

**YOUNGS BAY  
BENTHIC INVERTEBRATE STUDY**

**2019**

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**Prepared for:**

**Oregon Department of Environmental Quality  
Permit No. 101767**

## TABLE OF CONTENTS

|                         | <u>Page</u> |
|-------------------------|-------------|
| TABLE OF CONTENTS ..... | i           |
| INTRODUCTION.....       | 1           |
| METHODS .....           | 1           |
| RESULTS.....            | 2           |
| DISCUSSION.....         | 4           |

## LIST OF FIGURES

### Figure

|                                             |   |
|---------------------------------------------|---|
| 1. Youngs Bay Net-Pen Sites.....            | 7 |
| 2. Tide Point/Bornstein Site Stations ..... | 8 |
| 3. Yacht Club Site Stations.....            | 9 |

## LIST OF TABLES

### Table

|                                                                                              |    |
|----------------------------------------------------------------------------------------------|----|
| 1. Tide Pt. Sedimentation Log Sheet 2019.....                                                | 10 |
| 2. Bornstein Sedimentation Log Sheet 2019 .....                                              | 11 |
| 3. Yacht Club Sedimentation Log Sheet 2019.....                                              | 12 |
| 4. Yacht Club Percent Grain Size Distribution and Total Organic Carbon.....                  | 13 |
| 5. 2019 Tide Pt/Bornstein Percent Grain Size Distribution and Total Organic Carbon .....     | 13 |
| 6. 2019 Average Densities of Youngs Bay Dominant Species .....                               | 13 |
| 7. 2005-2019 Youngs Bay total organic carbon measurements.....                               | 13 |
| 8. 2019 Yacht Club Invertebrate Diversity and Density .....                                  | 14 |
| 9. 2019 Tide Pt/Bornstein invertebrate Diversity and Density .....                           | 15 |
| 10. Youngs Bay Benthic Invertebrate densities Per Station, 2005-2019.....                    | 16 |
| 11. Yacht Club Most Dominant Benthic Invertebrate Species Per Station, 2009-2019.....        | 16 |
| 12. Tide Pt/Bornstein Most Dominant Benthic Invertebrate Species Per Station 2009-2019 ..... | 16 |
| 13. Total Dissolved Solids Measurements of each Net Pen Site in Youngs Bay 2019 .....        | 16 |
| 14. Youngs Bay Beggiatoa sp. Water Temperature PH Log Sheet 2019 .....                       | 17 |
| 15. Yacht Club Wilcoxon Test Analysis Outfall Station 001.....                               | 18 |
| 16. Yacht Club Wilcoxon Test Analysis SUBC 004 .....                                         | 22 |
| 17. Bornsteins Wilcoxon Test Analysis Outfall 003 .....                                      | 26 |
| 18. Bornsteins Wilcoxon Test Analysis SUBC 009.....                                          | 29 |

|     |                                                 |    |
|-----|-------------------------------------------------|----|
| 19. | Tide Pt Wilcoxon Test Analysis SUBC 010 .....   | 32 |
| 20. | Tide Pt Wilcoxon Test Analysis Outfall 002..... | 35 |

## INTRODUCTION

This report is under the National Pollutant Discharge Elimination System (NPDES) permit (#101767) for the Clatsop County Fisheries salmon net-pen sites in Youngs Bay (Figure 1).

This report will include benthic invertebrate, total dissolved solids, core sampling data and analysis, *Beggiatoa* spp (mold) presence/absence, water temperature and pH readings taken from the Tide Point/Bornstein and Yacht Club net-pen sites in Youngs Bay. Clatsop County Fisheries (CCF) personnel were responsible for taking the benthic, water and core samples. This year, they were also responsible for the benthic invertebrate sorting and identification, water temperature, pH and the presence/absence of a mold *Beggiatoa* spp. Analytical Services (ALS) Environmental, in Kelso, Washington completed grain size distribution and total organic carbon testing of the sediment. Alexin Analytical Laboratories, Inc., in Tigard, OR, completed the total dissolved solids testing. All samples were taken in June/July of 2019. Under the new permit, the next sampling period will be in 2021, as long as the fish production level remains the same.

## METHODS

A homemade sampler was used in collecting the benthic data. The sampler was attached to a rope that was lowered into the water until it hit bottom. The rope was then pulled up and down several times along with the upper lead weights to help drive the sampler into the sediment. The sampler was then pulled out of the water. The 3-inch diameter aluminum tube was then loosened and a ring near the top of the sampler, which is attached to a small chain and rubber ball, was pulled to release the water pressure that was helping hold the sediment sample in the sampler. The sampler was pulled away from the aluminum tube while the tube was being held down firmly in a plastic tub. The bottom of the tube was then quickly lifted up while putting a hand under the bottom of the sediment sample. A plunger, which fits firmly inside the aluminum tube, gently pushed the sediment to the top of the tube. The sediment core was then pushed five centimeters beyond the top of the tube. The sediment core was then cut by a plastic scraper into the plastic tub along with the water from above the sediment core.

Each benthic replicate was deposited into a labeled small plastic bucket until all replicates were collected from each site. Each replicate was then rinsed through a 0.5-millimeter mesh screen with a small submersible water pump. The remaining debris and invertebrates were then rinsed into a labeled small plastic container. A buffered formalin solution was added to each replicate container. After one week, each replicate was rinsed and preserved in a Kahle's solution (protein stain) and ethanol until analyzed. The benthic invertebrates from each replicate were sorted and identified to the lowest possible taxonomic classification; usually species.

The sediment samples were taken with a 1 1/2-inch diameter aluminum core sampler approximately 5-cm deep for grain size distribution and total organic carbon content.

This sampler was lowered into the water until it hit bottom. The sampler was then brought straight up and out of the water. The sediment was pushed out from the bottom by a plunger that fit firmly inside the aluminum tube. The sediment was cut into a small, labeled plastic container. Each container was placed in a cooler with frozen gel packs to keep cool until analyzed.

The Tide Point/Bornstein site consisted of two impact stations (one at each net-pen area), two perimeter stations, and three reference stations (Figure 2). Perimeter station 18 was moved 2011 to the upstream side of the Bornstein's site due to the difficulty to get one sample grab due to the hardness of the bottom. The 16 net pens at the Tide Pt. site will be used again for the first time since 2008 to rear overwinter spring chinook smolts beginning the fall of 2019 to be released in the spring of 2020. This site was added back into the benthic sampling process. There were three benthic and two sediment grabs taken at each outfall, perimeter and reference station.

The Yacht Club site consisted of one outfall station, one perimeter station and three reference stations (Figure 3). Perimeter station SUBC 005 was difficult to sample due the depth and speed of the current; therefore was not sampled. There were three benthic and two sediment grabs taken at each outfall, perimeter and reference station.

A sedimentation log was established at the three Youngs Bay sites (Tables 1-3). One grab was taken under each net pen with a 1 1/2-inch core sampler. Each tube of sediment was analyzed for presence of sulfur odor, black surface layer and benthic invertebrates. Each grab was deposited back into the water after the observations were completed.

A log that includes water temperature, pH and the presence/absence of the *Beggiatoa* spp. was established for the requirement of our new permit. The water temperature was determined by the use of a daily thermograph reading with the probe hanging 4 feet down in the water column at the Yacht Club site. The pH was measured using an Oakton ecoTestr pH meter stick. The presence/absence of the mold *Beggiatoa* spp. was determined by lowering an underwater HD camera probe with an above the water viewing screen, Marcum Quest HD, to the bottom of each station.

## RESULTS

Tables 1-3 show the results of the Bornstein, Tide Pt. and Yacht Club sedimentation observations under each net pen. No hydrogen sulfide odor or black surface layer was present. All samples revealed living organisms present.

Table 4 shows the New Zealand mudsnail, *Potamopyrgus antipodarum*, was the most dominant species in four out of the five stations at the Yacht Club site. The largest concentration of a species occurred at outfall station 001 with the *Potamopyrgus antipodarum* at 43,970 per square meter. The grain size distribution varied at the Yacht Club stations with the highest percent sand of 93.9 at the reference station 001 and the lowest also at reference station 003 with 19.4 percent. The highest percent silt/clay was

found at reference station 003 at 68.9, while the lowest occurred at the reference station 001 with 4.3 percent. The total organic carbon (TOC) was the lowest at reference station 001 at 2.0 mg/L, while the highest occurred at the reference station 003 at 25.4 mg/L.

Table 5 shows the amphipod *Americorophium salmonis* and the New Zealand mudsnail *Potamopyrgus antipodarum* as sharing the most dominant benthic invertebrate species role in 3 stations each. The highest concentration of a species occurred at the perimeter station 010 with the New Zealand mudsnail *Potamopyrgus antipodarum* at 37,534 per square meter. The grain size distribution varied at each station. The highest percent gravel of 43.4 was at perimeter station 010, while the lowest of 0 was at reference stations 007, 008 and perimeter station 009. The highest percent sand of 59.7 was at reference station 007, and the lowest percent sand of 13.2 was at reference station 008. The highest percent silt/clay of 83.5 was at reference station 008, while the lowest percent silt/clay of 29.6 was at reference station 007. The total organic carbon (TOC) was the highest at perimeter station 010 at 120.9 mg/L, while the lowest was at reference station 007 at 7.3 mg/L.

Table 6 shows the average densities of the five most dominant species per outfall, perimeter and reference stations in the Young's Bay system for 2019. The New Zealand mudsnail *Potamopyrgus antipodarum* had the highest average density of 29,954 per square meter for the outfall stations and the perimeter stations at 34,025 per square meter. The amphipod *Americorophium salmonis* had the highest average density of 12,361 per square meter for the reference stations. The 2019 highest overall average density for the Young's Bay system was the New Zealand mudsnail *P. antipodarum* with 25,356 per square meter.

Table 7 shows the total organic carbon (mg/L) for each station since sampling period 2005. Most stations averaged 20 mg/L or less except outfall station 002 and perimeter station 010.

Tables 8 and 9 show species diversity trends at the three net-pen sites. The outfall station at the Yacht Club site averaged 10 species; the three reference stations averaged 5.6 species, while the perimeter station averaged 6 species. The outfall stations at the Bornstein and Tide Pt. sites averaged 9 and 6 species, respectively, while the reference stations averaged 6.2 species and perimeter stations averaged 6.5 species.

Table 10 shows the average densities of the five most common benthic invertebrate species over the last 8 sampling periods in Young's Bay. The top two benthic invertebrate species over the last 8 sampling periods have been the New Zealand mudsnail *P. antipodarum* and the amphipod *A. salmonis*.

Tables 11 and 12 show the average densities the most dominant benthic invertebrates per outfall, perimeter, and reference stations at both the Yacht Club and Tide Pt./Bornstein's net-pen sites over the past 6 sampling periods.

Table 13 shows the total dissolved solids measurements of the upstream and downstream side of each net pen site in Young's Bay.

Table 14 shows the presence/absence results of the mold *Beggiatoa* spp., water temperature and pH readings of the Young's Bay benthic stations. There was no presence of the mold growing under the net pens where the salmon are reared.

The Yacht Club site overall shows significant differences in dominant species percent of sample between the net pen site (Outfall 001) and reference stations away from the net pens (Table 15). There were also significant differences in species isolation comparisons of the New Zealand mud snail *Potamopyrgus antipodarum* and Oligochaeta between the outfall station 001 and reference stations, with more of these species at the outfall station. The Wilcoxin test also showed significant differences in the aquatic Oligochaeta (aquatic earthworms) between the perimeter station SUBC 004 and reference stations with more invertebrates at the perimeter station SUBC 004 than reference stations (Table 16).

The statistical analysis using the Wilcoxin test shows the Bornstein site in this year's samples (2019) shows significant differences in dominant species percent of sample between perimeter station SUBC 009 and the reference stations (Table 18). The Wilcoxin test also showed that there were no significant differences in species abundance, diversity and species isolation in comparison between perimeter station SUBC 009 and the reference station. There were significant differences in dominant species percent of sample between the reference stations and perimeter station SUBC 010. There were also significant differences in the isolated species New Zealand mudsnail *Potamopyrgus antipodarum* and amphipod *Eogammarus confervicolis* between reference stations and perimeter station SUBC 010. There were significantly more of these species at the perimeter station SUBC 010 than at the reference stations (Table 19).

The Tide Pt. site overall shows no significant differences in species diversity, abundance and isolated species between the net pen station Outfall 002 and the reference stations.

## DISCUSSION

Over the last 8 sampling periods (14 years), the average percent total organic carbon has been below 20 mg/L in 9 of the 11 stations. Total organic carbon is the amount of carbon found in an organic compound and is often used as a non-specific indicator of water quality. Low TOC can confirm the absence of potentially harmful organic chemicals in the water. It seems that the overall low TOC in Young's Bay over the last 14 years indicates good water quality.

Since the net pen areas are located in a tidal zone the total dissolved solids measurements reveal that there is some salt water present. Typically, brackish water ranges between 1000 to 10,000 milligrams per liter. Our readings were between 1100 and 1300 mg/L. It would naturally increase with the incoming tide from the ocean and decrease as the salt water moves out and the more freshwater from the upstream streams take over.

The absence of the mold *Beggiatoa spp.* in and around the Young's Bay net pens is a good indication that the salmon rearing is not affecting the benthic environment below. These sites have been in operation for over 20 years. The tidal movement is very strong in this area, at times, and has a good effect on keeping the extra nutrient waste from the fish being reared swept away from under the net pens.

The overall differences in species abundance and diversity in Young's Bay can be attributed to many factors. The location of each site, tidal flows, daily movements of certain benthic invertebrates, lunar phases, amount of natural debris and sediment within the water column, the extra nutrient load of fish waste (both natural and net pen) and exotic species all influence species abundance and diversity within the Young's Bay system.

This year's (2019) sampling results showed the New Zealand mudsnail *Potamopyrgus antipodarum* being the overall dominant benthic invertebrate in the Young's Bay system. The mudsnail was dominant at seven out of the twelve total stations. The amphipod *Americorophium salmonis* was dominant at four stations and the aquatic earthworms *Oligochaeta* was dominant at one station.

Since the sampling period in 2005, the New Zealand mud snail *P. antipodarum* and the amphipod *A. salmonis* have both shared the role as being the most dominant benthic invertebrate species in the Young's Bay system. Five out of the last eight sampling periods have shown small differences in the overall densities per station with the exception of 2011, 2013 and 2015 sampling periods (Table 10). These 2 species of invertebrates are both bottom dwellers and it would seem logical that the 2 species would be competing for space on the bottom of the bay. The numbers between the 2 species are going to fluctuate naturally annually.

The amphipod *A. salmonis* is an important food source for young salmon, both wild and hatchery, that are rearing in the estuary and as long as it remains as one of the dominant species in Young's Bay, the overall condition of the bay seems to remain natural even with the existence of the exotic species, New Zealand mud snail.

The New Zealand mud snail is adaptable to a wide variety of environmental conditions. They have been known to be eaten by fish and survive to reproduce after going through the fish's digestive system. These characteristics alone are reasons why this invertebrate species have been prolific in the Young's Bay system. Clatsop County Fisheries staff continues to notice the mud snails attached to the net-pen poles and nets

hanging in the water. The overall high densities of this species have seen a decline in the past eight years. Possible reasons could be the dispersal of the snails throughout the Young's Bay system. Evidence of this dispersal comes from the staff with this species of snails observed on net-pen poles and nets temporarily installed for salmon broodstock holding from mid-August to mid-November approximately five miles upstream from the Tide Point/Bornstein site. Dispersal to Young's Bay tributaries (Lewis & Clark, Walluski and upper Young's River) of the New Zealand mud snail has not yet been confirmed but is suspected. This dispersal, along with possible temporary consumption by other species of fish such as sturgeon, peamouth chubs, suckers and carp (all primarily bottom feeders), could have an affect on the overall densities of this exotic species within the net-pen areas. The snails could be consumed in one area and deposited as excrement in another area by any or all of these species of fish.

Overall, the impact of the salmon net pens in Young's Bay seem to stay within the allowable mixing zone of 50 feet surrounding each array of net pens. Species diversity and abundance seems to be slightly greater at the outfall sites at the Yacht Club site while the last four out of five sampling periods (a period of 8 years) the species diversity and abundance were nearly the same between the outfall and reference stations at the Tide Point/Bornstein's sites. Nutrients from fish food and waste, along with a diversity of structures under and around the net pens, are possible reasons for this occurrence at all of the Young's Bay net pens.

The next sampling will occur in the year 2021, unless fish production increases. If this occurs then the samplings will continue annually.

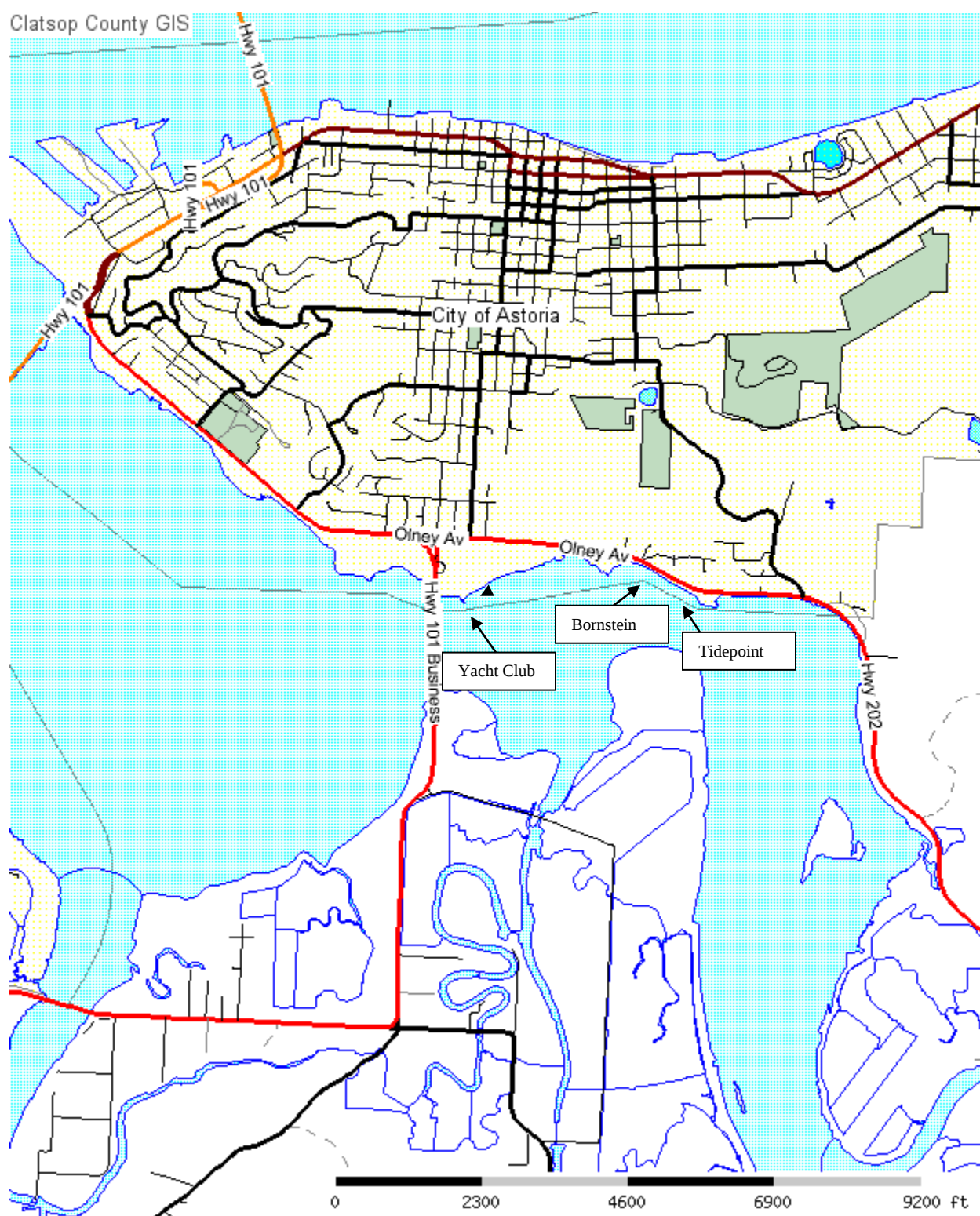


Figure 1. Youngs Bay Net-Pen Sites

YOUNGS BAY - TIDE POINT AND BORNSTEIN SITES

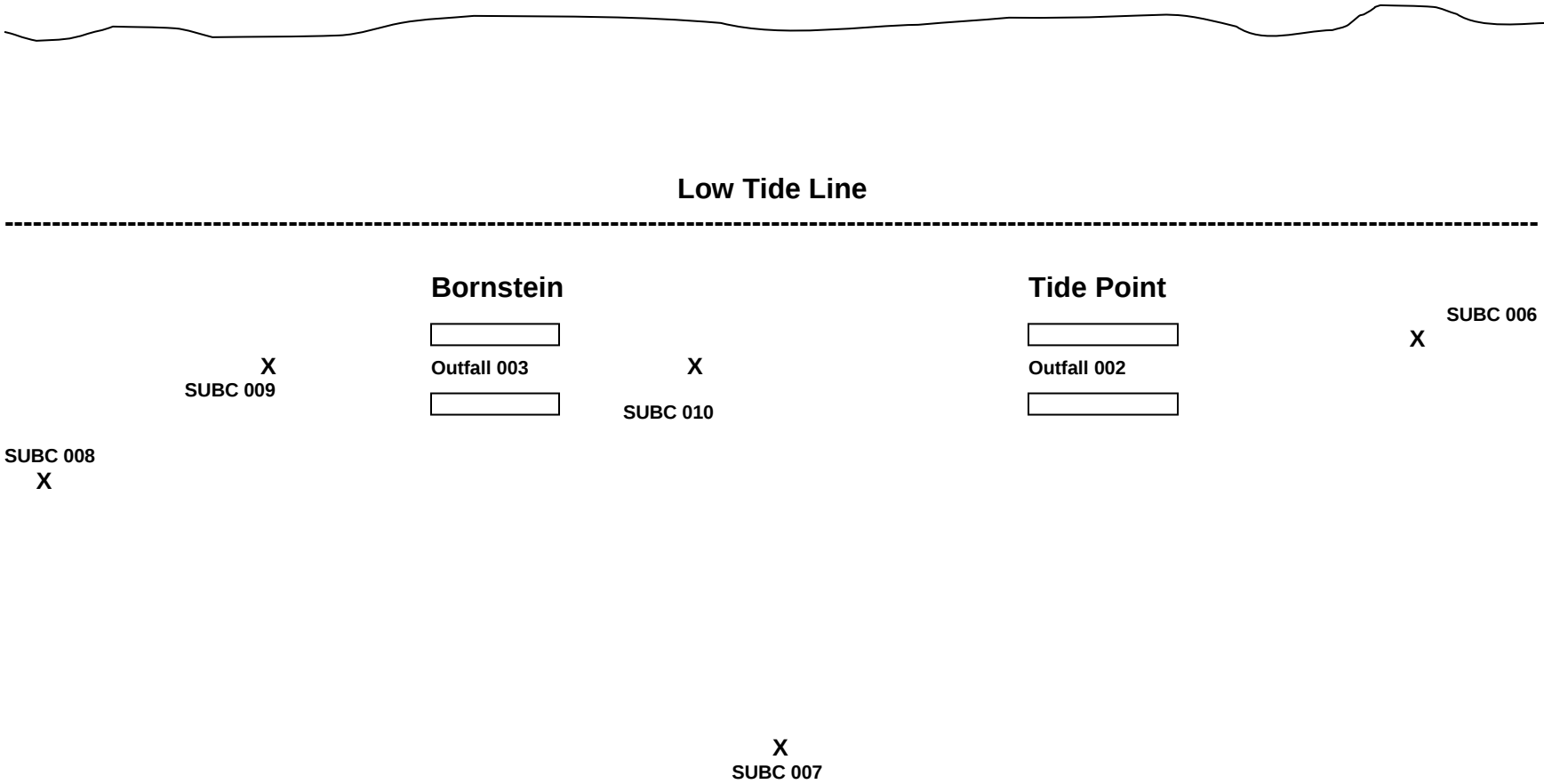


Figure 2. Tide Point/Bornstein Site Stations.

YOUNGS BAY - YACHT CLUB SITE

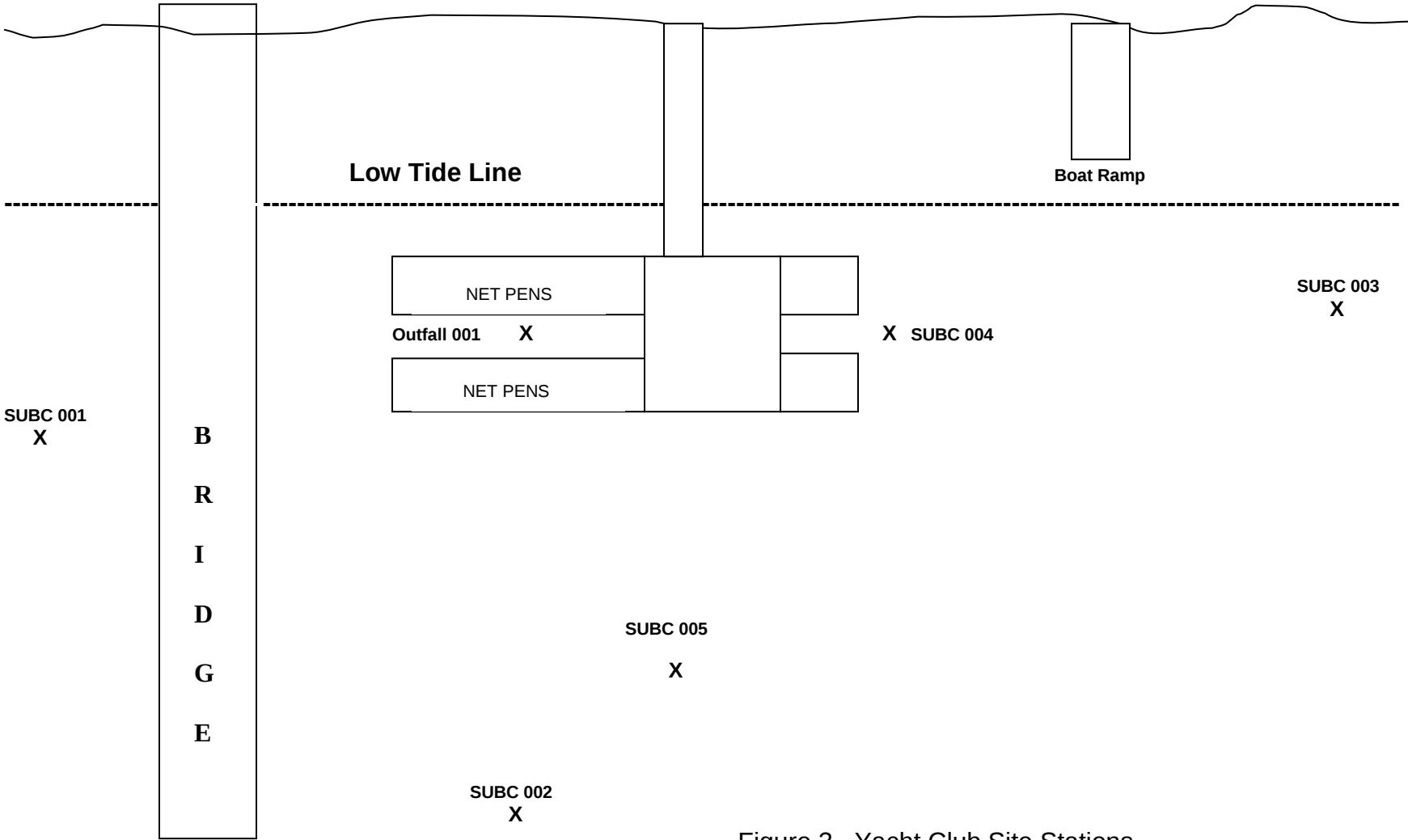
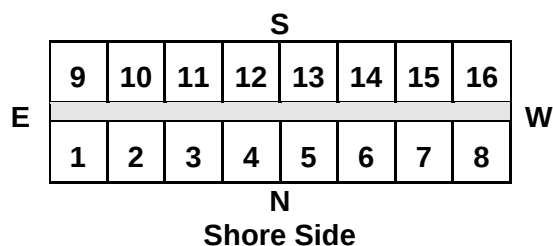


Figure 3. Yacht Club Site Stations

Table 1. Tide Point Sedimentation Log Sheet.

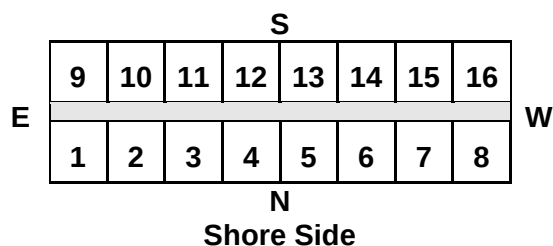


| Pen # | H <sub>2</sub> S odor | Black Surface Layer | Living Organisms Present | Depth of Oxidized Layer | Comments                                                         |
|-------|-----------------------|---------------------|--------------------------|-------------------------|------------------------------------------------------------------|
| 1     | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black near bottom, clam shells, wood chips        |
| 2     | No                    | No                  | Yes                      | ~2 – 3 cm.              | Soft lt. Brown top, black/brown near bottom, gravel, wood chunks |
| 3     | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom w/ clam shells, glass pieces         |
| 4     | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom, clam shells, wood pieces            |
| 5     | No                    | No                  | Yes                      | ~1 – 2 cm.              | Lt. brown top, black bottom, plant fibers                        |
| 6     | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom                                      |
| 7     | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom, woody debris                        |
| 8     | No                    | No                  | Yes                      | ~2 cm.                  | Lt. brown top, black bottom, mud stone throughout                |
| 9     | No                    | No                  | Yes                      | ~2 cm.                  | Lt. brown top, black bottom, clam shells                         |
| 10    | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom, sandy mud, clam shells              |
| 11    | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom, woody debris, clam shells           |
| 12    | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom                                      |
| 13    | No                    | No                  | Yes                      | ~2-3 cm.                | Lt. brown top, black bottom, wood chunks, clam shells            |
| 14    | No                    | No                  | Yes                      | ~3 cm.                  | Lt. brown top layer, black bottom                                |
| 15    | No                    | No                  | Yes                      | ~2 – 3 cm.              | Soft lt. brown top, black bottom, wood debris, clam shells       |
| 16    | No                    | No                  | Yes                      | ~2-3 cm.                | Soft lt. brown top, black bottom, plant & woody debris           |

Signature: Rod Litton

Date: 7/25/19

Table 2. Bornstein Sedimentation Log Sheet.

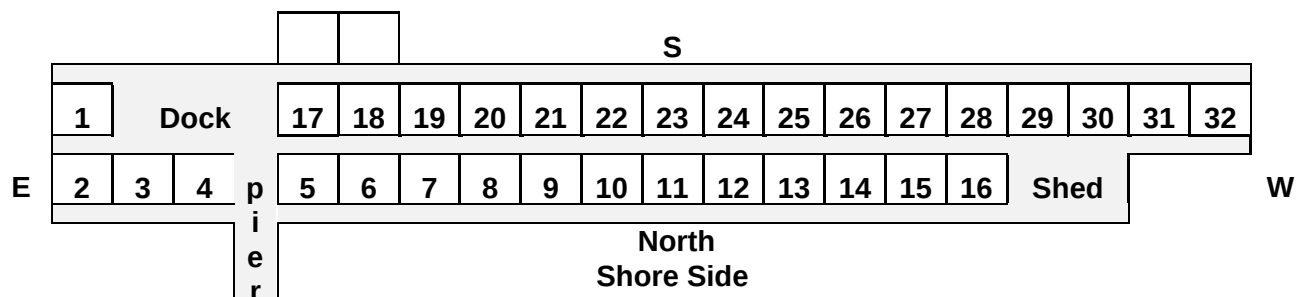


| Pen # | H <sub>2</sub> S odor | Black Surface Layer | Living Organisms Present | Depth of Oxidized Layer | Comments                                              |
|-------|-----------------------|---------------------|--------------------------|-------------------------|-------------------------------------------------------|
| 1     | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with gravel, wood , gray clay       |
| 2     | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with wood chunks, clam shell        |
| 3     | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with gravel, gray clay              |
| 4     | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with sand stone, gray clay          |
| 5     | No                    | No                  | Yes                      | 2.0cm                   | Lt brown soft top with gray clay, wood chunks         |
| 6     | No                    | No                  | Yes                      | 2.5cm                   | Lt brown soft top with gray clay, wood chunks         |
| 7     | No                    | No                  | Yes                      | 3.0cm                   | Lt brown soft top with gray sandy clay                |
| 8     | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with gray clay, wood chunks         |
| 9     | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with gray clay, wood chunks, gravel |
| 10    | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with gray clay, gravel, wood chunks |
| 11    | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with gravel, wood, gray clay        |
| 12    | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with gravel, wood, gray clay        |
| 13    | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top with gravel, gray clay              |
| 14    | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with gravel, sand, gray clay        |
| 15    | No                    | No                  | Yes                      | 3.0cm                   | Lt brown soft top with detritus, gray clay            |
| 16    | No                    | No                  | Yes                      | 1.0cm                   | Lt brown soft top with dark sandy gray clay           |

Signature: Rod Litton

Date: July 3, 2019

Table 3. Yacht Club Sedimentation Log Sheet.



| Pen # | H <sub>2</sub> S odor | Black Surface Layer | Living Organisms Present | Depth of Oxidized Layer | Comments                                          |
|-------|-----------------------|---------------------|--------------------------|-------------------------|---------------------------------------------------|
| 1     | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; sandy gray clay bottom         |
| 2     | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top w/detritus; gray clay bottom    |
| 3     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top w/detritus; gray clay bottom    |
| 4     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; gray clay w/clamshell, wood    |
| 5     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark clay sandy bottom         |
| 6     | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; gray sandy bottom w/detritus   |
| 7     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; gray sand; detritus            |
| 8     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray clay; wood pieces    |
| 9     | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; gray sandy clay; wood pieces   |
| 10    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; gray sandy clay; detritus      |
| 11    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray clay; detritus       |
| 12    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray clay; detritus       |
| 13    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray clay; live clam      |
| 14    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray clay bottom          |
| 15    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray clay; detritus       |
| 16    | No                    | No                  | Yes                      | 3cm                     | Lt brown soft top; dark gray clay bottom          |
| 17    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray clay; clam shell     |
| 18    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray clay; detritus; clam |
| 19    | No                    | No                  | Yes                      | 3.5cm                   | Lt brown soft top; gray sandy clay; detritus      |
| 20    | No                    | No                  | Yes                      | 3cm                     | Lt brown soft top; gray sandy clay bottom         |
| 21    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray sandy clay bottom    |
| 22    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray sandy clay bottom    |
| 23    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray sand; detritus       |
| 24    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray sand; detritus       |
| 25    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray sand; detritus       |
| 26    | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top; dark gray sandy bottom         |
| 27    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray sandy bottom         |
| 28    | No                    | No                  | Yes                      | 2.5cm                   | Lt brown soft top; gray sand; detritus            |
| 29    | No                    | No                  | Yes                      | 1.5cm                   | Lt brown soft top; gray sandy clay; detritus      |
| 30    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; gray sandy clay; detritus      |
| 31    | No                    | No                  | Yes                      | 2cm                     | Lt brown soft top; dark gray clay; detritus       |
| 32    | No                    | No                  | Yes                      | 1cm                     | Lt brown soft top; dark gray clay; detritus       |
|       |                       |                     |                          |                         |                                                   |
|       |                       |                     |                          |                         |                                                   |

Signature: Rod Litton

Date: 06/26/19

Table 4. 2019 Yacht Club Percent Grain Size Distribution and Total Organic Carbon.

| STATION     | %Gravel | %Sand | %Silt/Clay | TOC<br>mg/L | Most Dominant Species    | Density<br>#/sq.meter |
|-------------|---------|-------|------------|-------------|--------------------------|-----------------------|
| Outfall 001 | 1.0     | 35.3  | 51.1       | 18.30       | Potamopyrgus antipodarum | 43,970                |
| SUBC 001    | 0.0     | 93.9  | 4.3        | 2.00        | Potamopyrgus antipodarum | 11,007                |
| SUBC 002    | 0.0     | 39.6  | 57.4       | 12.00       | Americorophium salmonis  | 7,759                 |
| SUBC 003    | 0.0     | 19.4  | 77.3       | 25.40       | Potamopyrgus antipodarum | 22,195                |
| SUBC 004    | 0.0     | 45.1  | 50.3       | 11.90       | Potamopyrgus antipodarum | 42,827                |
| SUBC 005    | N/A     | N/A   | N/A        | N/A         | N/A                      | N/A                   |

Table 5. 2019 Tide Point/Bornsteins Percent Grain Size Distribution and Total Organic Carbon.

| STATION     | %Gravel | %Sand | %Silt/Clay | TOC<br>mg/L | Most Dominant Species    | Density<br>#/sq.meter |
|-------------|---------|-------|------------|-------------|--------------------------|-----------------------|
| Outfall 002 | 6.2     | 29.0  | 61.8       | 18.90       | Americorophium salmonis  | 37,293                |
| SUBC 008    | 0.0     | 13.2  | 83.5       | 15.30       | Potamopyrgus antipodarum | 12,692                |
| SUBC 009    | 0.0     | 25.9  | 71.3       | 19.60       | Potamopyrgus antipodarum | 21,714                |
| Outfall 003 | 14.4    | 28.6  | 57.8       | 56.80       | Americorophium salmonis  | 37,293                |
| SUBC 006    | 12.6    | 16.6  | 68.5       | 15.70       | Americorophium salmonis  | 35,970                |
| SUBC 007    | 0.0     | 59.7  | 29.6       | 7.30        | Oligochaeta              | 5,053                 |
| SUBC 010    | 43.37   | 37.66 | 27.72      | 120.90      | Potamopyrgus antipodarum | 37,534                |

Table 6. 2019 Average densities of Youngs Bay dominant species.

| SPECIES                  | OUTFALL | REFERENCE | PERIMETER | OVERALL |
|--------------------------|---------|-----------|-----------|---------|
| Potamgyrus antipodarum   | 29,954  | 12,090    | 34,025    | 25,356  |
| Americorophium salmonis  | 27,187  | 12,361    | 19,448    | 19,665  |
| Oligochaeta              | 3,047   | 1,974     | 2,045     | 2,355   |
| Eogammarus confervicolis | 2,065   | 491       | 1,804     | 1,453   |
| Nereis limnicola         | 1,143   | 1,152     | 1,143     | 1,146   |

Table 7. 2005-2019 Youngs Bay Total Organic Carbon Measurements (mg/L).

| STATION     | 2005  | 2007  | 2009  | 2011  | 2013  | 2015  | 2017  | 2019   | AVERAGE |
|-------------|-------|-------|-------|-------|-------|-------|-------|--------|---------|
| Outfall 001 | 11.00 | 23.70 | 20.40 | 24.00 | 17.50 | 18.20 | 23.00 | 18.30  | 19.51   |
| SUBC 001    | 11.50 | 13.70 | 10.60 | 14.60 | 18.20 | 10.00 | 9.70  | 2.00   | 11.29   |
| SUBC 002    | 9.10  | 12.10 | 16.60 | 12.90 | 14.00 | 9.00  | 13.90 | 12.00  | 12.45   |
| SUBC 003    | 16.90 | 12.10 | 12.80 | 14.70 | 14.80 | 12.30 | 12.00 | 25.40  | 15.13   |
| SUBC 004    | 13.70 | 12.60 | 13.60 | 13.10 | 22.70 | 14.70 | 14.80 | 11.90  | 14.64   |
| Outfall 002 | 24.70 | 20.20 | 21.60 | 67.50 | N/A   | N/A   | N/A   | 18.90  | 30.58   |
| SUBC 006    | 18.60 | 18.10 | 19.10 | 17.90 | 22.40 | 18.20 | 17.90 | 15.70  | 18.49   |
| SUBC 007    | 14.80 | 8.30  | 10.70 | 7.40  | 10.30 | 8.70  | 9.20  | 7.30   | 9.59    |
| SUBC 008    | 11.40 | 16.30 | 19.00 | 17.80 | 27.60 | 14.60 | 15.60 | 15.30  | 17.20   |
| SUBC 009    | 18.20 | 16.20 | 14.90 | 16.60 | 16.40 | 15.40 | 17.10 | 19.60  | 16.80   |
| SUBC 010    | 12.90 | 10.10 | 9.30  | 53.10 | 18.60 | 21.30 | 53.20 | 120.90 | 37.43   |
| Outfall 003 | 31.1  | 19.5  | 44.5  | 44.90 | 21.3  | 27.70 | 14.50 | 56.80  | 32.54   |

**Table 8. 2019 Yacht Club Benthic Invertebrate Denstities and Diversities.**

|                                       | <b>Outfall 001</b> | <b>SUBC 001</b> | <b>SUBC 002</b> | <b>SUBC003</b> | <b>SUBC 004</b> |
|---------------------------------------|--------------------|-----------------|-----------------|----------------|-----------------|
| <b>TAXON</b>                          | <b>#/Sq.M</b>      | <b>#/Sq.M</b>   | <b>#/Sq.M</b>   | <b>#/Sq.M</b>  | <b>#/Sq.M</b>   |
| Potamopyrgus antipodarum              | 43970              | 11007           | 6436            | 22195          | 42827           |
| Hobsonia florida                      | 842                | 481             | 120             | 241            | 241             |
| Oligochaeta                           | 3308               | 481             | 180             | 120            | 1143            |
| Americorophium spinicorne             | 0                  | 0               | 0               | 0              | 0               |
| Eogammarus confervicolus              | 3910               | 0               | 602             | 962            | 662             |
| Nereis limnicola                      | 2045               | 1684            | 1203            | 1143           | 1624            |
| Coullana canadensis                   | 0                  | 0               | 0               | 0              | 120             |
| Nemertinea                            | 0                  | 0               | 0               | 0              | 0               |
| Turbellaria, Rhabdocoela              | 0                  | 0               | 0               | 0              | 0               |
| Corbicula fluminea                    | 180                | 60              | 0               | 0              | 0               |
| Marenzelleria viridis                 | 0                  | 0               | 0               | 0              | 0               |
| Gnorimospaeroma insulare              | 120                | 0               | 0               | 0              | 0               |
| Hydroida colony                       | 0                  | 0               | 0               | 0              | 0               |
| Macoma balthica                       | 0                  | 0               | 0               | 0              | 0               |
| Nematoda                              | 180                | 0               | 0               | 120            | 0               |
| Americorophium salmonis               | 12932              | 5594            | 7759            | 16722          | 16481           |
| Cyclopoida                            | 0                  | 0               | 0               | 0              | 0               |
| Insecta, terrestrial adult            | 0                  | 0               | 0               | 0              | 0               |
| Idotea sp.                            | 0                  | 0               | 0               | 0              | 0               |
| Saduria entomon                       | 60                 | 180             | 0               | 60             | 60              |
| <b>Total/Sq.M</b>                     | <b>67548</b>       | <b>19489</b>    | <b>16301</b>    | <b>41564</b>   | <b>63158</b>    |
| <b>Number of Species</b>              | <b>10</b>          | <b>7</b>        | <b>6</b>        | <b>8</b>       | <b>8</b>        |
| <b>1st Species % of Population</b>    | <b>65.1</b>        | <b>56.5</b>     | <b>47.6</b>     | <b>53.4</b>    | <b>67.8</b>     |
| <b>1st + 2nd % of Population</b>      | <b>84.2</b>        | <b>85.2</b>     | <b>87.1</b>     | <b>93.6</b>    | <b>93.9</b>     |
| <b>1st+ 2nd + 3rd % of Population</b> | <b>90.0</b>        | <b>93.8</b>     | <b>94.5</b>     | <b>96.4</b>    | <b>96.5</b>     |

**Table 9. 2019 Tide Pt./Bornsteins Benthic Invertebrate Densities and Diversities.**

|                                       | Outfall 003   | SUBC 006      | SUBC 007      | SUBC 008      | SUBC 009      | SUBC 010      | Outfall 002   |
|---------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>TAXON</b>                          | <b>#/Sq.M</b> | <b>#/Sq.M</b> | <b>#/Sq.M</b> | <b>#/Sq.M</b> | <b>#/Sq.M</b> | <b>#/Sq.M</b> | <b>#/Sq.M</b> |
| Potamopyrgus antipodarum              | 17684         | 17263         | 2947          | 12692         | 21714         | 37534         | 28210         |
| Oligochaeta                           | 3248          | 421           | 5053          | 5594          | 2466          | 2406          | 2586          |
| Americorophium salmonis               | 31338         | 35970         | 4211          | 3910          | 13774         | 28090         | 37293         |
| Eogammarus confervicolis              | 1383          | 1263          | 0             | 120           | 60            | 3850          | 902           |
| Hobsonia florida                      | 662           | 60            | 361           | 301           | 180           | 180           | 602           |
| Nereis limnicola                      | 241           | 180           | 1143          | 1564          | 241           | 662           | 1143          |
| Cumacea                               | 120           | 0             | 902           | 0             | 120           | 0             | 0             |
| Corbicula fluminea                    | 60            | 361           | 0             | 0             | 0             | 120           | 241           |
| Macoma bathica                        | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Americorophium spinicorne             | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| C. canadensis                         | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Chironomidae larvae                   | 0             | 0             | 0             | 0             | 0             | 60            | 0             |
| Balanus                               | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Gnorimosphaeroma insulare             | 1624          | 180           | 0             | 120           | 0             | 481           | 0             |
| Hydracarina                           | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Nematoda                              | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Nemertinea                            | 0             | 0             | 0             | 0             | 0             | 60            | 0             |
| Entomobryidae                         | 0             | 0             | 0             | 0             | 0             | 0             | 0             |
| Hemimysis anamola                     | 0             | 0             | 0             | 60            | 0             | 0             | 0             |
| <b>Total/Sq.M</b>                     | <b>56361</b>  | <b>55699</b>  | <b>14616</b>  | <b>24361</b>  | <b>38556</b>  | <b>73443</b>  | <b>70977</b>  |
| <b>Number of Species</b>              | <b>9</b>      | <b>8</b>      | <b>6</b>      | <b>8</b>      | <b>7</b>      | <b>10</b>     | <b>7</b>      |
| <b>1st Species % of Population</b>    | <b>55.6</b>   | <b>64.6</b>   | <b>34.6</b>   | <b>52.1</b>   | <b>56.3</b>   | <b>51.1</b>   | <b>52.5</b>   |
| <b>1st + 2nd % of Population</b>      | <b>87.0</b>   | <b>95.6</b>   | <b>63.4</b>   | <b>75.1</b>   | <b>92.0</b>   | <b>89.4</b>   | <b>92.3</b>   |
| <b>1st+ 2nd + 3rd % of Population</b> | <b>92.7</b>   | <b>97.8</b>   | <b>83.5</b>   | <b>91.1</b>   | <b>98.4</b>   | <b>94.6</b>   | <b>95.9</b>   |

Table 10. Young's Bay Benthic Invertebrate Densities Per Station, 2005-19.

| Species                  | 2005  | 2007  | 2009  | 2011  | 2013  | 2015  | 2017 | 2019  |
|--------------------------|-------|-------|-------|-------|-------|-------|------|-------|
| Potamopyrgus antipodarum | 24941 | 26721 | 20601 | 15699 | 11325 | 21223 | 8186 | 21214 |
| Americorophium salmonis  | 15377 | 20854 | 22115 | 8692  | 18723 | 35873 | 5020 | 17839 |
| Oligochaeta              | 13160 | 12969 | 10471 | 4426  | 9662  | 4969  | 1039 | 2260  |
| Eogammarus confervicolis | 12929 | 2698  | 907   | 767   | 60    | 1704  | 421  | 1213  |
| Hobsonia florida         | 13074 | 2697  | 907   | 767   | 87    | 2142  | 421  | 360   |
| Nereis limnicola         | 670   | 1138  | 416   | 1117  | 661   | 1897  | 355  | 1072  |

Table 11. Yacht Club Most Dominant Benthic Invertebrate Species Per Station, 2009-19.

| Station     | 2009<br>Species | Density | 2011<br>Species | Density | 2013<br>Species | Density | 2015<br>Species | Density | 2017<br>Species | Density | 2019<br>Species | Density |
|-------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|
| Outfall 001 | Oligochaeta     | 31880   | P. antipodarum  | 67127   | Oligochaeta     | 84751   | P. antipodarum  | 60872   | P. antipodarum  | 16180   | P. antipodarum  | 43,970  |
| SUBC 001    | A. salmonis     | 15819   | A. salmonis     | 15880   | A. salmonis     | 39278   | A. salmonis     | 25985   | A. salmonis     | 12271   | P. antipodarum  | 11,007  |
| SUBC 002    | P. antipodarum  | 1203    | A. salmonis     | 16782   | A. salmonis     | 56421   | A. salmonis     | 51128   | P. antipodarum  | 962     | A. salmonis     | 7,759   |
| SUBC 003    | P. antipodarum  | 38316   | A. salmonis     | 15398   | A. salmonis     | 12150   | A. salmonis     | 22316   | P. antipodarum  | 8000    | P. antipodarum  | 22,195  |
| SUBC 004    | P. antipodarum  | 35970   | P. antipodarum  | 16962   | A. salmonis     | 20631   | A. salmonis     | 38075   | A. salmonis     | 13594   | P. antipodarum  | 42,827  |
| SUBC 005    | N/A             | N/A     | N/A             | N/A     | N/A             | N/A     | N/A             | N/A     | N/A             | N/A     | N/A             | N/A     |

Table 12. Tide Pt./Bornstein's Most Dominant Benthic Invertebrate Species Per Station, 2009-19.

| Station     | 2009<br>Species | Density | 2011<br>Species | Density | 2013<br>Species | Density | 2015<br>Species | Density | 2017<br>Species | Density | 2019<br>Species | Density |
|-------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|
| Outfall 002 | Oligochaeta     | 8060    | P. antipodarum  | 8000    | N/A             | N/A     | N/A             | N/A     | N/A             | N/A     | A. salmonis     | 37,293  |
| Outfall 003 | P. antipodarum  | 47879   | Oligochaeta     | 11188   | A. salmonis     | 24060   | A. salmonis     | 60872   | P. antipodarum  | 10226   | A. salmonis     | 31,338  |
| SUBC 006    | A. salmonis     | 92210   | A. salmonis     | 2346    | A. salmonis     | 11007   | A. salmonis     | 26105   | P. antipodarum  | 6015    | A. salmonis     | 35,970  |
| SUBC 007    | Oligochaeta     | 15459   | N. limnicola    | 5835    | P. antipodarum  | 14777   | A. salmonis     | 20571   | P. antipodarum  | 3970    | Oligochaeta     | 5,053   |
| SUBC 008    | Oligochaeta     | 9203    | P. antipodarum  | 3429    | Oligochaeta     | 9143    | A. salmonis     | 19428   | P. antipodarum  | 3609    | P. antipodarum  | 12,692  |
| SUBC 009    | P. antipodarum  | 21594   | A. salmonis     | 9564    | A. salmonis     | 5113    | A. salmonis     | 14737   | P. antipodarum  | 6316    | P. antipodarum  | 21,714  |
| SUBC 010    | A. salmonis     | 36631   | P. antipodarum  | 48661   | P. antipodarum  | 34045   | A. salmonis     | 33263   | P. antipodarum  | 13474   | P. antipodarum  | 37,534  |

Table 13. Total Dissolved Solids Measurements Of Each Net Pen Site in Youngs Bay, 2019.

| Net Pen Site | Upstream (mg/L) | Downstream (mg/L) |
|--------------|-----------------|-------------------|
| Tide Pt.     | 1160            | 1180              |
| Bornstein's  | 1190            | 1230              |
| Yacht Club   | 1160            | 1180              |

Table 14. Young's Bay *Beggiatoa* sp., Water Temperature, pH Log Sheet, 2019.

[illegible]

**Date: June 24, 2019**

Table 15 Outfall 001 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Number of Animals/Sample**

| Station Designation      | SUBC 001 |     |     | SUBC 002 |       |     | SUBC003 |     |     | Outfall 001 |       |     |                 |                                      |
|--------------------------|----------|-----|-----|----------|-------|-----|---------|-----|-----|-------------|-------|-----|-----------------|--------------------------------------|
| Number of Animals/Sample | 111      | 102 | 111 | 126      | 29    | 116 | 295     | 180 | 216 | 145         | 780   | 198 | $\alpha = 0.05$ |                                      |
| Excel Rank               | 3        | 2   | 3   | 6        | 1     | 5   | 11      | 8   | 10  | 7           | 12    | 9   | 8               | Tabular Value                        |
| Matches                  | 2        | 1   | 2   | 1        | 1     | 1   | 1       | 1   | 1   | 1           | 1     | 1   | T= 28           |                                      |
| Wilcoxon Rank            | 3.5      | 2   | 3.5 | 6        | 1     | 5   | 11      | 8   | 10  | 7           | 12    | 9   | T'= 11          |                                      |
|                          |          |     |     |          | T= 50 |     |         |     |     |             | T= 28 |     |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |     |          | N=9   |     |         |     |     |             | N=3   |     |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Number of Species/Sample**

| Station Designation      | SUBC 001 |     |     | SUBC 002 |         |   | SUBC003 |     |     | Outfall 001 |         |   |                 |                                      |
|--------------------------|----------|-----|-----|----------|---------|---|---------|-----|-----|-------------|---------|---|-----------------|--------------------------------------|
| Number of Species/Sample | 6        | 6   | 6   | 6        | 4       | 4 | 8       | 5   | 5   | 7           | 8       | 4 | $\alpha = 0.05$ |                                      |
| Excel Rank               | 6        | 6   | 6   | 6        | 1       | 1 | 11      | 4   | 4   | 10          | 11      | 1 | 8               | Tabular Value                        |
| Matches                  | 4        | 4   | 4   | 4        | 3       | 3 | 2       | 2   | 2   | 1           | 2       | 3 | T= 23.5         |                                      |
| Wilcoxon Rank            | 7.5      | 7.5 | 7.5 | 7.5      | 2       | 2 | 11.5    | 4.5 | 4.5 | 10          | 11.5    | 2 | T'= 15.5        |                                      |
|                          |          |     |     |          | T= 54.5 |   |         |     |     |             | T= 23.5 |   |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |     |          | N=9     |   |         |     |     |             | N=3     |   |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Dominant Species % of Sample**

| Station Designation          | SUBC 001 |      |      | SUBC 002 |       |      | SUBC003 |      |      | Outfall 001 |       |      |                 |                               |
|------------------------------|----------|------|------|----------|-------|------|---------|------|------|-------------|-------|------|-----------------|-------------------------------|
| Dominant Species % of Sample | 42.3     | 76.5 | 52.3 | 29.4     | 58.6  | 45.7 | 50.2    | 53.3 | 57.9 | 71          | 58.8  | 85.4 | $\alpha = 0.05$ |                               |
| Excel Rank                   | 2        | 11   | 5    | 1        | 8     | 3    | 4       | 6    | 7    | 10          | 9     | 12   | 8               | Tabular Value                 |
| Matches                      | 1        | 1    | 1    | 1        | 1     | 1    | 1       | 1    | 1    | 1           | 1     | 1    | T= 31           |                               |
| Wilcoxon Rank                | 2        | 11   | 5    | 1        | 8     | 3    | 4       | 6    | 7    | 10          | 9     | 12   | T'= 8           |                               |
|                              |          |      |      |          | T= 47 |      |         |      |      |             | T= 31 |      |                 | <b>Reject Null Hypothesis</b> |
|                              |          |      |      |          | N=9   |      |         |      |      |             | N=3   |      |                 |                               |

*The dominant species may not be the same for every station***Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation      | SUBC 001 |    |    | SUBC 002 |       |    | SUBC003 |    |     | Outfall 001 |       |     |                 |                               |
|--------------------------|----------|----|----|----------|-------|----|---------|----|-----|-------------|-------|-----|-----------------|-------------------------------|
| Potamopyrgus antipodarum | 47       | 78 | 58 | 37       | 17    | 53 | 148     | 96 | 125 | 103         | 459   | 169 | $\alpha = 0.05$ |                               |
| Excel Rank               | 3        | 6  | 5  | 2        | 1     | 4  | 10      | 7  | 9   | 8           | 12    | 11  | 8               | Tabular Value                 |
| Matches                  | 1        | 1  | 1  | 1        | 1     | 1  | 1       | 1  | 1   | 1           | 1     | 1   | T= 31           |                               |
| Wilcoxon Rank            | 3        | 6  | 5  | 2        | 1     | 4  | 10      | 7  | 9   | 8           | 12    | 11  | T'= 8           |                               |
|                          |          |    |    |          | T= 47 |    |         |    |     |             | T= 31 |     |                 | <b>Reject Null Hypothesis</b> |
|                          |          |    |    |          | N=9   |    |         |    |     |             | N=3   |     |                 |                               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |     |   | SUBC 002 |     |   | SUBC003 |     |     | Outfall 001 |      |     |                 |                                      |
|---------------------|----------|-----|---|----------|-----|---|---------|-----|-----|-------------|------|-----|-----------------|--------------------------------------|
| Hobsonia florida    | 5        | 2   | 1 | 1        | 0   | 1 | 2       | 2   | 0   | 6           | 6    | 2   | $\alpha = 0.05$ |                                      |
| Excel Rank          | 10       | 6   | 3 | 3        | 1   | 3 | 6       | 6   | 1   | 11          | 11   | 6   | 8               | Tabular Value                        |
| Matches             | 1        | 4   | 3 | 3        | 2   | 3 | 4       | 4   | 2   | 2           | 2    | 4   | T= 30.5         |                                      |
| Wilcoxon Rank       | 10       | 7.5 | 4 | 4        | 1.5 | 4 | 7.5     | 7.5 | 1.5 | 11.5        | 11.5 | 7.5 | T'= 8.5         |                                      |
|                     |          |     |   | T= 47.5  |     |   |         |     |     | T= 30.5     |      |     |                 | <b>Do Not Reject Null Hypothesis</b> |
|                     |          |     |   | N=9      |     |   |         |     |     | N=3         |      |     |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |   | Outfall 001 |    |    |                 |                               |
|---------------------|----------|-----|-----|----------|-----|-----|---------|-----|---|-------------|----|----|-----------------|-------------------------------|
| Oligochaeta         | 3        | 2   | 3   | 1        | 2   | 0   | 1       | 0   | 1 | 23          | 27 | 5  | $\alpha = 0.05$ |                               |
| Excel Rank          | 8        | 6   | 8   | 3        | 6   | 1   | 3       | 1   | 3 | 11          | 12 | 10 | 8               | Tabular Value                 |
| Matches             | 2        | 2   | 2   | 3        | 2   | 2   | 3       | 2   | 3 | 1           | 1  | 1  | T= 33           |                               |
| Wilcoxon Rank       | 8.5      | 6.5 | 8.5 | 4        | 6.5 | 1.5 | 4       | 1.5 | 4 | 11          | 12 | 10 | T'= 6           |                               |
|                     |          |     |     | T= 45    |     |     |         |     |   | T= 33       |    |    |                 | <b>Reject Null Hypothesis</b> |
|                     |          |     |     | N=9      |     |     |         |     |   | N=3         |    |    |                 |                               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation       | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |                                      |
|---------------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|--------------------------------------|
| Americorophium spinicorne | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\alpha = 0.05$ |                                      |
| Excel Rank                | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               | Tabular Value                        |
| Matches                   | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |                                      |
| Wilcoxon Rank             | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |                                      |
|                           |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 | <b>Do Not Reject Null Hypothesis</b> |
|                           |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation      | SUBC 001 |   |   | SUBC 002 |   |   | SUBC003 |   |   | Outfall 001 |    |   |                 |                                      |
|--------------------------|----------|---|---|----------|---|---|---------|---|---|-------------|----|---|-----------------|--------------------------------------|
| Eogammarus confervicolus | 0        | 0 | 0 | 10       | 0 | 0 | 12      | 1 | 3 | 0           | 65 | 0 | $\alpha = 0.05$ |                                      |
| Excel Rank               | 1        | 1 | 1 | 10       | 1 | 1 | 11      | 8 | 9 | 1           | 12 | 1 | 8               | Tabular Value                        |
| Matches                  | 7        | 7 | 7 | 1        | 7 | 7 | 1       | 1 | 1 | 7           | 1  | 7 | T= 20           |                                      |
| Wilcoxon Rank            | 4        | 4 | 4 | 10       | 4 | 4 | 11      | 8 | 9 | 4           | 12 | 4 | T'= 19          |                                      |
|                          |          |   |   | T= 58    |   |   |         |   |   | T= 20       |    |   |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |   |   | N=9      |   |   |         |   |   | N=3         |    |   |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |      |      | SUBC 002 |     |     | SUBC003 |     |   | Outfall 001 |    |    |                 |
|---------------------|----------|------|------|----------|-----|-----|---------|-----|---|-------------|----|----|-----------------|
| Nereis limnicola    | 6        | 11   | 11   | 9        | 4   | 7   | 4       | 7   | 8 | 3           | 10 | 21 | $\chi^2 = 0.05$ |
| Excel Rank          | 4        | 10   | 10   | 8        | 2   | 5   | 2       | 5   | 7 | 1           | 9  | 12 | 8               |
| Matches             | 1        | 2    | 2    | 1        | 2   | 2   | 2       | 2   | 1 | 1           | 1  | 1  | T= 22           |
| Wilcoxon Rank       | 4        | 10.5 | 10.5 | 8        | 2.5 | 5.5 | 2.5     | 5.5 | 7 | 1           | 9  | 12 | T'= 17          |
|                     |          |      |      | T= 56    |     |     |         |     |   | T= 22       |    |    |                 |
|                     |          |      |      | N=9      |     |     |         |     |   | N=3         |    |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |
|---------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|
| Coullana canadensis | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |
|                     |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 |
|                     |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |
|---------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|
| Nemertinea          | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |
|                     |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 |
|                     |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation     | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |
|-------------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|
| Turbellaria, Rhabdoceia | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank              | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               |
| Matches                 | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |
| Wilcoxon Rank           | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |
|                         |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 |
|                         |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis**

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |      |   | SUBC 002 |   |   | SUBC003 |   |   | Outfall 001 |      |   |                 |
|---------------------|----------|------|---|----------|---|---|---------|---|---|-------------|------|---|-----------------|
| Corbicula fluminea  | 0        | 1    | 0 | 0        | 0 | 0 | 0       | 0 | 0 | 2           | 1    | 0 | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 10   | 1 | 1        | 1 | 1 | 1       | 1 | 1 | 12          | 10   | 1 | 8               |
| Matches             | 9        | 2    | 9 | 9        | 9 | 9 | 9       | 9 | 9 | 1           | 2    | 9 | T= 27.5         |
| Wilcoxon Rank       | 5        | 10.5 | 5 | 5        | 5 | 5 | 5       | 5 | 5 | 12          | 10.5 | 5 | T'= 11.5        |
|                     |          |      |   | T= 50.5  |   |   |         |   |   | T= 27.5     |      |   |                 |
|                     |          |      |   | N=9      |   |   |         |   |   | N=3         |      |   |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation   | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |
|-----------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|
| Marenzelleria viridis | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank            | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               |
| Matches               | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |
| Wilcoxon Rank         | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |
|                       |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 |
|                       |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation       | SUBC 001 |    |    | SUBC 002 |    |    | SUBC003 |    |    | Outfall 001 |    |    |                 |
|---------------------------|----------|----|----|----------|----|----|---------|----|----|-------------|----|----|-----------------|
| Gnorimosphaeroma insulare | 0        | 0  | 0  | 0        | 0  | 0  | 0       | 0  | 0  | 0           | 2  | 0  | $\chi^2 = 0.05$ |
| Excel Rank                | 1        | 1  | 1  | 1        | 1  | 1  | 1       | 1  | 1  | 1           | 12 | 1  | 8               |
| Matches                   | 11       | 11 | 11 | 11       | 11 | 11 | 11      | 11 | 11 | 11          | 1  | 11 | T= 24           |
| Wilcoxon Rank             | 6        | 6  | 6  | 6        | 6  | 6  | 6       | 6  | 6  | 6           | 12 | 6  | T'= 15          |
|                           |          |    |    | T= 54    |    |    |         |    |    | T= 24       |    |    |                 |
|                           |          |    |    | N=9      |    |    |         |    |    | N=3         |    |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 001 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC003 |     |     | Outfall 001 |     |     |                 |
|---------------------|----------|-----|-----|----------|-----|-----|---------|-----|-----|-------------|-----|-----|-----------------|
| Hydroida colony     | 0        | 0   | 0   | 0        | 0   | 0   | 0       | 0   | 0   | 0           | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1       | 1   | 1   | 1           | 1   | 1   | 8               |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12      | 12  | 12  | 12          | 12  | 12  | T= 19.5         |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5     | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5        |
|                     |          |     |     | T= 58.5  |     |     |         |     |     | T= 19.5     |     |     |                 |
|                     |          |     |     | N=9      |     |     |         |     |     | N=3         |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis**

Table 16 SUBC 004 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Number of Animals/Sample**

| Station Designation      | SUBC 001 |     |     | SUBC 002 |       |     | SUBC 003 |     |     | SUBC 004 |       |     |                 |                                      |
|--------------------------|----------|-----|-----|----------|-------|-----|----------|-----|-----|----------|-------|-----|-----------------|--------------------------------------|
| Number of Animals/Sample | 111      | 102 | 111 | 126      | 29    | 116 | 295      | 180 | 216 | 291      | 187   | 572 | $\chi^2 = 0.05$ |                                      |
| Excel Rank               | 3        | 2   | 3   | 6        | 1     | 5   | 11       | 7   | 9   | 10       | 8     | 12  | $\approx 8$     | Tabular Value                        |
| Matches                  | 2        | 1   | 2   | 1        | 1     | 1   | 1        | 1   | 1   | 1        | 1     | 1   | T= 30           |                                      |
| Wilcoxon Rank            | 3.5      | 2   | 3.5 | 6        | 1     | 5   | 11       | 7   | 9   | 10       | 8     | 12  | T'= 9           |                                      |
|                          |          |     |     |          | T= 48 |     |          |     |     |          | T= 30 |     |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |     |          | N=9   |     |          |     |     |          | N=3   |     |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Number of Species/Sample**

| Station Designation      | SUBC 001 |   |   | SUBC 002 |       |     | SUBC 003 |   |   | SUBC 004 |       |   |                 |                                      |
|--------------------------|----------|---|---|----------|-------|-----|----------|---|---|----------|-------|---|-----------------|--------------------------------------|
| Number of Species/Sample | 6        | 6 | 6 | 6        | 4     | 4   | 8        | 5 | 5 | 7        | 5     | 6 | $\chi^2 = 0.05$ |                                      |
| Excel Rank               | 6        | 6 | 6 | 6        | 1     | 1   | 12       | 3 | 3 | 11       | 3     | 6 | $\approx 8$     | Tabular Value                        |
| Matches                  | 5        | 5 | 5 | 5        | 2     | 2   | 1        | 3 | 3 | 1        | 3     | 5 | T= 23           |                                      |
| Wilcoxon Rank            | 8        | 8 | 8 | 8        | 1.5   | 1.5 | 12       | 4 | 4 | 11       | 4     | 8 | T'= 16          |                                      |
|                          |          |   |   |          | T= 55 |     |          |   |   |          | T= 23 |   |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |   |   |          | N=9   |     |          |   |   |          | N=3   |   |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Dominant Species % of Sample**

| Station Designation          | SUBC 001 |      |      | SUBC 002 |       |      | SUBC 003 |      |      | SUBC 004 |       |      |                 |                                      |
|------------------------------|----------|------|------|----------|-------|------|----------|------|------|----------|-------|------|-----------------|--------------------------------------|
| Dominant Species % of Sample | 42.3     | 76.5 | 52.3 | 29.4     | 58.6  | 45.7 | 50.2     | 53.3 | 57.9 | 69.4     | 42.2  | 75.3 | $\chi^2 = 0.05$ |                                      |
| Excel Rank                   | 3        | 12   | 6    | 1        | 9     | 4    | 5        | 7    | 8    | 10       | 2     | 11   | $\approx 8$     | Tabular Value                        |
| Matches                      | 1        | 1    | 1    | 1        | 1     | 1    | 1        | 1    | 1    | 1        | 1     | 1    | T= 23           |                                      |
| Wilcoxon Rank                | 3        | 12   | 6    | 1        | 9     | 4    | 5        | 7    | 8    | 10       | 2     | 11   | T'= 16          |                                      |
|                              |          |      |      |          | T= 55 |      |          |      |      |          | T= 23 |      |                 | <b>Do Not Reject Null Hypothesis</b> |
|                              |          |      |      |          | N=9   |      |          |      |      |          | N=3   |      |                 |                                      |

*The dominant species may not be the same for every station*

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation      | SUBC 001 |    |    | SUBC 002 |       |    | SUBC 003 |    |     | SUBC 004 |       |     |                 |                                      |
|--------------------------|----------|----|----|----------|-------|----|----------|----|-----|----------|-------|-----|-----------------|--------------------------------------|
| Potamopyrgus antipodarum | 47       | 78 | 58 | 37       | 17    | 53 | 148      | 96 | 125 | 202      | 79    | 431 | $\chi^2 = 0.05$ |                                      |
| Excel Rank               | 3        | 6  | 5  | 2        | 1     | 4  | 10       | 8  | 9   | 11       | 7     | 12  | $\approx 8$     | Tabular Value                        |
| Matches                  | 1        | 1  | 1  | 1        | 1     | 1  | 1        | 1  | 1   | 1        | 1     | 1   | T= 30           |                                      |
| Wilcoxon Rank            | 3        | 6  | 5  | 2        | 1     | 4  | 10       | 8  | 9   | 11       | 7     | 12  | T'= 9           |                                      |
|                          |          |    |    |          | T= 48 |    |          |    |     |          | T= 30 |     |                 | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |    |    |          | N=9   |    |          |    |     |          | N=3   |     |                 |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |   |     | SUBC 002 |   |     | SUBC 003 |   |   | SUBC 004 |   |     |                 |
|---------------------|----------|---|-----|----------|---|-----|----------|---|---|----------|---|-----|-----------------|
| Hobsonia florida    | 5        | 2 | 1   | 1        | 0 | 1   | 2        | 2 | 0 | 3        | 0 | 1   | $\chi^2 = 0.05$ |
| Excel Rank          | 12       | 8 | 4   | 4        | 1 | 4   | 8        | 8 | 1 | 11       | 1 | 4   | $\chi^2 = 8$    |
| Matches             | 1        | 3 | 4   | 4        | 3 | 4   | 3        | 3 | 3 | 1        | 3 | 4   | T= 18.5         |
| Wilcoxon Rank       | 12       | 9 | 5.5 | 5.5      | 2 | 5.5 | 9        | 9 | 2 | 11       | 2 | 5.5 | T'= 20.5        |
|                     |          |   |     | T= 59.5  |   |     |          |   |   | T= 18.5  |   |     |                 |
|                     |          |   |     | N=9      |   |     |          |   |   | N=3      |   |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |     |   | SUBC 002 |     |     | SUBC 003 |     |   | SUBC 004 |   |    |                 |
|---------------------|----------|-----|---|----------|-----|-----|----------|-----|---|----------|---|----|-----------------|
| Oligochaeta         | 3        | 2   | 3 | 1        | 2   | 0   | 1        | 0   | 1 | 6        | 3 | 10 | $\chi^2 = 0.05$ |
| Excel Rank          | 8        | 6   | 8 | 3        | 6   | 1   | 3        | 1   | 3 | 11       | 8 | 12 | $\chi^2 = 8$    |
| Matches             | 3        | 2   | 3 | 3        | 2   | 2   | 3        | 2   | 3 | 1        | 3 | 1  | T= 32           |
| Wilcoxon Rank       | 9        | 6.5 | 9 | 4        | 6.5 | 1.5 | 4        | 1.5 | 4 | 11       | 9 | 12 | T'= 7           |
|                     |          |     |   | T= 46    |     |     |          |     |   | T= 32    |   |    |                 |
|                     |          |     |   | N=9      |     |     |          |     |   | N=3      |   |    |                 |

Tabular Value

**Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation       | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|---------------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Americorophium spinicorne | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank                | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | $\chi^2 = 8$    |
| Matches                   | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank             | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                           |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                           |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation      | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |   |   | SUBC 004 |     |    |                 |
|--------------------------|----------|-----|-----|----------|-----|-----|----------|---|---|----------|-----|----|-----------------|
| Eogammarus confervicolus | 0        | 0   | 0   | 10       | 0   | 0   | 12       | 1 | 3 | 2        | 0   | 9  | $\chi^2 = 0.05$ |
| Excel Rank               | 1        | 1   | 1   | 11       | 1   | 1   | 12       | 7 | 9 | 8        | 1   | 10 | $\chi^2 = 8$    |
| Matches                  | 6        | 6   | 6   | 1        | 6   | 6   | 1        | 1 | 1 | 1        | 6   | 1  | T= 21.5         |
| Wilcoxon Rank            | 3.5      | 3.5 | 3.5 | 11       | 3.5 | 3.5 | 12       | 7 | 9 | 8        | 3.5 | 10 | T'= 17.5        |
|                          |          |     |     | T= 56.5  |     |     |          |   |   | T= 21.5  |     |    |                 |
|                          |          |     |     | N=9      |     |     |          |   |   | N=3      |     |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis**

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |      |      | SUBC 002 |   |     | SUBC 003 |     |   | SUBC 004 |   |    |                 |
|---------------------|----------|------|------|----------|---|-----|----------|-----|---|----------|---|----|-----------------|
| Nereis limnicola    | 6        | 11   | 11   | 9        | 4 | 7   | 4        | 7   | 8 | 13       | 4 | 10 | $\chi^2 = 0.05$ |
| Excel Rank          | 4        | 10   | 10   | 8        | 1 | 5   | 1        | 5   | 7 | 12       | 1 | 9  | 8               |
| Matches             | 1        | 2    | 2    | 1        | 3 | 2   | 3        | 2   | 1 | 1        | 3 | 1  | T= 23           |
| Wilcoxon Rank       | 4        | 10.5 | 10.5 | 8        | 2 | 5.5 | 2        | 5.5 | 7 | 12       | 2 | 9  | T'= 16          |
|                     |          |      |      | T= 55    |   |     |          |     |   | T= 23    |   |    |                 |
|                     |          |      |      | N=9      |   |     |          |     |   | N=3      |   |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |    |    | SUBC 002 |    |    | SUBC 003 |    |    | SUBC 004 |    |    |                 |
|---------------------|----------|----|----|----------|----|----|----------|----|----|----------|----|----|-----------------|
| Coullana canadensis | 0        | 0  | 0  | 0        | 0  | 0  | 0        | 0  | 0  | 0        | 2  | 0  | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1  | 1  | 1        | 1  | 1  | 1        | 1  | 1  | 1        | 12 | 1  | 8               |
| Matches             | 11       | 11 | 11 | 11       | 11 | 11 | 11       | 11 | 11 | 11       | 1  | 11 | T= 24           |
| Wilcoxon Rank       | 6        | 6  | 6  | 6        | 6  | 6  | 6        | 6  | 6  | 6        | 12 | 6  | T'= 15          |
|                     |          |    |    | T= 54    |    |    |          |    |    | T= 24    |    |    |                 |
|                     |          |    |    | N=9      |    |    |          |    |    | N=3      |    |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|---------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Nemertinea          | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8               |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                     |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                     |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation     | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|-------------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Turbellaria, Rhabdoceia | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank              | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8               |
| Matches                 | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank           | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                         |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                         |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis**

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |    |    | SUBC 002 |    |    | SUBC 003 |    |    | SUBC 004 |    |    |                 |
|---------------------|----------|----|----|----------|----|----|----------|----|----|----------|----|----|-----------------|
| Corbicula fluminea  | 0        | 1  | 0  | 0        | 0  | 0  | 0        | 0  | 0  | 0        | 0  | 0  | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 12 | 1  | 1        | 1  | 1  | 1        | 1  | 1  | 1        | 1  | 1  | 8               |
| Matches             | 11       | 1  | 11 | 11       | 11 | 11 | 11       | 11 | 11 | 11       | 11 | 11 | T= 18           |
| Wilcoxon Rank       | 6        | 12 | 6  | 6        | 6  | 6  | 6        | 6  | 6  | 6        | 6  | 6  | T'= 21          |
|                     |          |    |    | T= 60    |    |    |          |    |    | T= 18    |    |    |                 |
|                     |          |    |    | N=9      |    |    |          |    |    | N=3      |    |    |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation   | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|-----------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Marenzelleria viridis | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank            | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8               |
| Matches               | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank         | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                       |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                       |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation       | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|---------------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Gnorimosphaeroma insulare | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank                | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8               |
| Matches                   | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank             | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                           |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                           |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated**

| Station Designation | SUBC 001 |     |     | SUBC 002 |     |     | SUBC 003 |     |     | SUBC 004 |     |     |                 |
|---------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------|
| Hydroida colony     | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | $\chi^2 = 0.05$ |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8               |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5         |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5        |
|                     |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |                 |
|                     |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                 |

Tabular Value

**Do Not Reject Null Hypothesis**

Table 17 Outfall 003 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Number of Animals/Sample**

| Station Designation      | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |    |     | Outfall 003 |     |     |                                                                                            |                                      |
|--------------------------|----------|-----|-----|----------|----|-----|----------|----|-----|-------------|-----|-----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Number of Animals/Sample | 247      | 309 | 370 | 69       | 71 | 103 | 231      | 53 | 121 | 273         | 252 | 412 | <  0.05 |                                      |
| Excel Rank               | 7        | 10  | 11  | 2        | 3  | 4   | 6        | 1  | 5   | 9           | 8   | 12  |  8      | Tabular Value                        |
| Matches                  | 1        | 1   | 1   | 1        | 1  | 1   | 1        | 1  | 1   | 1           | 1   | 1   | T= 29                                                                                      |                                      |
| Wilcoxon Rank            | 7        | 10  | 11  | 2        | 3  | 4   | 6        | 1  | 5   | 9           | 8   | 12  | T'= 10                                                                                     |                                      |
|                          |          |     |     | T= 49    |    |     |          |    |     | T= 29       |     |     |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |     | N=9      |    |     |          |    |     | N=3         |     |     |                                                                                            |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Number of Species/Sample**

| Station Designation      | SUBC 006 |   |    | SUBC 007 |   |   | SUBC 008 |   |     | Outfall 003 |   |    |                                                                                            |                                      |
|--------------------------|----------|---|----|----------|---|---|----------|---|-----|-------------|---|----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Number of Species/Sample | 5        | 6 | 8  | 5        | 6 | 6 | 6        | 4 | 7   | 7           | 6 | 9  | <  0.05 |                                      |
| Excel Rank               | 2        | 4 | 11 | 2        | 4 | 4 | 4        | 1 | 9   | 9           | 4 | 12 |  8      | Tabular Value                        |
| Matches                  | 2        | 5 | 1  | 2        | 5 | 5 | 5        | 1 | 2   | 2           | 5 | 1  | T= 27.5                                                                                    |                                      |
| Wilcoxon Rank            | 2.5      | 6 | 11 | 2.5      | 6 | 6 | 6        | 1 | 9.5 | 9.5         | 6 | 12 | T'= 11.5                                                                                   |                                      |
|                          |          |   |    | T= 50.5  |   |   |          |   |     | T= 27.5     |   |    |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |   |    | N=9      |   |   |          |   |     | N=3         |   |    |                                                                                            |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Dominant Species % of Sample**

| Station Designation          | SUBC 006 |      |      | SUBC 007 |      |      | SUBC 008 |    |      | Outfall 003 |      |      |                                                                                            |                                      |
|------------------------------|----------|------|------|----------|------|------|----------|----|------|-------------|------|------|--------------------------------------------------------------------------------------------|--------------------------------------|
| Dominant Species % of Sample | 27.5     | 25.6 | 37.8 | 17.4     | 12.7 | 27.2 | 76.2     | 17 | 21.5 | 32.6        | 36.5 | 27.4 | <  0.05 |                                      |
| Excel Rank                   | 8        | 5    | 11   | 3        | 1    | 6    | 12       | 2  | 4    | 9           | 10   | 7    |  8      | Tabular Value                        |
| Matches                      | 1        | 1    | 1    | 1        | 1    | 1    | 1        | 1  | 1    | 1           | 1    | 1    | T= 26                                                                                      |                                      |
| Wilcoxon Rank                | 8        | 5    | 11   | 3        | 1    | 6    | 12       | 2  | 4    | 9           | 10   | 7    | T'= 13                                                                                     |                                      |
|                              |          |      |      | T= 52    |      |      |          |    |      | T= 26       |      |      |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                              |          |      |      | N=9      |      |      |          |    |      | N=3         |      |      |                                                                                            |                                      |

*The dominant species may not be the same for every station***Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation      | SUBC 006 |    |     | SUBC 007 |     |    | SUBC 008 |     |    | Outfall 003 |    |     |                                                                                              |                                      |
|--------------------------|----------|----|-----|----------|-----|----|----------|-----|----|-------------|----|-----|----------------------------------------------------------------------------------------------|--------------------------------------|
| Potamopyrgus antipodarum | 68       | 79 | 140 | 12       | 9   | 28 | 176      | 9   | 26 | 89          | 92 | 113 | <  0.05 |                                      |
| Excel Rank               | 6        | 7  | 11  | 3        | 1   | 5  | 12       | 1   | 4  | 8           | 9  | 10  |  8      | Tabular Value                        |
| Matches                  | 1        | 1  | 1   | 1        | 2   | 1  | 1        | 2   | 1  | 1           | 1  | 1   | T= 27                                                                                        |                                      |
| Wilcoxon Rank            | 6        | 7  | 11  | 3        | 1.5 | 5  | 12       | 1.5 | 4  | 8           | 9  | 10  | T'= 12                                                                                       |                                      |
|                          |          |    |     | T= 51    |     |    |          |     |    | T= 27       |    |     |                                                                                              | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |    |     | N=9      |     |    |          |     |    | N=3         |    |     |                                                                                              |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |    | SUBC 008 |     |    | Outfall 003 |    |    |                                                                                              |                                      |
|---------------------|----------|-----|-----|----------|-----|----|----------|-----|----|-------------|----|----|----------------------------------------------------------------------------------------------|--------------------------------------|
| Oligochaeta         | 1        | 3   | 3   | 23       | 26  | 35 | 39       | 26  | 28 | 4           | 18 | 32 | <  0.05 |                                      |
| Excel Rank          | 1        | 2   | 2   | 6        | 7   | 11 | 12       | 7   | 9  | 4           | 5  | 10 |  8      | Tabular Value                        |
| Matches             | 1        | 2   | 2   | 1        | 2   | 1  | 1        | 2   | 1  | 1           | 1  | 1  | T= 19                                                                                        |                                      |
| Wilcoxon Rank       | 1        | 2.5 | 2.5 | 6        | 7.5 | 11 | 12       | 7.5 | 9  | 4           | 5  | 10 | T'= 20                                                                                       |                                      |
|                     |          |     |     | T= 59    |     |    |          |     |    | T= 19       |    |    |                                                                                              | <b>Do Not Reject Null Hypothesis</b> |

N=9

N=3

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation     | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |    |    | Outfall 003 |     |     |                                                                                            |               |
|-------------------------|----------|-----|-----|----------|----|----|----------|----|----|-------------|-----|-----|--------------------------------------------------------------------------------------------|---------------|
| Americorophium salmonis | 175      | 217 | 206 | 26       | 21 | 23 | 10       | 12 | 43 | 138         | 135 | 248 | <  0.05 |               |
| Excel Rank              | 9        | 11  | 10  | 5        | 3  | 4  | 1        | 2  | 6  | 8           | 7   | 12  |  8      | Tabular Value |
| Matches                 | 1        | 1   | 1   | 1        | 1  | 1  | 1        | 1  | 1  | 1           | 1   | 1   | T= 27                                                                                      |               |
| Wilcoxon Rank           | 9        | 11  | 10  | 5        | 3  | 4  | 1        | 2  | 6  | 8           | 7   | 12  | T'= 12                                                                                     |               |
|                         |          |     |     | T= 51    |    |    |          |    |    | T= 27       |     |     |                                                                                            |               |
|                         |          |     |     | N=9      |    |    |          |    |    | N=3         |     |     |                                                                                            |               |

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation      | SUBC 006 |    |    | SUBC 007 |   |   | SUBC 008 |   |   | Outfall 003 |   |   |                                                                                            |               |
|--------------------------|----------|----|----|----------|---|---|----------|---|---|-------------|---|---|--------------------------------------------------------------------------------------------|---------------|
| Eogammarus confervicolis | 1        | 7  | 13 | 0        | 0 | 0 | 0        | 0 | 2 | 14          | 4 | 5 | <  0.05 |               |
| Excel Rank               | 6        | 10 | 11 | 1        | 1 | 1 | 1        | 1 | 7 | 12          | 8 | 9 |  8      | Tabular Value |
| Matches                  | 1        | 1  | 1  | 5        | 5 | 5 | 5        | 5 | 1 | 1           | 1 | 1 | T= 29                                                                                      |               |
| Wilcoxon Rank            | 6        | 10 | 11 | 3        | 3 | 3 | 3        | 3 | 7 | 12          | 8 | 9 | T'= 10                                                                                     |               |
|                          |          |    |    | T= 49    |   |   |          |   |   | T= 29       |   |   |                                                                                            |               |
|                          |          |    |    | N=9      |   |   |          |   |   | N=3         |   |   |                                                                                            |               |

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation | SUBC 006 |     |   | SUBC 007 |    |     | SUBC 008 |     |    | Outfall 003 |     |    |                                                                                            |               |
|---------------------|----------|-----|---|----------|----|-----|----------|-----|----|-------------|-----|----|--------------------------------------------------------------------------------------------|---------------|
| Hobsonia florida    | 0        | 0   | 1 | 1        | 3  | 2   | 1        | 0   | 4  | 0           | 2   | 9  | <  0.05 |               |
| Excel Rank          | 1        | 1   | 5 | 5        | 10 | 8   | 5        | 1   | 11 | 1           | 8   | 12 |  8      | Tabular Value |
| Matches             | 4        | 4   | 3 | 3        | 1  | 2   | 3        | 4   | 1  | 4           | 2   | 1  | T= 23                                                                                      |               |
| Wilcoxon Rank       | 2.5      | 2.5 | 6 | 6        | 10 | 8.5 | 6        | 2.5 | 11 | 2.5         | 8.5 | 12 | T'= 16                                                                                     |               |
|                     |          |     |   | T= 55    |    |     |          |     |    | T= 23       |     |    |                                                                                            |               |
|                     |          |     |   | N=9      |    |     |          |     |    | N=3         |     |    |                                                                                            |               |

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation | SUBC 006 |   |     | SUBC 007 |    |   | SUBC 008 |   |    | Outfall 003 |   |   |                                                                                              |               |
|---------------------|----------|---|-----|----------|----|---|----------|---|----|-------------|---|---|----------------------------------------------------------------------------------------------|---------------|
| Nereis limnicola    | 0        | 1 | 2   | 7        | 9  | 3 | 4        | 6 | 16 | 2           | 1 | 1 | <  0.05 |               |
| Excel Rank          | 1        | 2 | 5   | 10       | 11 | 7 | 8        | 9 | 12 | 5           | 2 | 2 |  8      | Tabular Value |
| Matches             | 1        | 3 | 2   | 1        | 1  | 1 | 1        | 1 | 1  | 2           | 3 | 3 | T= 11.5                                                                                      |               |
| Wilcoxon Rank       | 1        | 3 | 5.5 | 10       | 11 | 7 | 8        | 9 | 12 | 5.5         | 3 | 3 | T'= 27.5                                                                                     |               |
|                     |          |   |     | T= 66.5  |    |   |          |   |    | T= 11.5     |   |   |                                                                                              |               |
|                     |          |   |     | N=9      |    |   |          |   |    | N=3         |   |   |                                                                                              |               |

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |     |     | Outfall 003 |     |     |                                                                                              |               |
|---------------------|----------|-----|-----|----------|----|----|----------|-----|-----|-------------|-----|-----|----------------------------------------------------------------------------------------------|---------------|
| Cumacea             | 0        | 0   | 0   | 0        | 3  | 12 | 0        | 0   | 0   | 1           | 0   | 1   | <  0.05 |               |
| Excel Rank          | 1        | 1   | 1   | 1        | 11 | 12 | 1        | 1   | 1   | 9           | 1   | 9   |  8      | Tabular Value |
| Matches             | 8        | 8   | 8   | 8        | 1  | 1  | 8        | 8   | 8   | 2           | 8   | 2   | T= 23.5                                                                                      |               |
| Wilcoxon Rank       | 4.5      | 4.5 | 4.5 | 4.5      | 11 | 12 | 4.5      | 4.5 | 4.5 | 9.5         | 4.5 | 9.5 | T'= 15.5                                                                                     |               |
|                     |          |     |     | T= 54.5  |    |    |          |     |     | T= 23.5     |     |     |                                                                                              |               |
|                     |          |     |     | N=9      |    |    |          |     |     | N=3         |     |     |                                                                                              |               |

**Do Not Reject Null Hypothesis**



Table 18 SUBC 009 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Number of Animals/Sample**

| Station Designation      | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |    |     | SUBC 009 |     |     |                                                                                            |                                      |
|--------------------------|----------|-----|-----|----------|----|-----|----------|----|-----|----------|-----|-----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Number of Animals/Sample | 247      | 309 | 370 | 69       | 71 | 103 | 231      | 53 | 121 | 221      | 240 | 180 | <  0.05 |                                      |
| Excel Rank               | 10       | 11  | 12  | 2        | 3  | 4   | 8        | 1  | 5   | 7        | 9   | 6   |  8      | Tabular Value                        |
| Matches                  | 1        | 1   | 1   | 1        | 1  | 1   | 1        | 1  | 1   | 1        | 1   | 1   | T= 22                                                                                      |                                      |
| Wilcoxon Rank            | 10       | 11  | 12  | 2        | 3  | 4   | 8        | 1  | 5   | 7        | 9   | 6   | T'= 17                                                                                     |                                      |
|                          |          |     |     | T= 56    |    |     |          |    |     | T= 22    |     |     |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |     | N=9      |    |     |          |    |     | N=3      |     |     |                                                                                            |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Number of Species/Sample**

| Station Designation      | SUBC 006 |     |    | SUBC 007 |     |     | SUBC 008 |     |      | SUBC 009 |   |     |                                                                                            |                                      |
|--------------------------|----------|-----|----|----------|-----|-----|----------|-----|------|----------|---|-----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Number of Species/Sample | 5        | 6   | 8  | 5        | 6   | 6   | 6        | 4   | 7    | 7        | 5 | 4   | <  0.05 |                                      |
| Excel Rank               | 3        | 6   | 12 | 3        | 6   | 6   | 6        | 1   | 10   | 10       | 3 | 1   |  8      | Tabular Value                        |
| Matches                  | 3        | 4   | 1  | 3        | 4   | 4   | 4        | 2   | 2    | 2        | 3 | 2   | T= 16                                                                                      |                                      |
| Wilcoxon Rank            | 4        | 7.5 | 12 | 4        | 7.5 | 7.5 | 7.5      | 1.5 | 10.5 | 10.5     | 4 | 1.5 | T'= 23                                                                                     |                                      |
|                          |          |     |    | T= 62    |     |     |          |     |      | T= 16    |   |     |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |     |    | N=9      |     |     |          |     |      | N=3      |   |     |                                                                                            |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation          | SUBC 006 |      |      | SUBC 007 |      |      | SUBC 008 |    |      | SUBC 009 |      |      |                                                                                            |                                      |
|------------------------------|----------|------|------|----------|------|------|----------|----|------|----------|------|------|--------------------------------------------------------------------------------------------|--------------------------------------|
| Dominant Species % of Sample | 27.5     | 25.6 | 37.8 | 17.4     | 12.7 | 27.2 | 76.2     | 17 | 21.5 | 55.2     | 57.1 | 56.7 | <  0.05 |                                      |
| Excel Rank                   | 7        | 5    | 8    | 3        | 1    | 6    | 12       | 2  | 4    | 9        | 11   | 10   |  8      | Tabular Value                        |
| Matches                      | 1        | 1    | 1    | 1        | 1    | 1    | 1        | 1  | 1    | 1        | 1    | 1    | T= 30                                                                                      |                                      |
| Wilcoxon Rank                | 7        | 5    | 8    | 3        | 1    | 6    | 12       | 2  | 4    | 9        | 11   | 10   | T'= 9                                                                                      |                                      |
|                              |          |      |      | T= 48    |      |      |          |    |      | T= 30    |      |      |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |
|                              |          |      |      | N=9      |      |      |          |    |      | N=3      |      |      |                                                                                            |                                      |

*The dominant species may not be the same for every station*

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation      | SUBC 006 |    |     | SUBC 007 |     |    | SUBC 008 |     |    | SUBC 009 |     |     |                                                                                              |                                      |
|--------------------------|----------|----|-----|----------|-----|----|----------|-----|----|----------|-----|-----|----------------------------------------------------------------------------------------------|--------------------------------------|
| Potamopyrgus antipodarum | 68       | 79 | 140 | 12       | 9   | 28 | 176      | 9   | 26 | 122      | 137 | 102 | <  0.05 |                                      |
| Excel Rank               | 6        | 7  | 11  | 3        | 1   | 5  | 12       | 1   | 4  | 9        | 10  | 8   |  8      | Tabular Value                        |
| Matches                  | 1        | 1  | 1   | 1        | 2   | 1  | 1        | 2   | 1  | 1        | 1   | 1   | T= 27                                                                                        |                                      |
| Wilcoxon Rank            | 6        | 7  | 11  | 3        | 1.5 | 5  | 12       | 1.5 | 4  | 9        | 10  | 8   | T'= 12                                                                                       |                                      |
|                          |          |    |     | T= 51    |     |    |          |     |    | T= 27    |     |     |                                                                                              | <b>Do Not Reject Null Hypothesis</b> |
|                          |          |    |     | N=9      |     |    |          |     |    | N=3      |     |     |                                                                                              |                                      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |    | SUBC 008 |     |    | SUBC 009 |    |    |                                                                                            |                                      |
|---------------------|----------|-----|-----|----------|-----|----|----------|-----|----|----------|----|----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Oligochaeta         | 1        | 3   | 3   | 23       | 26  | 35 | 39       | 26  | 28 | 9        | 11 | 21 | <  0.05 |                                      |
| Excel Rank          | 1        | 2   | 2   | 7        | 8   | 11 | 12       | 8   | 10 | 4        | 5  | 6  |  8      | Tabular Value                        |
| Matches             | 1        | 2   | 2   | 1        | 2   | 1  | 1        | 2   | 1  | 1        | 1  | 1  | T= 15                                                                                      |                                      |
| Wilcoxon Rank       | 1        | 2.5 | 2.5 | 7        | 8.5 | 11 | 12       | 8.5 | 10 | 4        | 5  | 6  | T'= 24                                                                                     |                                      |
|                     |          |     |     | T= 63    |     |    |          |     |    | T= 15    |    |    |                                                                                            |                                      |
|                     |          |     |     | N=9      |     |    |          |     |    | N=3      |    |    |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation     | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |    |    | SUBC 009 |    |    |                                                                                            |                                      |
|-------------------------|----------|-----|-----|----------|----|----|----------|----|----|----------|----|----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Americorophium salmonis | 175      | 217 | 206 | 26       | 21 | 23 | 10       | 12 | 43 | 84       | 89 | 56 | <  0.05 |                                      |
| Excel Rank              | 10       | 12  | 11  | 5        | 3  | 4  | 1        | 2  | 6  | 8        | 9  | 7  |  8      | Tabular Value                        |
| Matches                 | 1        | 1   | 1   | 1        | 1  | 1  | 1        | 1  | 1  | 1        | 1  | 1  | T= 24                                                                                      |                                      |
| Wilcoxon Rank           | 10       | 12  | 11  | 5        | 3  | 4  | 1        | 2  | 6  | 8        | 9  | 7  | T'= 15                                                                                     |                                      |
|                         |          |     |     | T= 54    |    |    |          |    |    | T= 24    |    |    |                                                                                            |                                      |
|                         |          |     |     | N=9      |    |    |          |    |    | N=3      |    |    |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation      | SUBC 006 |    |    | SUBC 007 |   |   | SUBC 008 |   |    | SUBC 009 |   |   |                                                                                            |                                      |
|--------------------------|----------|----|----|----------|---|---|----------|---|----|----------|---|---|--------------------------------------------------------------------------------------------|--------------------------------------|
| Eogammarus confervicolis | 1        | 7  | 13 | 0        | 0 | 0 | 0        | 0 | 2  | 1        | 0 | 0 | <  0.05 |                                      |
| Excel Rank               | 8        | 11 | 12 | 1        | 1 | 1 | 1        | 1 | 10 | 8        | 1 | 1 |  8      | Tabular Value                        |
| Matches                  | 2        | 1  | 1  | 7        | 7 | 7 | 7        | 7 | 1  | 2        | 7 | 7 | T= 16.5                                                                                    |                                      |
| Wilcoxon Rank            | 8.5      | 11 | 12 | 4        | 4 | 4 | 4        | 4 | 10 | 8.5      | 4 | 4 | T'= 22.5                                                                                   |                                      |
|                          |          |    |    | T= 61.5  |   |   |          |   |    | T= 16.5  |   |   |                                                                                            |                                      |
|                          |          |    |    | N=9      |   |   |          |   |    | N=3      |   |   |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |     |    | SUBC 009 |     |     |                                                                                              |                                      |
|---------------------|----------|-----|-----|----------|----|-----|----------|-----|----|----------|-----|-----|----------------------------------------------------------------------------------------------|--------------------------------------|
| Hobsonia florida    | 0        | 0   | 1   | 1        | 3  | 2   | 1        | 0   | 4  | 1        | 2   | 0   | <  0.05 |                                      |
| Excel Rank          | 1        | 1   | 5   | 5        | 11 | 9   | 5        | 1   | 12 | 5        | 9   | 1   |  8      | Tabular Value                        |
| Matches             | 4        | 4   | 4   | 4        | 1  | 2   | 4        | 4   | 1  | 4        | 2   | 4   | T= 18.5                                                                                      |                                      |
| Wilcoxon Rank       | 2.5      | 2.5 | 6.5 | 6.5      | 11 | 9.5 | 6.5      | 2.5 | 12 | 6.5      | 9.5 | 2.5 | T'= 20.5                                                                                     |                                      |
|                     |          |     |     | T= 59.5  |    |     |          |     |    | T= 18.5  |     |     |                                                                                              |                                      |
|                     |          |     |     | N=9      |    |     |          |     |    | N=3      |     |     |                                                                                              | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |   |     | SUBC 007 |    |   | SUBC 008 |   |    | SUBC 009 |   |   |          |
|---------------------|----------|---|-----|----------|----|---|----------|---|----|----------|---|---|----------|
| Nereis limnicola    | 0        | 1 | 2   | 7        | 9  | 3 | 4        | 6 | 16 | 2        | 1 | 1 | < 0.05   |
| Excel Rank          | 1        | 2 | 5   | 10       | 11 | 7 | 8        | 9 | 12 | 5        | 2 | 2 | 8        |
| Matches             | 1        | 3 | 2   | 1        | 1  | 1 | 1        | 1 | 1  | 2        | 3 | 3 | T= 11.5  |
| Wilcoxon Rank       | 1        | 3 | 5.5 | 10       | 11 | 7 | 8        | 9 | 12 | 5.5      | 3 | 3 | T'= 27.5 |
|                     |          |   |     | T= 66.5  |    |   |          |   |    | T= 11.5  |   |   |          |
|                     |          |   |     | N=9      |    |   |          |   |    | N=3      |   |   |          |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |   |   | SUBC 007 |    |    | SUBC 008 |   |   | SUBC 009 |   |   |        |
|---------------------|----------|---|---|----------|----|----|----------|---|---|----------|---|---|--------|
| Cumacea             | 0        | 0 | 0 | 0        | 3  | 12 | 0        | 0 | 0 | 2        | 0 | 0 | < 0.05 |
| Excel Rank          | 1        | 1 | 1 | 1        | 11 | 12 | 1        | 1 | 1 | 10       | 1 | 1 | 8      |
| Matches             | 9        | 9 | 9 | 9        | 1  | 1  | 9        | 9 | 9 | 1        | 9 | 9 | T= 20  |
| Wilcoxon Rank       | 5        | 5 | 5 | 5        | 11 | 12 | 5        | 5 | 5 | 10       | 5 | 5 | T'= 19 |
|                     |          |   |   | T= 58    |    |    |          |   |   | T= 20    |   |   |        |
|                     |          |   |   | N=9      |    |    |          |   |   | N=3      |   |   |        |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |    |    | SUBC 007 |     |     | SUBC 008 |     |     | SUBC 009 |     |     |          |
|---------------------|----------|----|----|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|
| Corbicula fluminea  | 0        | 2  | 4  | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | < 0.05   |
| Excel Rank          | 1        | 11 | 12 | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8        |
| Matches             | 10       | 1  | 1  | 10       | 10  | 10  | 10       | 10  | 10  | 10       | 10  | 10  | T= 16.5  |
| Wilcoxon Rank       | 5.5      | 11 | 12 | 5.5      | 5.5 | 5.5 | 5.5      | 5.5 | 5.5 | 5.5      | 5.5 | 5.5 | T'= 22.5 |
|                     |          |    |    | T= 61.5  |     |     |          |     |     | T= 16.5  |     |     |          |
|                     |          |    |    | N=9      |     |     |          |     |     | N=3      |     |     |          |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and SUBC 009 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |     | SUBC 008 |     |     | SUBC 009 |     |     |          |
|---------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|
| Macoma bathica      | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | < 0.05   |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 8        |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T= 19.5  |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'= 19.5 |
|                     |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     |          |
|                     |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |          |

Tabular Value

**Do Not Reject Null Hypothesis**

Table 19 SUBC 010 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Number of Animals/Sample**

| Station Designation      | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |    |     | SUBC 010 |     |     |                                                                                            |               |
|--------------------------|----------|-----|-----|----------|----|-----|----------|----|-----|----------|-----|-----|--------------------------------------------------------------------------------------------|---------------|
| Number of Animals/Sample | 247      | 309 | 370 | 69       | 71 | 103 | 231      | 53 | 121 | 491      | 198 | 532 | <  0.05 |               |
| Excel Rank               | 8        | 9   | 10  | 2        | 3  | 4   | 7        | 1  | 5   | 11       | 6   | 12  |  8      | Tabular Value |
| Matches                  | 1        | 1   | 1   | 1        | 1  | 1   | 1        | 1  | 1   | 1        | 1   | 1   | T= 29                                                                                      |               |
| Wilcoxon Rank            | 8        | 9   | 10  | 2        | 3  | 4   | 7        | 1  | 5   | 11       | 6   | 12  | T'= 10                                                                                     |               |
|                          |          |     |     | T= 49    |    |     |          |    |     | T= 29    |     |     | <b>Do Not Reject Null Hypothesis</b>                                                       |               |
|                          |          |     |     | N=9      |    |     |          |    |     | N=3      |     |     |                                                                                            |               |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Number of Species/Sample**

| Station Designation      | SUBC 006 |     |    | SUBC 007 |     |     | SUBC 008 |   |     | SUBC 010 |     |    |                                                                                            |               |
|--------------------------|----------|-----|----|----------|-----|-----|----------|---|-----|----------|-----|----|--------------------------------------------------------------------------------------------|---------------|
| Number of Species/Sample | 5        | 6   | 8  | 5        | 6   | 6   | 6        | 4 | 7   | 8        | 7   | 8  | <  0.05 |               |
| Excel Rank               | 2        | 4   | 10 | 2        | 4   | 4   | 4        | 1 | 8   | 10       | 8   | 10 |  8      | Tabular Value |
| Matches                  | 2        | 4   | 3  | 2        | 4   | 4   | 4        | 1 | 2   | 3        | 2   | 3  | T= 30.5                                                                                    |               |
| Wilcoxon Rank            | 2.5      | 5.5 | 11 | 2.5      | 5.5 | 5.5 | 5.5      | 1 | 8.5 | 11       | 8.5 | 11 | T'= 8.5                                                                                    |               |
|                          |          |     |    | T= 47.5  |     |     |          |   |     | T= 30.5  |     |    | <b>Do Not Reject Null Hypothesis</b>                                                       |               |
|                          |          |     |    | N=9      |     |     |          |   |     | N=3      |     |    |                                                                                            |               |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Dominant Species % of Sample**

| Station Designation          | SUBC 006 |      |      | SUBC 007 |      |      | SUBC 008 |    |      | SUBC 010 |      |      |                                                                                            |               |
|------------------------------|----------|------|------|----------|------|------|----------|----|------|----------|------|------|--------------------------------------------------------------------------------------------|---------------|
| Dominant Species % of Sample | 27.5     | 25.6 | 37.8 | 17.4     | 12.7 | 27.2 | 76.2     | 17 | 21.5 | 52.5     | 41.4 | 53.4 | <  0.05 |               |
| Excel Rank                   | 7        | 5    | 8    | 3        | 1    | 6    | 12       | 2  | 4    | 10       | 9    | 11   |  8      | Tabular Value |
| Matches                      | 1        | 1    | 1    | 1        | 1    | 1    | 1        | 1  | 1    | 1        | 1    | 1    | T= 30                                                                                      |               |
| Wilcoxon Rank                | 7        | 5    | 8    | 3        | 1    | 6    | 12       | 2  | 4    | 10       | 9    | 11   | T'= 9                                                                                      |               |
|                              |          |      |      | T= 48    |      |      |          |    |      | T= 30    |      |      | <b>Do Not Reject Null Hypothesis</b>                                                       |               |
|                              |          |      |      | N=9      |      |      |          |    |      | N=3      |      |      |                                                                                            |               |

*The dominant species may not be the same for every station*

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation      | SUBC 006 |    |     | SUBC 007 |     |    | SUBC 008 |     |    | SUBC 010 |    |     |                                                                                              |               |
|--------------------------|----------|----|-----|----------|-----|----|----------|-----|----|----------|----|-----|----------------------------------------------------------------------------------------------|---------------|
| Potamopyrgus antipodarum | 68       | 79 | 140 | 12       | 9   | 28 | 176      | 9   | 26 | 258      | 82 | 284 | <  0.05 |               |
| Excel Rank               | 6        | 7  | 9   | 3        | 1   | 5  | 10       | 1   | 4  | 11       | 8  | 12  |  8      | Tabular Value |
| Matches                  | 1        | 1  | 1   | 1        | 2   | 1  | 1        | 2   | 1  | 1        | 1  | 1   | T= 31                                                                                        |               |
| Wilcoxon Rank            | 6        | 7  | 9   | 3        | 1.5 | 5  | 10       | 1.5 | 4  | 11       | 8  | 12  | T'= 8                                                                                        |               |
|                          |          |    |     | T= 47    |     |    |          |     |    | T= 31    |    |     | <b>Reject Null Hypothesis</b>                                                                |               |
|                          |          |    |     | N=9      |     |    |          |     |    | N=3      |    |     |                                                                                              |               |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |    | SUBC 008 |     |    | SUBC 010 |    |   |                                                                                            |                                      |
|---------------------|----------|-----|-----|----------|-----|----|----------|-----|----|----------|----|---|--------------------------------------------------------------------------------------------|--------------------------------------|
| Oligochaeta         | 1        | 3   | 3   | 23       | 26  | 35 | 39       | 26  | 28 | 20       | 12 | 8 | <  0.05 |                                      |
| Excel Rank          | 1        | 2   | 2   | 7        | 8   | 11 | 12       | 8   | 10 | 6        | 5  | 4 |  8      | Tabular Value                        |
| Matches             | 1        | 2   | 2   | 1        | 2   | 1  | 1        | 2   | 1  | 1        | 1  | 1 | T= 15                                                                                      |                                      |
| Wilcoxon Rank       | 1        | 2.5 | 2.5 | 7        | 8.5 | 11 | 12       | 8.5 | 10 | 6        | 5  | 4 | T'= 24                                                                                     |                                      |
|                     |          |     |     | T= 63    |     |    |          |     |    | T= 15    |    |   |                                                                                            |                                      |
|                     |          |     |     | N=9      |     |    |          |     |    | N=3      |    |   |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation     | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |    |    | SUBC 010 |    |     |                                                                                            |                                      |
|-------------------------|----------|-----|-----|----------|----|----|----------|----|----|----------|----|-----|--------------------------------------------------------------------------------------------|--------------------------------------|
| Americorophium salmonis | 175      | 217 | 206 | 26       | 21 | 23 | 10       | 12 | 43 | 174      | 91 | 202 | <  0.05 |                                      |
| Excel Rank              | 9        | 12  | 11  | 5        | 3  | 4  | 1        | 2  | 6  | 8        | 7  | 10  |  8      | Tabular Value                        |
| Matches                 | 1        | 1   | 1   | 1        | 1  | 1  | 1        | 1  | 1  | 1        | 1  | 1   | T= 25                                                                                      |                                      |
| Wilcoxon Rank           | 9        | 12  | 11  | 5        | 3  | 4  | 1        | 2  | 6  | 8        | 7  | 10  | T'= 14                                                                                     |                                      |
|                         |          |     |     | T= 53    |    |    |          |    |    | T= 25    |    |     |                                                                                            |                                      |
|                         |          |     |     | N=9      |    |    |          |    |    | N=3      |    |     |                                                                                            | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation      | SUBC 006 |   |    | SUBC 007 |   |   | SUBC 008 |   |   | SUBC 010 |   |    |                                                                                            |                               |
|--------------------------|----------|---|----|----------|---|---|----------|---|---|----------|---|----|--------------------------------------------------------------------------------------------|-------------------------------|
| Eogammarus confervicolis | 1        | 7 | 13 | 0        | 0 | 0 | 0        | 0 | 2 | 31       | 9 | 24 | <  0.05 |                               |
| Excel Rank               | 6        | 8 | 10 | 1        | 1 | 1 | 1        | 1 | 7 | 12       | 9 | 11 |  8      | Tabular Value                 |
| Matches                  | 1        | 1 | 1  | 5        | 5 | 5 | 5        | 5 | 1 | 1        | 1 | 1  | T= 32                                                                                      |                               |
| Wilcoxon Rank            | 6        | 8 | 10 | 3        | 3 | 3 | 3        | 3 | 7 | 12       | 9 | 11 | T'= 7                                                                                      |                               |
|                          |          |   |    | T= 46    |   |   |          |   |   | T= 32    |   |    |                                                                                            |                               |
|                          |          |   |    | N=9      |   |   |          |   |   | N=3      |   |    |                                                                                            | <b>Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |     |    | SUBC 010 |     |     |                                                                                              |                                      |
|---------------------|----------|-----|-----|----------|----|-----|----------|-----|----|----------|-----|-----|----------------------------------------------------------------------------------------------|--------------------------------------|
| Hobsonia florida    | 0        | 0   | 1   | 1        | 3  | 2   | 1        | 0   | 4  | 2        | 0   | 1   | <  0.05 |                                      |
| Excel Rank          | 1        | 1   | 5   | 5        | 11 | 9   | 5        | 1   | 12 | 9        | 1   | 5   |  8      | Tabular Value                        |
| Matches             | 4        | 4   | 4   | 4        | 1  | 2   | 4        | 4   | 1  | 2        | 4   | 4   | T= 18.5                                                                                      |                                      |
| Wilcoxon Rank       | 2.5      | 2.5 | 6.5 | 6.5      | 11 | 9.5 | 6.5      | 2.5 | 12 | 9.5      | 2.5 | 6.5 | T'= 20.5                                                                                     |                                      |
|                     |          |     |     | T= 59.5  |    |     |          |     |    | T= 18.5  |     |     |                                                                                              |                                      |
|                     |          |     |     | N=9      |    |     |          |     |    | N=3      |     |     |                                                                                              | <b>Do Not Reject Null Hypothesis</b> |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |   |     | SUBC 007 |    |   | SUBC 008 |   |    | SUBC 010 |     |   |                                                                                       |      |
|---------------------|----------|---|-----|----------|----|---|----------|---|----|----------|-----|---|---------------------------------------------------------------------------------------|------|
| Nereis limnicola    | 0        | 1 | 2   | 7        | 9  | 3 | 4        | 6 | 16 | 4        | 2   | 5 | <  | 0.05 |
| Excel Rank          | 1        | 2 | 3   | 10       | 11 | 5 | 6        | 9 | 12 | 6        | 3   | 8 |    | 8    |
| Matches             | 1        | 1 | 2   | 1        | 1  | 1 | 2        | 1 | 1  | 2        | 2   | 1 | T=                                                                                    | 18   |
| Wilcoxon Rank       | 1        | 2 | 3.5 | 10       | 11 | 5 | 6.5      | 9 | 12 | 6.5      | 3.5 | 8 | T'=                                                                                   | 21   |
|                     |          |   |     | T= 60    |    |   |          |   |    | T= 18    |     |   | <b>Do Not Reject Null Hypothesis</b>                                                  |      |
|                     |          |   |     | N=9      |    |   |          |   |    | N=3      |     |   |                                                                                       |      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |     |     | SUBC 010 |     |     |                                                                                       |      |
|---------------------|----------|-----|-----|----------|----|----|----------|-----|-----|----------|-----|-----|---------------------------------------------------------------------------------------|------|
| Cumacea             | 0        | 0   | 0   | 0        | 3  | 12 | 0        | 0   | 0   | 0        | 0   | 0   | <  | 0.05 |
| Excel Rank          | 1        | 1   | 1   | 1        | 11 | 12 | 1        | 1   | 1   | 1        | 1   | 1   |    | 8    |
| Matches             | 10       | 10  | 10  | 10       | 1  | 1  | 10       | 10  | 10  | 10       | 10  | 10  | T=                                                                                    | 16.5 |
| Wilcoxon Rank       | 5.5      | 5.5 | 5.5 | 5.5      | 11 | 12 | 5.5      | 5.5 | 5.5 | 5.5      | 5.5 | 5.5 | T' =                                                                                  | 22.5 |
|                     |          |     |     | T= 61.5  |    |    |          |     |     | T= 16.5  |     |     | <b>Do Not Reject Null Hypothesis</b>                                                  |      |
|                     |          |     |     | N=9      |    |    |          |     |     | N=3      |     |     |                                                                                       |      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |      |    | SUBC 007 |   |   | SUBC 008 |   |   | SUBC 010 |   |      |                                                                                       |      |
|---------------------|----------|------|----|----------|---|---|----------|---|---|----------|---|------|---------------------------------------------------------------------------------------|------|
| Corbicula fluminea  | 0        | 2    | 4  | 0        | 0 | 0 | 0        | 0 | 0 | 0        | 0 | 2    | <  | 0.05 |
| Excel Rank          | 1        | 10   | 12 | 1        | 1 | 1 | 1        | 1 | 1 | 1        | 1 | 10   |    | 8    |
| Matches             | 9        | 2    | 1  | 9        | 9 | 9 | 9        | 9 | 9 | 9        | 9 | 2    | T= 20.5                                                                               |      |
| Wilcoxon Rank       | 5        | 10.5 | 12 | 5        | 5 | 5 | 5        | 5 | 5 | 5        | 5 | 10.5 | T'= 18.5                                                                              |      |
|                     |          |      |    | T= 57.5  |   |   |          |   |   | T= 20.5  |   |      | <b>Do Not Reject Null Hypothesis</b>                                                  |      |
|                     |          |      |    | N=9      |   |   |          |   |   | N=3      |   |      |                                                                                       |      |

**Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |     | SUBC 008 |     |     | SUBC 010 |     |     |                                                                                         |      |
|---------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------------------------------------------------------------------------------------|------|
| Macoma bathica      | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | <  | 0.05 |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   |    | 8    |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | T=                                                                                      | 19.5 |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | T'=                                                                                     | 19.5 |
|                     |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5  |     |     | <b>Do Not Reject Null Hypothesis</b>                                                    |      |
|                     |          |     |     | N=9      |     |     |          |     |     | N=3      |     |     |                                                                                         |      |

Table 20 Outfall 002 / Reference Condition Comparisons

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Number of Animals/Sample**

| Station Designation      | SUBC 006 |     |     | SUBC 007 |    |     | SUBC 008 |    |     | Outfall 002 |    |     |                                                                                       |      |               |
|--------------------------|----------|-----|-----|----------|----|-----|----------|----|-----|-------------|----|-----|---------------------------------------------------------------------------------------|------|---------------|
| Number of Animals/Sample | 247      | 309 | 370 | 69       | 71 | 103 | 231      | 53 | 121 | 809         | 84 | 287 | <  | 0.05 |               |
| Excel Rank               | 8        | 10  | 11  | 2        | 3  | 5   | 7        | 1  | 6   | 12          | 4  | 9   |    | 8    | Tabular Value |
| Matches                  | 1        | 1   | 1   | 1        | 1  | 1   | 1        | 1  | 1   | 1           | 1  | 1   | T=                                                                                    | 25   |               |
| Wilcoxon Rank            | 8        | 10  | 11  | 2        | 3  | 5   | 7        | 1  | 6   | 12          | 4  | 9   | T'=                                                                                   | 14   |               |
|                          |          |     |     | T= 53    |    |     |          |    |     | T= 25       |    |     | <b>Do Not Reject Null Hypothesis</b>                                                  |      |               |
|                          |          |     |     | N=9      |    |     |          |    |     | N=3         |    |     |                                                                                       |      |               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Number of Species/Sample**

| Station Designation      | SUBC 006 |   |    | SUBC 007 |   |   | SUBC 008 |   |      | Outfall 002 |   |   |                                                                                            |               |
|--------------------------|----------|---|----|----------|---|---|----------|---|------|-------------|---|---|--------------------------------------------------------------------------------------------|---------------|
| Number of Species/Sample | 5        | 6 | 8  | 5        | 6 | 6 | 6        | 4 | 7    | 7           | 5 | 6 | <  0.05 |               |
| Excel Rank               | 2        | 5 | 12 | 2        | 5 | 5 | 5        | 1 | 10   | 10          | 2 | 5 |  8      | Tabular Value |
| Matches                  | 3        | 5 | 1  | 3        | 5 | 5 | 5        | 1 | 2    | 2           | 3 | 5 | T= 20.5                                                                                    |               |
| Wilcoxon Rank            | 3        | 7 | 12 | 3        | 7 | 7 | 7        | 1 | 10.5 | 10.5        | 3 | 7 | T'= 18.5                                                                                   |               |
|                          |          |   |    | T= 57.5  |   |   |          |   |      | T= 20.5     |   |   | <b>Do Not Reject Null Hypothesis</b>                                                       |               |
|                          |          |   |    | N=9      |   |   |          |   |      | N=3         |   |   |                                                                                            |               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Dominant Species % of Sample**

| Station Designation          | SUBC 006 |      |      | SUBC 007 |      |      | SUBC 008 |    |      | Outfall 002 |    |    |                                                                                       |      |
|------------------------------|----------|------|------|----------|------|------|----------|----|------|-------------|----|----|---------------------------------------------------------------------------------------|------|
| Dominant Species % of Sample | 27.5     | 25.6 | 37.8 | 17.4     | 12.7 | 27.2 | 76.2     | 17 | 21.5 | 60          | 12 | 44 | <  | 0.05 |
| Excel Rank                   | 8        | 6    | 9    | 4        | 2    | 7    | 12       | 3  | 5    | 11          | 1  | 10 |    | 8    |
| Matches                      | 1        | 1    | 1    | 1        | 1    | 1    | 1        | 1  | 1    | 1           | 1  | 1  | T=                                                                                    | 22   |
| Wilcoxon Rank                | 8        | 6    | 9    | 4        | 2    | 7    | 12       | 3  | 5    | 11          | 1  | 10 | T'=                                                                                   | 17   |
|                              |          |      |      | T= 56    |      |      |          |    |      | T= 22       |    |    | Do Not Reject Null Hypothesis                                                         |      |
|                              |          |      |      | N=9      |      |      |          |    |      | N=3         |    |    |                                                                                       |      |

*The dominant species may not be the same for every station***Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation      | SUBC 006 |    |     | SUBC 007 |     |    | SUBC 008 |     |    | Outfall 002 |    |     |                                                                                         |                               |               |
|--------------------------|----------|----|-----|----------|-----|----|----------|-----|----|-------------|----|-----|-----------------------------------------------------------------------------------------|-------------------------------|---------------|
| Potamopyrgus antipodarum | 68       | 79 | 140 | 12       | 9   | 28 | 176      | 9   | 26 | 274         | 62 | 133 | <  | 0.05                          | Tabular Value |
| Excel Rank               | 7        | 8  | 10  | 3        | 1   | 5  | 11       | 1   | 4  | 12          | 6  | 9   |    | 8                             |               |
| Matches                  | 1        | 1  | 1   | 1        | 2   | 1  | 1        | 2   | 1  | 1           | 1  | 1   | T= 27                                                                                   |                               |               |
| Wilcoxon Rank            | 7        | 8  | 10  | 3        | 1.5 | 5  | 11       | 1.5 | 4  | 12          | 6  | 9   | T'= 12                                                                                  | Do Not Reject Null Hypothesis |               |
|                          |          |    |     | T= 51    |     |    |          |     |    | T= 27       |    |     |                                                                                         |                               |               |
|                          |          |    |     | N=9      |     |    |          |     |    | N=3         |    |     |                                                                                         |                               |               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |    | SUBC 008 |     |    | Outfall 002 |   |    |                                                                                       |      |               |
|---------------------|----------|-----|-----|----------|-----|----|----------|-----|----|-------------|---|----|---------------------------------------------------------------------------------------|------|---------------|
| Oligochaeta         | 1        | 3   | 3   | 23       | 26  | 35 | 39       | 26  | 28 | 20          | 9 | 14 | <  | 0.05 |               |
| Excel Rank          | 1        | 2   | 2   | 7        | 8   | 11 | 12       | 8   | 10 | 6           | 4 | 5  |    | 8    | Tabular Value |
| Matches             | 1        | 2   | 2   | 1        | 2   | 1  | 1        | 2   | 1  | 1           | 1 | 1  | T=                                                                                    | 15   |               |
| Wilcoxon Rank       | 1        | 2.5 | 2.5 | 7        | 8.5 | 11 | 12       | 8.5 | 10 | 6           | 4 | 5  | T'=                                                                                   | 24   |               |
|                     |          |     |     | T= 63    |     |    |          |     |    | T= 15       |   |    | <b>Do Not Reject Null Hypothesis</b>                                                  |      |               |
|                     |          |     |     | N=9      |     |    |          |     |    | N=3         |   |    |                                                                                       |      |               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation     | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |    |    | Outfall 002 |     |     |                                                                                       |      |                               |
|-------------------------|----------|-----|-----|----------|----|----|----------|----|----|-------------|-----|-----|---------------------------------------------------------------------------------------|------|-------------------------------|
| Americorophium salmonis | 175      | 217 | 206 | 26       | 21 | 23 | 10       | 12 | 43 | 484         | 10  | 126 | <  | 0.05 | Tabular Value                 |
| Excel Rank              | 9        | 11  | 10  | 6        | 4  | 5  | 1        | 3  | 7  | 12          | 1   | 8   |    | 8    |                               |
| Matches                 | 1        | 1   | 1   | 1        | 1  | 1  | 2        | 1  | 1  | 1           | 2   | 1   | T=                                                                                    | 21.5 |                               |
| Wilcoxon Rank           | 9        | 11  | 10  | 6        | 4  | 5  | 1.5      | 3  | 7  | 12          | 1.5 | 8   | T'=                                                                                   | 17.5 |                               |
|                         |          |     |     | T= 56.5  |    |    |          |    |    | T= 21.5     |     |     |                                                                                       |      | Do Not Reject Null Hypothesis |
|                         |          |     |     | N=9      |    |    |          |    |    | N=3         |     |     |                                                                                       |      |                               |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation      | SUBC 006 |    |    | SUBC 007 |   |   | SUBC 008 |   |   | Outfall 002 |   |   |                                                                                            |               |  |
|--------------------------|----------|----|----|----------|---|---|----------|---|---|-------------|---|---|--------------------------------------------------------------------------------------------|---------------|--|
| Eogammarus confervicolis | 1        | 7  | 13 | 0        | 0 | 0 | 0        | 0 | 2 | 15          | 0 | 0 | <  0.05 | Tabular Value |  |
| Excel Rank               | 8        | 10 | 11 | 1        | 1 | 1 | 1        | 1 | 9 | 12          | 1 | 1 |  8      |               |  |
| Matches                  | 1        | 1  | 1  | 7        | 7 | 7 | 7        | 7 | 1 | 1           | 7 | 7 | T= 20                                                                                      |               |  |
| Wilcoxon Rank            | 8        | 10 | 11 | 4        | 4 | 4 | 4        | 4 | 9 | 12          | 4 | 4 | T'= 19                                                                                     |               |  |
|                          |          |    |    | T= 58    |   |   |          |   |   | T= 20       |   |   | <b>Do Not Reject Null Hypothesis</b>                                                       |               |  |
|                          |          |    |    | N=9      |   |   |          |   |   | N=3         |   |   |                                                                                            |               |  |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |   |     | SUBC 007 |    |     | SUBC 008 |   |    | Outfall 002 |     |     |                                                                                         |      |
|---------------------|----------|---|-----|----------|----|-----|----------|---|----|-------------|-----|-----|-----------------------------------------------------------------------------------------|------|
| Hobsonia florida    | 0        | 0 | 1   | 1        | 3  | 2   | 1        | 0 | 4  | 7           | 1   | 2   | <  | 0.05 |
| Excel Rank          | 1        | 1 | 4   | 4        | 10 | 8   | 4        | 1 | 11 | 12          | 4   | 8   |    | 8    |
| Matches             | 3        | 3 | 4   | 4        | 1  | 2   | 4        | 3 | 1  | 1           | 4   | 2   | T=                                                                                      | 26   |
| Wilcoxon Rank       | 2        | 2 | 5.5 | 5.5      | 10 | 8.5 | 5.5      | 2 | 11 | 12          | 5.5 | 8.5 | T'=                                                                                     | 13   |
|                     |          |   |     | T= 52    |    |     |          |   |    | T= 26       |     |     | <b>Do Not Reject Null Hypothesis</b>                                                    |      |
|                     |          |   |     | N=9      |    |     |          |   |    | N=3         |     |     |                                                                                         |      |

**Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |   |     | SUBC 007 |    |   | SUBC 008 |   |    | Outfall 002 |     |    |        |
|---------------------|----------|---|-----|----------|----|---|----------|---|----|-------------|-----|----|--------|
| Nereis limnicola    | 0        | 1 | 2   | 7        | 9  | 3 | 4        | 6 | 16 | 7           | 2   | 10 | < 0.05 |
| Excel Rank          | 1        | 2 | 3   | 8        | 10 | 5 | 6        | 7 | 12 | 8           | 3   | 11 | 8      |
| Matches             | 1        | 1 | 2   | 2        | 1  | 1 | 1        | 1 | 1  | 2           | 2   | 1  | T= 23  |
| Wilcoxon Rank       | 1        | 2 | 3.5 | 8.5      | 10 | 5 | 6        | 7 | 12 | 8.5         | 3.5 | 11 | T'= 16 |
|                     |          |   |     | T= 55    |    |   |          |   |    | T= 23       |     |    |        |
|                     |          |   |     | N=9      |    |   |          |   |    | N=3         |     |    |        |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |    |    | SUBC 008 |     |     | Outfall 002 |     |     |          |
|---------------------|----------|-----|-----|----------|----|----|----------|-----|-----|-------------|-----|-----|----------|
| Cumacea             | 0        | 0   | 0   | 0        | 3  | 12 | 0        | 0   | 0   | 0           | 0   | 0   | < 0.05   |
| Excel Rank          | 1        | 1   | 1   | 1        | 11 | 12 | 1        | 1   | 1   | 1           | 1   | 1   | 8        |
| Matches             | 10       | 10  | 10  | 10       | 1  | 1  | 10       | 10  | 10  | 10          | 10  | 10  | T= 16.5  |
| Wilcoxon Rank       | 5.5      | 5.5 | 5.5 | 5.5      | 11 | 12 | 5.5      | 5.5 | 5.5 | 5.5         | 5.5 | 5.5 | T'= 22.5 |
|                     |          |     |     | T= 61.5  |    |    |          |     |     | T= 16.5     |     |     |          |
|                     |          |     |     | N=9      |    |    |          |     |     | N=3         |     |     |          |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |    |    | SUBC 007 |     |     | SUBC 008 |     |     | Outfall 002 |     |    |          |
|---------------------|----------|----|----|----------|-----|-----|----------|-----|-----|-------------|-----|----|----------|
| Corbicula fluminea  | 0        | 2  | 4  | 0        | 0   | 0   | 0        | 0   | 0   | 2           | 0   | 2  | < 0.05   |
| Excel Rank          | 1        | 9  | 12 | 1        | 1   | 1   | 1        | 1   | 1   | 9           | 1   | 9  | 8        |
| Matches             | 8        | 3  | 1  | 8        | 8   | 8   | 8        | 8   | 8   | 3           | 8   | 3  | T= 24.5  |
| Wilcoxon Rank       | 4.5      | 10 | 12 | 4.5      | 4.5 | 4.5 | 4.5      | 4.5 | 4.5 | 10          | 4.5 | 10 | T'= 14.5 |
|                     |          |    |    | T= 53.5  |     |     |          |     |     | T= 24.5     |     |    |          |
|                     |          |    |    | N=9      |     |     |          |     |     | N=3         |     |    |          |

Tabular Value

**Do Not Reject Null Hypothesis****Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated**

| Station Designation | SUBC 006 |     |     | SUBC 007 |     |     | SUBC 008 |     |     | Outfall 002 |     |     |          |
|---------------------|----------|-----|-----|----------|-----|-----|----------|-----|-----|-------------|-----|-----|----------|
| Macoma bathica      | 0        | 0   | 0   | 0        | 0   | 0   | 0        | 0   | 0   | 0           | 0   | 0   | < 0.05   |
| Excel Rank          | 1        | 1   | 1   | 1        | 1   | 1   | 1        | 1   | 1   | 1           | 1   | 1   | 8        |
| Matches             | 12       | 12  | 12  | 12       | 12  | 12  | 12       | 12  | 12  | 12          | 12  | 12  | T= 19.5  |
| Wilcoxon Rank       | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5      | 6.5 | 6.5 | 6.5         | 6.5 | 6.5 | T'= 19.5 |
|                     |          |     |     | T= 58.5  |     |     |          |     |     | T= 19.5     |     |     |          |
|                     |          |     |     | N=9      |     |     |          |     |     | N=3         |     |     |          |

Tabular Value

**Do Not Reject Null Hypothesis**