approximately three miles south of the Project Area on the western side of the Patapsco River in Stony Creek. Older records suggest a similar lack of SAV within three miles of the Project Area (e.g., Orth et al. 1994).

## 6.0 References

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**Appendix A**

**Fish Trawl, Benthic Grab and Plankton Tow Coordinate Locations**

**Table A-1. Fish Trawl Beginning and End Coordinates, June 2006 Sampling.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Beginning** | | **End** | |
| **Longitude** | **Latitude** | **Longitude** | **Latitude** |
| 1 | -76.50755 | 39.21533 | -76.50331 | 39.21768 |
| 2 | -76.50374 | 39.21622 | -76.50731 | 39.21338 |
| 3 | -76.50661 | 39.21286 | -76.50242 | 39.21658 |
| 4 | -76.50222 | 39.21558 | -76.50581 | 39.21276 |
| 5 | -76.50427 | 39.21333 | -76.50095 | 39.21632 |
| 6 | -76.50189 | 39.21982 | -76.50345 | 39.22373 |
| 7 | -76.50451 | 39.21955 | -76.50860 | 39.21615 |
| 8 | -76.50958 | 39.21550 | -76.51272 | 39.21208 |
| 9 | -76.51460 | 39.21023 | -76.51478 | 39.21197 |
| 10 | -76.51350 | 39.21272 | -76.50966 | 39.21579 |
| 11 | -76.50479 | 39.20948 | -76.50407 | 39.20526 |

**Table A-2. Plankton Tow Beginning and End Coordinates, June 2006 Sampling.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Beginning** | | **End** | |
| **Longitude** | **Latitude** | **Longitude** | **Latitude** |
| 1 | -76.50588 | 39.21100 | -76.50633 | 39.21150 |
| 2 | -76.50573 | 39.21124 | -76.50509 | 39.24238 |
| 3 | -76.50504 | 39.21232 | -76.50317 | 39.21536 |
| 4 | -76.50367 | 39.21579 | -76.50396 | 39.21586 |
| 5 | -76.50408 | 39.21660 | -76.50279 | 39.21969 |
| 6 | -76.50274 | 39.22016 | -76.50207 | 39.21507 |
| 7 | -76.50292 | 39.21586 | -76.50530 | 39.21727 |
| 8 | -76.50539 | 39.21754 | -76.50836 | 39.21637 |
| 9 | -76.50818 | 39.21690 | -76.51022 | 39.21495 |
| 10 | -76.51005 | 39.21547 | -76.50935 | 39.21628 |
| 11 | -76.50864 | 39.21762 | -76.50795 | 39.21642 |
| 12 | -76.50800 | 39.21711 | -76.50337 | 39.21525 |
| 13 | -76.50364 | 39.21549 | -76.50316 | 39.21404 |
| 14 | -76.50379 | 39.20650 | -76.50584 | 39.20221 |
| 15 | -76.50563 | 39.20174 | -76.49925 | 39.19521 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table A-3. Benthic and Sediment Sample Locations, June 2006 Sampling.** | | | | | | |
| **Sample ID** | **Longitude** | **Latitude** |  | **Sample ID** | **Longitude** | **Latitude** |
| 1 | -76.50581 | 39.21758 | 16 | -76.51315 | 39.20937 |
| 2 | -76.50454 | 39.21611 | 17 | -76.51275 | 39.21135 |
| 3 | -76.50317 | 39.21723 | 18 | -76.51108 | 39.21136 |
| 4 | -76.50669 | 39.21517 | 19 | -76.50951 | 39.21312 |
| 5 | -76.50720 | 39.21836 | 20 | -76.50746 | 39.21435 |
| 6 | -76.49869 | 39.21521 | 21 | -76.50809 | 39.21348 |
| 7 | -76.50216 | 39.21493 | 22 | -76.50235 | 39.21948 |
| 8 | -76.50030 | 39.21594 | 23 | -76.50457 | 39.22128 |
| 9 | -76.49840 | 39.21756 | 24 | -76.50850 | 39.21925 |
| 10 | -76.49953 | 39.21782 | 25 | -76.51270 | 39.21521 |
| 11 | -76.50185 | 39.21700 | 26 | -76.51580 | 39.21045 |
| 12 | -76.50987 | 39.21408 | 27 | -76.50296 | 39.21329 |
| 13 | -76.51441 | 39.20972 | 28 | -76.50677 | 39.21311 |
| 14 | -76.51420 | 39.20724 | 29 | -76.50639 | 39.20909 |
| 15 | -76.51315 | 39.20937 | 30 | -76.50904 | 39.20642 |