

Seabed Video and Photographic Survey — Berth “A” and Cable Route

Minas Passage Tidal Energy Study Site

Based on Surveys on
July 2-3 and August 4-5, 2009

Submitted to:

Fundy Ocean Research Centre for Energy (FORCE)

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MARINE SURVEY REPORT
FUNDY TIDAL POWER RESEARCH AND DEVELOPMENT PROJECT

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EXECUTIVE SUMMARY

In 2008-2009, the Province of Nova Scotia contracted Minas Basin Pulp and Power Limited to establish a Tidal Energy Demonstration Facility to provide test facilities for tidal energy technologies in Nova Scotia’s Bay of Fundy. This report contains video images and still photographs of the seabed obtained in 2009 at Berth “A” and its proposed cable route to shore, one of three locations designated for tidal device installations at the test facility in northern Minas Passage, west of Cape Sharp. Surveys encompassing Berth “A” were carried out on July 2-3 and August 4-5, 2009 to provide input to siting and design for the turbine development and deployment. Seabed surficial geology and biological communities observed at the site were representative of the major types observed in previous baseline studies (2008) over the broader extent of the tidal demonstration site.

INTRODUCTION

In 2007, the Province of Nova Scotia initiated a process aimed at developing tidal energy resources of the Bay of Fundy, as part of its strategy to meet Provincial renewable energy goals. The process resulted in the completion of a Strategic Environmental Assessment (SEA) in early 2008, which assessed the Bay of Fundy environment and potential impacts of various tidal energy technologies, and subsequently resulted in the award of initial funding to support the creation of a tidal energy demonstration facility in the Bay. The concept for the Tidal Energy Demonstration Facility was developed by Minas Basin Pulp and Power Company Limited, the successful contractor in the process; necessary background geophysical surveys and seabed photographic surveys were done and assessed; public consultation, a review of shipping traffic and local lobster fisheries was carried out; and a suitable demonstration site was chosen in northern Minas Passage slightly west of Cape Sharp in 2008. Subsequently, three berths (circular areas of the seabed 200 m in diameter) and associated cable routes to shore were selected for use by tidal device providers/consortia initially expressing interest, including the teams of Minas Basin Pulp and Power/Marine Current Turbines; Nova Scotia Power Inc (NSPI)/OpenHydro; and Clean Current/Alstom. The oversight body for the facility, the Fundy Ocean Research Centre for Energy (FORCE) was duly established in late 2009.

The tidal energy research facility includes three installation berths (A, B, & C) to be occupied by tidal energy device providers, each of which has an associated cable route to shore (International Telecom 2009), and an associated shore facility to provide a connection to the power grid. Berth “C” was the first scheduled to be occupied, proposed for a deployment of the NSPI/OpenHydro turbine¹ while Berth “A” and Berth “B” were designated for subsequent development. Video and 35 mm photographs to assess seabed geology and bottom characteristics were obtained at Berth “A” in July and August 2009, to give both broad coverage and more intensive localized coverage on promising locations within the installation site. This report summarizes information on geology and benthic communities, and contains seabed imagery obtained at Berth “A” and the associated cable route.²

METHODS

The present study was carried out to obtain detailed site-specific information from Berth “A” and the associated cable route to shore, areas which were not covered in the 2008 baseline video and photographic survey (Envirosphere Consultants Limited 2008a & b). Surveys at Berth “A” took place on July 2-3 and August 4-5, 2009, from *Tide Force*, a 50’ lobster boat operated by Mr. Mark Taylor out of Halls Harbour, Nova Scotia. For positioning, a DGPS (Hemisphere, VS100 GPS Compass receiver, 0.6 m accuracy) and computer navigation software (WinFrog Integrated Navigation System, Fugro Pelagos Inc.) operated by Seaforth Geosurveys, Dartmouth, Nova Scotia, was used to both acquire and log position information.

A Sony Hi-8 handycam in an Amphibico® underwater housing (field of view of about 52.5 cm wide and 40 cm high (0.2 m²)) and SLD10 underwater light, both mounted in a protective aluminum frame (July & August), and a Benthos® deep-sea 35 mm camera with strobe, mounted on a 225 kg steel frame (July only)(1 m² area at the typical distance of 1 m above the bottom) were deployed from the

¹ Deployed on November 12, 2009.

² Separate reports are available for Berths “B” and “C” and their associated cable routes.

vessel 30 minutes to up to 1 hour before and after slack tide, at current speeds from zero to moderate (up to about 3-4 kts).

Five locations at Berth “A” were pre-selected by the marine geological consultant (G. Fader, Atlantic Marine Geological Consulting, Halifax) to give broad coverage of the site, a 200 m diameter circle centred on 45° 21’ 53.892” N, 64° 25’ 46.290” W (Figure 1), to assist in geological interpretation both locally and for the demonstration project area as a whole. As well, video was obtained along the centerline of the proposed cable route for Berth “A”. Following the survey, the video was digitized and still frame images as well as video from the sites were captured using video editing software (Barra Video, Halifax). Several cross sections of seabed features inside and adjacent to Berth “A” were extracted by Seaforth Geosurveys from the digital elevation model for the seabed at the site.

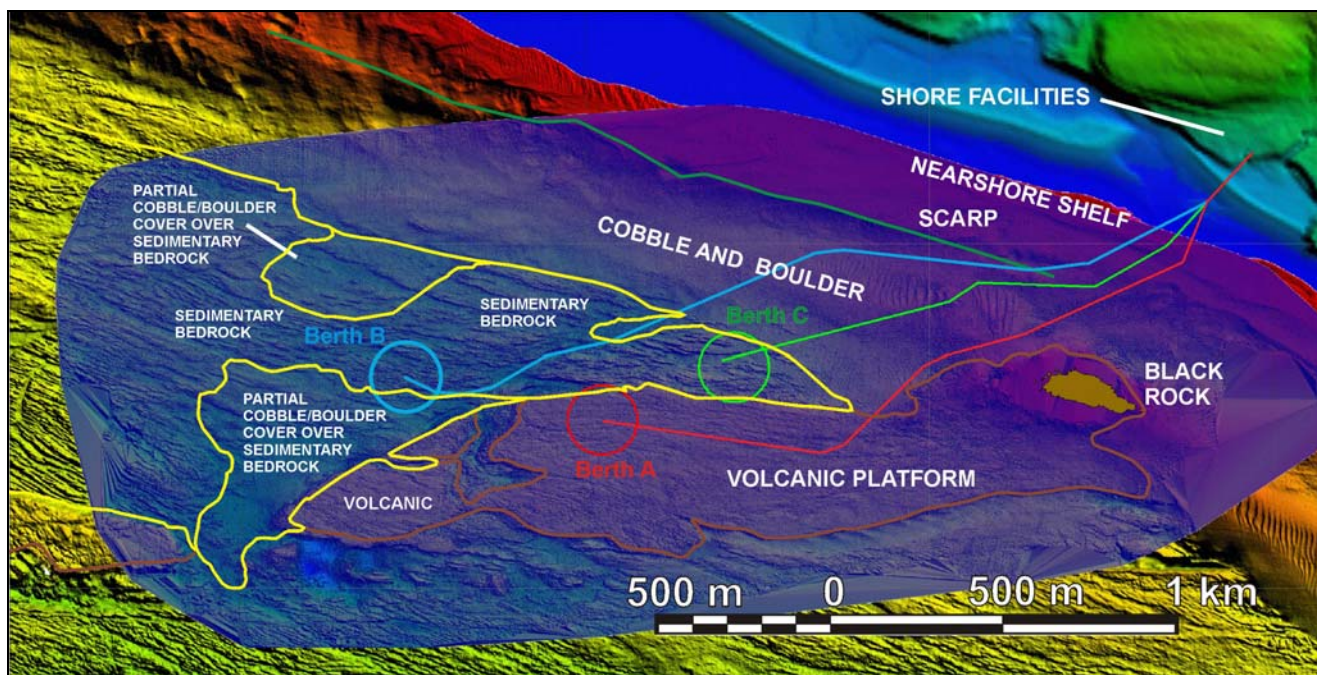


Figure 1. Surficial geology interpretation and locations of tidal turbine berths and proposed, cable routes, December 2009. Geology interpretation based on AMGC (2009).

RESULTS AND DISCUSSION

General

Maps of station locations, image captures and bottom photographs, as well as a DVD of the video for each survey are presented in Appendices A to C. Berth “A” is situated near the northern edge of a level basalt platform partly covered with boulders and cobble, which extends east-west in the study area (AMGC, 2009) (Figure 1). The seabed over most of the berth site has an average depth of 30.5 m below MLW but can reach 46 m where it crosses the northern edge of the platform (Figure 2) (maximum and minimum depth of 46.4 and 27.5 m respectively) (Seaforth Geosurveys, personal communication).

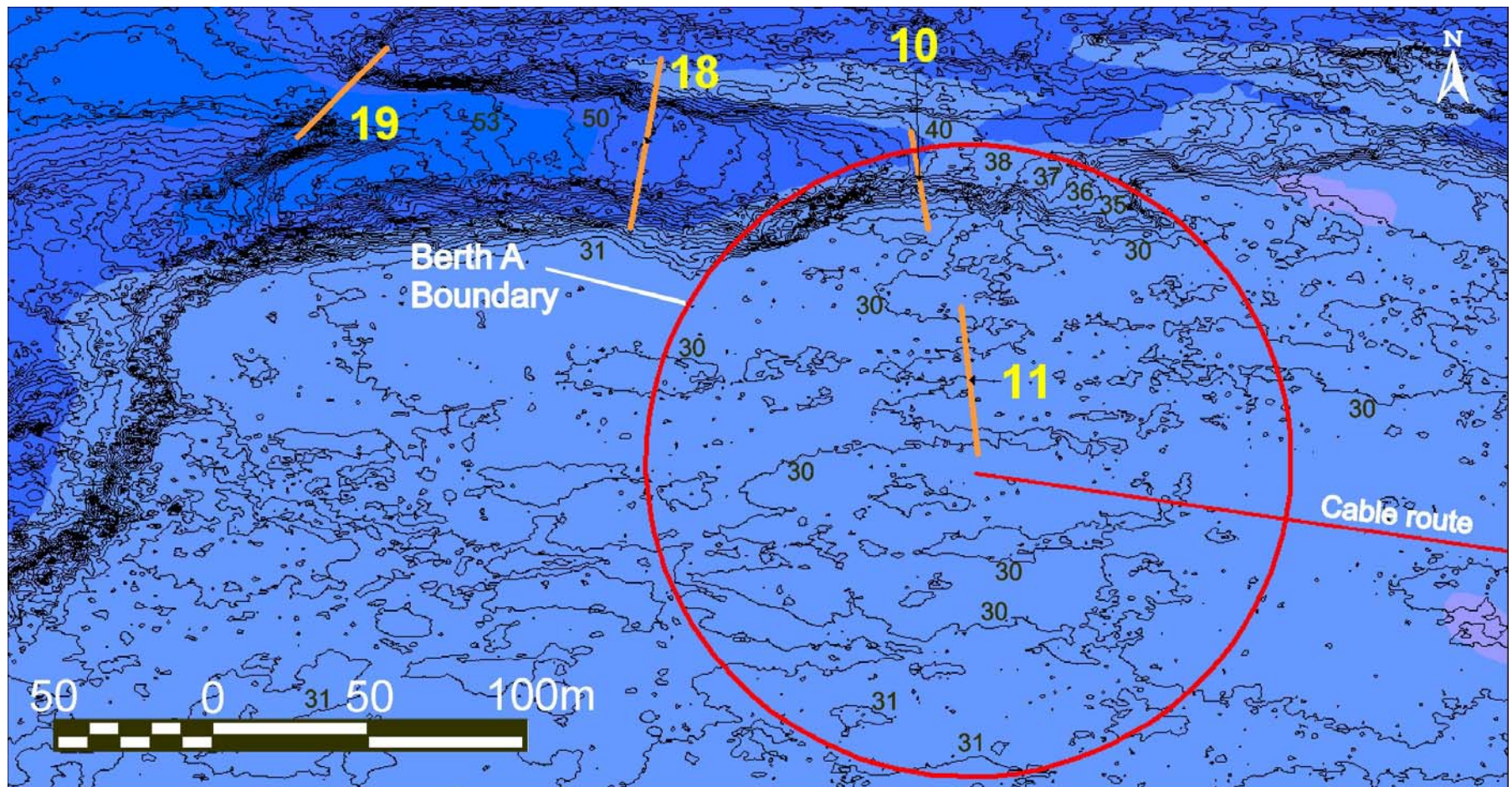


Figure 2. Bottom contours and locations of cross-sectional profiles from Berth “A”.

The Berth “A” site is level with microtopography largely due to the presence of boulders (Figures 2 & 3, Transect 11)[Note: The low vertical exaggeration for cross section Transect 11, shown in figure 3, compared to other cross sections, shows relief on the scale of 0.5 to 1 m.]. The scarp at the northern edge of Berth “A” has a steep, 1:1 slope (Transect 10, Figure 3).

The cable route to shore from Berth “A” (Figure 1) extends eastward over the bedrock platform, before descending the excarpment formed by the northern edge of the platform, to an area of relatively level cobble and boulder bottom at the base of the scarp. It continues northeast near the base of the scarp over cobble and boulder bottom towards the west edge of Black Rock, passing just east of a field of mobile gravel and cobble waves. Passing Black Rock enroute to shore, the route descends into a shallow longshore trough, and then rises abruptly onto a gravel shelf which borders the shore in the vicinity of the proposed cable landfall (Figure 1).

Berth Site

Bottom Type—The centre of the 200 m diameter circle which delineates Berth “A” is approximately 1400 m west of Black Rock. The site is located on an east-west trending ridge of basalt bedrock, which has a rounded and hummocky surface, typically varying less than 1 m in elevation, and strewn with boulders (AMGC 2009)(Figures 4-7). Linear features resembling cracks are common and occasional pits eroded in the bedrock occur (e.g. Figure 5). Video and still photographic images obtained at Berth “A” show the same characteristics as the ridge as a whole.

Biological Communities—Biological communities resembled those sampled in the 2008 survey (Table 1)(Figures 4-7). The Berth is entirely on the basalt platform, and communities included the same major components as in 2008, including the dominants, the Northern Red Anemone (*Urticina felina*), the yellow, encrusting breadcrumb sponge (*Halichondria panicea*) and the red, blood star (*Henricia sanguinolenta*). A surface covering of tubes of benthic organisms (‘biolayer’)(also observed in 2008, one of two types of ‘biolayer’, this one associated with volcanic bedrock) occurred frequently, and as well hermit crabs and the sea star *Asterias vulgaris*. Clumps of attached mussels (probably *Modiolus modiolus*) in depressions in the bedrock, and the occurrence of Daubed Shanny (*Lumpenus maculatus*) (fish) in two images, were new observations for the site.

Cable Route

Bottom Type—The proposed cable route (Figure 1; Appendix C, Figure C1) runs roughly from west to east over the basalt platform for 700 m from Berth “A”, from depths of ~30 m, before turning to the northeast at about 27 m depth (Figures 8-10). The route crosses the edge of the bedrock platform at a point where there is a gradual transition to a deeper, cobble and boulder zone, and then runs to the northeast along the northwest margin of the bedrock platform towards the west side of Black Rock (Figures 11-15). The transitional area leaving the bedrock platform as well as points along the stretch to Black Rock show occasional occurrences of basalt boulders on a bottom surface predominantly cobble and boulder, but with occasional patches and waves of gravel (Figure 14). The route passes between the eastern end of a field of gravel/cobble waves and Black Rock, and passes into a deeper, trough-like area where boulders and cobble predominate, but where some siltstone/mudstone bedrock is exposed (Figure 16), before rising up the slope of the nearshore shelf. The shelf is dominated by boulder and cobble on the slope (Figure 17) and gravel and cobble on the gradually sloping plateau of the shelf where it joins with the cable routes from the other berths

(Figure 18)(imagery from the shallower water on the shelf is contained in the companion report for Berth “C”). The shelf is described in baseline studies from 2008 (AMGC 2009; EnviroSphere Consultants Ltd. 2009; Stewart (2009))³.

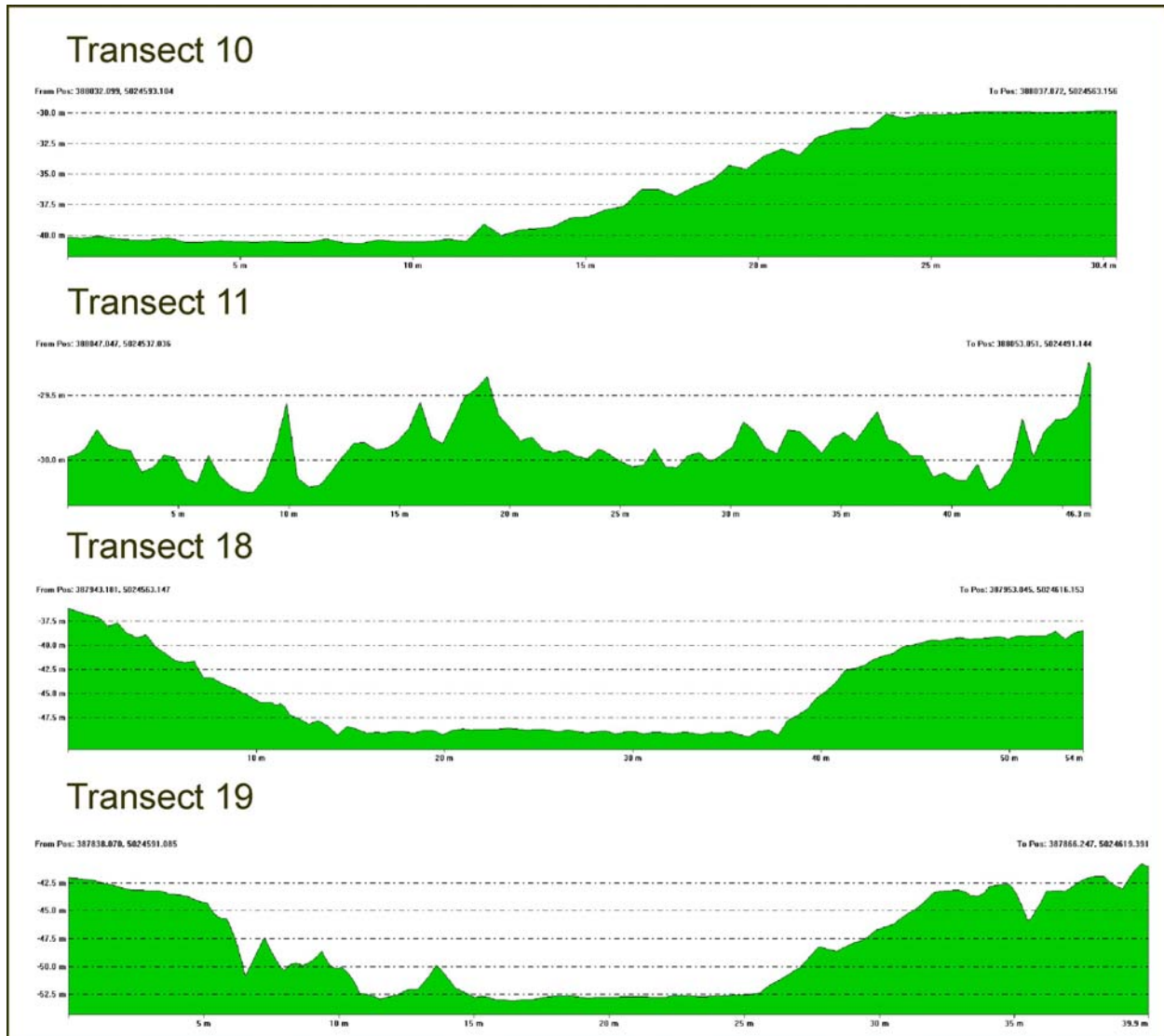


Figure 3. Cross sections in the vicinity of Berth “A”. For locations, see Figure 2.

³ As of November 2009, the landing point of the cables for the project will be further to the east by about 400 m. Additional video taken in the summer of 2009 of a transect crossing the shelf in the vicinity of the now-proposed cable landfall is presented in a separate report.



Figure 4. Exposed basalt with fractures and pits at Berth “A”. Image includes a fish (Daubed Shanny), attached mussels, Northern Red Sea Anemone, Blood Star (*Henricia sanguinolenta*) and unidentified seastars as well as ‘biolayer’ of attached organisms. Location BEN A11, Appendix B, July 3, 2009. Vertical dimension of image = 1 m.

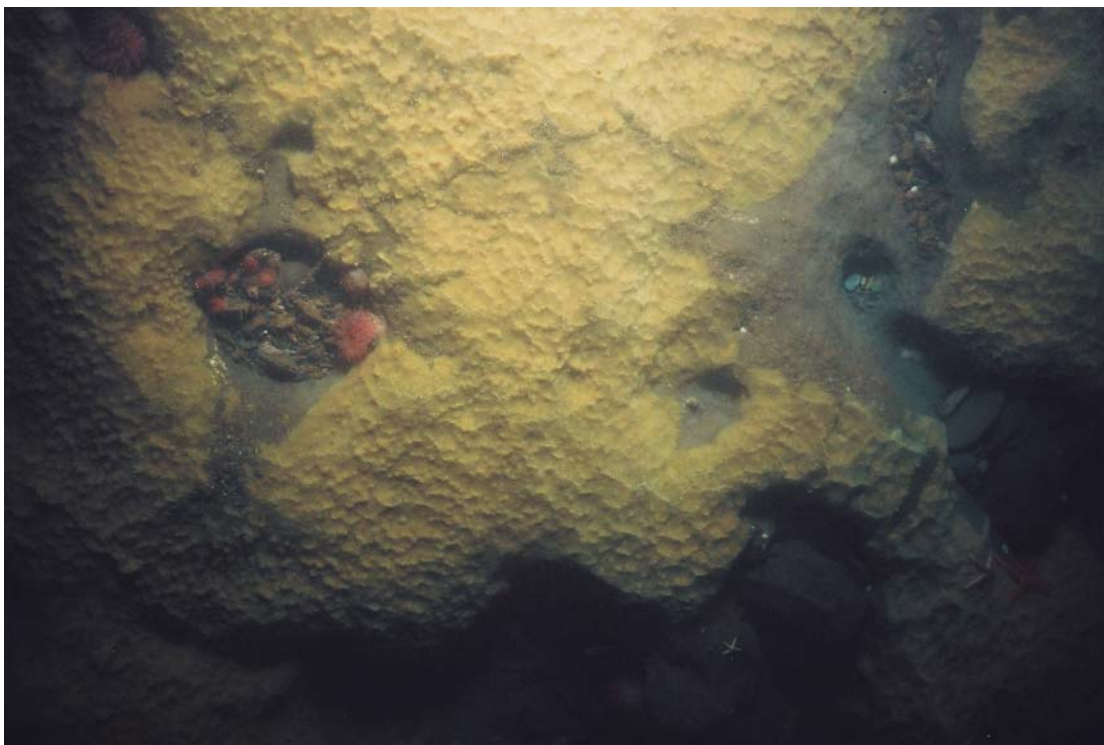


Figure 5. Basalt bedrock, Berth “A”, Station BEN-A11-2, July 3, 2009. Rock encrusted with breadcrumb sponge, with mussels and Northern Red Sea Anemone in pits. Vertical dimension of image = 1 m.



Figure 6. Bedrock at Berth “A” (Station BEN-A11-4, Appendix B), with encrusting sponge, surface ‘biolayer’, Northern Red anemones, and seastars, July 3, 2009. Vertical dimension of image = 1 m.



Figure 7. Basalt bedrock at Berth “A”, showing rounded surface with fractures, breadcrumb sponge, and Northern Red Anemone (Station A7-2-C, July 2, 2009, Appendix A). Unit on scale bar = 10 cm.

Biological Communities—Biological organisms characteristic of the basalt bedrock as described for Berth “A” above, were observed along the cable route where it runs over the basalt platform. Typical species include Northern Red Anemone, Blood Star, Breadcrumb sponge encrusting on rocks (Figure 18), and occasional occurrences of seastars (*Asterias* sp.) and hermit crabs. Few organisms were observed on cobble/boulder bottom, particularly where the gravel & cobble as well as gravel waves predominate, but the biological community was similar to that observed in earlier surveys in the adjacent areas to the west, including occasional breadcrumb sponge on the tops of boulders, and the occasional occurrence of mobile species such as hermit crabs (Table 1), and a fish (Station AC18, Figure 12). Breadcrumb sponge occurred more frequently in the trough between Black Rock and the nearshore shelf, where boulders and bedrock exposures were more common, and particularly barnacles and edge fauna (the erect bryozoan, *Flustra foliacea*) occurred (Figure 15). Cobbles and boulders on the slope of the shelf supported a “biolayer” of organisms at the surface, as well as attached organisms such as *Flustra*. The outer edge of the shelf where the survey ended was occupied by coralline algae and short dulse (*Palmaria palmata*) (Figure 18).



Figure 8. Basalt bedrock and attached organisms, Berth “A” cable route Station AC30-2-C (Appendix C), showing encrusting sponges, sea anemones, July 2, 2009.



Figure 9. Boulders and cobble over bedrock on top of basalt platform, at Station AC27 on Berth “A” cable Route, July 2, 2009.



Figure 10. Cobbles and boulders over basalt bedrock along Berth “A” cable route, Station AC22-2, August 4, 2009.

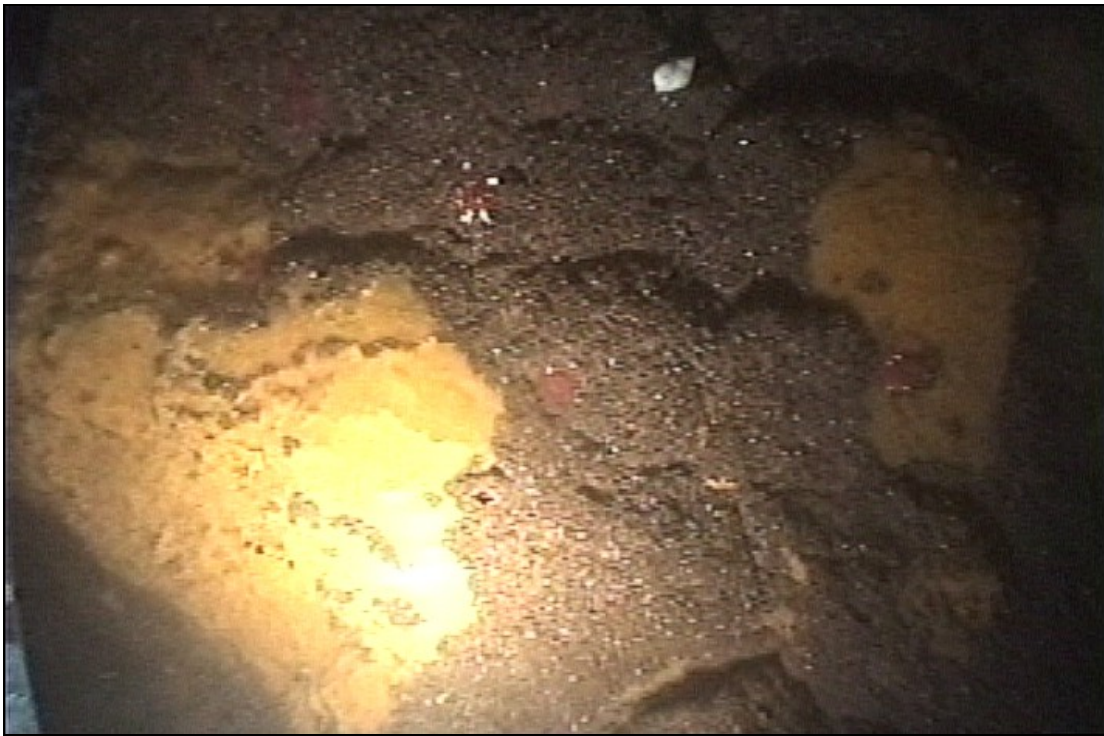


Figure 11. Basalt boulder in transitional area between bedrock platform and cobble to boulder area, Station AC19, August 4, 2009.



Figure 12. Transitional area between the bedrock platform and cobble-boulder bottom aalong cable route, west of Black rock, (Station AC18-1), August 4, 2009.



Figure 13. Boulder with attached hermit crab (in snail shell), Station AC13-2, July 2, 2009.



Figure 14. Gravel to cobble wave on seabed west of Black Rock, Station AC11-3, July 2, 2009.



Figure 15. Cobble/boulder bottom west of Black Rock, Station AC10-3, July 2, 2009.

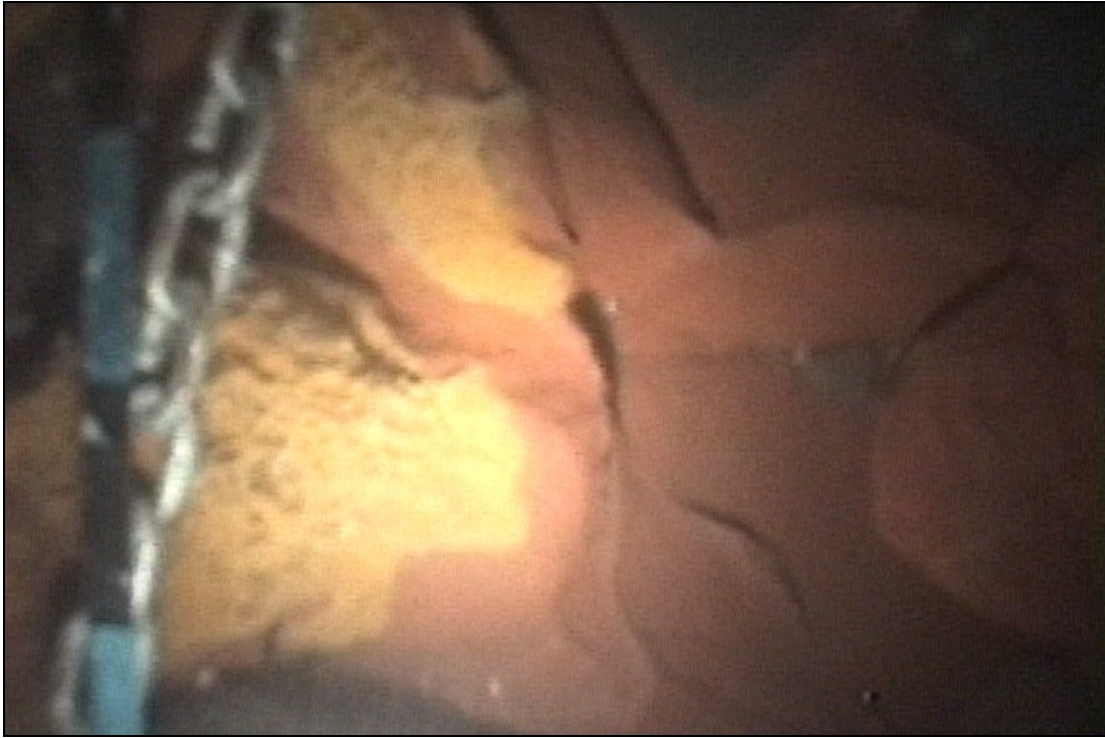


Figure 16. Mudstone bedrock exposure in nearshore trough, encrusted with breadcrumb sponge, Station AC8-3, July 2, 2009.



Figure 17. Cobble and boulder bottom on slope of nearshore shelf, showing ‘biolayer’ of tube-building organisms, and attached erect bryozoan (*Flustra*), Station AC3-2, July 2, 2009.



Figure 18. Cobble bottom with attached red algae (*Palmaria palmata*), coralline algae and *Flustra foliacea*, Station AC1-2, July 2, 2009.

CONCLUSIONS

In general, the same seabed types were observed at Berth “A” as occurred in adjacent areas of the volcanic bedrock platform as were observed in the 2008 survey (Envirosphere Consultants Limited 2008a & b)(AMGC 2009). Bottom communities at the Berth site were likewise similar to those observed earlier (AMGC 2009; Envirosphere Consultants Limited 2009; Stewart 2009). The cable route crossed parts of the basalt bedrock platform in the area, and bottom types and communities there were similar to those observed in those areas in the earlier survey. Bottom types encountered between the basalt bedrock platform and shore, where it crossed areas of cobble and boulder bottom, demonstrated the same characteristics and associated biological communities as determined in nearby areas to the west in earlier surveys, with the exception of an occurrence of bedrock (mudstone) outcrops, and an associated increased occurrence of more encrusting sponges on boulders, between Black Rock and the nearshore shelf.

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Tables

Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
BERTH “A”					
July 2-3 & August 4-5, 2009	A 7-1	29.6	video	basalt bedrock	yellow encrusting breadcrumb sponge 90%, northern red anemone (~5), seastar juv (2)
	A 7-2	29.7	video	basalt bedrock	yellow encrusting breadcrumb sponge, 85%, northern red anemone (~6). Seastar juv.(4), <i>Asterias</i> sp. and biolayer.
	A 7-3	29.8	video	basalt bedrock	yellow encrusting breadcrumb sponge, 85%, with biofilm layer, northern red anemone (1), juv. Seastar juv. and a possible barnacle.
	A 7-4	29.5	video	basalt bedrock	yellow encrusting breadcrumb sponge intermixed with biolayer (50/50), possible barnacles and one northern red anemone.
	A 8-1	29.7	video	cobble to boulder on basalt bedrock	yellow encrusting breadcrumb sponge, 50%) northern red anemone (1) and possible barnacles.
	A 8-2	29.8	video	basalt bedrock	flat, yellow encrusting breadcrumb sponge (95%), biolayer, two northern red anemone and two juv. seastars.
	A 8-3	30.2	video	cobble to boulder	biolayer with one juv. seastar and some yellow encrusting breadcrumb sponge.
	A 9-1	31.0	video	small to large cobble to boulder	yellow encrusting breadcrumb sponge, 50%, edge fauna, possible barnacles and amphipod/polychaete tubes.
	A 9-2	30.5	video	cobble to boulder	yellow encrusting breadcrumb sponge, 25%, with biolayer, possible barnacles, <i>Flustra</i> and hermit crab.
	A 9-3	29.8	video	basalt bedrock	yellow encrusting breadcrumb sponge intermixed with biolayer (30/70), juv. seastar (~5).
	A 9-4	30.2	video	cobble to boulder	yellow encrusting breadcrumb sponge mixed with biolayer, edge fauna, barnacles and <i>Asterias</i> sp (~2).

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Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	A10-1	29.5	video	basalt bedrock	yellow encrusting breadcrumb sponge (30%), northern red anemone (~8) and blood stars (~2).
	A10-2	30.1	video	basalt bedrock	99% yellow encrusting breadcrumb sponge.
	A10-3	29.8	video	basalt bedrock	30% yellow encrusting breadcrumb sponge, edge fauna and juv. seastars (~3), Daubed shanny (<i>Lumpenus maculatus</i>) fish.
	A10a-1	29.6	video	basalt bedrock	yellow encrusting breadcrumb sponge, 75%, biolayer
	A10a-2	29.7	video	basalt boulder	edge fauna, northern red anemone, barnacles, juv seastar (~7), blood star, yellow encrusting breadcrumb sponge
	A10a-3	29.6	video	basalt bedrock	70% yellow encrusting breadcrumb sponge, northern red anemone, possible white encrusting sponges
	A10a-4	29.4	video	basalt bedrock	edge fauna, possible biolayer, several juv. seastars, and patch of yellow encrusting breadcrumb sponge.
	A10a-5	29.6	video	cobble to boulder	yellow encrusting breadcrumb sponge (75%), <i>Asterias</i> sp., northern red anemone (~4), biolayer (20%) and 5% brownish colored sponge
	A10a-6	30.0	video	cobble to boulder	edge fauna, yellow encrusting breadcrumb sponge, northern red anemone (~4)
	A10a-7	29.7	video	cobble to boulder	edge fauna, possible <i>Flustra</i> sp, juvenile seastar, northern red anemone (~10) and yellow encrusting breadcrumb sponge (75%)
	A10a-8	29.5	video	boulder	25% yellow encrusting breadcrumb sponge, juv seastars (~4), barnacles and possible biolayer with some tube building organisms.
	A10b-1	30.3	video	basalt bedrock	patches of biolayer scattered with barnacles and several small patches of yellow encrusting breadcrumb sponge.

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Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	A10b-2	29.5	video	basalt bedrock	98% yellow encrusting breadcrumb sponge with northern red anemone and possible barnacle or snail shell.
	A10b-3	30.0	video	cobble to ooulder	yellow encrusting breadcrumb sponge with snail shells, a juv. seastar and edged with a biolayer.
	A10b-4	30.0	video	basalt boulder	3 juvenile seastars, edge fauna and limited yellow encrusting breadcrumb sponge.
	A10b-5	29.9	video	basalt bedrock	98% yellow encrusting breadcrumb sponge
	A10b-6	29.8	video	basalt bedrock	35% yellow encrusting breadcrumb sponge, with <i>Asterias</i> sp, northern red anemone and a blood star as well as patches of biolayer.
	A10c-1	29.5	video	basalt bedrock	yellow encrusting breadcrumb sponge with possible biolayer and one northern red anemone.
	A10c-2	29.4	video	cobble to boulder	yellow encrusting breadcrumb sponge and barnacles
	A10c-3	29.7	video	bedrock platform	60% yellow encrusting breadcrumb sponge with one northern red anemone.
	A10c-4	30.3	video	basalt bedrock	six <i>Asterias</i> sp, one blood star, several northern red anemone (~3) and several white anemone (~2), biolayer
	A10c-5	30.2	video	basalt bedrock	yellow encrusting breadcrumb sponge, <i>Asterias</i> (~2).
	A10c-6	29.2	video	basalt bedrock	yellow encrusting breadcrumb sponge, 50%, and some barnacles
	A10c-7	29.2	video	cobble to boulder	small patches of yellow encrusting breadcrumb sponge, juvenile seastars (~5) and a barnacle?
	A10c-8	30.0	video	boulder	99% yellow encrusting breadcrumb sponge
	A11-1	30.0	video	basalt bedrock	yellow encrusting breadcrumb sponge, 70%, blood stars (~3) and barnacles
	A11-2	29.4	video	basalt bedrock	biolayer (60%), yellow encrusting breadcrumb sponge and northern red anemone (2)

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Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	A11-3	29.4	video	basalt bedrock	biolayer, 80%, some yellow encrusting breadcrumb sponge, northern red anemone (~2), <i>Asterias</i> sp.
	A11-4	29.7	video	basalt bedrock	60% yellow encrusting breadcrumb sponge, northern red anemone (~4), juv. seastar and barnacles.
	A12-1	29.5	video	cobble to boulder	yellow encrusting breadcrumb sponge and biolayer (70/30), edge fauna, barnacles, northern red anemone and possible hermit crab
	A12-2	29.8	video	basalt bedrock	biolayer 100%, northern red anemone
	A12-3	29.6	video	basalt bedrock	yellow breadcrumb sponge (10%), basalt biolayer (10%)
BERTH “A”, 35 mm photos					
July 2-3, 2009	BEN A 9-1	31.4	35 mm	eroded (smooth) basalt bedrock	yellow breadcrumb sponge (10%), basalt biolayer (10%), northern red anemone(~8), barnacle
	BEN A10-1	30.1	35 mm	basalt bedrock	yellow breadcrumb sponge (20%), basalt biolayer (60%), northern red anemone (~13), bloodstar (2), seastar juv (5), barnacle (o)
	BEN A10-2	29.8	35 mm	basalt bedrock	yellow breadcrumb sponge (90%), bloodstar (1), mussels (~3), barnacles (o), Daubed Shanny
	BEN A11-1	30.3	35 mm	basalt bedrock	yellow breadcrumb sponge (<5%), basalt biolayer (80%), northern red anemone(~13), bloodstar (1), seastar juv (3), mussels (~20), Hermit crab (~3), Daubed Shanny
	BEN A11-2	30.6	35 mm	basalt bedrock	yellow breadcrumb sponge (85%), basalt biolayer (<5%), northern red anemone(~7), mussels (~30), bloodstar (2), hermit crab (1), seastar juv (1), barnacle (2)
	BEN A11-3	30.3	35 mm	basalt bedrock, boulders	yellow breadcrumb sponge (25%), basalt biolayer (55%), northern red anemone(~15), bloodstar (3), seastar juv (9)

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Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	BEN A11-4	29.6	35 mm	basalt bedrock	yellow breadcrumb sponge (30%), basalt biolayer (35%), northern red anemone(~39), bloodstar (1), seastar juv (3), edge fauna (o)
	BEN A11-5	30.1	35 mm	basalt bedrock	yellow breadcrumb sponge (15%), basalt biolayer (85%), northern red anemone(~14), bloodstar (4), seastar juv (9), hermit crab (1), tunicate?
	BEN A11-6	29.6	35 mm	basalt bedrock	yellow breadcrumb sponge (80%), basalt biolayer (10%), northern red anemone(~6), bloodstar (1), seastar juv (1), hermit crab (1), tunicate?
BERTH “A” CABLE ROUTE					
July 2-3, 2009 & August 4-5, 2009	AC 1-1	7.26	video	gravel to cobble	red algae (<i>Palmaria palmata</i>), possible barnacles
	AC 1-2	6.8	video	boulder	northern red anemone (~2), red algae, <i>Flustra</i> and possible coralline algae
	AC 1-3	7.0	video	boulder	red algae (<i>Palmaria palmata</i>), barnacles and biolayer
	AC 2-1	11.8	video	cobble to boulder	biolayer with <i>Flustra</i> , barnacles and snail shell
	AC 2-2	11.4	video	cobble to boulder	biolayer with <i>Flustra</i> and barnacles
	AC 2-3	11.5	video	boulder	biolayer with barnacles
	AC 2-4	11.6	video	boulder	biolayer with tube building organisms and barnacles
	AC 3-1	14.9	video	basalt gravel to cobble	biolayer and barnacles
	AC 3-2	14.5	video	cobble to boulder	biolayer with tube-building organisms, barnacles and <i>Flustra</i>
	AC 3-3	14.2	video	basalt bedrock	biolayer, barnacle, <i>Asterias</i> sp and some tube-building organisms
	AC 4-1	17.8	video	cobble to boulder	patches of yellow encrusting breadcrumb sponge, barnacles, <i>Flustra</i> and biolayer
	AC 4-2	17.5	video	cobble to boulder mudstone	yellow encrusted breadcrumb sponge with barnacles, juvenile seastar
	AC 4-3	17.4	video	cobble	patch of yellow encrusted breadcrumb sponge
	AC 5-1	19.3	video	gravel to cobble	barnacles

Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	AC 5-2	19.1	video	gravel to cobble	patch of yellow encrusting breadcrumb sponge, barnacles and possible biolayer
	AC 5-3	18.7	video	cobble	patches of yellow encrusting breadcrumb sponge, barnacles, blood stars (~2)
	AC 6-1	20.9	video	gravel to boulder	no biota noted
	AC 6-2	21.2	video	gravel to boulder	patch of yellow encrusting breadcrumb sponge, barnacles
	AC 6-3	21.0	video	gravel to boulder	no biota noted
	AC 7-1	22.3	video	gravel, cobble to mudstone boulder	patch of yellow encrusting breadcrumb sponge with possible barnacle
	AC 7-2	22.9	video	gravel to large cobble	possible barnacle and patch of yellow encrusting breadcrumb sponge
	AC 7-3	22.2	video	gravel to cobble	patch of yellow encrusting breadcrumb sponge, 5%, possible barnacle
	AC 8-1	21.3	video	cobble to boulder	yellow encrusting breadcrumb sponge (75%)
	AC 8-2	19.4	video	cobble to boulder	40% yellow encrusting breadcrumb sponge
	AC 8-3	19.8	video	mudstone bedrock	yellow encrusting breadcrumb sponge, 30%
	AC 9-1	17.7	video	basalt cobble to boulder	yellow encrusting breadcrumb sponge (20%), barnacle
	AC 9-2	18.1	video	gravel to cobble	no biota noted
	AC 9-3	19.1	video	basalt boulder with gravel at base	no biota noted
	AC 9-4	17.9	video	fine gravel	no biota noted
	AC 9-5	17.8	video	gravel to boulder	no biota noted
	AC10-1	11.9	video	mudstone boulder	patch of yellow encrusting breadcrumb sponge (10%), edge fauna with tube building organisms, barnacles
	AC10-2	11.1	video	mudstone boulder	small patch of yellow encrusting breadcrumb sponge, tube building organisms, barnacles
	AC10-3	11.8	video	gravel to cobble	<i>Flustra</i> , edge fauna
	AC10-4	14.3	video	gravel to cobble	no biota noted
	AC10-5	14.3	video	cobble	no biota noted
	AC10-6	14.7	video	cobble	no biota noted
	AC11-1	16.5	video	gravel to cobble	possible small patch of yellow encrusting breadcrumb sponge

Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	AC11-2	17.2	video	fine gravel to cobble	no biota noted
	AC11-3	16.7	video	gravel to cobble	no biota noted
	AC12-1	18.3	video	gravel to cobble	possible small patch of yellow encrusting breadcrumb and possible barnacle
	AC12-2	19.3	video	cobble	no biota noted
	AC12-3	17.5	video	gravel to cobble with possible clay?	no biota noted
	AC13-1	24.6	video	gravel to cobble	no biota noted
	AC13-2	22.9	video	basalt boulder	hermit crab in snail shell
	AC13-3	21.9	video	gravel to cobble	no biota noted
	AC14-1	29.9	video	fine to coarse gravel	no biota noted
	AC14-2	28.3	video	fine gravel to cobble	no biota noted
	AC14-3	27.4	video	fine gravel to cobble	no biota noted
	AC15-1	30.0	video	gravel to cobble	no biota noted
	AC15-2	29.6	video	gravel to cobble	no biota noted
	AC15-3	30.1	video	boulder	possible barnacle
	AC16-1	28.1	video	cobble to boulder	no biota noted
	AC16-2	29.2	video	gravel to cobble	no biota noted
	AC16-3	29.8	video	gravel to cobble	no biota noted
	AC17-1	27.0	video	quartzite boulder	tube building organisms and barnacles
	AC17-2	28.8	video	gravel to cobble mixture (mudstone, basalt, and quartzite)	no biota noted other than possible lumpfish <i>Liparis</i> sp?
	AC17-3	30.0	video	gravel to cobble (mudstone, basalt, etc.)	no biota noted
	AC18-1	30.4	video	gravel to cobble	unidentified fish
	AC18-2	31.8	video	gravel to cobble mudstone and basalt	no biota noted
	AC18-3	31.4	video	gravel to cobble mudstone and basalt	yellow encrusting breadcrumb sponge, 80%
	AC19-1	26.5	video	basalt bedrock	60% yellow encrusting breadcrumb sponge, possible biolayer, barnacles, northern red anemone (~4)
June 18, 2009	AC19-2	26.3	video	basalt bedrock	patches of yellow encrusting breadcrumb sponge, biolayer, barnacles, snail shell with possible hermit crab and northern red anemone (~3)
	AC19-3	25.9	video	basalt bedrock with crevices	yellow encrusting breadcrumb spongem (75%), <i>Asterias</i> sp (~3) and northern red anemone

Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	AC20-1	25.5	video	basalt bedrock	20% yellow encrusting breadcrumb sponge, possible biolayer and northern red anemone (~2)
	AC20-2	26.2	video	basalt bedrock	yellow encrusting breadcrumb sponge, possible juvenile northern red anemone
	AC20-3	26.2	video	basalt bedrock	small patch of yellow encrusting breadcrumb sponge (2%), biolayer and northern red anemone (~4) and possible <i>Asterias</i>
	AC21-1	28.3	video	cobble to boulder on basalt bedrock	possible biolayer with barnacles
	AC21-2	27.2	video	basalt boulder on bedrock	possible biolayer with barnacles, northern red anemone (~4)
	AC21-3	25.7	video	basalt bedrock	possible biolayer with barnacles, northern red anemone (~6)
	AC22-1	27.7	video	basalt bedrock	yellow encrusting breadcrumb sponge (60%), with possible biolayer
	AC22-2	28.3	video	gravel to cobble on bedrock	patches of yellow encrusting breadcrumb sponge, barnacles and northern red anemone (~1)
	AC22-3	29.5	video	basalt bedrock	possible biolayer with barnacles
	AC23-1	29.0	video	basalt bedrock	98% yellow encrusting breadcrumb sponge with some barnacles
	AC23-2	30.0	video	gravel to cobble on bedrock	patch of yellow encrusting breadcrumb sponge (5%) and biolayer
	AC23-3	28.9	video	boulder on bedrock	90% yellow encrusting breadcrumb sponge
	AC24-1	27.9	video	gravel to cobble on bedrock	no biota noted
	AC24-2	26.7	video	basalt bedrock	yellow encrusting breadcrumb sponge, 60%, possible blood star and juvenile seastar
	AC24-3	26.7	video	basalt bedrock	95% yellow encrusting breadcrumb sponge
	AC25-1	29.2	video	basalt bedrock	98% yellow encrusting breadcrumb sponge with one northern red anemone
	AC25-2	29.3	video	basalt bedrock	80% yellow encrusting breadcrumb sponge with some barnacles.

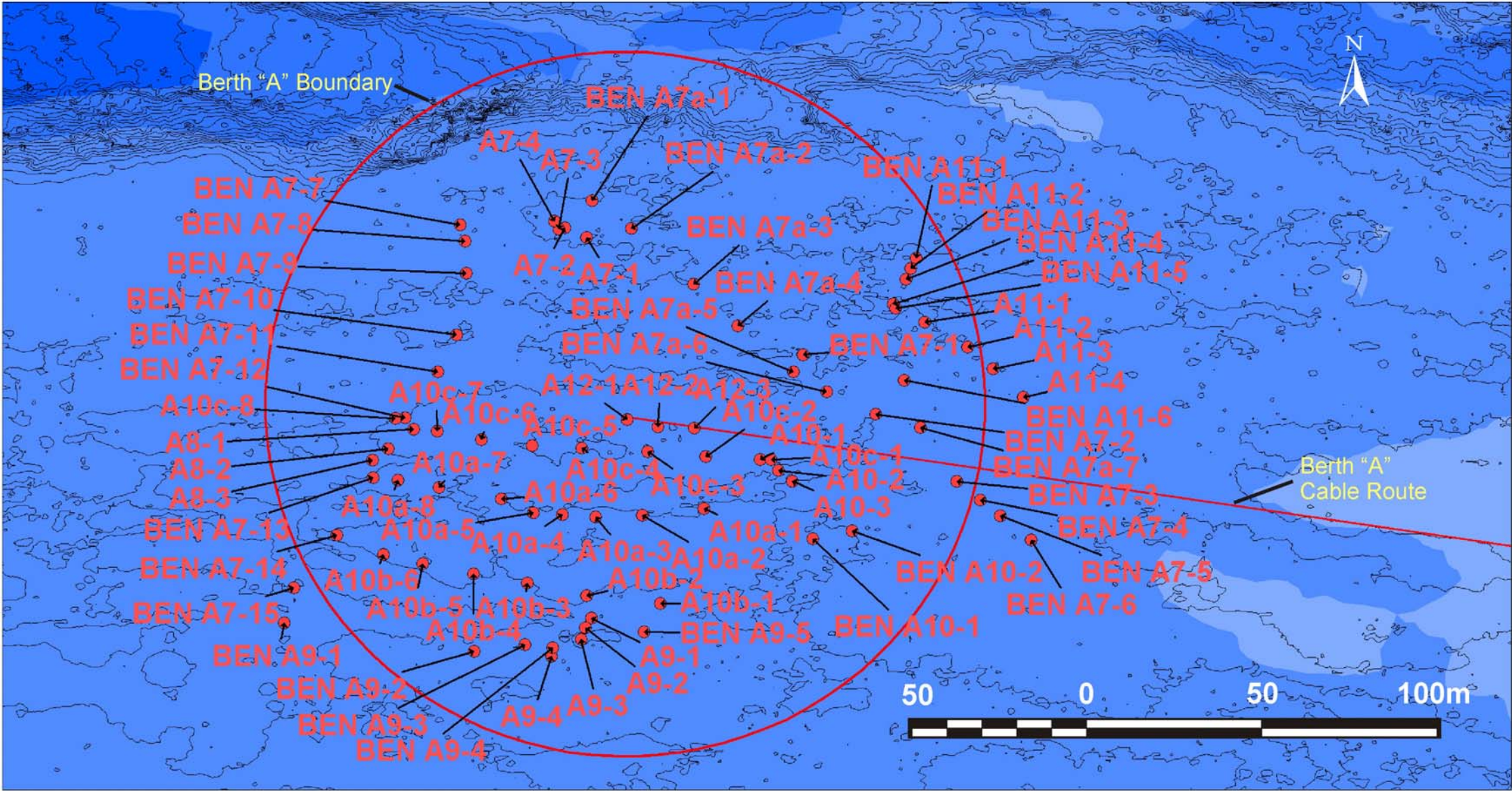
Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	AC27-1	28.6	video	basalt bedrock	yellow encrusting breadcrumb sponge (90%), northern red anemone (3), barnacles
	AC27-2	29.2	video	basalt bedrock with crevices	yellow encrusting breadcrumb sponge (80%), <i>Asterias</i> sp, northern red anemone and one possible white anemone
	AC27-3	29.6	video	cobble to boulder on bedrock	50% yellow encrusting breadcrumb sponge, one blood star, 4 juvenile seastars and several northern red anemones.
	AC27-4	29.5	video	boulder on bedrock	patch of yellow encrusting breadcrumb sponge, and northern red anemone (~2)
	AC27-5	28.1	video	cobble to boulder	20% yellow encrusting breadcrumb sponge
	AC27-6	28.5	video	boulder on bedrock	30% yellow encrusting breadcrumb sponge, possible biolayer and barnacles
	AC27-7	28.7	video	gravel to boulder on bedrock	patches of yellow encrusting breadcrumb sponge with possible barnacle
	AC27-8	28.3	video	cobble on bedrock	small patch of yellow encrusting breadcrumb sponge (5%)
	AC28-1	28.2	video	basalt bedrock with crevices	small patches of yellow encrusting breadcrumb sponge, northern red anemone (~4)
	AC28-2	28.1	video	cobble to boulder on basalt bedrock	30% yellow encrusting breadcrumb sponge, one blood star, <i>Asterias</i> sp, and northern red anemone (~6)
	AC28-3	28.4	video	basalt bedrock	95% yellow encrusting breadcrumb sponge and one northern red anemone.
	AC30-1	28.6	video	basalt bedrock	10% yellow encrusting breadcrumb sponge, possible barnacles and/or juvenile seastar and three northern red anemones.
	AC30-2	28.8	video	basalt bedrock with crevice	yellow encrusting breadcrumb sponge (85%), northern red anemone (~4), white anemone (~2), edge fauna and biolayer

Table 1. Surficial geology observations and biological information obtained in seabed video and still photography surveys, Berth “A” and associated cable route, July & August, 2009. Depths below mean low water (MLW) from the digital terrain model. % = % cover; “o”= occasional; (N)= number in view.

Cruise Date	Station	Depth (m)	Image Type	Bottom Type	Biological Component
	AC30-3	28.6	video	cobble to boulder over bedrock	yellow encrusting breadcrumb sponge (80%), edge fauna, blood star, several possible juvenile seastars and northern red anemones (~7)
	AC31-1	29.5	video	basalt bedrock	patches of yellow encrusting breadcrumb sponge, edge fauna, one blood star and many northern red anemones (~18)
	AC31-2	28.6	video	basalt bedrock	<i>Asterias</i> sp, juvenile seastar, northern red anemone (~7) and edge fauna.
	AC31-3	28.3	video	basalt bedrock	yellow encrusting breadcrumb sponge (15%) and possible blood.star.
	AC31-4	28.6	video	boulder to basalt bedrock	patches of yellow encrusting breadcrumb sponge, edge fauna, possible biolayer, juvenile seastar, northern red anemone (~3)
	AC32-1	28.9	video	basalt bedrock	yellow encrusting breadcrumb sponge (90%) with possible snail shell.
	AC32-2	29.6	video	basalt bedrock	65% yellow encrusting breadcrumb sponge
	AC32-3	29.3	video	cobble to boulder	45% yellow encrusting breadcrumb sponge, edge fauna and possible patch of biolayer
	AC32-4	28.6	video	basalt bedrock	99% yellow encrusting breadcrumb sponge.

APPENDIX A- JULY AND AUGUST SURVEYS, 2009, BERTH "A", VIDEO IMAGE CAPTURES



**Video and
Photograph
Locations**

**Berth A
Cable Route
Minas Passage**

Images acquired
July 2, 2009 &
August 4-5, 2009

● Video or
Photo Station

(Photo stations have
"BEN-" prefix)

Depth contours in metres

Envirosphere Consultants Ltd.

Table A1. List of video sampling stations, Minas Passage study site, Berth "A", July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE	COMMENT
A 7 - 1	7/2/2009	3:45:45	45 21.9234	64 25.7802	29.6 m	video	
A 7 - 2	7/2/2009	3:46:16	45 21.9249	64 25.7849	29.7 m	video	
A 7 - 3	7/2/2009	3:46:48	45 21.9247	64 25.7863	29.8 m	video	
A 7 - 4	7/2/2009	3:47:28	45 21.9259	64 25.7872	29.5 m	video	
A 8 - 1	7/2/2009	3:50:04	45 21.8935	64 25.8168	29.7 m	video	
A 8 - 2	7/2/2009	3:50:30	45 21.8905	64 25.8223	29.8 m	video	
A 8 - 3	7/2/2009	3:50:55	45 21.8887	64 25.8257	30.2 m	video	
A 9 - 1	7/2/2009	3:53:49	45 21.8651	64 25.7776	31.0 m	video	
A 9 - 2	7/2/2009	3:54:11	45 21.8636	64 25.7789	30.5 m	video	
A 9 - 3	7/2/2009	3:54:33	45 21.8618	64 25.7797	29.8 m	video	
A 9 - 4	7/2/2009	3:55:08	45 21.8591	64 25.7861	30.2 m	video	
A10 - 1	7/2/2009	3:57:12	45 21.8899	64 25.7417	29.5 m	video	
A10 - 2	7/2/2009	3:57:39	45 21.8883	64 25.7377	30.1 m	video	
A10 - 3	7/2/2009	3:58:03	45 21.8866	64 25.7347	29.8 m	video	
A10a - 1	8/5/2009	1:24:45	45 21.8822	64 25.7537	29.6 m	video	
A10a - 2	8/5/2009	1:25:18	45 21.8810	64 25.7671	29.7 m	video	
A10a - 3	8/5/2009	1:25:48	45 21.8806	64 25.7771	29.6 m	video	
A10a - 4	8/5/2009	1:26:13	45 21.8809	64 25.7843	29.4 m	video	
A10a - 5	8/5/2009	1:26:36	45 21.8811	64 25.7906	29.6 m	video	
A10a - 6	8/5/2009	1:27:02	45 21.8831	64 25.7976	30.0 m	video	
A10a - 7	8/5/2009	1:27:43	45 21.8847	64 25.8112	29.7 m	video	
A10a - 8	8/5/2009	1:28:07	45 21.8857	64 25.8200	29.5 m	video	
A10b - 1	8/5/2009	1:31:28	45 21.8675	64 25.7628	30.3 m	video	
A10b - 2	8/5/2009	1:31:57	45 21.8685	64 25.7788	29.5 m	video	
A10b - 3	8/5/2009	1:32:23	45 21.8703	64 25.7917	30.0 m	video	
A10b - 4	8/5/2009	1:32:47	45 21.8715	64 25.8033	30.0 m	video	
A10b - 5	8/5/2009	1:33:11	45 21.8729	64 25.8143	29.9 m	video	
A10b - 6	8/5/2009	1:33:31	45 21.8742	64 25.8229	29.8 m	video	
A10c - 1	8/5/2009	1:36:40	45 21.8899	64 25.7394	29.5 m	video	

Table A1. List of video sampling stations, Minas Passage study site, Berth "A", July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE	COMMENT
A10c - 2	8/5/2009	1:37:06	45 21.8902	64 25.7536	29.4 m	video	
A10c - 3	8/5/2009	1:37:28	45 21.8908	64 25.7661	29.7 m	video	
A10c - 4	8/5/2009	1:37:54	45 21.8911	64 25.7804	30.3 m	video	
A10c - 5	8/5/2009	1:38:14	45 21.8914	64 25.7911	30.2 m	video	
A10c - 6	8/5/2009	1:38:37	45 21.8921	64 25.8022	29.2 m	video	
A10c - 7	8/5/2009	1:38:56	45 21.8933	64 25.8117	29.2 m	video	
A10c - 8	8/5/2009	1:39:15	45 21.8951	64 25.8208	30.0 m	video	
A11 - 1	7/2/2009	4:00:49	45 21.9114	64 25.7066	30.0 m	video	
A11 - 2	7/2/2009	4:01:21	45 21.9077	64 25.6972	29.4 m	video	
A11 - 3	7/2/2009	4:01:45	45 21.9045	64 25.6917	29.4 m	video	
A11 - 4	7/2/2009	4:02:13	45 21.9002	64 25.6850	29.7 m	video	
A12 - 1	7/2/2009	4:05:02	45 21.8956	64 25.7707	29.5 m	video	
A12 - 2	7/2/2009	4:05:28	45 21.8946	64 25.7640	29.8 m	video	
A12 - 3	7/2/2009	4:05:47	45 21.8945	64 25.7561	29.6 m	video	



Figure A1. A7-1-A



Figure A4. A7-1-D



Figure A7. A7-2-C



Figure A2. A7-1-B



Figure A5. A7-2-A



Figure A8. A7-2-D



Figure A3. A7-1-C



Figure A6. A7-2-B



Figure A9. A7-2-E



Figure A10. A7-3-A



Figure A13. A7-4-A



Figure A16. A8-1-A



Figure A11. A7-3-B



Figure A14. A7-4-B



Figure A17. A8-1-B



Figure A12. A7-3-C



Figure A15. A7-4-C



Figure A18. A8-1-C



Figure A19. A8-1-D



Figure A22. A8-2-C



Figure A25. A8-3-B



Figure A20. A8-2-A



Figure A23. A8-2-D



Figure A26. A8-3-C



Figure A21. A8-2-B



Figure A24. A8-3-A



Figure A27. A9-1-A



Figure A28. A9-1-B



Figure A31. A9-2-A



Figure A34. A9-3-A



Figure A29. A9-1-C



Figure A32. A9-2-C



Figure A35. A9-3-B



Figure A30. A9-1-D



Figure A33. A9-2-D



Figure A36. A9-3-C



Figure A37. A9-4-A



Figure A40. A10-1-A



Figure A43. A10-2-A



Figure A38. A9-4-B



Figure A41. A10-1-B



Figure A44. A10-2-B



Figure A39. A9-4-C



Figure A42. A10-1-C



Figure A45. A10-2-C



Figure A46. A10-3-A



Figure A49. A10a-1-A



Figure A52. A10a-2-A



Figure A47. A10-3-B



Figure A50. A10a-1-B



Figure A53. A10-2-B



Figure A48. A10-3-C



Figure A51. A10a-1-C



Figure A54. A10a-2-C



Figure A55. A10a-3-A



Figure A58. A10a-4-A



Figure A61. A10a-5-A



Figure A56. A10a-3-B



Figure A59. A10a-4-B



Figure A62. A10a-5-B



Figure A57. A10a-3-C



Figure A60. A10a-4-C



Figure A63. A10a-5-C



Figure A64. A10a-6-A



Figure A67. A10a-7-A



Figure A70. A10a-8-A



Figure A65. A10a-6-B



Figure A68. A10a-7-B



Figure A71. A10-8-B



Figure A66. A10a-6-C



Figure A69. A10a-7-C



Figure A72. A10a-8-C



Figure A73. A10b-1-A



Figure A76. A10b-2-A



Figure A79. A10b-2-D



Figure A74. A10b-1-B



Figure A77. A10b-2-B



Figure A80. A10b-3-A



Figure A75. A10b-1-C



Figure A78. A10b-2-C



Figure A81. A10b-3-B



Figure A82. A10b-3-C



Figure A85. A10b-4-C



Figure A88. A10b-5-C



Figure A83. A10b-4-A



Figure A86. A10b-5-A



Figure A89. A10b-6-A



Figure A84. A10b-4-B



Figure A87. A10b-5-B



Figure 90. A10b-6-B



Figure A91. A10b-6-C



Figure A94. A10c-1-B



Figure A97. A10c-2-B



Figure A92. A10b-6-D



Figure A95. A10c-1-C



Figure A98. A10c-2-C



Figure A93. A10c-1-A



Figure A96. A10c-2-A



Figure A99. A10c-2-D



Figure A100. A10c-3-A



Figure A103. A10c-3-D



Figure A106. A10c-4-C



Figure A101. A10c-3-B



Figure A104. A10c-4-A



Figure A107. A10c-4-D



Figure A102. A10c-3-C



Figure A105. A10c-4-B



Figure A108. A10c-5-A



Figure A109. A10c-5-B



Figure A112. A10c-6-A



Figure A115. A10c-6-D



Figure A110. A10c-5-C



Figure A113. A10c-6-B



Figure A116. A10c-7-A



Figure A111. A10c-5-D



Figure A114. A10c-6-C



Figure A117. A10c-7-B



Figure A118. A10c-7-C



Figure A121. A10c-8-B



Figure A124. A11-1-A



Figure A119. A10c-7-D



Figure A122. A10c-8-C



Figure A125. A11-1-B



Figure A120. A10c-8-A



Figure A123. A10c-8-D



Figure A126. A11-1-C



Figure A127. A11-1-D



Figure A130. A11-2-C



Figure A133. A11-3-B



Figure A128. A11-2-A



Figure A131. A11-2-D



Figure A134. A11-3-C



Figure A129. A11-2-B



Figure A132. A11-3-A



Figure A135. A11-4-A



Figure A136. A11-4-B



Figure A139. A12-1-B



Figure A142. A12-2-B



Figure A137. A11-4-C



Figure A140. A12-1-C



Figure A143. A12-2-C



Figure A138. A12-1-A



Figure A141. A12-2-A



Figure A144. A12-3-A

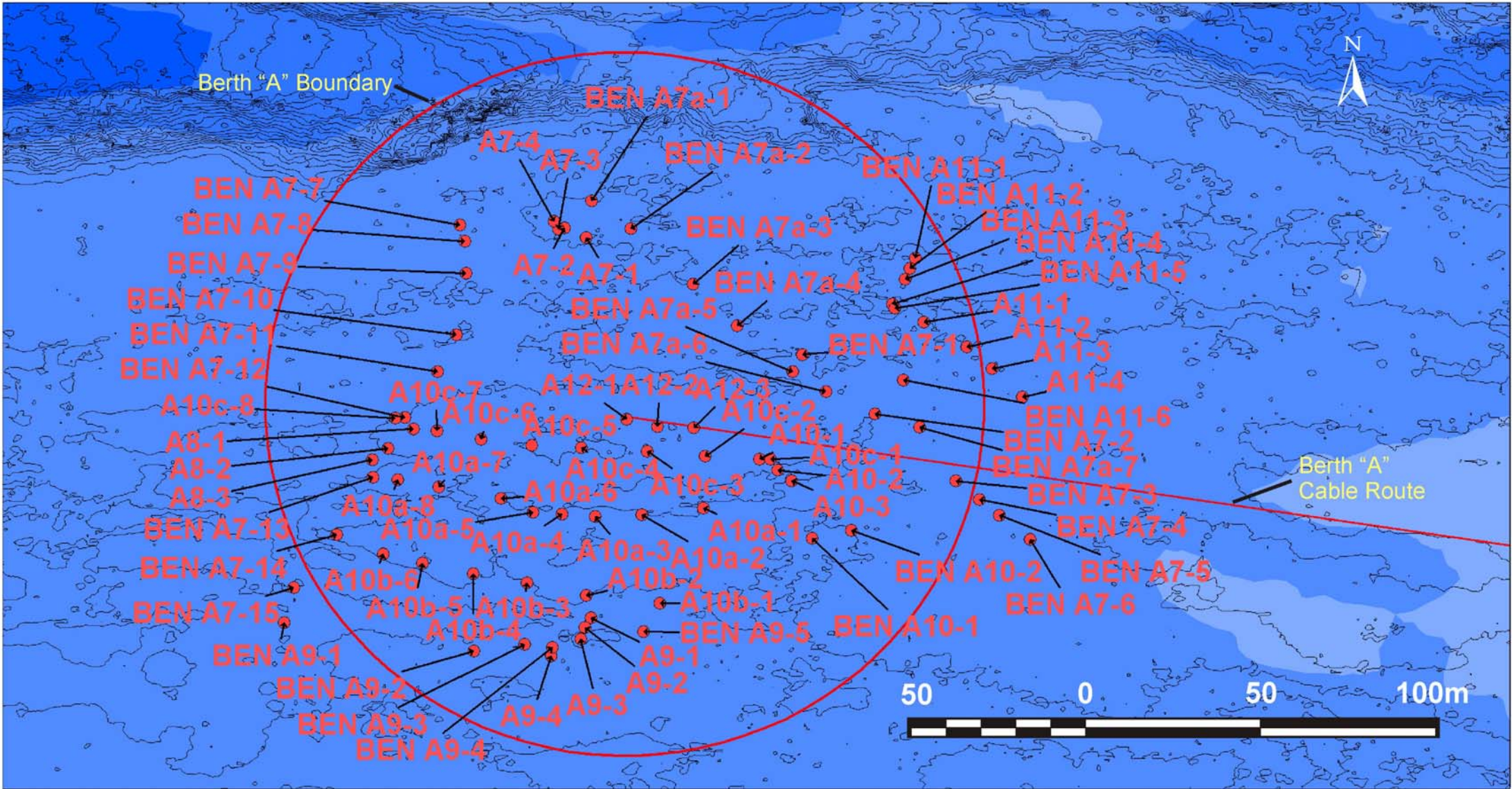


Figure A145. A12-3-B



Figure A146. A12-3-C

APPENDIX B- VIDEO AND PHOTOGRAPHIC SURVEY, BERTH “A”, JULY 2-3, 2009, 35mm Photos



**Video and
Photograph
Locations**

**Berth A
Cable Route
Minas Passage**

Images acquired
July 2, 2009 &
August 4-5, 2009

● Video or
Photo Station

(Photo stations have
"BEN-" prefix)

Depth contours in metres

Envirosphere Consultants Ltd.

Table A1. List of still photo sampling stations, Minas Passage study site, Berth "A", July, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
BEN A 7 - 1	7/2/2009	10:04:1	45 21.9061	64 25.7328	29.9 m	photo
BEN A 7 - 2	7/2/2009	10:04:4	45 21.8972	64 25.7169	29.8 m	photo
BEN A 7 - 3	7/2/2009	10:05:3	45 21.8871	64 25.6991	29.1 m	photo
BEN A 7 - 4	7/2/2009	10:05:4	45 21.8843	64 25.6939	29.5 m	photo
BEN A 7 - 5	7/2/2009	10:06:0	45 21.8819	64 25.6895	29.5 m	photo
BEN A 7 - 6	7/2/2009	10:06:2	45 21.8783	64 25.6828	29.6 m	photo
BEN A 7 - 7	7/2/2009	10:16:5	45 21.9250	64 25.8075	30.0 m	photo
BEN A 7 - 8	7/2/2009	10:17:1	45 21.9225	64 25.8065	30.3 m	photo
BEN A 7 - 9	7/2/2009	10:17:4	45 21.9176	64 25.8061	30.1 m	photo
BEN A 7 - 10	7/2/2009	10:18:4	45 21.9081	64 25.8079	30.0 m	photo
BEN A 7 - 11	7/2/2009	10:19:2	45 21.9024	64 25.8119	30.7 m	photo
BEN A 7 - 12	7/2/2009	10:20:2	45 21.8953	64 25.8188	29.8 m	photo
BEN A 7 - 13	7/2/2009	10:21:3	45 21.8860	64 25.8254	29.7 m	photo
BEN A 7 - 14	7/2/2009	10:22:2	45 21.8771	64 25.8331	29.5 m	photo
BEN A 7 - 15	7/2/2009	10:23:2	45 21.8689	64 25.8421	31.5 m	photo
BEN A 7a - 1	7/3/2009	5:09:50	45 21.9291	64 25.7791	29.8 m	photo
BEN A 7a - 2	7/3/2009	5:10:12	45 21.9250	64 25.7705	29.9 m	photo
BEN A 7a - 3	7/3/2009	5:10:42	45 21.9166	64 25.7568	29.9 m	photo
BEN A 7a - 4	7/3/2009	5:11:04	45 21.9103	64 25.7471	29.4 m	photo
BEN A 7a - 5	7/3/2009	5:11:37	45 21.9034	64 25.7349	29.2 m	photo
BEN A 7a - 6	7/3/2009	5:11:58	45 21.9005	64 25.7276	29.8 m	photo
BEN A 7a - 7	7/3/2009	5:12:47	45 21.8953	64 25.7072	29.3 m	photo
BEN A 9 - 1	7/3/2009	5:01:24	45 21.8634	64 25.8441	31.4 m	photo
BEN A 9 - 2	7/3/2009	5:03:13	45 21.8596	64 25.8029	30.6 m	photo
BEN A 9 - 3	7/3/2009	5:03:43	45 21.8608	64 25.7920	30.0 m	photo
BEN A 9 - 4	7/3/2009	5:04:07	45 21.8604	64 25.7859	30.4 m	photo
BEN A 9 - 5	7/3/2009	5:05:39	45 21.8631	64 25.7662	30.3 m	photo
BEN A10 - 1	7/3/2009	4:56:29	45 21.8779	64 25.7301	30.1 m	photo
BEN A10 - 2	7/3/2009	4:57:02	45 21.8792	64 25.7215	29.8 m	photo

Table A1. List of still photo sampling stations, Minas Passage study site, Berth "A", July, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
BEN A11 - 1	7/3/2009	4:48:22	45 21.9212	64 25.7087	30.3 m	photo
BEN A11 - 2	7/3/2009	4:48:40	45 21.9196	64 25.7098	30.6 m	photo
BEN A11 - 3	7/3/2009	4:48:57	45 21.9180	64 25.7109	30.3 m	photo
BEN A11 - 4	7/3/2009	4:49:52	45 21.9141	64 25.7135	29.6 m	photo
BEN A11 - 5	7/3/2009	4:50:19	45 21.9135	64 25.7130	30.1 m	photo
BEN A11 - 6	7/3/2009	4:51:12	45 21.9024	64 25.7108	29.6 m	photo

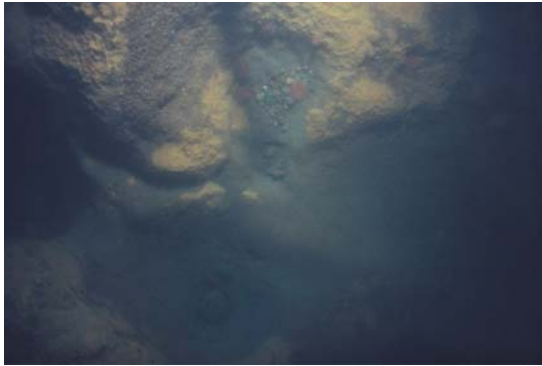


Figure B1. Station BEN-A9-1, July 2009



Figure B4. Station BEN-A11-1.

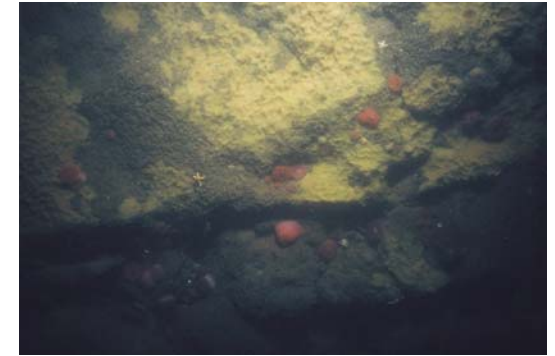


Figure B7. Station BEN-A11-4, July 2009

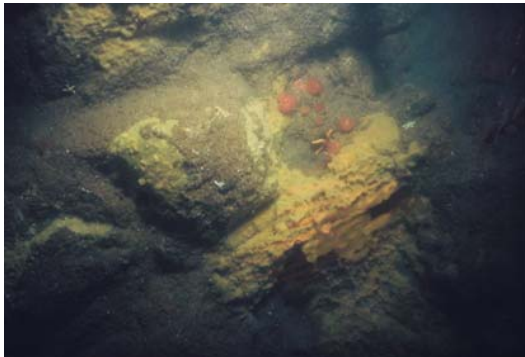


Figure B2. Station BEN-A10-1, July 2009

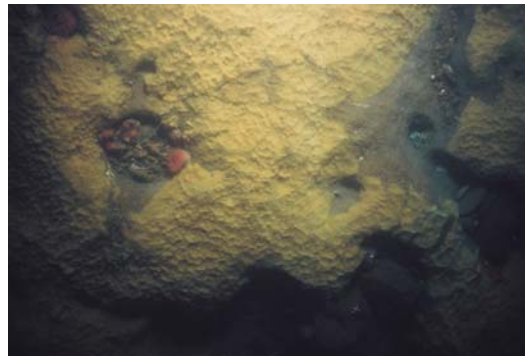


Figure B5. Station BEN-A11-2, July 2009.

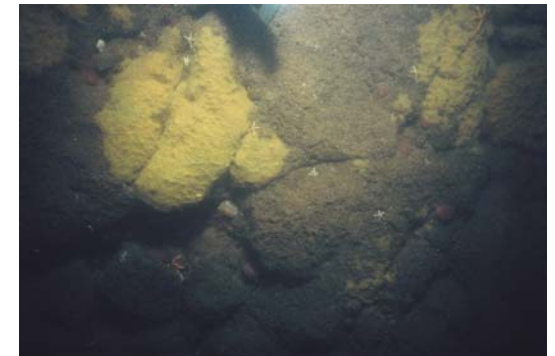


Figure B8. Station BEN-A11-5, July 2009



Figure B3. Station BEN-A10-2, July 2009.



Figure B6. Station BEN-A11-3, July 2009.



Figure B9. Station BEN-A11-6, July 2009.

APPENDIX C- VIDEO SURVEY, BERTH "A" CABLE ROUTE, JULY AND AUGUST, 2009

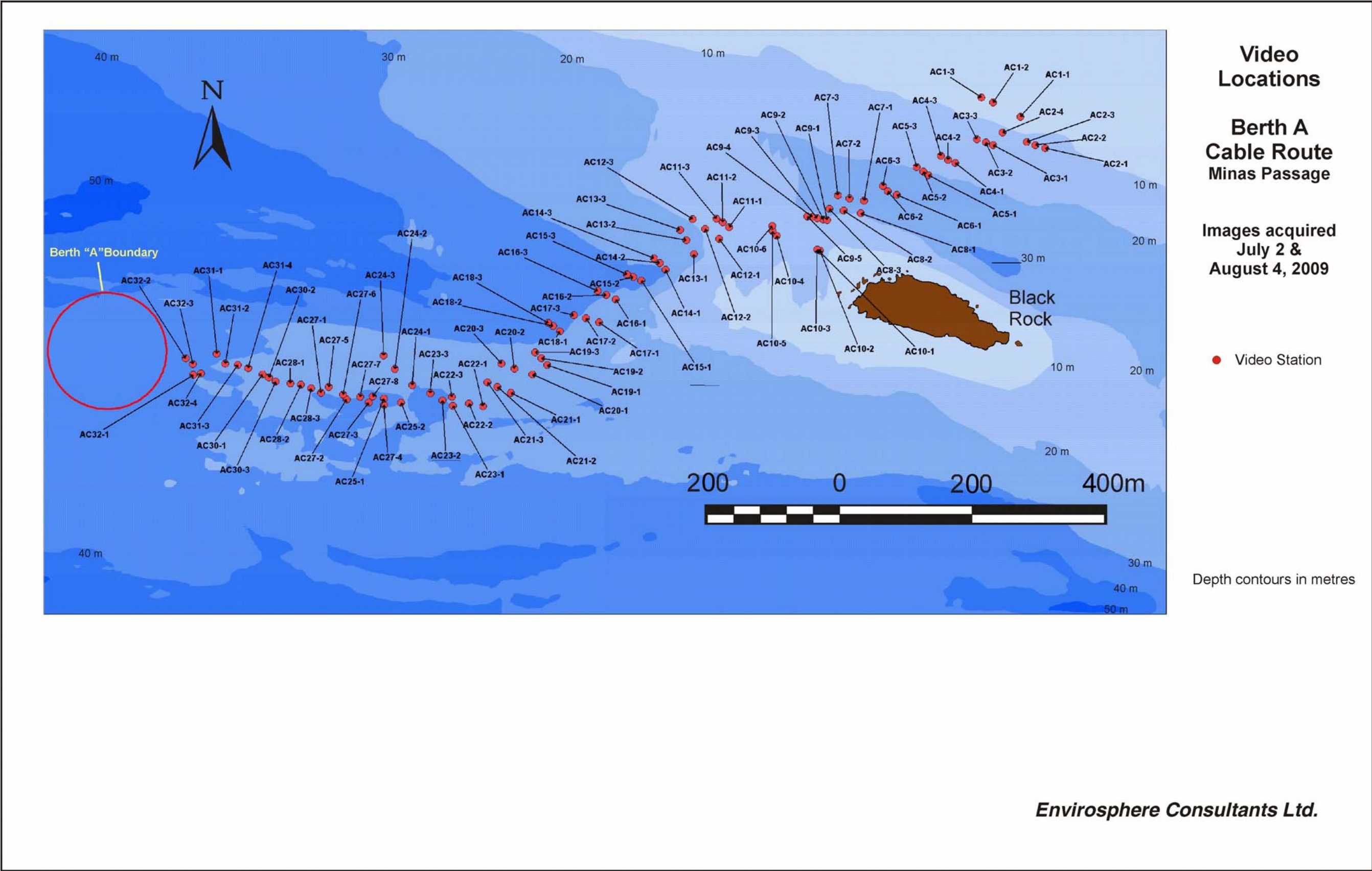


Table C1. List of video sampling stations, Minas Passage study site, Berth "A" Cable Route, July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
AC 1 - 1	7/2/2009	9:42:42	45 22.1390	64 24.5806	7.26 m	video
AC 1 - 2	7/2/2009	9:43:36	45 22.1516	64 24.6170	6.8 m	video
AC 1 - 3	7/2/2009	9:43:56	45 22.1562	64 24.6328	7.0 m	video
AC 2 - 1	7/2/2009	9:47:29	45 22.1105	64 24.5465	11.8 m	video
AC 2 - 2	7/2/2009	9:47:47	45 22.1134	64 24.5596	11.4 m	video
AC 2 - 3	7/2/2009	9:48:01	45 22.1161	64 24.5712	11.5 m	video
AC 2 - 4	7/2/2009	9:48:43	45 22.1243	64 24.6035	11.6 m	video
AC 3 - 1	7/2/2009	9:50:46	45 22.1123	64 24.6153	14.9 m	video
AC 3 - 2	7/2/2009	9:51:01	45 22.1145	64 24.6248	14.5 m	video
AC 3 - 3	7/2/2009	9:51:18	45 22.1171	64 24.6371	14.2 m	video
AC 4 - 1	7/2/2009	9:53:19	45 22.0944	64 24.6643	17.8 m	video
AC 4 - 2	7/2/2009	9:53:36	45 22.0973	64 24.6739	17.5 m	video
AC 4 - 3	7/2/2009	9:53:51	45 22.1007	64 24.6838	17.4 m	video
AC 5 - 1	7/2/2009	9:56:08	45 22.0826	64 24.6993	19.3 m	video
AC 5 - 2	7/2/2009	9:56:22	45 22.0857	64 24.7062	19.1 m	video
AC 5 - 3	7/2/2009	9:56:36	45 22.0896	64 24.7148	18.7 m	video
AC 6 - 1	7/2/2009	9:59:08	45 22.0635	64 24.7402	20.9 m	video
AC 6 - 2	7/2/2009	9:59:27	45 22.0664	64 24.7519	21.2 m	video
AC 6 - 3	7/2/2009	9:59:46	45 22.0714	64 24.7588	21.0 m	video
AC 7 - 1	7/2/2009	10:01:2	45 22.0570	64 24.7829	22.3 m	video
AC 7 - 2	7/2/2009	10:01:4	45 22.0589	64 24.8019	22.9 m	video
AC 7 - 3	7/2/2009	10:02:0	45 22.0616	64 24.8172	22.2 m	video
AC 8 - 1	7/2/2009	10:05:1	45 22.0456	64 24.7864	21.3 m	video
AC 8 - 2	7/2/2009	10:05:3	45 22.0474	64 24.8090	19.4 m	video
AC 8 - 3	7/2/2009	10:05:5	45 22.0489	64 24.8280	19.8 m	video
AC 9 - 1	7/2/2009	10:08:1	45 22.0383	64 24.8305	17.7 m	video
AC 9 - 2	7/2/2009	10:08:3	45 22.0388	64 24.8361	18.1 m	video
AC 9 - 3	7/2/2009	10:08:4	45 22.0398	64 24.8435	19.1 m	video
AC 9 - 4	7/2/2009	10:09:0	45 22.0407	64 24.8500	17.9 m	video

Table C1. List of video sampling stations, Minas Passage study site, Berth "A" Cable Route, July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
AC 9 - 5	7/2/2009	10:09:1	45 22.0410	64 24.8568	17.8 m	video
AC10 - 1	7/2/2009	10:11:0	45 22.0106	64 24.8420	11.9 m	video
AC10 - 2	7/2/2009	10:11:2	45 22.0096	64 24.8391	11.1 m	video
AC10 - 3	7/2/2009	10:11:4	45 22.0106	64 24.8426	11.8 m	video
AC10 - 4	7/2/2009	10:17:5	45 22.0224	64 24.8963	14.3 m	video
AC10 - 5	7/2/2009	10:18:1	45 22.0263	64 24.9019	14.3 m	video
AC10 - 6	7/2/2009	10:18:4	45 22.0316	64 24.9025	14.7 m	video
AC11 - 1	7/2/2009	10:20:4	45 22.0293	64 24.9592	16.5 m	video
AC11 - 2	7/2/2009	10:21:1	45 22.0337	64 24.9678	17.2 m	video
AC11 - 3	7/2/2009	10:21:2	45 22.0367	64 24.9763	16.7 m	video
AC12 - 1	7/2/2009	10:23:3	45 22.0182	64 24.9719	18.3 m	video
AC12 - 2	7/2/2009	10:24:0	45 22.0269	64 24.9906	19.3 m	video
AC12 - 3	7/2/2009	10:24:3	45 22.0358	64 25.0074	17.5 m	video
AC13 - 1	7/2/2009	10:27:4	45 22.0030	64 25.0040	24.6 m	video
AC13 - 2	7/2/2009	10:28:1	45 22.0161	64 25.0150	22.9 m	video
AC13 - 3	7/2/2009	10:28:3	45 22.0254	64 25.0234	21.9 m	video
AC14 - 1	7/2/2009	10:31:0	45 21.9879	64 25.0410	29.9 m	video
AC14 - 2	7/2/2009	10:31:2	45 21.9939	64 25.0490	28.3 m	video
AC14 - 3	7/2/2009	10:31:4	45 21.9986	64 25.0567	27.4 m	video
AC15 - 1	7/2/2009	10:34:0	45 21.9773	64 25.0722	30.0 m	video
AC15 - 2	7/2/2009	10:34:2	45 21.9805	64 25.0832	29.6 m	video
AC15 - 3	7/2/2009	10:34:4	45 21.9828	64 25.0916	30.1 m	video
AC16 - 1	7/2/2009	10:37:3	45 21.9592	64 25.1050	28.1 m	video
AC16 - 2	7/2/2009	10:37:5	45 21.9629	64 25.1178	29.2 m	video
AC16 - 3	7/2/2009	10:38:1	45 21.9664	64 25.1290	29.8 m	video
AC17 - 1	7/2/2009	10:40:5	45 21.9374	64 25.1263	27.0 m	video
AC17 - 2	7/2/2009	10:41:1	45 21.9407	64 25.1437	28.8 m	video
AC17 - 3	7/2/2009	12:00:0	45 21.9434	64 25.1594	30.0 m	video
AC18 - 1	8/4/2009	13:02:4	45 21.9281	64 25.1770	30.4 m	video

Table C1. List of video sampling stations, Minas Passage study site, Berth "A" Cable Route, July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
AC18 - 2	8/4/2009	13:03:0	45 21.9328	64 25.1862	31.8 m	video
AC18 - 3	8/4/2009	13:03:2	45 21.9357	64 25.1931	31.4 m	video
AC19 - 1	8/4/2009	13:06:3	45 21.8964	64 25.1925	26.5 m	video
AC19 - 2	8/4/2009	13:06:5	45 21.9027	64 25.2006	26.3 m	video
AC19 - 3	8/4/2009	13:07:1	45 21.9078	64 25.2089	25.9 m	video
AC20 - 1	8/4/2009	13:10:2	45 21.8872	64 25.2117	25.5 m	video
AC20 - 2	8/4/2009	13:11:0	45 21.8921	64 25.2353	26.2 m	video
AC20 - 3	8/4/2009	13:11:2	45 21.8964	64 25.2528	26.2 m	video
AC21 - 1	8/4/2009	13:14:4	45 21.8697	64 25.2395	28.3 m	video
AC21 - 2	8/4/2009	13:15:0	45 21.8747	64 25.2575	27.2 m	video
AC21 - 3	8/4/2009	13:15:2	45 21.8786	64 25.2706	25.7 m	video
AC22 - 1	8/4/2009	13:18:4	45 21.8564	64 25.2753	27.7 m	video
AC22 - 2	8/4/2009	13:19:0	45 21.8586	64 25.2938	28.3 m	video
AC22 - 3	8/4/2009	13:19:2	45 21.8643	64 25.3167	29.5 m	video
AC23 - 1	8/4/2009	13:23:1	45 21.8560	64 25.3152	29.0 m	video
AC23 - 2	8/4/2009	13:23:3	45 21.8607	64 25.3289	30.0 m	video
AC23 - 3	8/4/2009	13:23:5	45 21.8671	64 25.3448	28.9 m	video
AC24 - 1	8/4/2009	13:27:3	45 21.8742	64 25.3689	27.9 m	video
AC24 - 2	8/4/2009	13:28:0	45 21.8887	64 25.3926	26.7 m	video
AC24 - 3	8/4/2009	13:28:2	45 21.9008	64 25.4079	26.7 m	video
AC25 - 1	7/2/2009	4:30:21	45 21.8610	64 25.4060	29.2 m	video
AC25 - 2	7/2/2009	4:30:45	45 21.8576	64 25.3831	29.3 m	video
AC27 - 1	7/2/2009	4:21:25	45 21.8647	64 25.4884	28.6 m	video
AC27 - 2	7/2/2009	4:22:01	45 21.8592	64 25.4550	29.2 m	video
AC27 - 3	7/2/2009	4:22:29	45 21.8568	64 25.4259	29.6 m	video
AC27 - 4	7/2/2009	4:22:50	45 21.8550	64 25.4054	29.5 m	video
AC27 - 5	7/2/2009	4:28:47	45 21.8703	64 25.4786	28.1 m	video
AC27 - 6	7/2/2009	4:29:15	45 21.8635	64 25.4596	28.5 m	video
AC27 - 7	7/2/2009	4:29:45	45 21.8621	64 25.4368	28.7 m	video

Table C1. List of video sampling stations, Minas Passage study site, Berth "A" Cable Route, July and August, 2009.

STATION NUMBER	DATE	TIME (ADT)	LATITUDE	LONGITUDE	DEPTH (m)	TYPE OF SAMPLE
AC27 - 8	7/2/2009	4:30:05	45 21.8627	64 25.4205	28.3 m	video
AC28 - 1	7/2/2009	4:20:30	45 21.8725	64 25.5293	28.2 m	video
AC28 - 2	7/2/2009	4:20:47	45 21.8716	64 25.5158	28.1 m	video
AC28 - 3	7/2/2009	4:21:06	45 21.8687	64 25.5017	28.4 m	video
AC30 - 1	7/2/2009	4:19:27	45 21.8804	64 25.5661	28.6 m	video
AC30 - 2	7/2/2009	4:19:43	45 21.8774	64 25.5576	28.8 m	video
AC30 - 3	7/2/2009	4:20:00	45 21.8739	64 25.5490	28.6 m	video
AC31 - 1	7/2/2009	4:14:08	45 21.8983	64 25.6272	29.5 m	video
AC31 - 2	7/2/2009	4:18:11	45 21.8894	64 25.6154	28.6 m	video
AC31 - 3	7/2/2009	4:18:35	45 21.8884	64 25.5993	28.3 m	video
AC31 - 4	7/2/2009	4:18:56	45 21.8859	64 25.5851	28.6 m	video
AC32 - 1	7/2/2009	4:08:16	45 21.8783	64 25.6570	28.9 m	video
AC32 - 2	7/2/2009	4:10:45	45 21.8935	64 25.6678	29.6 m	video
AC32 - 3	7/2/2009	4:11:08	45 21.8879	64 25.6580	29.3 m	video
AC32 - 4	7/2/2009	4:11:35	45 21.8795	64 25.6473	28.6 m	video



Figure C1. AC1-1-A



Figure C4. AC1-1-D



Figure C7. AC1-2-B



Figure C2. AC1-1-B



Figure C5. AC1-1-E

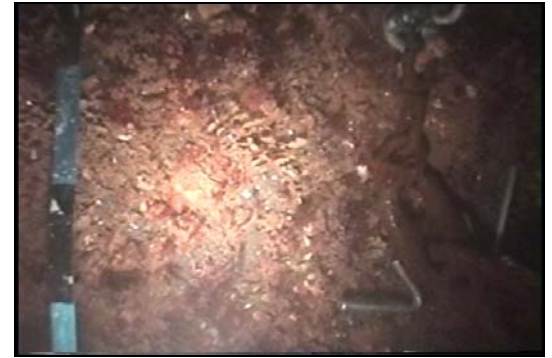


Figure C8. AC1-2-C



Figure C3. AC1-1-C



Figure C6. AC1-2-A



Figure C9. AC1-2-D



Figure C10. AC1-2-E



Figure C13. AC1-3-C



Figure C16. AC2-A-B



Figure C11. AC1-3-A



Figure C14. AC1-3-D



Figure C17. AC2-1-C



Figure C12. AC1-3-B



Figure C15. AC2-1-A



Figure C18. AC2-1-D



Figure C19. AC2-2-A



Figure C22. AC2-3-A



Figure C25. AC2-3-D



Figure C20. AC2-2-B



Figure C23. AC2-3-B



Figure C26. AC2-4-A



Figure C21. AC2-2-C



Figure C24. AC2-3-C



Figure C27. AC2-4-B



Figure C28. AC2-4-C



Figure C31. AC3-1-B



Figure C34. AC3-2-A



Figure C29. AC2-4-D



Figure C32. AC3-1-C



Figure C35. AC3-2-B



Figure C30. AC3-1-A



Figure C33. AC3-1-D



Figure C36. AC3-2-C



Figure C37. AC3-3-A



Figure C40. AC3-3-D



Figure C43. AC4-1-C



Figure C38. AC3-3-B



Figure C41. AC4-1-A



Figure C44. AC4-2-A



Figure C39. AC3-3-C



Figure C42. AC4-1-B



Figure C45. AC4-2-B



Figure C46. AC4-2-C



Figure C49. AC4-3-B



Figure C52. AC5-1-B



Figure C47. AC4-2-D



Figure C50. AC4-3-C



Figure C53. AC5-1-C



Figure C48. AC4-3-A



Figure C51. AC5-1-A



Figure C54. AC5-2-A



Figure C55. AC5-2-B



Figure C58. AC5-3-B



Figure C61. AC6-1-A



Figure C56. AC5-2-C



Figure C59. AC5-3-C



Figure C62. AC6-1-B



Figure C57. AC5-3-A



Figure C60. AC5-3-D



Figure C63. AC6-1-C



Figure C64. AC6-2-A



Figure C67. AC6-3-A



Figure C70. AC6-3-D



Figure C65. AC6-2-B



Figure C68. AC6-3-B



Figure C71. AC7-1-A



Figure C66. AC6-2-C



Figure C69. AC6-3-C



Figure C72. AC7-1-B



Figure C73. AC7-1-C



Figure C76. AC7-2-C



Figure C79. AC7-3-C



Figure C74. AC7-2-A



Figure C77. AC7-3-A



Figure C80. AC8-1-A



Figure C75. AC7-2-B



Figure C78. AC7-3-B



Figure C81. AC8-1-B



Figure C82. AC8-1-C



Figure C85. AC8-2-C



Figure C88. AC8-3-A



Figure C83. AC8-2-A



Figure C86. AC8-2-D

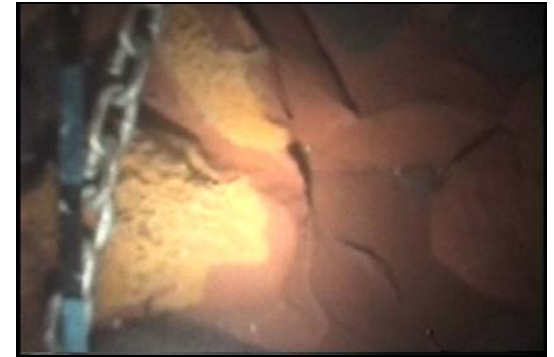


Figure C89. AC8-3-B



Figure C84. AC8-2-B



Figure C87. AC8-2-E



Figure C90. AC8-3-C



Figure C91. AC9-1-A



Figure C94. AC9-2-A



Figure C97. AC9-3-A



Figure C92. AC9-1-B



Figure C95. AC9-2-B



Figure C98. AC9-3-B



Figure C93. AC9-1-C



Figure C96. AC9-2-C



Figure C99. AC9-3-C



Figure C100. AC9-3-D



Figure C103. AC9-5-A



Figure C106. AC10-1-A



Figure C101. AC9-4-A



Figure C104. AC9-5-B



Figure C107. AC10-1-B



Figure C102. AC9-4-B



Figure C105. AC9-5-C



Figure C108. AC10-1-C



Figure C109. AC10-2-A



Figure C112. AC10-3-A



Figure C115. AC10-4-A



Figure C110. AC10-2-B



Figure C113. AC10-3-B



Figure C116. AC10-4-B



Figure C111. AC10-2-C



Figure C114. AC10-3-C



Figure C117. AC10-4-C



Figure C118. AC10-5-A



Figure C121. AC10-6-A



Figure C124. AC11-1-A



Figure C119. AC10-5-B



Figure C122. AC10-6-B



Figure C125. AC11-1-B



Figure C120. AC10-5-C



Figure C123. AC10-6-C



Figure C126. AC11-1-C



Figure C127. AC11-1-D



Figure C130. AC11-2-C



Figure C133. AC11-3-C



Figure C128. AC11-2-A



Figure CC131. AC11-3-A



Figure C134. AC12-1-A



Figure C129. AC11-2-B



Figure C132. AC11-3-B



Figure C135. AC12-1-B



Figure C136. AC12-1-C



Figure C139. AC12-2-C



Figure C142. AC12-3-C



Figure C137. AC12-2-A



Figure C140. AC12-3-A



Figure C143. AC12-3-D



Figure C138. AC12-2-B



Figure C141. AC12-3-B



Figure C144. AC12-3-E



Figure C145. AC13-1-A



Figure C148. AC13-2-A



Figure C151. AC13-2-D



Figure C146. AC13-1-B



Figure C149. AC13-2-B



Figure C152. AC13-2-E



Figure C147. AC13-1-C



Figure C150. AC13-2-C



Figure C153. AC13-3-A



Figure C154. AC13-3-B



Figure C157. AC14-1-A



Figure C160. AC14-2-B



Figure C155. AC13-3-C



Figure C158. AC14-1-B



Figure C161. AC14-2-C



Figure C156. AC13-3-D



Figure C159. AC14-2-A



Figure C162. AC14-3-A



Figure C163. AC14-3-B



Figure C166. AC15-1-B



Figure C169. AC15-2-B



Figure C164. AC14-3-C



Figure C167. AC15-1-C



Figure C170. AC15-2-C



Figure C165. AC15-1-A



Figure C168. AC15-2-A



Figure C171. AC15-3-A



Figure C172. AC15-3-B



Figure C175. AC16-1-B



Figure C178. AC16-2-B



Figure C173. AC15-3-C



Figure C176. AC16-1-C



Figure C179. AC16-2-C



Figure C174. AC16-1-A



Figure C177. AC16-2-A



Figure C180. AC16-3-A



Figure C181. AC16-3-B

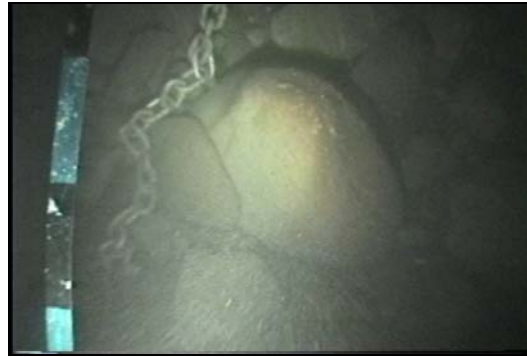


Figure C184. AC17-1-A



Figure C187. AC17-2-A



Figure C182. AC16-3-C



Figure C185. AC17-1-B



Figure C188. AC17-2-B



Figure C183. AC16-3-D



Figure C186. AC17-1-C



Figure C189. AC17-2-C



Figure C190. AC17-3-A



Figure C193. AC18-1-A



Figure C196. AC18-1-D



Figure C191. AC17-3-B



Figure C194. AC18-1-B



Figure C197. AC18-1-E



Figure C192. AC17-3-C



Figure C195. AC18-1-C



Figure C198. AC18-2-A



Figure C199. AC18-2-B



Figure C202. AC18-3-A



Figure C205. AC18-3-D



Figure C200. AC18-2-C



Figure C203. AC18-3-B



Figure C206. AC18-3-E



Figure C201. AC18-2-D



Figure C204. AC18-3-C



Figure C207. AC19-1-A



Figure C208. AC19-1-B



Figure C211. AC19-1-E



Figure C214. AC19-2-C



Figure C209. AC19-1-C



Figure C212. AC19-2-A



Figure C215. AC19-2-D



Figure C210. AC19-1-D



Figure C213. AC19-2-B



Figure C216. AC19-2-E



Figure C217. AC19-3-A



Figure C220. AC19-3-D



Figure C223. AC19-3-G



Figure C218. AC19-3-B



Figure C221. AC19-3-E



Figure C224. AC20-1-A



Figure C219. AC19-3-C



Figure C222. AC19-3-F



Figure C225. AC20-1-B



Figure C226. AC20-1-C



Figure C229. AC20-2-B



Figure C232. AC20-3-A



Figure C227. AC20-1-D



Figure C230. AC20-2-C



Figure C233. AC20-3-B



Figure C228. AC20-2-A



Figure C231. AC20-2-D



Figure C234. AC20-3-C



Figure C235. AC20-3-D



Figure C238. AC21-1-C



Figure C241. AC21-2-C



Figure C236. AC21-1-A



Figure C239. AC21-2-A



Figure C242. AC21-2-D



Figure C237. AC21-1-B



Figure C240. AC21-2-B



Figure C243. AC21-3-A



Figure C244. AC21-3-B



Figure C247. AC22-1-A



Figure C250. AC22-1-D



Figure C245. AC21-3-C



Figure C248. AC22-1-B



Figure C251. AC22-1-E



Figure C246. AC21-3-D



Figure C249. AC22-1-C



Figure C252. AC22-2-A



Figure C253. AC22-2-B



Figure C256. AC22-2-E



Figure C259. AC22-3-C



Figure C254. AC22-2-C



Figure C257. AC22-3-A



Figure C260. AC22-3-D



Figure C255. AC22-2-D



Figure C258. AC22-3-B



Figure C261. AC22-3-E



Figure C262. AC23-1-A



Figure C265. AC23-1-D



Figure C268. AC23-2-B

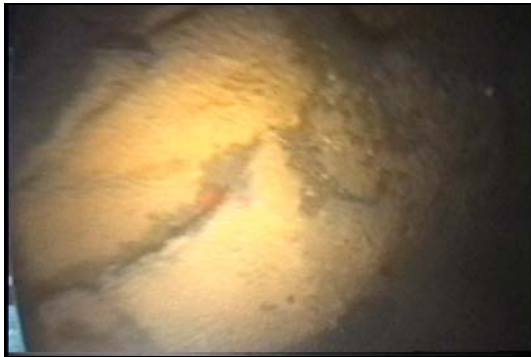


Figure C263. AC23-1-B



Figure C266. AC23-1-E



Figure C269. AC23-2-C



Figure C264. AC23-1-C



Figure C267. AC23-2-A



Figure C270. AC23-2-D



Figure C271. AC23-2-E



Figure C274. AC23-3-C



Figure C277. AC23-3-F



Figure C272. AC23-3-A



Figure C275. AC23-3-D



Figure C278. AC24-1-A



Figure C273. AC23-3-B



Figure C276. AC23-3-E



Figure C279. AC24-1-B



Figure C280. AC24-1-C



Figure C283. AC24-2-A



Figure C286. AC24-2-D



Figure C281. AC24-1-D



Figure C284. AC24-2-B



Figure C287. AC24-2-E



Figure C282. AC24-1-E



Figure C285. AC24-2-C



Figure 288. AC24-3-A



Figure C289. AC24-3-B



Figure C292. AC25-1-A



Figure C295. AC25-1-D



Figure C290. AC24-3-C



Figure C293. AC25-1-B



Figure C296. AC25-1-E



Figure C291. AC24-3-D



Figure C294. AC25-1-C



Figure C297. AC25-2-A



Figure C298. AC25-2-B



Figure C301. AC25-2-E



Figure C304. AC27-1-C



Figure C299. AC25-2-C



Figure C302. AC27-1-A



Figure C305. AC27-1-D



Figure C300. AC25-2-D



Figure C303. AC27-1-B



Figure C306. AC27-2-A



Figure C307. AC27-2-B



Figure C310. AC27-2-E



Figure C313. AC27-3-B



Figure C308. AC27-2-C



Figure C311. AC27-2-F



Figure C314. AC27-3-C



Figure C309. AC27-2-D



Figure C312. AC27-3-A



Figure C315. AC27-3-D



Figure C316. AC27-3-E



Figure C319. AC27-4-C



Figure C322. AC27-5-A



Figure C317. AC27-4-A



Figure C320. AC27-4-D



Figure C323. AC27-5-B



Figure C318. AC27-4-B



Figure C321. AC27-4-E



Figure C324. AC27-5-C



Figure C325. AC27-5-D



Figure C328. AC27-6-B



Figure C331. AC27-6-E



Figure C326. AC27-5-E



Figure C329. AC27-6-C



Figure C332. AC27-6-F



Figure C327. AC27-6-A



Figure C330. AC27-6-D



Figure C333. AC27-7-A



Figure C334. AC27-7-B



Figure C337. AC27-7-E



Figure C340. AC27-8-C



Figure C335. AC27-7-C



Figure C338. AC27-8-A



Figure C341. AC27-8-D



Figure C336. AC27-7-D



Figure C339. AC27-8-B



Figure C342. AC27-8-E



Figure C343. AC28-1-A



Figure C346. AC28-1-D



Figure C349. AC28-2-C



Figure C344. AC28-1-B



Figure C347. AC28-2-A



Figure C350. AC28-2-D



Figure C345. AC28-1-C



Figure C348. AC28-2-B



Figure C351. AC28-2-E



Figure C352. AC28-3-A



Figure C355. AC28-3-D



Figure C358. AC30-1-B



Figure C353. AC28-3-B



Figure C356. AC28-3-E



Figure C359. AC30-1-C



Figure C354. AC28-3-C



Figure C357. AC30-1-A



Figure C360. AC30-1-D



Figure C361. AC30-2-A



Figure C364. AC30-2-D



Figure C367. AC30-3-B

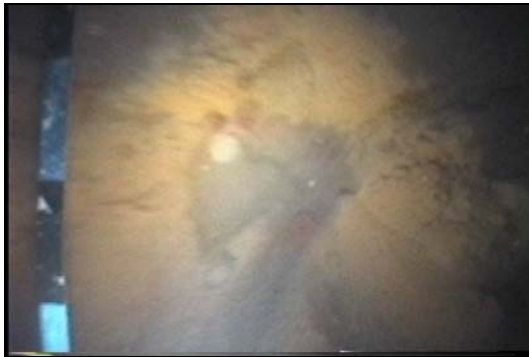


Figure C362. AC30-2-B



Figure C365. AC30-2-E



Figure C368. AC30-3-C



Figure C363. AC30-2-C



Figure C366. AC30-3-A



Figure C369. AC31-1-A



Figure C370. AC31-1-B



Figure C373. AC31-2-A



Figure C376. AC31-2-D



Figure C371. AC31-1-C



Figure C374. AC31-2-B



Figure C377. AC31-2-E



Figure C372. AC31-1-D



Figure C375. AC31-2-C



Figure C378. AC31-3-A



Figure C379. AC31-3-B

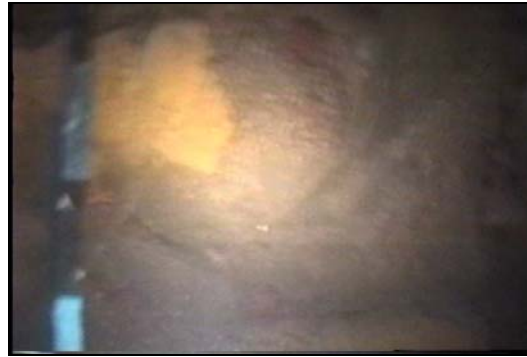


Figure C382. AC31-4-B



Figure C385. AC31-4-E



Figure C380. AC31-3-C



Figure C383. AC31-4-C



Figure C386. AC32-1-A



Figure C381. AC31-4-A



Figure C384. AC31-4-D



Figure C387. AC32-1-B



Figure C388. AC32-1-C



Figure C391. AC32-2-B



Figure C394. AC32-3-B



Figure C389. AC32-1-D



Figure C392. AC32-2-C



Figure C395. AC32-3-C



Figure C390. AC32-2-A



Figure C393. AC32-3-A



Figure C396. AC32-3-D



Figure C397. AC32-4-A



Figure C400. AC32-4-D



Figure C398. AC32-4-B



Figure C399. AC32-4-C