

Appendix E

Fish and Benthic Survey Results

Sorensen Engineering Ltd.

November 15, 2016

Strum Consulting conducted benthic invertebrate and fish surveys in the intertidal area near Oak Bay Hatchery in July 2015. The following are results from those studies.

Benthic Invertebrate Survey

Methodology

(from correspondence with Heather Mosher, environmental scientist with Strum Consulting)

Benthic invertebrate sampling was completed July 14 and 15, 2015, during the evening low tide. Three samples were taken along 30 m long transects parallel to the shore 500 m, 300 m, 200 m and 100 m away from the effluent outflow pipe (Drawing 1).

Samples were collected using a 10 cm in diameter corer inserted 10 cm in to the substrate. Samples were then passed through a 250 µm sieve and stored in a 10% buffered formalin solution for preservation until further identification.

Invertebrates were identified using the following sources for reference:

- Littoral and sublittoral marine invertebrates of Passamaquoddy Bay (Brinkhurst et al., 1975);
- A field guide to the Atlantic seashore (Gosner, 1978);
- Guide to identification of marine and estuarine invertebrates: Cape Hatteras to the Bay of Fundy (Gosner, 1971); and
- The polychaete worms: Definitions and keys to the orders, families and genera (Fauchald, 1977).

Results

Table 1 shows the sample populations collected from the transects which consisted of *Nereidae*, *Corophium sp.*, and *Mya arenaria*.

Table 1: Benthic Invertebrate Survey Results (Collected by Strum Consulting July 14-15, 2015)

	Transect A (500m)			Transect B (300m)			Transect C (200m)			Transect D (100m)		
Invertebrate	TA-1	TA-2	TA-3	TB-1	TB-2	TB-3	TC-1	TC-2	TC-3	TD-1	TD-2	TD-3
Nereidae	4	3	3	1	11*	1	3	9	5	4	5	19
Corophium sp.	28	1	32	0	2	7	4	2	3	3	19	2
Mya arenaria	6	7	4	1	2	8	4	3	1	4	5	0

* "6 really small"

Fish Survey

Methodology

(from correspondence with Heather Mosher, environmental scientist with Strum Consulting)

Fish sampling was done along the shore adjacent to the effluent outflow pipe during high tide on July 16, 2015. Methods of captured include a fyke net, minnow traps and beach seining. The fyke net and

minnow traps were set during the flood tide and checked during the ebb tide, once they were re-exposed. Beach seining was completed during high tide using the parallel set deployment method (Portt et al., 2006) with a 20 m beach seine, covering an area of 100 m². Five beach seine passes were completed at the locations marked on Drawing 2. Any fish species caught were measured for fork length (the distance from the tip of their nose to the fork in the tail) and sexed if possible.

Results

The results are shown in table 2 with locations shown in drawing 2. Mummichogs were the only species captured in the minnow traps and beach seines. The fyke net captured mummichog, Atlantic Silverside, and green crabs. One minnow trap and three beach seines were found empty. The water quality conditions at the time of the survey can be seen in table 3.

Table 2: Fish Survey Results (Collected by Strum Consulting July 16, 2015)

Method of Capture	Fish Species		Fork Length (cm)	Notes
	Common Name	Scientific Name		
Minnow Trap 1	Mummichog	<i>Fundulus heteroclitus</i>	8	
Minnow Trap 2	Mummichog	<i>Fundulus heteroclitus</i>	6	
Minnow Trap 2	Mummichog	<i>Fundulus heteroclitus</i>	6	
Minnow Trap 3	No species caught			
Beach Seine 1	No species caught			
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	6	
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	7	Breeding Male
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	6	
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	8	
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	8	Breeding Male
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	7	
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	8	
Beach Seine 2	Mummichog	<i>Fundulus heteroclitus</i>	8	
Beach Seine 3	No species caught			
Beach Seine 4	No species caught			
Beach Seine 5	No species caught			
Fyke Net	Atlantic Silverside	<i>Menidia menidia</i>	14	
Fyke Net	Atlantic Silverside	<i>Menidia menidia</i>	10	
Fyke Net	Mummichog	<i>Fundulus heteroclitus</i>	8	
Fyke Net	Green Crab	<i>Carcinus maenas</i>	W: 5 L: 4.5	Female
Fyke Net	Green Crab	<i>Carcinus maenas</i>	W: 5 L: 3-5	Male
Fyke Net	Green Crab	<i>Carcinus maenas</i>	W: 3.5 L: 4.5	Female
Fyke Net	Green Crab	<i>Carcinus maenas</i>	W: 5 L: 4.5	Male

Table 3: Water Quality Conditions (From Strum Consulting July 16, 2015)

Water Quality Conditions	
Temperature (°C)	17.8
DO (%)	143.2
DO (mg/L)	12.19
C	38425
TDS	30342
Salinity (ppt)	30.4
PH	7.4

References (provided by Strum Consulting)

- Brinkhurst, R.O., Linkletter, L.E., Lord, E.I., Connors, S.A., and Dadswell, M.J. 1975. A preliminary guide to the littoral and sublittoral marine invertebrates of Passamaquoddy Bay. Identification Centre, Biological Station and Huntsman Marine Laboratory, St. Andrews, N.B.
- Fauchald, K. 1977. The polychaete worms: Definitions and keys to the orders, families and genera. Natural History Museum of Los Angeles County: Los Angeles, CA (USA), Science Series.
- Gosner, K.L. 1979. A field guide to the Atlantic seashore: Invertebrates and seaweeds of the Atlantic Coast from the Bay of Fundy to Cape Hatteras; Text and Illustrations. Boston: Houghton Mifflin.
- Gosner, K.L. 1971. A guide to identification of marine and estuarine invertebrates: Cape Hatteras to the Bay of Fundy. Wiley-Interscience, John Wiley & Sons, Ltd.
- Portt, C.B., Coker, G.A., Ming, D.L., and Randall, R.G. 2006. A review of fish sampling methods commonly used in Canadian freshwater habitats. Cant. Tech. Rep. Fish. Aquat. Sci. 2604 p.



Notes:

1. Reference: New Brunswick Digital Topographic Mapping, GeoGratis Digital NTS Map 21G03.
2. Projection: NAD83(CSRS), New Brunswick Stereographic
3. GPS Data Collected is Typically to +/-5m Accuracy.

Legend:

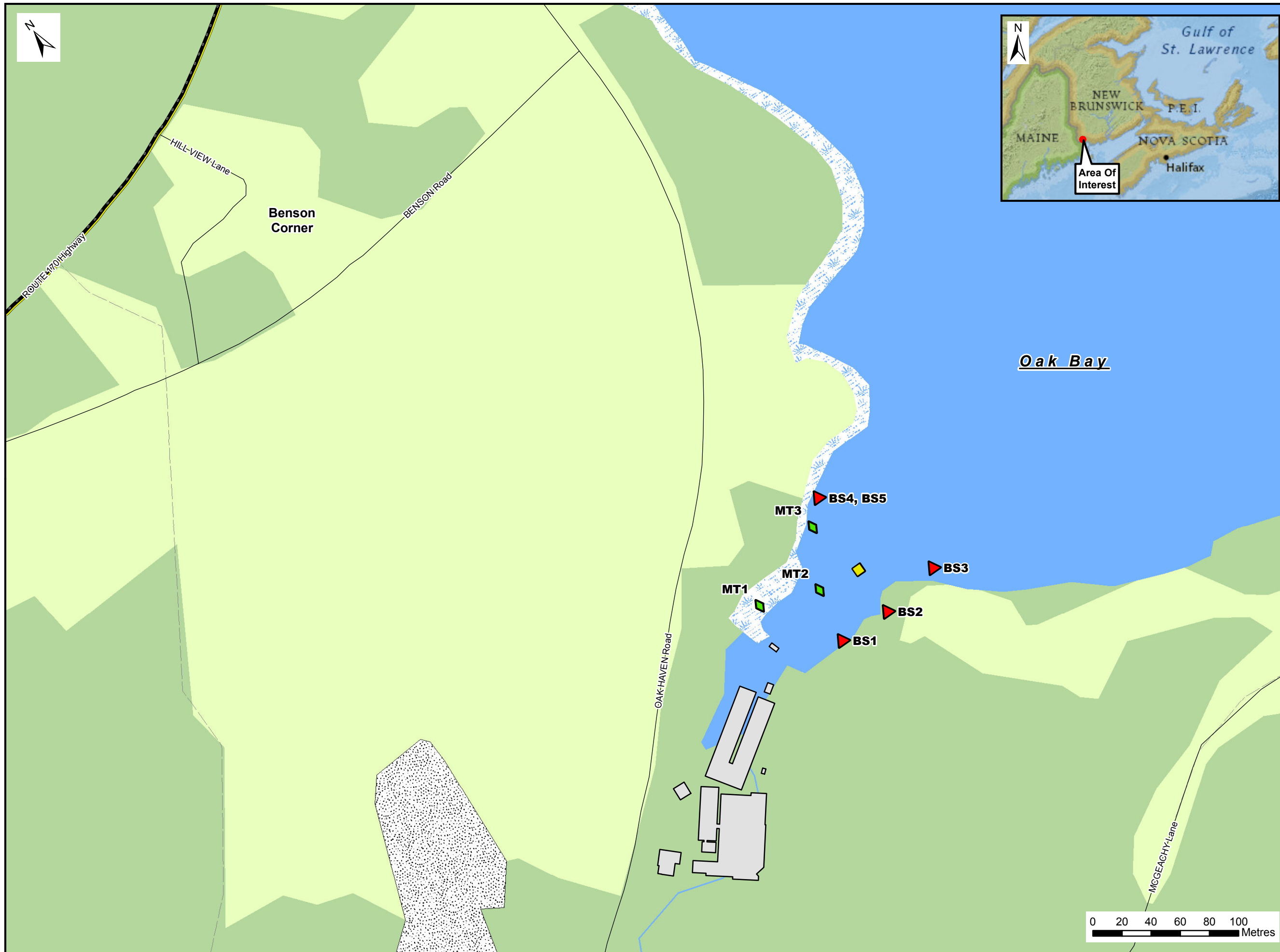
- Benthic Invertebrate Sample
- Adjacent Properties
- Project Site Boundaries
- Major Roads and Highways
- Public Roads
- Limited Use Road
- Trail / Access Road
- ▶▶▶ Watercourse
- Building
- Quarry
- Provincial Park
- Provincial Significant Wetland
- General Wetland
- Water Bodies

Benthic Invertebrate Sampling Locations



Engineering * Surveying * Environmental
Bedford * Antigonish * Moncton * Deer Lake

Date: October 2016	Project #: 15-5278
Scale: 1:8000	1
Drawn By: H. Serhan	
Checked By: H. Mosher	



Notes:

1. Reference: New Brunswick Digital Topographic Mapping, GeoGratis Digital NTS Map 21G03.
2. Projection: NAD83(CSRS), New Brunswick Stereographic
3. GPS Data Collected is Typically to +/-5m Accuracy.

Legend:

Fish Sampling Locations (Type)

- Beach Seine
- Fyke Net
- Minnow Trap
- Major Roads and Highways
- Public Roads
- Limited Use Road
- Trail / Access Road
- Watercourse
- Building
- Quarry
- Provincial Park
- Provincial Significant Wetland
- General Wetland
- Water Bodies

Fish Sampling Locations



Engineering * Surveying * Environmental
Bedford * Antigonish * Moncton * Deer Lake

Date:	Project #:
October 2016	15-5278

Scale:	Drawing #:
1:8000	2

Drawn By:
H. Serhan

Checked By:
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