

APPENDIX F

# Benthic Habitat Assessment



**Stantec**

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January 12, 2012  
File: 121614003

Jim Wooder, Sydney Ports Corp.  
10 Marine Drive  
Edwardsville, NS  
B2A 4S6

**Attention: Mr. James Wooder**

Dear Mr. Wooder:

**Reference: Benthic Habitat Survey for PEV Wharf Approach Deepening Project**

On behalf of Provincial Energy Ventures (PEV), Stantec Consulting Ltd. (Stantec) was contracted to conduct a benthic habitat assessment within the two areas proposed to be affected by PEV Berth Dredge Project activities: the main dredge area in Sydney Harbour (*i.e.*, Wharf Approach) and Blast Furnace Cove (see Figure 1), Nova Scotia.

PEV is proposing to deepen the approach to the PEV wharf facility at the former Sydney Steel Corporation docks. Their proposal includes the removal of bottom sediments to -16.5 m elevation in a 350,000 m<sup>2</sup> area. All dredged sediment will be disposed within a newly constructed Confined Disposal Facility (CDF) in Blast Furnace Cove on the PEV leased property. This work is scheduled to take place in 2012.

### **Benthic Transects and Survey Methods**

Video benthic surveys were contracted by CBCL Limited (CBCL) to be completed in the main dredge area of the Wharf Approach and in Blast Furnace Cove to characterize the benthic environment in each area. Stantec was contracted by CBCL to complete the review of the video survey results. A total of 14 video transects were completed to assess the benthic habitat in the Project area (Figure 1). Within the main dredge area, nine video transects were completed (T-1 – T-9). Six of these transects were set East to West (T-1 – T-6), while three ran North to South (T-7 – T-9). An additional five transects (T-10 – T-14) were assessed within Blast Furnace Cove. One transect was assessed from South to North (T-11) while all other Blast Furnace Cove transects ran East to West (T-10 and T-12 – T-14). The geographic coordinates for the start and end of each transect line are provided in Table 1.

The video surveys were completed in both the main dredge area and Blast Furnace Cove using a Remotely Operated Vehicle (RoV). A Stantec aquatic specialist reviewed the videos after they were taken. The RoV was operated from a small vessel to which it was attached via an umbilical communications cable. Within the main dredge area, depth, substrate and visibility conditions prevented the use of weighted transect lines for video surveying. As such, the RoV operator used GPS and visual landmarks to follow the transect line path. The conditions within Blast Furnace Cove allowed the use of physical transect lines, marked at 25 m intervals. In some areas of the Cove, the weighted transect lines sunk into deep silt, obscuring the 25 m markers. Additional limitations in video interpretation were realized when the videos were reviewed by Stantec, as discussed in the following section.

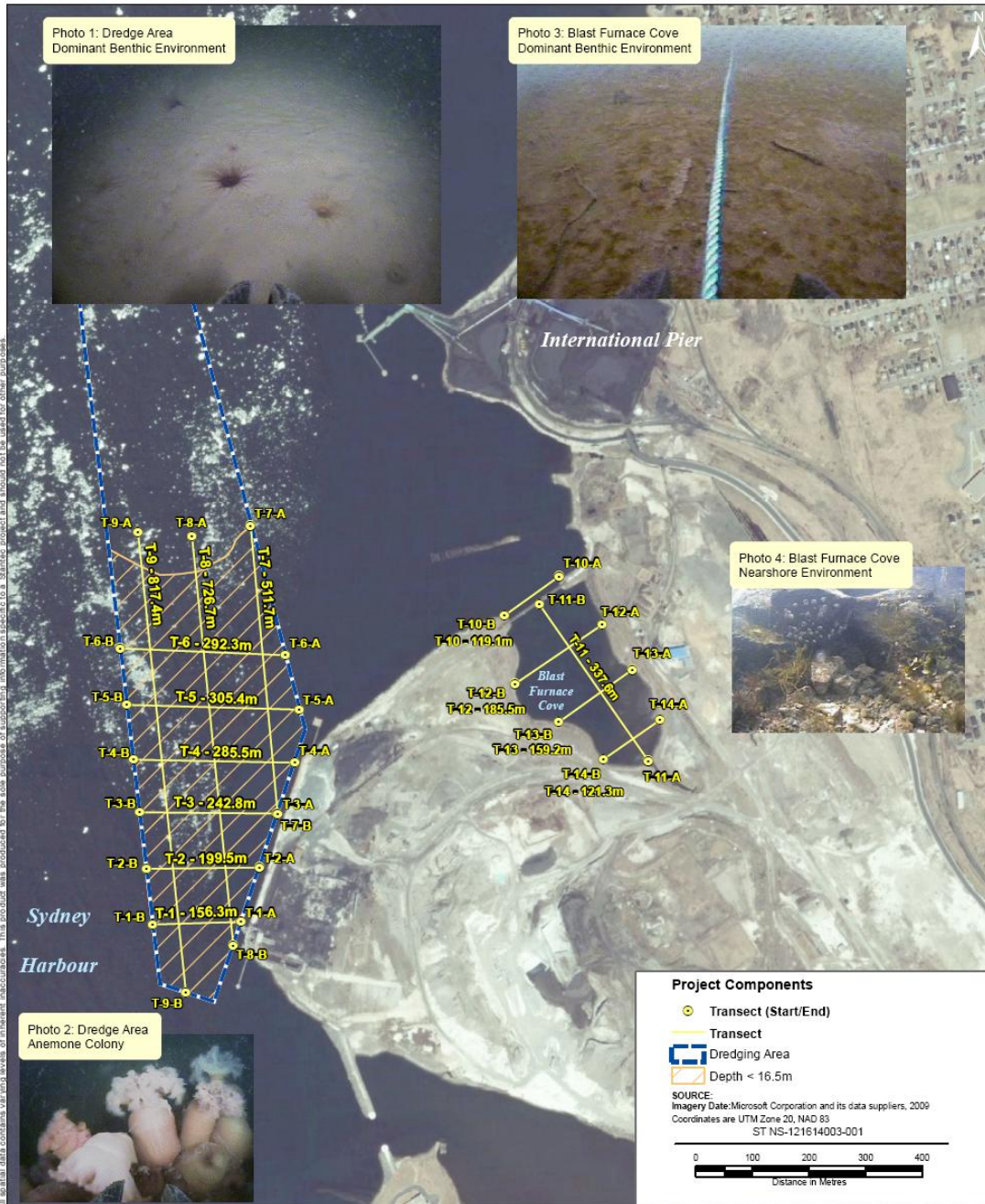
Reference: Benthic Habitat Survey for PEV Berth Dredging Project

**Table 1 Summary of Geographic Coordinates for Benthic Video Survey Transect Lines**

Area	Transect ID	NSD 83 UTM Zone 20N		Position on Transect
		Easting	Northing	
Main Dredge Area	T-1-A	715710	5115000	Start
	T-1-B	715554	5114995	End
	T-2-A	715743	5115096	Start
	T-2-B	715544	5115094	End
	T-3-A	715774	5115191	Start
	T-3-B	715531	5115194	End
	T-4-A	715806	5115281	Start
	T-4-B	715521	5115286	End
	T-5-A	715814	5115375	Start
	T-5-B	715509	5115384	End
	T-6-A	715789	5115471	Start
	T-6-B	715497	5115483	End
	T-7-A	715727	5115700	Start
	T-7-B	715776	5115190	End
	T-8-A	715624	5115681	Start
	T-8-B	715697	5114958	End
	T-9-A	715528	5115688	Start
	T-9-B	715613	5114875	End
Blast Furnace Cove	T-10-A	716273	5115610	Start
	T-10-B	716176	5115541	End
	T-11-A	716431	5115284	Start
	T-11-B	716238	5115561	End
	T-12-A	716349	5115525	Start
	T-12-B	716195	5115421	End
	T-13-A	716402	5115445	Start
	T-13-B	716272	5115353	End
	T-14-A	716451	5115356	Start
	T-14-B	716352	5115287	End

Reference: Benthic Habitat Survey for PEV Berth Dredging Project

Figure1 Benthic Survey Transect Locations



PREPARED BY: M. Huskins-Shupe	PEV BERTH DREDGING PROJECT  <b>Benthic Survey Transect Locations</b>	FIGURE NO.: 1
REVIEWED BY: C. Shupe		DATE: Jan 05, 2012
CLIENT: PEV		

**Reference: Benthic Habitat Survey for PEV Berth Dredging Project**

The video survey for each transect was reviewed in the Dartmouth, NS Stantec office by an aquatic specialist. Three categories of data were collected from the video surveys and used to characterize the benthic environment within the dredge area and within Blast Furnace Cove: substrate type, macrofaunal life and macrofloral life. Upon review of the videos, several interpretation limitations were identified:

- short range of visibility within the dredge area (e.g., < 2 m frequently)
- lack of weighted transect lines within the dredge area
- variable video quality on some transects in the dredge area (e.g., visual interference from static lines)
- deep silt cover in Blast Furnace Cove buried portions of the weighted transect line and 25 m transect markers not always visible
- variable video quality on some transects in Blast Furnace Cove (e.g., T-12 and T-13)
- lack of consistent depth data associated with video surveys in both Project Areas

Given the limitations identified above, the following methods were applied when reviewing substrate type, macrofaunal and macrofloral life using the RoV video surveys collected in the dredge area and Blast Furnace Cove.

The distribution of substrate types was estimated as a percentage overall within 5 minute intervals for each transect within the dredge area. The distribution of substrate types in Blast Furnace Cove was assessed every 2 minutes or 25 m, depending on the visibility of transect distance markers. The following substrate classifications were used:

- Bedrock
- Boulder (>25 cm)
- Rubble (14-25 cm)
- Cobble (3-13 cm)
- Gravel (2-3 cm)
- Sandy silt
- Clay
- Organic
- Shell hash (fragments or whole shells of deceased organisms)

Macrofauna and macroflora were identified to the lowest possible taxonomic level. The limited range of visibility and variable video quality resulted in algae being identified to the level of red, green or brown in most instances. Species-level identification of fish could not be made with confidence. Multiple invertebrates were identified to genus level and occasionally to species level. The abundance of macrofauna distribution was classified based upon four categories (assessed every 5 minutes within the main dredge area and every 2 minutes (or 25 m, when visible) within Blast Furnace Cove):

- A = Abundant, Numerous (not quantifiable) observations made throughout the entire section
- C = Common, Numerous (not quantifiable) observations made intermittently along the section
- O = Occasional, Quantifiable observations made intermittently along the section
- U = Uncommon, Quantifiable observations made infrequently along the section

**Reference: Benthic Habitat Survey for PEV Berth Dredging Project**

Macroflora abundance was estimated as a percentage of substrate covered in each 5 minute interval per transect within the dredge area. Within Blast Furnace Cove, abundance was estimated based on macroflora cover every 25 m or 2 min., depending on visibility of the transect distance markers.

**Results**

Detailed results of the video survey observations are included in the attached Appendix A.

*Main Dredge Area*

The benthic environment within the main dredge area was found to be homogenous and can be characterized as a sandy-silt substrate supporting sparse macrofauna and macroflora (Photo 1, Figure 1). The occasional solitary hard surface offered by either debris or rock punctuated the barrenness with small clusters of improved diversity. The near shore area offered the greatest abundance of hard substrate material.

The benthic environment in the dredge area supported sparse cover from macroflora. Red and brown (including *Laminaria sp.* and *Fucus sp.*) algae were observed intermittently along most transects when a rock or hard debris were present on top of the silty-sand substrate. However, the cover provided by the algae was typically less than 1% within a five minute assessment window of a transect. Green algae were observed very rarely in the benthic surveys, and also supported less than 1% cover within an assessment window when present. All algae types were more commonly observed in the near shore area than in the deeper waters of the dredge area.

The macrofaunal community observed in the benthic environment included two anemone species, the Northern cerianthid (*Cerianthus borealis*) and the frilled anemone (*Metridium senile*). Northern cerianthid were observed more frequently, but their distribution was limited to a ranking of occasional throughout most of the transects. In a few areas they became common. The frilled anemones were typically uncommon, usually appearing as a single entity on a solitary rock or piece of debris. A colony of frilled anemones (e.g., Photo 2, Figure 1) was observed only a few times within the entire video survey area and was associated with hard debris when present.

The sandy-silt substrate of the main dredge area also supported infrequent observations of starfish, crab, slime worms (*Myxicola infundibulum*) and sand dollars (*Echinarachnius parma*). The starfish are anticipated to be Northern (common) sea star (*Asterias vulgaris*), while the crab are likely rock crab (*Cancer irroratus*). These invertebrates exhibited a distribution ranking of uncommon throughout the survey area. A variety of fish species were also observed at a ranking of uncommon distribution in the dredge area. Both pelagic and bottom-dwelling species were observed; however, species-level identification could not be made with confidence given the limitations described above. Instead, a list of potential fish species was compiled based on the fish observed in the available video for the dredge area.

- Pelagic species
  - Atlantic silverside (*Menidia menidia*)
  - Rock gunnel (*Pholis gunnelis*)
  - Cunner (sea perch) (*Tautoglabrus adspersus*)
  - Hake sp. (*Urophycis sp.*)



**Reference: Benthic Habitat Survey for PEV Berth Dredging Project**

- Bottom-dwelling species
  - Flatfish sp. (e.g., flounder)
  
  - Non-flatfish species (e.g., potentially sculpin)

Using available bathymetric mapping for the region, depths in the dredge area were estimated to range from approximately 35 m at the south (nearshore) end of transects T-7 to T-9, to 50 m at the north (offshore) end of the three transects. There appears to be a narrow area of shallower water along the nearshore area in the videos (e.g., likely less than 5 m); however, detailed shoreline depth information is not available. The transects running east to west (T-1 to T-6) were spread along the 35 – 50 m depth gradient from nearshore (T-1) to offshore (T-6).

*Blast Furnace Cove*

There are two differing types of benthic environments within Blast Furnace Cove: the nearshore environment and the central Cove environment. The nearshore environment encompasses a rocky embankment that extends approximately 20 - 25 m into the Cove around its full perimeter. The remainder of Blast Furnace Cove is referred to as the central Cove area, which dominates the benthic environment.

The nearshore environment is characterized by a shoreline embankment comprised of gravel, cobble and rocky debris which is sometimes silt-covered and sometimes clear. It is anticipated that the rocky shoreline is the result of anthropogenic activities in Blast Furnace Cove. When the hard, rocky substrate is clear of silt-cover, it supports moderate macroflora diversity. Red, green and brown (including *Laminaria sp.* and *Fucus sp.*) algae were observed in the shallow waters of the shoreline, covering up to 100% of the substrate in some areas. However, the macrofauna community remained sparse with few or no organisms being observed within the nearshore area of each transect. Snails were observed occasionally (likely periwinkle, *Littorina sp.*). Frilled anemones were also present, but uncommon. Calcareous sponges were observed in some areas of the rocky near shore environment, but were uncommon.

Within the central Cove area, the substrate is predominantly sandy with a few areas of sufficient silt cover along each transect to bury the weighted transect line. Macrofauna and macroflora were sparse at the time of the survey. Red, green and brown (*Laminaria sp.* and *Fucus sp.*) algae were observed on the intermittent rock and debris pieces found on the sand. Combined, the three algae groups could provide up to 100% cover on an individual rock but within a two minute assessment window of the video, algae cover would represent less than 1% overall cover.

Empty shells (i.e., shell hash) were observed intermittently throughout the central Cove area, as were shrimp and snails (likely periwinkle). Shrimp were not able to be identified to species level using the available video. The abundance of shrimp increased to common along T-12 and snails became abundant along T-14. At the southern end of the Cove, in the vicinity of the brook input (i.e., T-11-A, Figure 1), dense clusters of bivalves were observed. The bivalves were primarily clams, but included some mussels as well. Murky water conditions during the T-11 transect survey prevented species-level identification of the bivalves. A small number of jellyfish, or potentially sea gooseberries (*Pleurobrachia pileus*), were observed along the southern half of transect T-11. A single crab was observed in each of transects T-10, T-12, T-13 and T-14. Frilled anemone and Northern cerianthid were present but uncommon. Bottom-dwelling flat fish were observed occasionally along transect T-10, the outermost transect in the Blast Furnace Cove surveys. Barnacles (*Balanus balanoides*) were also observed on some hard surfaces in T-10 and T-11.

**Reference: Benthic Habitat Survey for PEV Berth Dredging Project**

A review of available bathymetric mapping confirmed that the nearshore environment of Blast Furnace Cove is less than 1 m deep. Depth within the central Cove area ranges from 1- 5 m in the southeast end and from 5 – 8 m in the northwest end. The video surveys confirmed that the Cove is consistently relatively flat-bottomed, lacking the deep hole that was suggested by some bathymetric maps.

*Summary*

Blast Furnace Cove offers an environment different from that of the main dredge area in the form of a rocky embankment around its perimeter, increased protection from ocean currents, and shallower water that allows greater light penetration. Despite these differences, both Project areas support only sparse macrofauna overall at the time of the video surveying. Macroflora abundance increased to moderate cover in the near shore area of the Blast Furnace Cove but remained similarly sparse in the central Cove area as observed in the much deeper main dredge area. Both areas are dominated by silty-sand substrate and lack good juvenile and adult lobster habitat.

**Closure**

We trust that this letter report provides you with sufficient information to characterize the benthic habitat for PEV Wharf Approach Deepening Project in Sydney Harbour. Should you have any questions or wish to discuss any of the above, please do not hesitate to contact me.

Sincerely,

**STANTEC CONSULTING LTD.**

***ORIGINAL SIGNED BY***

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Attachments: Figure 1  
Appendix A



## **APPENDIX A**

### **Video Transect Survey Assessment Results**

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project - Main Dredge Area	
Transect ID: T-1		Begin WP ID: A		End WP ID: B	
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
29 - 35 min	sandy-silt: 95% gravel/cobble: 3% rubble: 2%	crab (U) frilled anemone (U) Northern cerianthid (U) fish-pelagic (U)	None visible	rocky substrate appears in patches; fish are small-bodied	
35 - 40 min	sandy-silt: 100%	crab (U) frilled anemone (U) Northern cerianthid (U) starfish (U) fish-pelagic (U)	green algae (<1%) - solitary plant brown algae (<1%)	shallow layer of oxygenated silt, then can see darker anoxic layer	
40 - 45 min	sandy-silt: 99% shell hash: 1%	Northern cerianthid (C) starfish (U) fish-hake sp. (U)	brown or red algae (<1%) dead algae ( <i>Laminaria</i> sp.)	woody debris	
45 - 50 min	sandy-silt: 100%	Northern cerianthid (O) fish-pelagic (U)	None visible	fish are small-bodied; a single frilled anemone observed just outside transect assessment area	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-2		Begin WP ID: A		End WP ID: B	MAIN DREDGE AREA
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 5 min	sandy-silt: 100%	frilled anemone (U) Northern cerianthid (U) starfish (U) crab (U)	None visible		
5 - 10 min	sandy-silt: 100%	Northern cerianthid (O) frilled anemone (U)	None visible		
10 - 15 min	sandy-silt: 100%	Northern cerianthid (O) fish-pelagic (U)	None visible	pelagic fish observed were small-bodied	
15-20 min	sandy-silt: 100%	Northern cerianthid (O) fish-pelagic (U) fish-bottom dwelling (U) crab (U)	None visible		
20 - 25 min	sandy-silt: 100%	Northern cerianthid (O) fish-pelagic (U) fish-bottom dwelling (U)	None visible	solitary piece of garbage observed	
25 - 29 min	sandy-silt: 100%	Northern cerianthid (O) frilled anemone (U) fish-pelagic (U)	None visible		

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-3		Begin WP ID: A		End WP ID: B	
		MAIN DREDGE AREA			
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0:28 - 0:32	sandy-silt: 90% gravel/cobble: 9% shell hash: 1%	frilled anenome (U) Northern cerianthid (U)	None visible	gravel/cobble occurs in patches on top of silty-sand; garbage and debris observed	
0:32 - 0:37	sandy-silt: 100%	frilled anenome (U) Northern cerianthid (O) starfish (U) crab (U) fish-pelagic (U)	None visible	debris observed	
0:37 - 0:42	sandy-silt: 100%	Northern cerianthid (U) starfish (U) fish-bottom dwelling (U)	red algae: <1%	garbage observed; poor visibility	
0:42 - 0:47	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U)	None visible		
0:47 - 0:52	sandy-silt: 99% shell hash: 1%	Northern cerianthid (O) crab (U) fish-bottom dwelling (U)	None visible		
0:52	sandy-silt: 100%	frilled anenome (U) Northern cerianthid (U) starfish (U) fish-bottom dwelling (U)	None visible		

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-4		Begin WP ID: A		End WP ID: B	
MAIN DREDGE AREA					
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 5 min	sandy-silt: 95% gravel/cobble: 5%	frilled anenome (U) Northern cerianthid (O)	None visible	poor visibility	
5 - 10 min	sandy-silt: 95% gravel/cobble: 4% shell hash: 1%	Northern cerianthid (U) crab (U) starfish (U)	None visible	poor visibility	
10 - 15 min	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U)	None visible	poor visibility	
15 - 20 min	sandy-silt: 100%	Northern cerianthid (O) starfish (U) crab (U)	None visible	poor visibility	
20 - 27 min	sandy-silt: 100%	Northern cerianthid (U) starfish (U) fish-bottom dwelling (U)	None visible	poor visibility; garbage observed	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-5		Begin WP ID: A		End WP ID: B	MAIN DREDGE AREA
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 5 min	sandy-silt: 100% shell hash: <1%	frilled anenome (O) Northern cerianthid (O) slime worm (U) fish-pelagic (U)	red algae: <1% dead algae	2 DVDs of this transect provided: 1st DVD starts ~10 seconds earlier and shows slime worms but ends prematurely. 2nd DVD plays full transect survey, minus the first 10 seconds, so is missing the slime worm observation.	
5 - 10 min	sandy-silt: 100%	frilled anenome (U) Northern cerianthid (U)	None visible		
10 - 15 min	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U) fish-bottom dwelling (U)	dead algae	pelagic fish are small-bodied; bottom dwelling fish are flatfish	
15 - 20 min	sandy-silt: 100%	frilled anenome (U) Northern cerianthid (U) starfish (U) crab (U) fish-pelagic (U) fish-bottom dwelling (U)	None visible	bottom dwelling fish observed are both flat-fish and non-flatfish species. Debris present. RoV wanders above substrate in some areas, making benthic environment difficult to assess.	
20 - 25 min	sandy-silt: 100% shell hash: <1%	Northern cerianthid (U) starfish (U) crab (U) fish-bottom dwelling (O)	dead algae	bottom dwelling fish are flatfish; pelagic fish are small-bodied. RoV wanders above substrate in some areas, making benthic environment difficult to assess.	
25 - 29 min	sandy-silt: 100%	Northern cerianthid (U) sand dollar (U) fish-pelagic (U) fish-bottom dwelling (U)	None visible	pelagic fish are small-bodied; bottom dwelling fish are flatfish and non-flatfish	



Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-6		Begin WP ID: A		End WP ID: B	MAIN DREDGE AREA
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 5 min	sandy-silt: 100%	frilled anenome (U) Northern cerianthid (O) crab (U) fish-bottom dwelling (U)	dead laminaria	woody debris	
5 - 10 min	sandy-silt: 100%	Northern cerianthid (U) starfish (U)	None visible		
10 - 15 min	sandy-silt: 100%	Northern cerianthid (U) starfish (U) crab (U) sand dollar (U) fish-pelagic (U) fish-bottom dwelling (U)	brown algae ( <i>Laminaria</i> sp. and <i>Fucus</i> sp.): <1%  dead algae	Possible sand dollar (single organism) observed. ID not confirmed with available video.	
15 - 20 min	sandy-silt: 100%	Northern cerianthid (U) fish-bottom dwelling (U)	None visible		

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project			
Transect ID: T-7		Begin WP ID: A		End WP ID: B		MAIN DREDGE AREA	
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments			
0 - 5 min	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U)	None visible	fish are small- bodied			
5 - 10 min	sandy-silt: 100%	Northern cerianthid (O) fish-bottom dwelling (U)	None visible				
10 - 15 min	sandy-silt: 100%	Northern cerianthid (U)	None visible	very poor visibility (RoV too far from substrate)			
15 - 20 min	sandy-silt: 100%	Northern cerianthid (U) crab (U)	None visible				
20 - 25 min	sandy-silt: 100%	Northern cerianthid (U) crab (U) fish-pelagic (U)	None visible	fish are small- bodied			
25 - 30 min	sandy-silt: 100%	Northern cerianthid (O) crab (U) fish-pelagic (U) starfish (U)	brown algae: <1% (solitary plant)	fish are small- bodied			
30 - 35 min	sandy-silt: 100%	Northern cerianthid (U) frilled anemone (U)	None visible				
35 - 40 min	sandy-silt: 96% gravel: 2% cobble: 2%	Northern cerianthid (U) frilled anemone (U) starfish (U)	brown algae ( <i>Laminaria</i> sp.): <1%	debris			
40 - 45 min	sandy-silt: 90% gravel: 3% cobble: 5% rubble: 2%	Northern cerianthid (U) frilled anemone (U) crab (U) fish-bottom dwelling (U)	dead algae ( <i>Fucus</i> sp.)	debris (e.g., garbage off existing wharf area)			
45 - 50 min	sandy-silt: 98% gravel: 1% cobble: 1%	Northern cerianthid (U) frilled anemone (U) crab (U)	brown algae ( <i>Fucus</i> sp.): <1%				

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-8		Begin WP ID: A		End WP ID: B	MAIN DREDGE AREA
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 5 min	sandy-silt: 100%	Northern cerianthid (O) frilled anemone (U) starfish (U) fish-pelagic (U)	brown algae: <1%	garbage observed	
5 - 10 min	sandy-silt: 100%	Northern cerianthid (O) starfish (U) fish-pelagic (U)	brown algae: <1%		
10 - 15 min	sandy-silt: 99% shell hash: 1%	Northern cerianthid (U) frilled anemone (U) crab (U) fish-pelagic (U)	dead algae (brown)	garbage observed	
0 - 5 min	sandy-silt: 100%	Northern cerianthid (O) crab (U) fish-pelagic (U)	brown algae: <1%		
5 - 10 min	sandy-silt: 99% shell hash: 1%	starfish (U) fish-bottom dwelling (U) fish-pelagic (U)	None visible		
10 - 15 min	sandy-silt: 100%	Northern cerianthid (C)	None visible		
15 - 20 min	sandy-silt: 100%	Northern cerianthid (C) starfish (U)	None visible	light-coloured silt layer shallow over top of deeper black/anoxic silt layer	
20 - 25 min	sandy-silt: 100%	Northern cerianthid (O) crab (U) fish-pelagic (U)	dead algae		
25 - 30 min	sandy-silt: 100%	Northern cerianthid (C) frilled anemone (U) fish-pelagic (U)	dead algae		
35 - 40 min	sandy-silt: 100%	Northern cerianthid (C) frilled anemone (U) fish-bottom dwelling (U) fish-pelagic (U)	red algae: <1% dead algae	garbage observed; pelagic fish are small-bodied; unidentified bottom-dwelling fish	
40 - 45 min	sandy-silt: 100%	Northern cerianthid (C) frilled anemone (U)	red and brown algae mix: 5%	garbage observed	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-9		Begin WP ID: A		End WP ID: B	MAIN DREDGE AREA
Transect Time Stamp (min)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
37 - 42 min	sandy-silt: 100% shell hash: <1%	Northern cerianthid (O) starfish (U)	brown algae: <1%	Visibility very poor; repeated crashes of RoV into substrate	
42 - 47 min	sandy-silt: 100%	Northern cerianthid (O) fish-pelagic (U)	brown algae: <1% dead algae	Visibility very poor; repeated crashes of RoV into substrate. Fish are small-bodied.	
47 - 52 min	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U)	brown algae: <1%	Visibility very poor; repeated crashes of RoV into substrate	
52 - 53 min	sandy-silt: 100%	None visible	None visible	Video time stamp jumps at 10:53 and 11:35	
video timer jumps					
35 - 37 min (20 - 22 min)	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U) starfish (U)	brown or green algae: <1%	Switched to video player timer at 20:00 for record keeping. Potential transect line spotted in video at 20min50sec.	
video timer jumps					
22 - 27 min	sandy-silt: 100%	Northern cerianthid (U) fish-pelagic (U)	brown or red algae: <1% dead algae	very poor visibility	
27 - 32 min	sandy-silt: 100%	Northern cerianthid (U) starfish (U) rock crab (U) fish-pelagic (U)	brown algae: <1% dead algae	fish observed were small-bodied and one larger-bodied. Crab identified to species because of close proximity to camera. garbage observed	
32 - 37 min	sandy-silt: 100% shell hash: <1%	Northern cerianthid (U) starfish (U) crab (U) fish-bottom dwelling (U)	None visible	video jumped	
37 - 42 min	sandy-silt: 100%	Northern cerianthid (O)	red algae: <1%	Possible sand dollar (single organism) observed. ID not confirmed with available video. Garbage observed	
42 - 47 min	sandy-silt: 100%	Northern cerianthid (O)	None visible	very poor visibility (RoV moving quickly, either well above substrate or so close that it skims the substrate, stirring up silt)	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-10		Begin WP ID: B		End WP ID: A	
BLAST FURNACE COVE					
Transect Time Stamp (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 1:49 min (0 - 25 m)	sand: 70% gravel: 20% cobble: 5% rubble/boulder mix: 5%	frilled anemone (U) snails (O)	red algae: 50%	debris observed (concrete?)	
1:50 - 5:43 min (25 - 50 m)	sand: 75% gravel: 3% cobble: 18% boulder: 2% shell hash: 2%	Northern cerianthid (U) snails (U) fish-bottom dwelling (O) shrimp (O)	brown algae: 5% red algae: 10%	garbage observed; angular rock included substrate mix	
5:43 - 16:00 min	RoV snagged on bottom and had to be reversed to undo. Survey started again at 16:00 min.				
16:00 - 24:15 min (50 - 75 m)	sandy silt: 23% gravel: 15% rubble: 80% shell hash: 2%	Northern cerianthid (U) frilled anemone (U) barnacle (U) crab (U) calcareous sponge (U)	red algae: 80% green algae: 5% brown algae ( <i>Laminaria</i> sp. and <i>Fucus</i> sp.): 15%	lead line buried in silt; angular rock included in substrate mix	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project			
Transect ID: T-11		Begin WP ID: B		End WP ID: A		BLAST FURNACE COVE	
Transect Time Stamp (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments			
0 - 4:39 min (0 - 25 m)	sandy silt: 100% shell hash: <1%	Northern cerianthid (O) shrimp (O)	None visible	garbage observed; lead line buried in silt in sections			
4:39 - 7:47 (25 - 50 m)	sandy silt: 100% cobble: <1%	Northern cerianthid (U) shrimp (C )	None visible	garbage observed; lead line buried in silt in sections			
7:47 - 9:54 (50 - 75 m)	sandy silt: 98% gravel: 1% shell hash: 1%	Northern cerianthid (U) shrimp (C )	None visible	garbage observed			
9:54 - 11:30 min (75 - 100 m)	sandy silt: 100%	Northern cerianthid (U) shrimp (C )	None visible	fish are small-bodied; garbage observed			
11:30 - 13:49 min (100 - 125 m)	sandy silt: 98% cobble: 1% shell hash: 1%	Northern cerianthid (O) shrimp (O)	Red algae: 5%	water very murky: poor visibility RoV caught on lead-line for a while			
13:49 - 16:01 min (125 - 150 m)	sandy silt: 90% gravel: 5% cobble: 5%	Northern cerianthid (U) shrimp (O)	red algae: 5% green algae: 1% brown algae carpeting substrate: 60%	deeper water therefore poorer visibility; small drop-off observed.			
16:01 - 17:35 min (150 - 175 m)	sandy silt: 100%	Northern cerianthid (U) shrimp (O)	red algae: 1%				
17:35 - 18:37 min (175 - 200 m)	sandy silt: 100%	frilled anemone (U)	red algae: 1%	water gets deeper again (small drop-off observed); therefore water more murky and visibility poorer			
18:37 - 19:50 min (200+m)	sandy silt: 100%	Northern cerianthid (C ) jellyfish/sea gooseberry (U)	None visible	RoV operators re-set their transect line shortly past 200 m mark.			
21:14 - 23:57 min (200 - 225 m)	sandy silt: 100%	frilled anemone (U)	green algae: 1% red algae: 2%	concrete debris			
23:57 - 26:20 min (225 - 250 m)	sandy silt: 78% gravel: 20% cobble: 2%	snails (periwinkle) (A) clams (O)	brown algae ( <i>Laminaria</i> ): 1% green algae: 1%	garbage observed			
26:20 - 29:02 min (250 - 275 m)	sandy silt: 97% gravel: 2% shell hash: 1%	snails (periwinkle) (A) clams (O) jellyfish/sea gooseberry (U) barnacles (U) mussels (U)	None visible	water very murky: poor visibility RoV operator dictated depth: 2 feet			
29:02 - 31:40 min (275 - 300 m)	sandy silt: 45% gravel: 25% cobble: 20% shell hash: 10%	snails (periwinkle) (A) clams (A) jellyfish/sea gooseberry (U) barnacles (O)	red algae: 2% brown algae: 3% green carpeting algae: 75%	RoV approaches mouth of brook; woody debris; periwinkles and clams carpet substrate			
31:40 - 33:00 min (300+ m)	sandy silt: 60% gravel: 20% cobble: 10%	barnacles (C ) clams (C )	brown algae: 5%	RoV enters mouth of brook at end of transect; woody debris			



Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project					
Transect ID: T-12		Begin WP ID: B		End WP ID: A					
Transect Time Stamp (min:sec)		Substrate Type (% Coverage)		Macrofaunal Life (Estimated Abundance)		Macrofloral Life (Estimated % coverage)		Comments	
0 - 2:05 min (0 - 50 m)		gravel/cobble mix: 100% in first 25 m down embankment silty-sand: 100% along flat bottom of second 25 m		calcareous sponge (U)		None visible		garbage observed; transect markers unclear following the first 25 and 50 m markers; silt layer over rocky substrate; video is choppy	
2:05 - 6:12 min		silty sand: 100%		Northern cerianthid (U) frilled anemone (U) shrimp (C )		brown algae ( <i>Fucus</i> sp.): <1%		garbage observed; lead line buried in silt; video is choppy	
6:12 - 10:36 min		silty sand: 98% rubble: 1% (solitary piece) shell hash: 1%		shrimp (C ) crab (U)		dead algae red algae (silt-covered): <1%		garbage observed; video is choppy	
10:36 - 12:37 min		silty sand: 75% gravel/cobble mix with shell hash: 25% (on top of silty sand substrate)		frilled anemone (U) shrimp (C )		red algae (silt-covered): 10%		leaf litter; woody debris; video is choppy	
12:37 - 13:30 min		gravel: 80% cobble: 20%		snails (O)		brown algae: 55% green algae: 5%		no silt layer over rocky substrate; video is very choppy	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project					
Transect ID: T-13		Begin WP ID: B		End WP ID: A					
Transect Time Stamp (min:sec)		Substrate Type (% Coverage)		Macrofaunal Life (Estimated Abundance)		Macrofloral Life (Estimated % coverage)		Comments	
1:37 - 2:34 min (0 - 25 m)		sandy silt: 5% gravel: 75% cobble: 20%		crab (U)		green algae: <1%		clean rock, not covered by silt	
2:34 - 4:40 min (25 - 50 m)		sandy silt: 95% gravel: 5%		shrimp (U)		red algae: <1%		garbage	
4:40 - 6:08 min 50 - 75 m		sandy silt: 100%		frilled anemone (U) shrimp (O)		algal mat (red?) in patches covering bottom: 60%			
6:10 - 7:49 min (75 - 100 m)		sandy silt: 100%		Northern cerianthid (U) shrimp (O)		red algae: <1% green algae: <1% dead algae			
7:49 - 10:44 min (100 - 125 m)		sandy silt: 35% gravel: 40% cobble: 15% shell hash: 10%		snails (periwinkle) (O) shrimp (U) clams (C)		green algae: <1%		lead line buried in deep silt in some sections; clean rock, not covered by silt	
10:44 - 11:20 min (125+ m)		gravel: 40% cobble: 40% rubble: 20%		None visible		None visible		clean rock, not covered by silt	

Date: Nov. 27 - Dec. 4, 2011		Project # 121614003		Project Name: PEV Wharf Deepening Project	
Transect ID: T-14		Begin WP ID: B		End WP ID: A	
BLAST FURNACE COVE					
Transect Time Stamp (min:sec)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundance)	Macrofloral Life (Estimated % coverage)	Comments	
0 - 1:30 min	sand: 20% gravel: 75% cobble: 5%	None observed	None observed	embankment area	
1:30 - 3:30 min	silty sand: 90% gravel: 8% cobble and shell hash: 2%	snails (A)	red algae: 5% brown algae: 5% green algae: <1%	garbage observed	
3:30 - 6:00 min	silty sand: 90% gravel and shell hash mix: 5% cobble and shell hash mix: 5%	Snails (A) crab (U)	None observed	water too shallow to get RoV all the way to shore	