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New England District

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September 9-12, 2008 Field Survey Report

BOSTON HARBOR INNER HARBOR MAINTENANCE DREDGING PROJECT DREDGE PLUME MONITORING

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SEPTEMBER 9-12, 2008
FIELD SURVEY REPORT

BOSTON HARBOR INNER HARBOR MAINTENANCE DREDGING PROJECT
DREDGE PLUME MONITORING

Submitted to:

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ACRONYMS AND ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
CAD	Confined Aquatic Disposal
CTD	Conductivity Temperature Depth
CY	Cubic Yards
DB	Decibels
DO	Dissolved Oxygen
GF/F	Glass Fiber Filter
EPA	Environmental Protection Agency
HS	High Slack
LNG	Liquefied Natural Gas
LS	Low Slack
MBDS	Massachusetts Bay Disposal Site
ME	Maximum Ebb
MF	Maximum Flood
NAE	New England District
NTU	Nephelometric Turbidity Units
OBS	Optical Back-Scatter
SAP	Sampling and Analysis Plan
SRM	Standard Reference Materials
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

This report covers the field and laboratory activities conducted at the request of the U.S. Army Corps of Engineers, New England District (USACE) to support a maintenance dredging project for the Boston Harbor Inner Harbor in Boston, Massachusetts. This field report includes a description of work performed during water quality monitoring conducted in Boston Harbor during removal of silty material, unsuitable for ocean placement, during the maintenance dredging of the main ship channel near Governor's Flats (Figure 1) from September 9-12, 2008.

1.1 Site Description

Boston Harbor is the largest port in New England and serves as a major hub for national and international shipping and commerce. Beginning in the spring of 2008, USACE has been conducting maintenance dredging of the inner portion of the Federal navigation channels in Boston Harbor. The maintenance dredging has been broken into base work and optional contract work. The base work involves dredging the Main Ship Channel from a location approximately half-way between Spectacle Island and Castle Island upstream to approximately the North Jetty, the upper Reserved Channel, and the approach channel to the Navy Dry Dock, all to their authorized depths. The base plan also involves the dredging of a Confined Aquatic Disposal (CAD) cell in the Mystic River and the removal of the silty layer over another CAD cell in the Main Ship Channel of the lower harbor. Approximately 1.3 million cubic yards (cy) of the 1.7 million cy to be dredged from the Federal channels is unsuitable for ocean placement and will be placed into CAD cells located beneath the Federal channels. The remaining 400,000 cy of dredged material, plus the parent material excavated in constructing the CAD cells, will be placed at the Massachusetts Bay Disposal Site (MBDS).

1.2 Project Objectives

The primary objective of this monitoring effort was to conduct shipboard field monitoring to gauge the extent of potential water quality impacts and to track plume trajectories resulting from dredging operations. In particular, sediment resuspension, transport, and subsequent deposition on potential winter flounder spawning grounds have been identified by the resource agencies as an environmental concern. In order to identify any potential project related impacts relative to these resources, this monitoring effort used proven methods from similar past dredge monitoring projects to track dredging plume migration in real-time. Monitoring was performed over multiple tidal cycles at those times when dredging activities had the greatest potential to impact sensitive resource areas. This information could have been used to make operational adjustments during dredging operations, as may have been necessary, to minimize impacts either to water quality or to potential winter flounder spawning habitat from sediment transport.

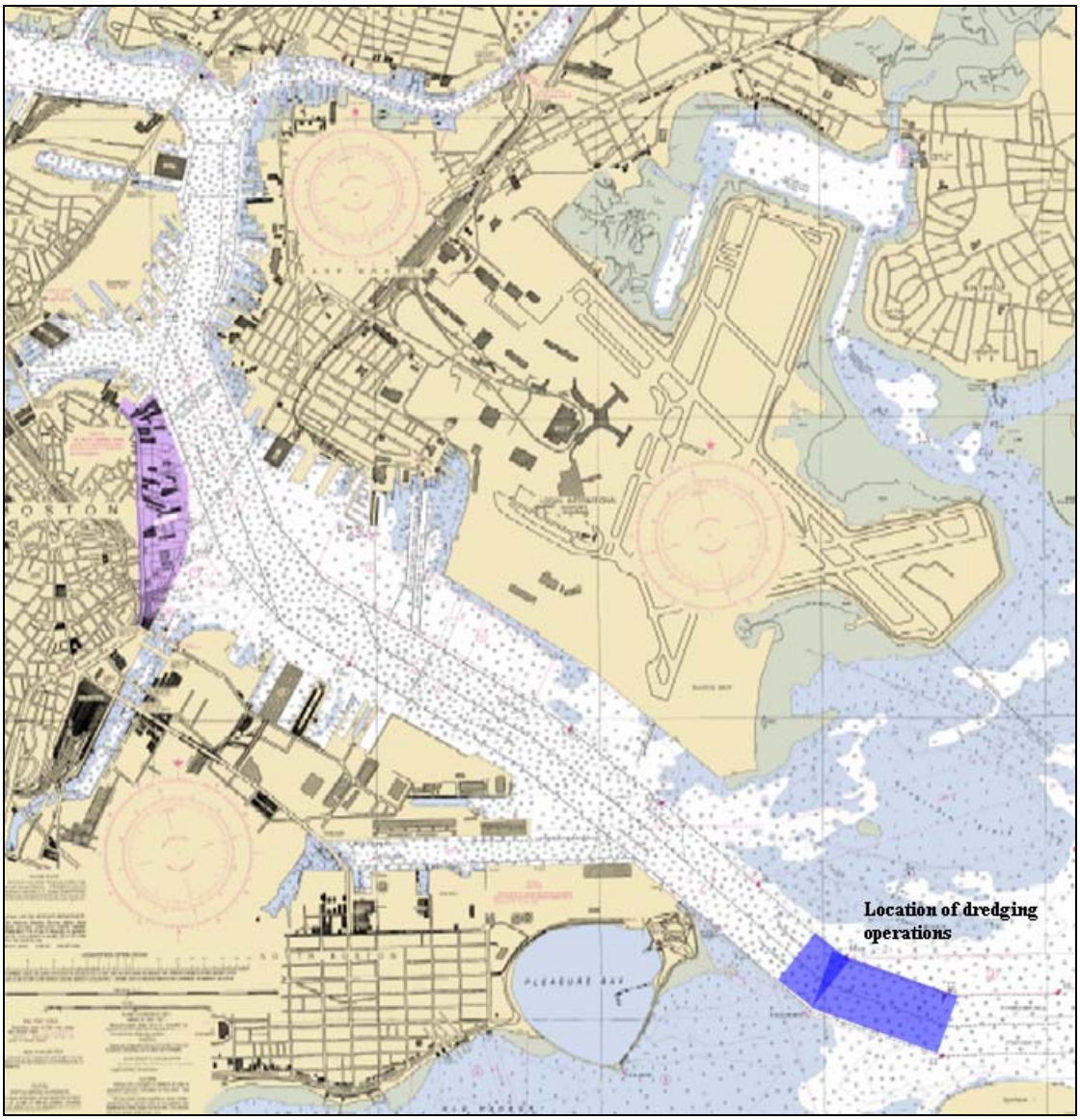

Figure 1. Site Map showing Boston Inner Harbor and the dredging location during the survey in the lower portion of the Federal Channel.

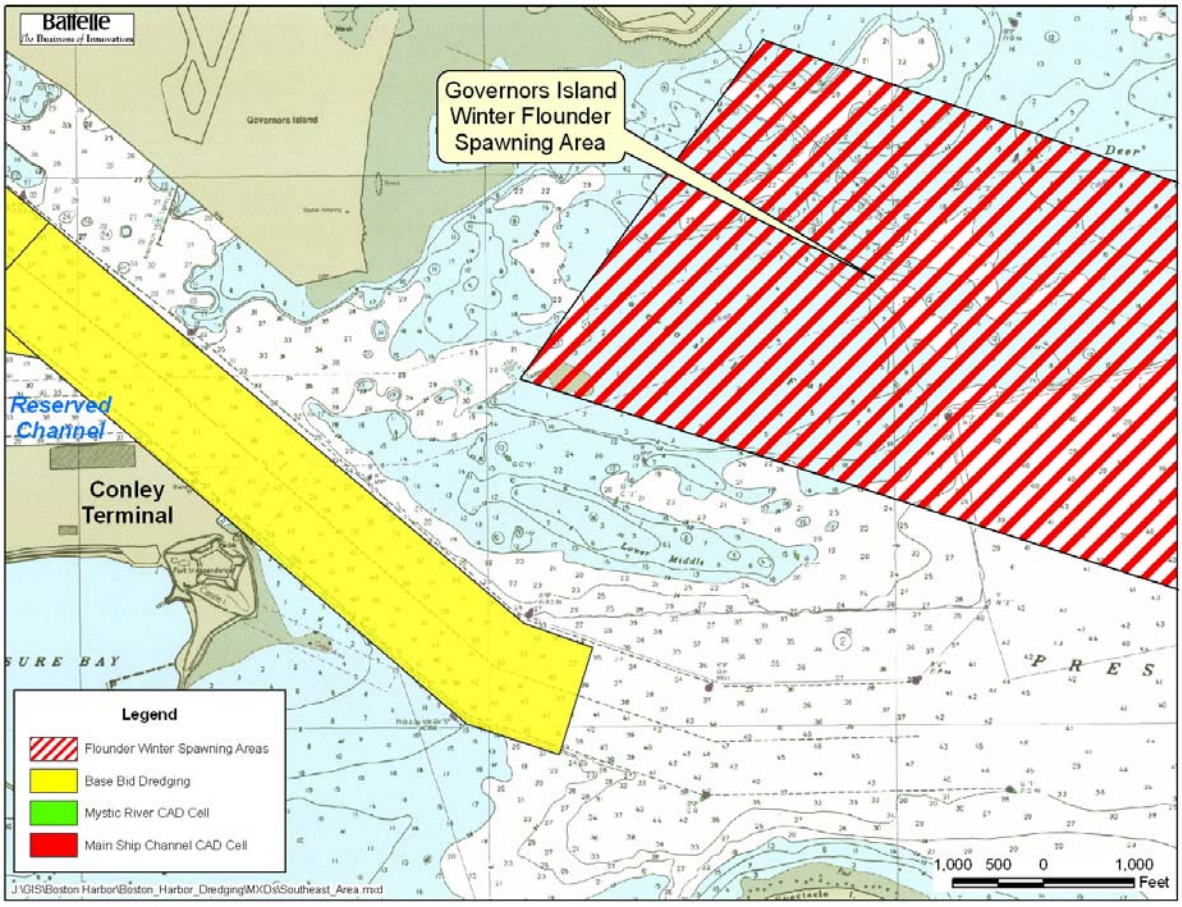

Figure 2. Map of Boston Harbor Inner Harbor Maintenance Dredging Lower Harbor Area and Winter Flounder Spawning Area.

1.3 Field Activity Summary

Water quality monitoring was conducted in Boston Harbor's Lower Harbor within an area south of the Reserved Channel, east of Castle Island and northwest of Spectacle Island, from September 9 through September 12, 2008 during maintenance dredging (Figure 2). All planned field monitoring activities were completed during the removal of the unsuitable, silty material in the channel. This included plume tracking and turbidity monitoring over two complete tidal cycles (8 tide phase events) during dredging operations in the Lower Harbor. Dredged material plumes were observed during each monitoring event. Turbidity values never exceeded the established threshold criteria of dredge plume migration to areas outside the navigation channel (25 NTU's above background in less than 25 feet depth MLLW). Therefore, no monitoring exceedance protocols were initiated. All planned samples were collected for laboratory total suspended solids (TSS) analysis.

Table 1 presents the timeline of field activities performed and a list of on-site field personnel during all survey activities. Dredge plume monitoring was performed over four days (September 9 through September 12). September 11 and 12 were authorized by USACE as additional

dredging monitoring days (standby day) to sample during tide phases that could not be sampled on September 9 and September 10 when dredging operations were suspended for ship passages. This field report describes field sampling activities and provides a synopsis of some preliminary observations from the survey. A description of survey methods is provided in Section 2. A chronological summary of survey activities for sampling is provided in Section 3. Preliminary survey results are provided in Section 4. A description of survey problems, corrective actions, and recommendations for future surveys, can be found in Section 5. Supporting information such as field logs and TSS data are provided in Appendices 1-5 of this document.

Table 1. Survey Personnel for Boston Harbor Inner Harbor Maintenance Dredging Plume Monitoring.

Personnel	Field Activity / Tide / Date	Main Ship Channel Dredge Monitoring HS & MF[a] 09/09/2008	Main Ship Channel Dredge Monitoring HS & ME 09/10/2008	Main Ship Channel Dredge Monitoring ME, LS, & MF[a] 09/11/2008[b]	Main Ship Channel Dredge Monitoring LS 09/12/2008[b]
Battelle Staff					
Chief Scientist		Matt Fitzpatrick	Matt Fitzpatrick	Paul Dragos	Paul Dragos
Lead Technician		Jessica Fahey	Jessica Fahey	Jessica Fahey	Matt Fitzpatrick
Sample Collector		Annie Murphy	Annie Murphy		
NAVSAM Operator		Bob Mandeville	Bob Mandeville	Bob Mandeville	Bob Mandeville
Vessel Captain		Bob Carr	Bob Carr	Bob Carr	Bob Carr

[a] HS = High Slack; MF = Maximum Flood; ME = Maximum Ebb; LS = Low Slack
[b] Standby day used to sample during tide phases not sampled earlier due to suspension of dredging operations.

Figure 3. Dredging Operations of Maintenance Material in the Lower Harbor.

2.0 METHODS

Details on the survey/sampling methods can be found in the final project Sampling and Analysis Plan (Battelle, 2008).

The study design incorporated a broad scale monitoring of sediment plumes using a ship-mounted Acoustic Doppler Current Profiler (ADCP) combined with discrete location water column profiling for *in situ* turbidity using a CTD/Turbidity sensor and rosette, including whole water sample collection for TSS analysis.

2.1 Plume Tracking using ADCP

Plume tracking was conducted using RD Instruments 1200kHz Workhorse Sentinel ADCP mounted on the Battelle R/V *Aquamonitor* (Figure 4). The ADCP measured acoustic backscatter intensity in decibels (db), as a surrogate measure of suspended sediment concentration, at 0.5 m vertical intervals throughout the water column while the vessel was underway. As the vessel ran transects across the ship channel and the adjacent shallow areas or longitudinally along the ship channel, the ADCP mapped out vertical slices of suspended sediment concentration along those transects. These cross sections provided a real-time map of plume location, movement, and dispersion which was used to select CTD/Turbidity water column vertical profile locations. Table 2 presents a summary of ADCP transects performed.

Figure 4. RD Instruments 1200khz Workhorse Sentinel ADCP Mounted on the Battelle R/V Aquamonitor and ADCP Real-Time Display / Data Collection laptop.

2.2 Vertical CTD/Turbidity/Dissolved Oxygen Profiling and TSS Sampling

A CTD/Turbidity sensor and rosette water sampler was lowered over the stern of the R/V *Aquamonitor* (Figure 4) to perform vertical profiles at discrete locations (summarized in Table 3). The profiler was equipped with an underwater instrument package consisting of the CTD, a Dissolved Oxygen (DO) sensor, optical backscatter turbidity sensors (OBS) and a water-sampling system including 9L Rosette sampling bottles. Three OBS's were included in the

sensor suite, each configured for a different range of potential turbidity measurements (0– 25, 0–125, and 0–500 NTU).

Table 2. Type and Approximate Locations of ADCP Transects

Tide Stage[a]	ADCP File ID	Route Start Time	Transect Type and Approximate Locations
Lower Harbor Dredge Monitoring 09-Sept-08			
HS (weak ebb)	BH082008	07:39	cross-channel 300 ft up, 100, 300, 500, 1000, 1500 ft down-current
Ship Passage	BH082016	10:51	cross-channel in front vessel *Acadian*
	BH082017	11:01	cross-channel behind vessel *Acadian*[1]
Ship Passage	BH082024	13:38	cross-channel in front and behind vessel *Yuanhe*[1]
MF	BH082028	15:05	cross-channel 300 ft up, 300, 500,1000 ft down-current
	BH082029	15:27	along-channel transect
Lower Harbor Dredge Monitoring 10-Sept-08			
HS (weak ebb)	BH082037	09:13	Multiple concentric circles around the dredge to find plume location and current direction
	BH082039	09:36	cross-current 300 ft up, 300, 500,1000 ft down-current
ME	BH082047	11:15	2 transects along the edge of the south side of the channel
	BH082048	12:01	cross-channel 300 ft up, 300, 500,1000 ft down-current
	BH082050	12:33	cross-channel 1500 ft down current
Ship Passage	BH082063	17:22	cross-channel behind vessel *Grandeur of the Sea*[1]
Lower Harbor Dredge Monitoring 11-Sept-08			
ME	BH082068	11:54	cross-channel 300 ft up, 200 ft down-current
	BH082070	12:11	cross-channel 300 ft down-current
	BH082073	12:37	cross-channel 500, 1000, 1500 ft down-current
LS (weak flood)	BH082088	16:07	along south side of channel, cross-channel 300 ft up current, 300, 500 ft down-current
	BH082089	16:30	1000 ft down-current
	BH082090	16:39	along the plume transect
MF	BH082104	19:00	cross-current 300 ft up, 100, 300, 500, 1000 ft down-current
Lower Harbor Dredge Monitoring 12-Sept-08			
LS (weak ebb)	BH082117	14:38	cross-channel 300 ft up, 300, 500, 1000,1500 ft down-current
	BH082119	15:09	cross-channel 2000 ft down-current
	BH082121	15:18	along-channel transect

[1]Transect were run on a cross-channel line located approximately 200 ft astern of the vessel as the transect began.
[a] HS = High Slack. MF = Max Flood. LS = Low Slack. ME = Max Ebb.

Figure 5. CTD/Turbidity/Dissolved Oxygen Profiler and Water Sample Rosette System Being Deployed from the R/V Aquamonitor.

Figure 6. Bench Top Turbidimeter.

Whole water samples were collected using the Rosette sample bottles for laboratory TSS analysis and for shipboard measurement of turbidity using a bench top LaMotte Model 2020e Turbidimeter. Samples were collected by triggering the Rosette bottles at three depths. The designated depths were near-surface, near-bottom and at the turbidity maximum, if one was observed. If a turbidity maximum wasn't observed then the sample was collected at mid-depth. After the Rosette was recovered and on deck, samples were transferred to 1-L opaque bottles and stored on ice (~4°C) in the dark until they were delivered to Alpha Analytical for processing and TSS analysis. Water from the near-bottom and mid-depth samples were also transferred from the Rosette bottles to 10mL glass vials for immediate onboard turbidity analysis (Figure 6). The outside of the vials were cleaned and dried prior to insertion into the Turbidimeter to prevent particles and condensation on the outside of the vial from interfering with the measurements. The instrument was set up to collect two separate readings from each sample and average the results. The averaged result was transcribed onto the field data sheet.

Table 3. Summary of CTD/Turbidity Profiles and TSS Samples

Date	Type of Monitoring	Monitoring Period	Number of Profile Stations	Number of TSS Samples (including 5% QC)	Total Number of Samples Per Day
9/9/2008	Dredging	High Slack	6	18 + 1 dup	41
		Max Flood	6	17 + 1 dup[a]	
	Ship Passage	Ship Passage	1	2[b]	
	Ship Passage	Ship Passage	1	2[b]	
9/10/2008	Dredging	High Slack	6	18 + 1 dup	40
		Max Ebb	6	18 + 1 dup	
	Ship Passage	Ship Passage	1	2[b]	
9/11/2008	Dredging	Max Ebb	6	18 + 1 dup	59
		Low Slack	6	18 + 1 dup	
		Max Flood	6	18 + 1 dup	
	Ship Passage	Ship Passage	1	2[b]	
9/12/2008	Dredging	Low Slack	6	18 + 1 dup	19

[a] A mid depth sample was not collected at one of the lateral extents due to water depths of less than 4 meters.
[b] Samples collected at near-bottom and mid-depth only.

2.3 Laboratory TSS Processing

The whole water samples collected during the survey were analyzed by Alpha Analytical Laboratory for TSS using EPA method 160.2. A well-mixed sample was filtered through a standard glass fiber filter (GF/F) and the residual retained on the filter was dried and weighed.

For each batch of 20 or fewer samples, a laboratory method blank, duplicate, and SRM was processed and analyzed with the field samples. Results are reported in Appendix 5 on a dry-weight basis.

2.4 Deviations

During sampling of the ship passages the surface samples were inadvertently not collected due to a procedural error resulting from confusion over different ship sampling protocols during dredge monitoring and disposal monitoring surveys.

Other deviations from planned activities are described in Section 5.

3.0 SURVEY CHRONOLOGY

Note: All times are recorded as Eastern Daylight Time

Lower Harbor Dredge Monitoring: Tuesday, September 9, 2008

0608 Crew arrives at Hewitt's Cove Marina, begins setup, system checks, navigation check.
0621 Depart Hewitt's Cove Marina for Boston Lower Harbor Dredge area.
0700 Arrive Boston Lower Harbor Dredge area. Determine current direction and get navigation fix on dredge.
0739 Begin high slack monitoring and ADCP transects.
0820 ADCP transects completed. Start CTD profiles and TSS/turbidity sample collection.
0916 CTD profiles and TSS/turbidity sample collection completed.
0920 Dredge moves out of the navigation channel so an LNG can pass.
1051 Ship *Acadian* passes- the draft was not readable due to chipping paint. Dredge operations continue to be shut down to allow LNG ship passage. No max ebb monitoring is possible.
1101 Conduct ship passage monitoring. Note: an ADCP transect was conducted prior to the ship passage; slightly elevated backscatter was observed.
1120 Dredge operations still down. Fuel tank ship *Jasmine Express* with a draft of 21 feet passes. A transect and profile were performed behind the ship but no TSS samples collected. The sample were not collected because the ADCP showed similarly elevated backscatter prior to ship passage and after the ship had passed. The benchtop turbidity meter showed lower turbidity readings than the ship that had passed one half hour before.
1155 Container ship *MSC Everest* with a draft of 31.5 feet passes. Dredge operations remain down to allow passage of the *MSC Everest*. Could not conduct a cast with the CTD in a short enough time to capture the plume as there was a lot of ship traffic in the channel. Prop wash observed in upper water column; no near-bottom backscatter. Large school of adult menhaden observed on the surface in mid-channel; also seen on ADCP.
1230 Dredge begins to reposition back into the channel.
1245 Dredge is positioned, but needs to change scows.

1338 Container ship *Yuanhe* with a draft of 34.8 feet passes. Dredge operations continue to be shut down while waiting for the scow to return from dumping.
1347 Conduct ship passage monitoring.
1415 Dredging is back to full operations, but slack low monitoring could not be conducted.
1505 Begin max flood monitoring and ADCP transects. Massive school of adult menhaden observed near # 8 buoy. Other schools visible jumping on the flats.
1527 ADCP transects complete.
1531 Begin CTD profiles and TSS/turbidity sample collection. The lateral extent samples (MF12) could only be collected at the surface and bottom due to shallow water depth.
1622 CTD profiles and TSS/turbidity sample collection completed.
1630 Begin transit back to Hewitt's Cove Marina.
1710 Arrive Hewitt's Cove Marina, navigation check completed, shut down for the night.

Lower Harbor Dredge Monitoring: Wednesday, September 10, 2008

0648 Crew arrives at Hewitt's Cove Marina, begins setup, system checks, navigation check.
0710 Depart Hewitt's Cove Marina for Boston Lower Harbor Dredge area.
0748 Arrive Boston Lower Harbor Dredge area, but the dredge is inactive. Circle around dredge to determine current direction and get navigation fix on dredge. Small plume observed NW of dredge from 0750 to 0855. Possible that the dredge had stopped work just prior to arrival.
0915 Dredge is back to full operation.
0936 Begin high slack monitoring and ADCP transects.
1005 ADCP transects completed. Start CTD profiles and TSS/turbidity sample collection. Harbor seal observed near the 1000ft up current TSS station.
1106 CTD profiles and TSS/turbidity sample collection completed. Large school of adult menhaden observed near buoy #5A.
1201 Begin max ebb monitoring and ADCP transects. Ran transect along south edge of channel to see if plume was moving outside channel.
1242 ADCP transects completed. Start CTD profiles and TSS/turbidity sample collection.
1333 CTD profiles and TSS/turbidity sample collection completed.
1410 Dredge begins to switch scows, and a support boat shows up to load equipment. The dredge continues to be inactive until 1745- low slack monitoring and max flood monitoring are not able to be conducted.
1722 Cruise ship "*Grandeur of the Sea"* with a draft of 25.6 feet passes. Large school of menhaden observed between buoy # 6 and dredge.
1725 Conduct ship passage monitoring.
1745 Begin transit back to Hewitt's Cove Marina.
1824 Arrive Hewitt's Cove Marina, navigation check completed, shut down for the night.

Lower Harbor Dredge Monitoring: Thursday, September 11, 2008

1020 Crew arrives at Hewitt's Cove Marina, begins setup, system checks, navigation check.
1035 Depart Hewitt's Cove Marina for Boston Lower Harbor Dredge area.
1115 Arrive Boston Lower Harbor Dredge area. Begin max flood monitoring. Lost communication from navigation system. Better after reboot. Problem reoccurred. Switched comm lines with Navsam computer. Fixed.
1121 Determine current direction, get navigation fix on dredge and begin ADCP transects.
1259 Transects complete, begin CTD profiles and TSS/turbidity sample collection. Spotty navigation data coming into the ADCP computer was observed. The COM lines were switched and the problem was resolved.
1401 CTD profiles and TSS/turbidity sample collection completed.
1500 Dredge begins to switch scows.
1553 Dredging is back to full operations. School of menhaden observed in flats to SW of the navigation channel.
1607 Begin low slack monitoring and ADCP transects. Some nav comm dropout again, but getting enough signal to continue.
1639 ADCP transects complete. Begin CTD profiles and TSS/turbidity sample collection.
1746 CTD profiles and TSS/turbidity sample collection completed.
1820 Cruise ship "*Norwegian Spirit*" with a draft of 26 feet passes.
1825 Conduct ship passage monitoring.
1900 Begin max flood monitoring. Determine current direction, get navigation fix on dredge and begin ADCP transects.
1931 ADCP transect complete. Begin CTD profiles and TSS/turbidity sample collection.
2021 CTD profiles and TSS/turbidity sample collection completed.
2025 Depart for Hewitt's Cove Marina.
2110 Arrive Hewitt's Cove Marina. Navigation check completed, shut down for the day.

Lower Harbor Dredge Monitoring: Friday, September 12, 2008

1258 Crew arrives at Hewitt's Cove Marina, begins setup, system checks, navigation check.
1340 Depart Hewitt's Cove Marina for Boston Lower Harbor Dredge area.
1435 Arrive Boston Lower Harbor Dredge area. Begin low slack monitoring.
1438 Determine current direction, get navigation fix on dredge and begin ADCP transects.
1521 ADCP transect complete. Begin CTD profiles and TSS/turbidity sample collection.
1620 A cruise ship passed. An ADCP transect was run, but no samples were collected (scoped only for three max).
1640 CTD profiles and TSS/turbidity sample collection completed.
1647 Depart for Hewitt's Cove Marina.
1725 Arrive Hewitt's Cove Marina, conduct navigation check, and breakdown and pack up all equipment.

4.0 SURVEY RESULTS

4.1 Field Observations

During the first day of monitoring, September 9, 2008, dredge plumes were surveyed during HS, and MF. Using ADCP, plumes were observed as far as the 300 ft up current and 500 ft down-current transects during HS, and as far as the 500 ft down-current transect during MF. The plumes were in the channel directly down-current of dredging operations and were narrow relative to the channel width. They were estimated to range from roughly 50 ft wide near the dredge to 150 ft wide at the furthest observed down-current transects. Neither plume was observed outside of the channel. During HS, approximately 250 ft down-current of the dredging operation, at the approximate plume centroid, turbidity was measured using OBS up to approximately 16 NTU above background[2]. OBS data received preliminary calibration using the bench top turbidimeter. Turbidity returned to background (approximately 2-3 NTU) by the 1000 ft down-current transects. At lateral stations located near the northeast edge of the channel on the centroid transect (approximately 250 ft down-current), turbidity values were at or near background (2-3 NTU). During the MF monitoring, approximately 400 ft down-current of the dredging operation in the channel, at the approximate plume centroid, turbidity was measured using OBS up to approximately 37 NTU above background. At the plume down current location, approximately 750 feet down current in the channel, OBS readings dropped back to 18 NTU above background. No exceedances were measured during any of the plume surveys. Very large (150 by 20 meter) schools of adult menhaden were observed in the channel down current of the dredge activities but outside any dredge plume and up along the tidal flats. Occasionally, these schools were being preyed upon by larger predatory fish.

During the passage of the tanker ship *Acadian*, an ADCP transect was run, a vertical profile taken, and samples were collected in the wake of the ship. These observations were made approximately 1 hour and 40 minutes after the dredge stopped working to allow the LNG ship to pass. Prior to the *Acadian* passage slightly elevated backscatter readings were observed with the ADCP. The draft of the *Acadian* could not be observed. A sediment plume was observed in the wake of the ship using the ADCP, OBS sensors and the bench top turbidity meter. The OBS sensors showed readings as high as 10 NTU above background.

During the passage of the container ship *Yuanhe*, an ADCP transect was run, a vertical profile taken, and samples were collected in the wake of the ship. These observations were made approximately 2 hours and 20 minutes after the dredge stopped working to allow the LNG ship to pass. The draft of the *Yuanhe* was 9.8 meters. A sediment plume was observed in the wake of the ship using the ADCP, OBS sensors and the bench top turbidity meter. OBS readings throughout the water column ranged from 7 to 16 NTU above background.

[2] Two reference stations were sampled during each tide phase. At all 16 reference stations the OBS profiles showed a background turbidity level of 2-3 NTU with occasional elevated turbidity peaks at certain depth, usually near bottom. The elevated turbidity peaks superimposed on the background level were likely residual dredged material plume turbidity and did not represent an accurate measure of the ambient turbidity. A background value of 2 NTU was chosen as the most realistic (and conservative) representation of the ambient turbidity.

On September 10, 2008, dredge plumes were monitored during HS and ME. Using ADCP, a plume was observed as far as the 1000 ft down-current transect during HS, and as far as the 1500 ft down-current transect during the ME. The plumes were located in the channel on the south side of the channel directly down-current of dredging operations and were narrow relative to the channel width. Both tide phase plumes were estimated to range from roughly 50 ft wide near the dredge to 200 ft wide at the furthest observed down-current transects. During the HS, a filament of the plume was observed out of the channel to the south as far as approximately 500 ft from the edge of the channel at concentrations no greater than 7 NTU. Approximately 500 ft down-current of the dredging operation, at the approximate plume centroid, turbidity was measured by OBS up to approximately 5 NTU above background during HS and approximately 16 NTU during ME. Turbidity values were near background (2-3 NTU) at both the lateral stations during each tide phase. South lateral stations were located outside the channel approximately 400 ft south of the southern channel edge and north lateral stations were located in the channel near the north channel edge on the centroid transect (approximately 500 ft down-current) during each tide phase . No exceedances were observed during either plume survey. Large schools of adult menhaden were observed upcurrent and in close proximity to the dredge operations. Schools of fish (probably menhaden) were also observed on the boat echosounder and on the ADCP. All fish were observed outside of the dredge plume. A harbor seal was observed up current of the dredge operations near the reference station.

An ADCP transect was run, a vertical profile taken, and samples were collected in the wake of the cruise ship *Grandeur of the Sea* (8 meter draft). These observations were made while the dredge had been inactive for over three hours. A weak sediment plume was observed in the wake of the ship using the ADCP, the vertical profile and the bench top turbidity meter. Readings obtained with the OBS sensors showed turbidity readings around 13 NTU above background near the bottom decreasing to approximately background over the upper half of the water column.

On September 11, 2008, dredge plumes were monitored during ME, LS, and MF. Using ADCP, a dredge plume was observed as far as the 1000 ft down-current transect during LS and MF and as far as the 1500 ft down-current transect during ME. During ME, the dredged material plume was observed running east in the channel and maintaining a coherent shape that was estimated at approximately 300-400 ft wide at the 1500 ft line. Turbidity values measured during vertical profiles down-current (in the channel) ranged up to 17 NTU above background 300-500ft from the dredge and were up to 15 NTU at 1000 ft. During MF, a filament of the plume was observed running west out of the channel approximately 150 ft into the flats near Castle Island. The plume was more disperse, being carried by the flood currents which diverge in this area. Observations during the LS monitoring were similar to the MF since there was a weak flood current at the time. Turbidity values measured during vertical profiles down-current (in the flats near Castle Is.) during MF and LS ranged up to 8 NTU above background.

On September 12, 2008, dredge plumes were monitored during LS. Measurements were made from approximately 1 hour before to 1 hour after the published time of LS. During that time the tide was weakly ebbing eastward and then turned to flood with a northward rotation. During the first hour, the plume was tracked as far as the 1500 ft down-current (eastward) transect. During the turn of the tide, the plume was transported no more than 500 to 700 ft from the dredge in a

northeasterly direction (out of the channel and into the flats to the northeast). Turbidity values measured during vertical profiles ranged up to 20 NTU above background 300-500 ft from the dredge. Turbidity values at the lateral plume stations were as high as 13 NTU above background.

4.2 Results

CTD/Turbidity profiles and whole water samples were collected at each planned location during both dredge plume and disposal plume monitoring. A summary of the profiles taken and the samples collected is presented in Table 4. All the *in situ* CTD, OBS turbidity, and DO profile data are presented in Appendix 3. Turbidity data presented in Appendix 3 have been calibrated using the bench top turbidimeter measurements made in the field but have not been corrected for background.

All field bench top turbidimeter measurements are presented in Appendix 4. These include measurements taken at each profile at the turbidity profile peak depth and near bottom.

Results of the laboratory analysis of TSS are provided in Appendix 5.

Table 4. CTD/Turbidity Vertical Profile Locations and Samples Collected

Station	Station Type	NAVSAM File ID	Longitude	Latitude	Sample Time (EST)	Bathymetric Depth (ft)	Number of TSS Samples Collected
Lower Harbor Dredge Monitoring 09-Sept-08							
HS11	Plume Centroid	BH082046	-70.999664	42.333435	8:23	38.1	4
HS12	Lateral Extent	BH082052	-70.999466	42.332500	8:35	23.6	3
HS13	Plume Down Current	BH082055	-70.997849	42.333233	8:47	44.3	3
HS14	Lateral Extent	BH082058	-70.997101	42.336666	8:57	37.1	3
HS15	Reference	BH082061	-70.994064	42.335316	9:05	42.0	3
HS16	Reference	BH082064	-70.999870	42.337215	9:16	40.4	3
SH11	Ship Passage	BH082070	-71.003716	42.337967	11:10	42.7	2
SH14	Ship Passage	BH082083	-71.002480	42.336765	13:46	44.6	2
MF11	Plume Centroid	BH082092	-71.002899	42.335167	15:32	44.6	3
MF12	Lateral Extent	BH082096	-71.003815	42.334332	15:41	12.1	2
MF13	Plume Down Current	BH082099	-71.003700	42.336018	15:48	47.2	4
MF14	Lateral Extent	BH082102	-70.999985	42.337215	15:58	38.7	3
MF15	Reference	BH082105	-71.004616	42.340302	16:09	40.7	3
MF16	Reference	BH082108	-70.995567	42.336216	16:22	38.1	3
Lower Harbor Dredge Monitoring 10-Sept-08							
HS21	Plume Centroid	BH082122	-70.996864	42.332565	10:08	35.1	3
HS22	Lateral Extent	BH082125	-70.996651	42.330368	10:17	34.1	3
HS23	Lateral Extent	BH082128	-70.994003	42.334351	10:27	41.7	3
HS24	Plume Down Current	BH082131	-70.994797	42.331982	10:36	34.4	4
HS25	Reference	BH082134	-70.991486	42.334415	10:45	41.0	3

Table 4. CTD/Turbidity Vertical Profile Locations and Samples Collected, continued

Station	Station Type	NAVSAM File ID	Longitude	Latitude	Sample Time (EST)	Bathymetric Depth (ft)	Number of TSS Samples Collected
HS26	Reference	BH082140	-71.000153	42.337215	11:06	41.0	3
ME21	Plume Centroid	BH082146	-70.998497	42.333000	12:51	34.8	3
ME22	Lateral Extent	BH082149	-70.998764	42.332001	12:58	19.7	3
ME23	Lateral Extent	BH082152	-70.996780	42.335949	13:06	34.4	3
ME24	Plume Down Current	BH082156	-70.996666	42.332684	13:15	42.7	4
ME25	Reference	BH082159	-70.993034	42.335018	13:23	37.7	3
ME26	Reference	BH082163	-71.000450	42.337467	13:33	35.4	3
SH21	Ship Passage	BH082174	-71.001633	42.337032	17:27	44.3	2
Lower Harbor Dredge Monitoring 11-Sept-08							
ME11	Plume Centroid	BH082189	-70.997086	42.333832	13:03	44.3	3
ME12	Lateral Extent	BH082192	-70.995483	42.336449	13:13	37.7	3
ME13	Lateral Extent	BH082197	-70.997864	42.332066	13:23	21.7	3
ME14	Plume Down Current	BH082200	-70.994499	42.334034	13:34	41.0	4
ME15	Reference	BH082203	-70.992050	42.336750	13:44	37.7	3
ME16	Reference	BH082206	-71.001602	42.336582	14:01	37.4	3
LS11	Plume Centroid	BH082216	-71.005249	42.333302	16:50	10.8	3
LS12	Lateral Extent	BH082219	-71.002632	42.335899	16:59	44.3	3
LS13	Lateral Extent	BH082223	-71.010117	42.329166	17:11	13.1	4
LS14	Plume Down Current	BH082226	-71.007797	42.333649	17:21	10.5	3
LS15	Reference	BH082229	-70.997498	42.334599	17:38	45.9	3
LS16	Reference	BH082232	-71.004051	42.338501	17:50	42.3	3
SH31	Ship Passage	BH082237	-70.994934	42.333984	18:29	46.6	2
MF21	Plume Centroid	BH082241	-71.003464	42.333950	19:32	16.1	3
MF22	Lateral Extent	BH082246	-71.003448	42.332802	19:40	17.1	3
MF23	Lateral Extent	BH082249	-71.003815	42.335732	19:49	48.9	3
MF24	Plume Down Current	BH082252	-71.005684	42.334568	19:57	14.4	3
MF25	Reference	BH082256	-71.007103	42.338165	20:08	50.5	3
MF26	Reference	BH082260	-70.998550	42.333332	20:21	47.6	4
Lower Harbor Dredge Monitoring 12-Sept-08							
LS21	Plume Centroid	BH082278	-70.994453	42.335583	15:24	36.7	4
LS22	Lateral Extent	BH082282	-70.994583	42.334618	15:34	37.4	3
LS23	Lateral Extent	BH082285	-71.992880	42.337680	15:43	19.4	3
LS24	Plume Down Current	BH082289	-70.992554	42.336468	15:59	35.8	3
LS25	Reference	BH082292	-70.992386	42.332649	16:07	43.6	3
LS26	Reference	BH082295	-71.001335	42.333965	16:40	32.8	3

5.0 PROBLEMS EXPERIENCED, ACTIONS TAKEN, AND RECOMMENDATIONS

5.1 Logistical

The passage of an LNG tanker and 3 other ships coincident with the ME and LS on the first day of the survey, September 9, suspended dredging operations for several hours and prevented sampling during the ME and LS. On September 10 dredging was suspended during LS and MF due to problems with the dredge. Two standby days were used on September 11 and September 12 to sample during ME, MF and two LS tide phases not sampled earlier.

Dredge 54 operated by Great Lakes Dredge and Dock Company is 185 ft long and 60 wide. During dredging a 200 ft scow was tied to the dredge with the scow set forward of the dredge barge approximately 50 ft for an approximate total length of 235 ft (Figure 7). Both were oriented lengthwise along the channel with the business end of the dredge and the bow of the scow oriented up-channel. This configuration meant that while the tide was ebbing, it was not possible to run across channel transects 100 ft from the operation of the dredge bucket since that line ran through the scow and dredge. Instead transects were run as close as possible but usually no closer than approximately 250 ft. During flood tide, although the course of the 100 ft transect line was clear of the scow, safety considerations prohibited running transects any closer than approximately 150 ft from the dredge bucket operation.

Figure 7. Dredge 54 Operated by Great Lakes Dredge and Dock Company and Scow During Dredging of Maintenance Material in the Lower Harbor.

5.2 Technical

During operations on September 11, the RS232 communications line from the ship's navigation system to the ADCP laptop experienced some occasional drop-out. Restarting the ADCP data

collection software corrected the problem at first. But the problem returned and the navigation data lines were switched between the ADCP and the NAVSAM computers which resolved the problem.

At the reference locations, the OBS profiles showed a background turbidity level of 2-3 NTU with occasional elevated turbidity peaks at certain depth, usually near bottom. The elevated turbidity peaks superimposed on the background level were likely residual dredged material plume turbidity and did not represent an accurate measure of the ambient turbidity. A background value of 2 NTU was chosen as the most realistic (and conservative) representation of the ambient turbidity.

6.0 REFERENCES

Sampling and Analysis Plan for Boston Harbor Inner Harbor Maintenance Dredging Plume Monitoring. (Battelle, 2008)

Appendix 1

Sampling Logs

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DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS:** MLF **WEATHER:** Overcast SW ~10kts

MONITORING PERIOD (hh:mm) From: 0700 **To:** _____ **TIDE STAGE** (HS) ME LS MF

DREDGING ACTIVITY:

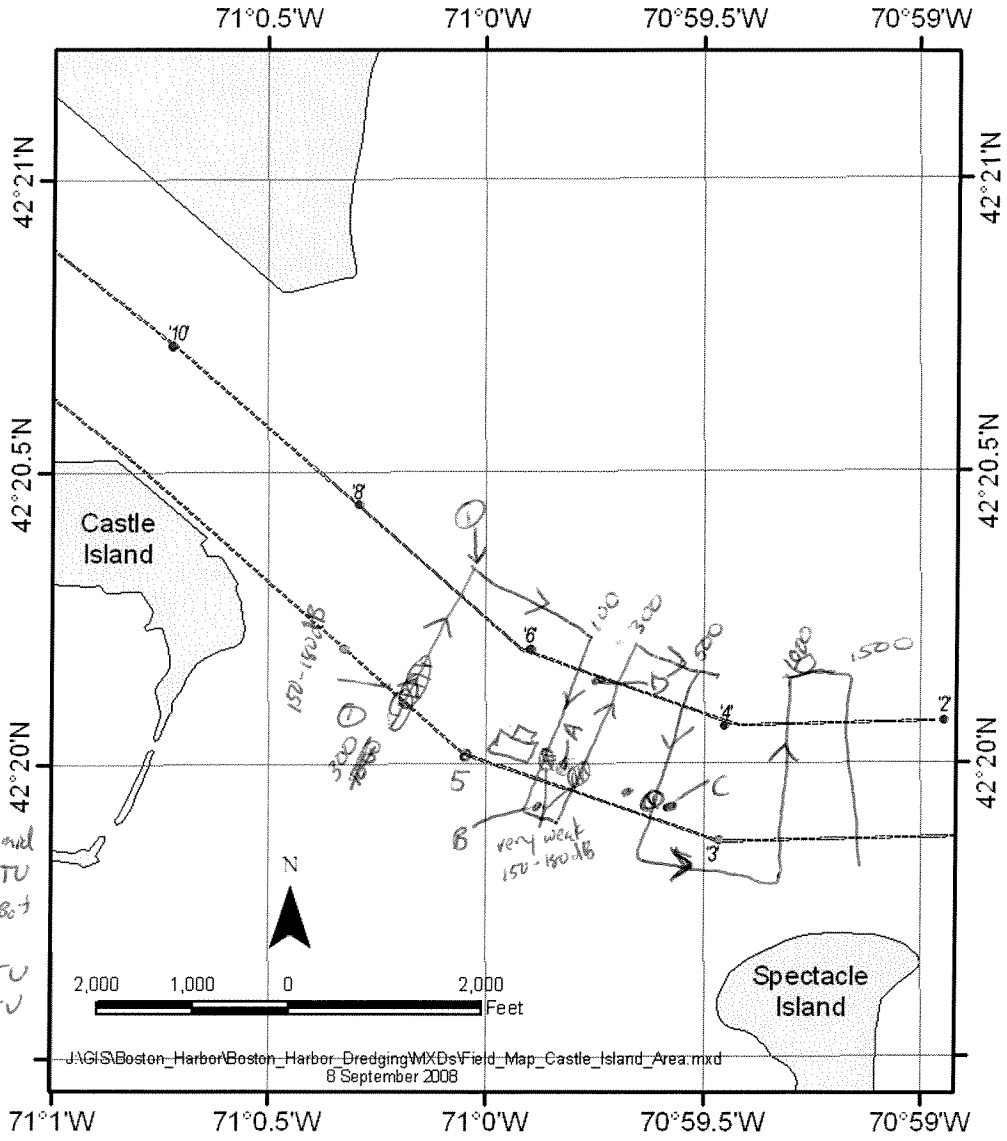
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Start Time	File Name/Notes
1	0739	BH082-008
2	0820	009 - HS1
3	0833	010 - HS2
4	0843	011 - HS3B
5	0854	012 - HS4
6	0902	013 - HS5
7	0915	014 - HS6

CTD PROFILES:

Map Ref	Time	Station ID/Notes
HS ME1 A	0821	150' SE of Dredge 25 NTU mid
HS2 B	0833	150' S of Dredge 2-3 NTU
HS3 C	0845	600' SE of dredge 5 NTU Bot
HS4 D	0854	5 NTU
HS5 E	0903	Ref downcurrent ~4-5 NTU
HS6 F	0915	Ref up current ~4-5 NTV



FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ 0714 ME @ 1000 LS @ 1308 MF @ 1600

ADCP is 21" deep

Reference Samples collected as dredge was moved out of ~~Ch~~ channel for approaching LNG ~ 0920

Depart HCM @ 0621

Computer clock sync NavSam 06:48:36
ADCP 06:48:40

on station 0700 begin current monitoring and draw transect lines

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS**: MRF **WEATHER**: Overcast SW 15-20

MONITORING PERIOD (hh:mm) From: 1100 **To**: 1115 **TIDE STAGE** HS (ME) LS MF

DREDGING ACTIVITY:

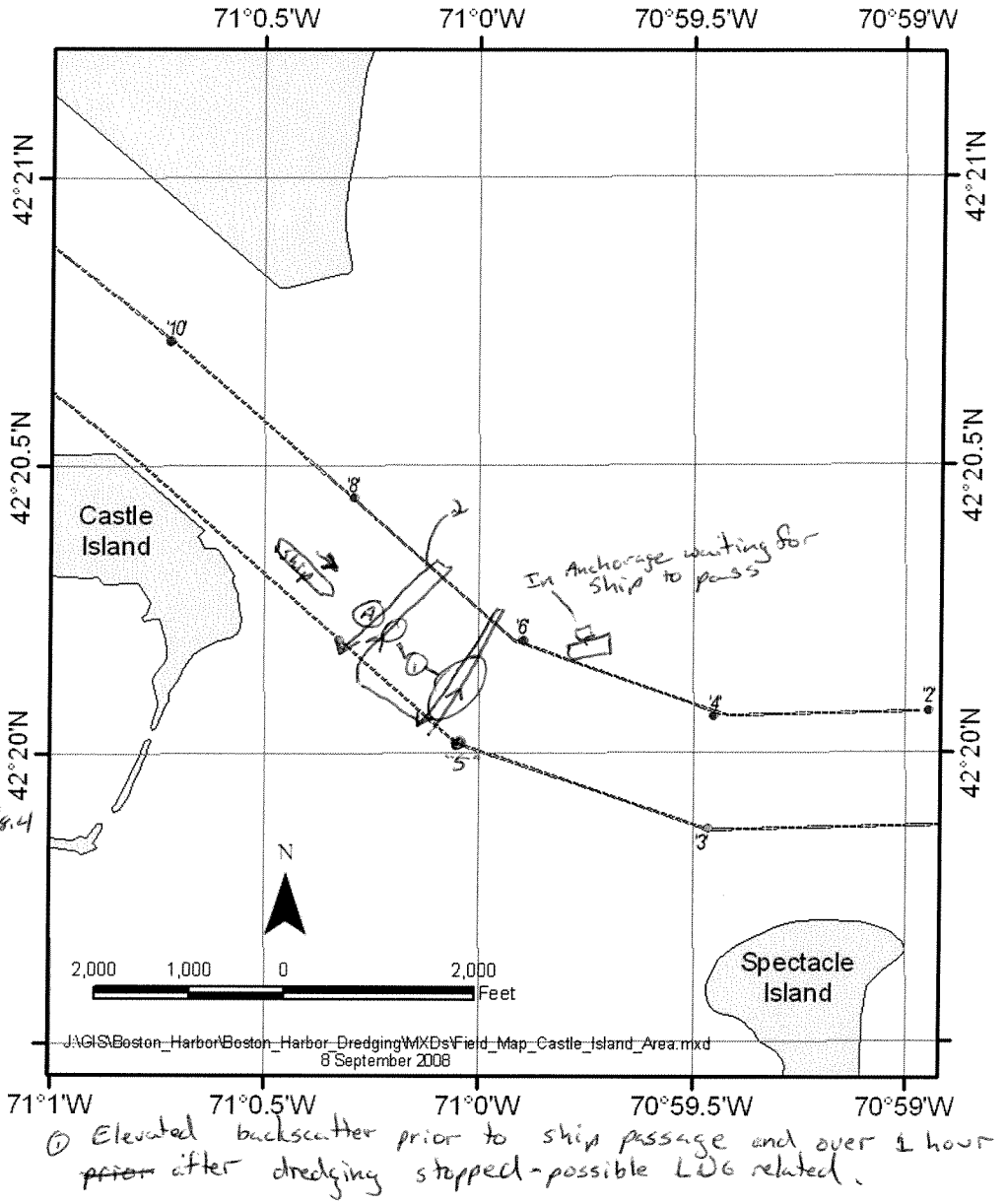
Dredging	Disposal
None	

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1051	BH082-016
2	1101	" 017-sp1
		~~DUP~~

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1111	Sp 1 benchtop water: 11.7/8.4



① Elevated backscatter prior to ship passage and over 1 hour ~~prior~~ after dredging stopped - possible LDG related.

FISH PASSAGE: Ship Name = ACADIAN draft is not readable

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ MF @

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS:** MRF **WEATHER:** Overcast SW 15-20

MONITORING PERIOD (hh:mm) From: 1120 **To:** **TIDE STAGE** HS ME LS MF

DREDGING ACTIVITY:

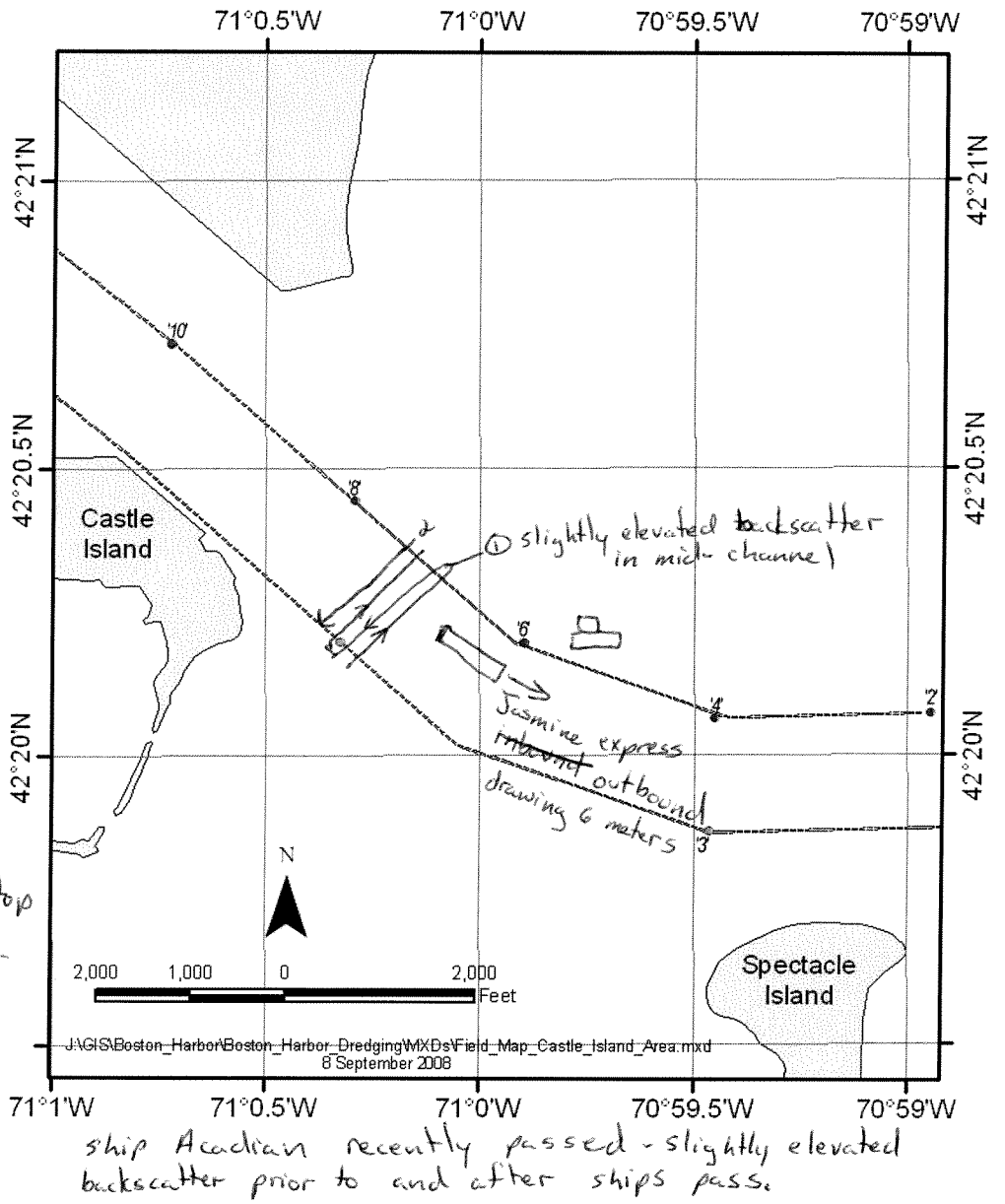
Dredging Disposal None - waiting for ships to pass

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1120	BH082-018
2		↓ 019-SP2

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1138	SP2 - very high backscatter and low in situ turbidity - benchtop turbidity samples are lower than prior ship passage - 6.52/8.6 No TSS collected



ship Acadian recently passed - slightly elevated backscatter prior to and after ships pass.

FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ MF @

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS:** MRF **WEATHER:** Overcast

MONITORING PERIOD (hh:mm) From: 1145 **To:** 1245 **TIDE STAGE** HS ME LS MF

DREDGING ACTIVITY:

Dredging Disposal None

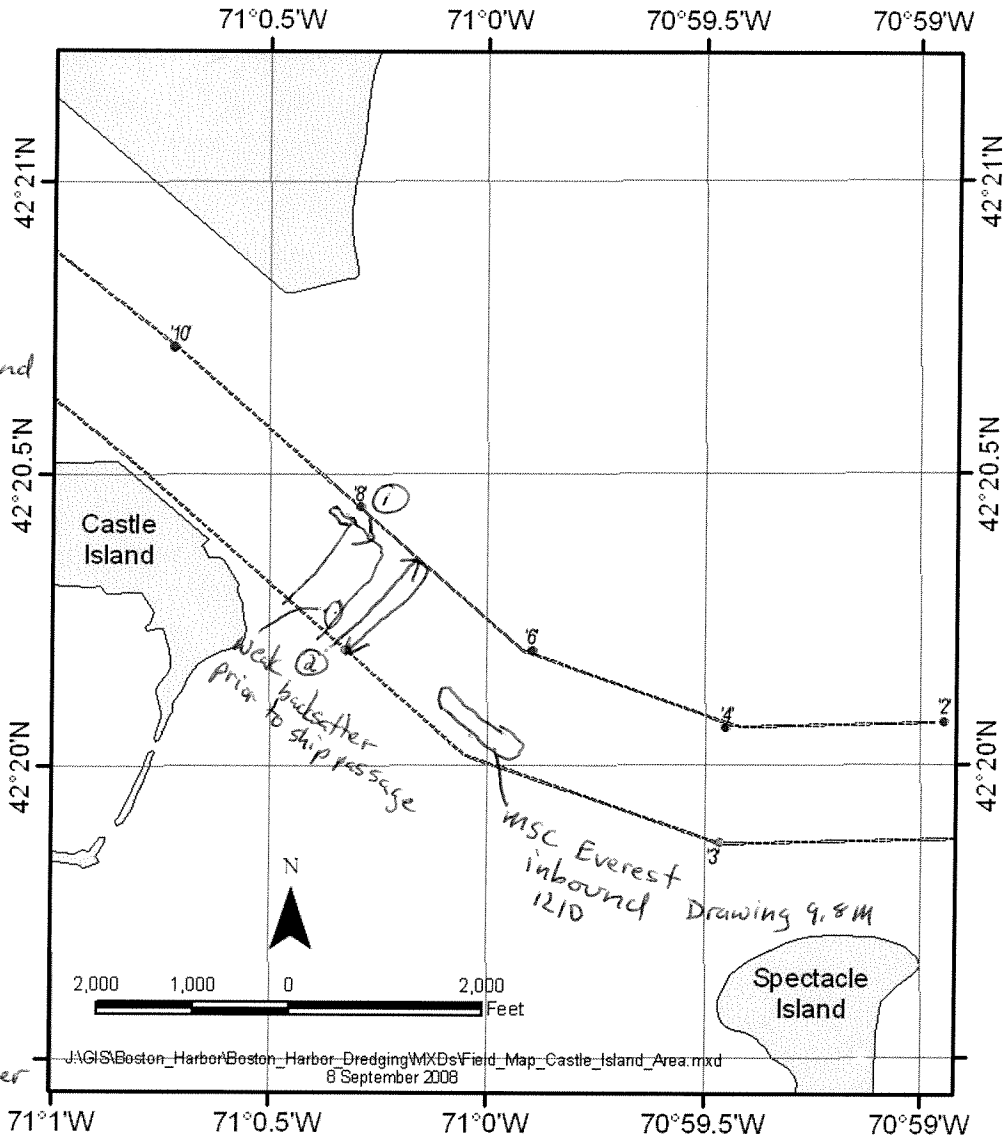
Dredge is repositioning into the channel @~1230
~1245 change scows

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1155	BH082-020 - background
		021-SP3

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A		Could not conduct
		a CTD cast in an
		appropriate amount of
		time due to boat
		traffic ~~and~~ Propwash
		was observed in the
		upper water column -
		no near bottom backscatter



FISH PASSAGE: Large schools of adult menhaden observed on the surface in mid channel / can also be seen as hard reflections on ADCP

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ 1308 MF @

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE
Duxbury Project Number: G606444

Survey ID: BH082
Project Title: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS:** MRF **WEATHER:** SW 15-20

MONITORING PERIOD (hh:mm) From: 1245 **To:** _____ **TIDE STAGE** HS ME (LS) MF

DREDGING ACTIVITY:

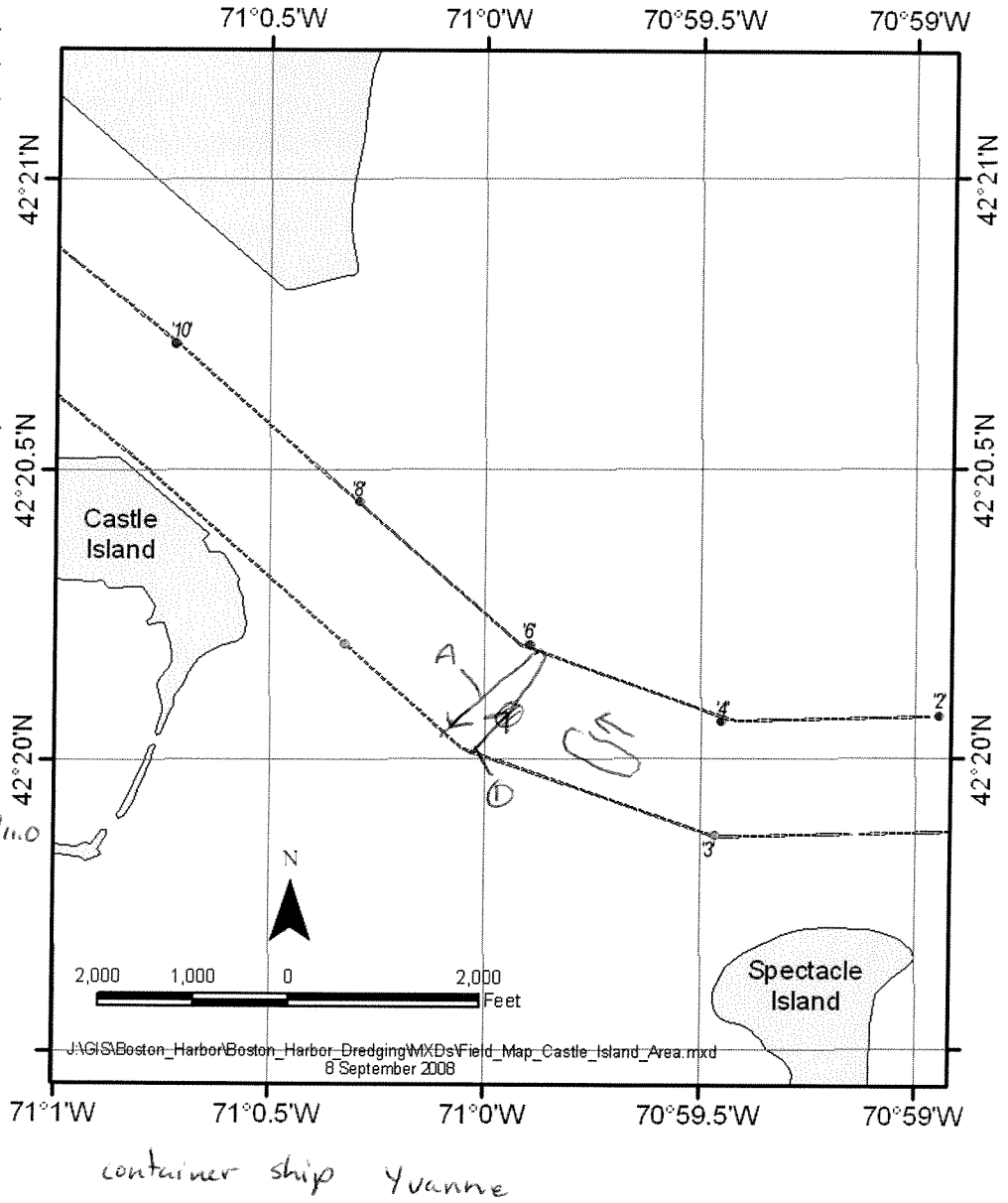
Dredging Disposal None

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1338	BH082-024 SP4
		fairly high backscatter
		from surface to bottom
		150 – >200 db
		plume was dissipating
		on upcast

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1347	SP4 - Bench top - 9.48/11.0



container ship Yvonne

FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ 1308 MF @

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/09/08 **INITIALS:** MRF **WEATHER:** light rain SW wind ~5-10 kts

MONITORING PERIOD (hh:mm) From: 1300 **To:** 1430 **TIDE STAGE** HS ME LS (MF)

DREDGING ACTIVITY:

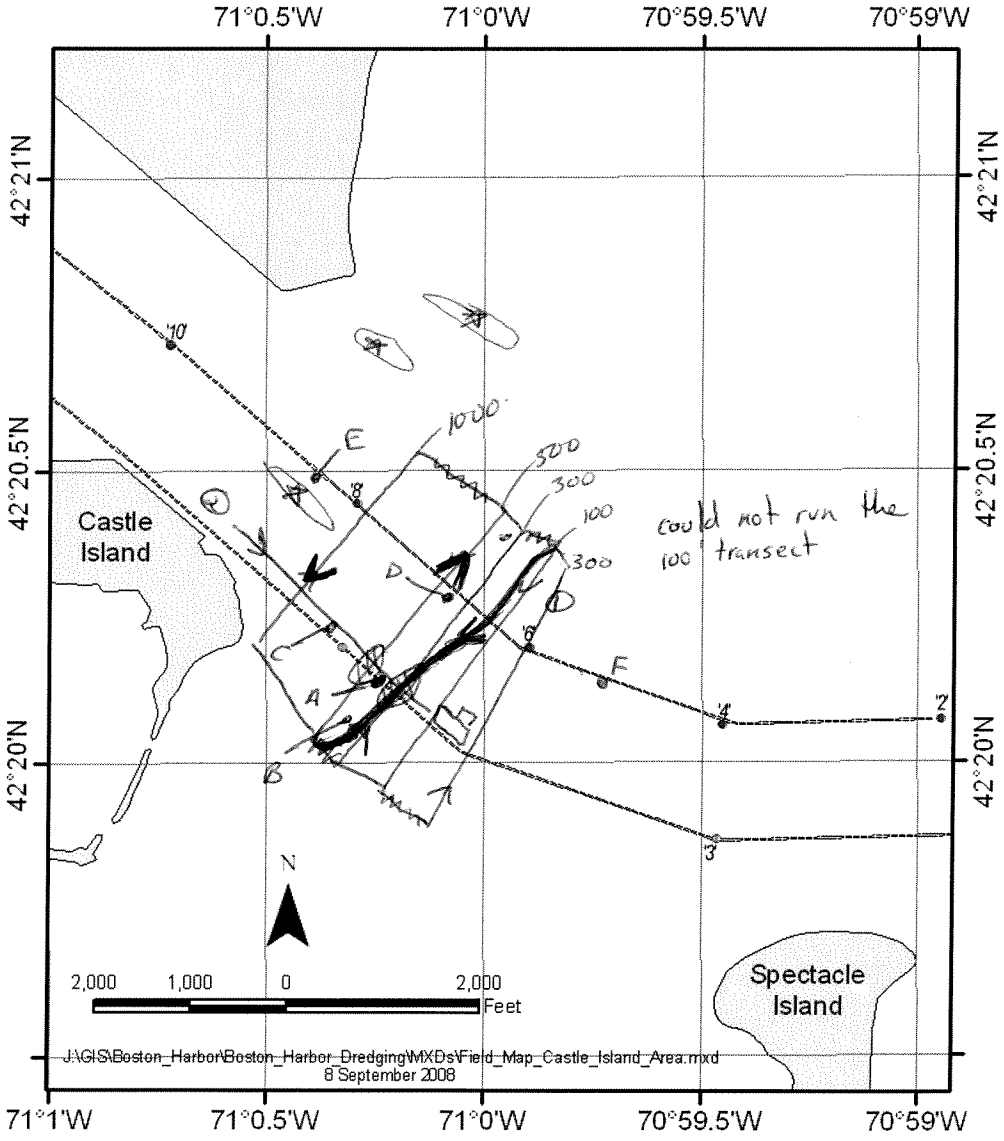
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1505	BH082-028
2	1527	BH082-029
3	1530	030 MF1
4	1539	031 MF2
	1546	032 MF3
	1556	033 MF4
	1605	034 MF5
	1619	035 MF6

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1531	MF1 14.2 / 19.4
B	1539	MF2 3.49 / 17.7
C	1546	MF3 11.1 / 15.0
D	1556	MF4 2.77 / 2.97
E	1605	MF5 2.98 / 4.49
F	1620	MF6 1.71 / 1.97



FISH PASSAGE: massive school of Adult Menhaden (150 x 20 meters) near #8 buoy other schools on the flats are being worked by predatory fish marked w/ ★

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ MF @ 1610

@ MF2 could only collect surface + Bottom due to water depth. The plume centroid was on the edge of the channel moving NW. MF5 ~1500' down current had slightly elevated bottom values

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/10/08 **INITIALS:** MRF **WEATHER:** Sunny N wind ~10

MONITORING PERIOD (hh:mm) From: 0748 **To:** 1100 **TIDE STAGE** (HS) ME LS MF

DREDGING ACTIVITY:

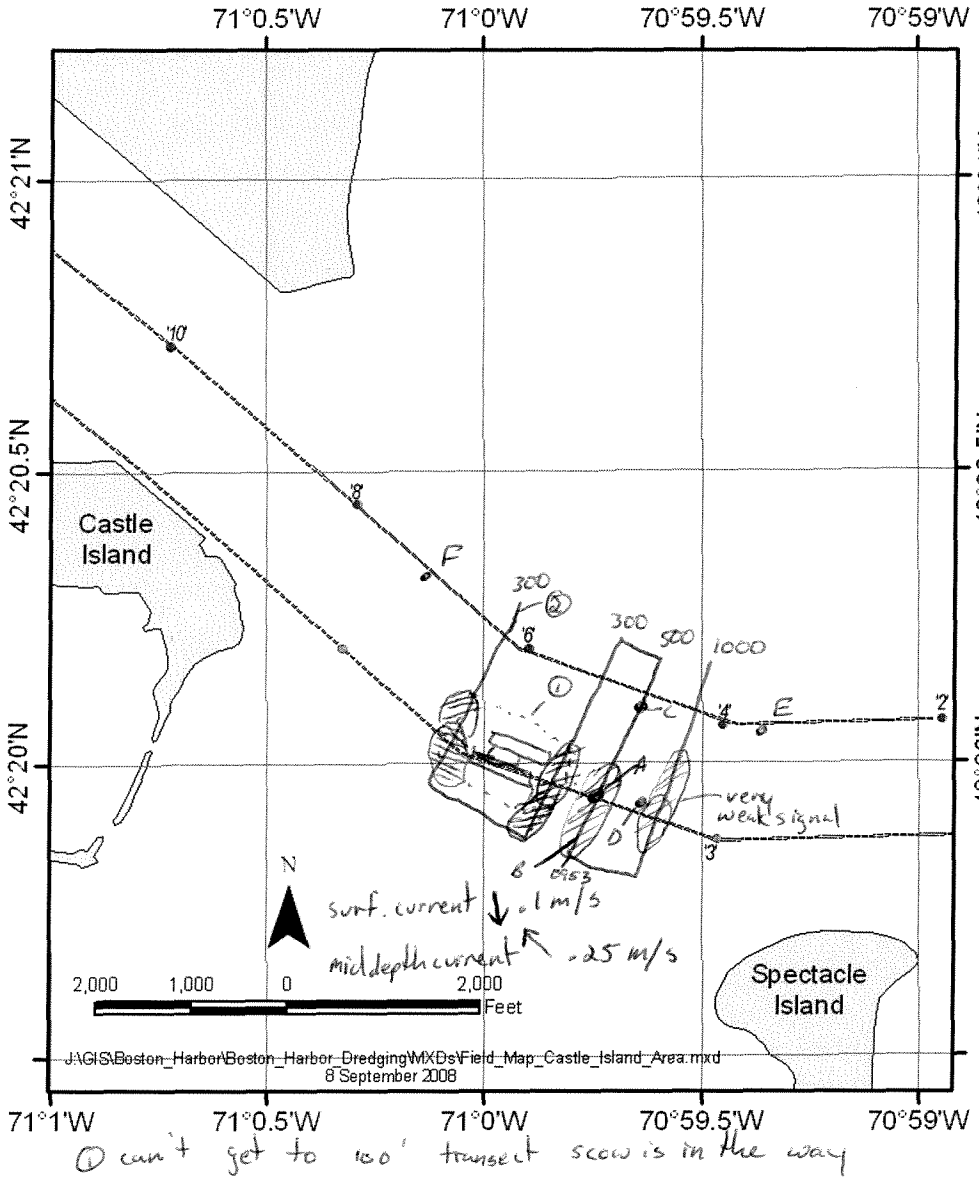
Dredging	Disposal
Dredge is inactive upon arrival to 0915	

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	0748	BH082-037 ran several circles around dredge while inactive
	0913	BH082-038 - shows stronger surf current and <.1 m/s mid depth currents
2	0936	BH082-039
	1005	040 - MF1
	1013	041 MF2
	1023	042 MF3
	1033	043 MF4

CTD PROFILES: 045 MF5 - 1042; 046 MF6 - 1056

Map Ref	Time	HS Station ID/Notes
A	1007	~~MF1~~ turbidity ~3.5
B	1015	~~MF2~~ ~1.8
C	1025	~~MF3~~ turb - 2.5/1.9
D	1035	~~MF4~~ 2.4/2.85
E	1044	~~MF5~~ 2.16/1.63
F	1057	~~MF6~~ 2.87/2.59



① can't get to 100' transect scow is in the way

FISH PASSAGE: large school of Adult menhaden spotted off harbor seal off the 1000' upcurrent station (MF6) marker 5A @ 1115

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ 0812 ME @ 1100 LS @ 1405 MF @ 1710

Off the dock for survey area @ 0710

Small plume observed NW of Dredge from 0750 until 0855.

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE
Survey ID: BH082
Duxbury Project Number: G606444
Project Title: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/10/08 **INITIALS**: MRF **WEATHER**: Partly Cloudy N wind 5-10

MONITORING PERIOD (hh:mm) From: 1130 **To**: 1340 **TIDE STAGE** HS (ME) LS MF

DREDGING ACTIVITY:

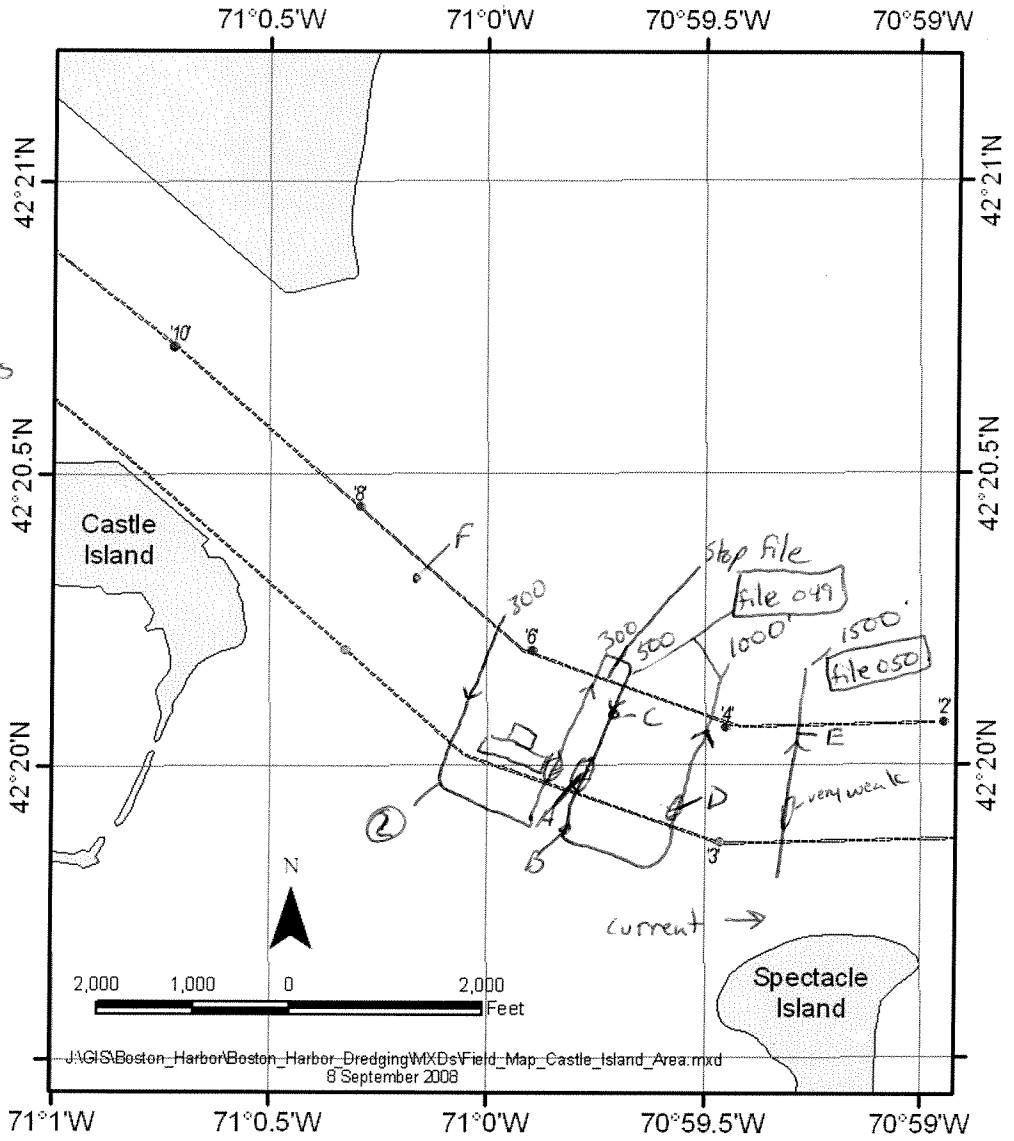
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1		BH082-047 - Run transects along southern channel to see if plume was moving outside.
2	1201	BH082 048
	1242	↓ 051 - ME1
	1256	052 ME2
	1304	053 ME3
	1311	054 ME4
	1320	055 ME5
	1329	056 ME6

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1249	ME1 5.25/3.21
B	1257	ME2 1.97/2.06
C	1304	ME3 3.1/4.14
D	1313	ME4 2.51/2.37
E	1320	ME5 4.97/3.92
F	1330	ME6 2.69/2.74



FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ 1115 LS @ MF @

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/10/08 **INITIALS:** MRY **WEATHER:** Mostly cloudy N wind ~ 10 kts

MONITORING PERIOD (hh:mm) From: 1400 **To:** 1745 **TIDE STAGE** HS ME (LS) MF

DREDGING ACTIVITY:

(Dredging) Disposal

switching scows from 1410 to dredge broken until ~1745 at least

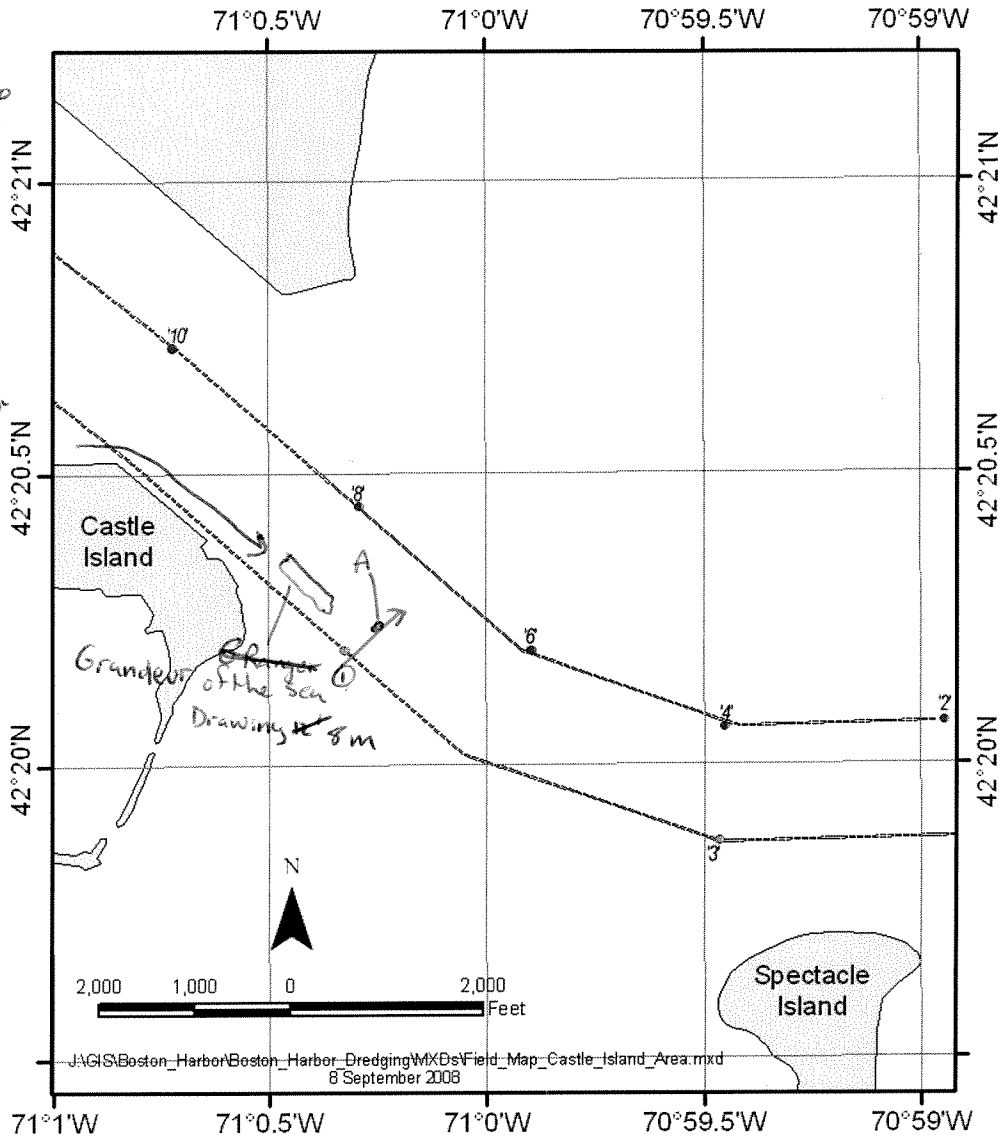
Ship passage @ 1722

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1722	BH082-063 Ship passage
		ADCP transect stopped mid channel for CTD profile

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1725	SH21 turbidity bot 9.09 / mid 4.71
+		



FISH PASSAGE: lg school of Menhaden between marker 6 + dredge @ 1440 - can be seen in file 058 ensemble 1300

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ 1405 MF @ 1500

A small plume observed south of the dredge while inactive profile indicated ~32 NTU while benchtop meter showed 16.0.

Ran files 057 - 059 to track the movement

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE
Duxbury Project Number: G606444

Survey ID: BH082
Project Title: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/11/08 **INITIALS:** RMD **WEATHER:** sunny, wind 5-10 E

MONITORING PERIOD (hh:mm) From: 1120 **To:** 1350 **TIDE STAGE** HS (ME) LS MF

DREDGING ACTIVITY:

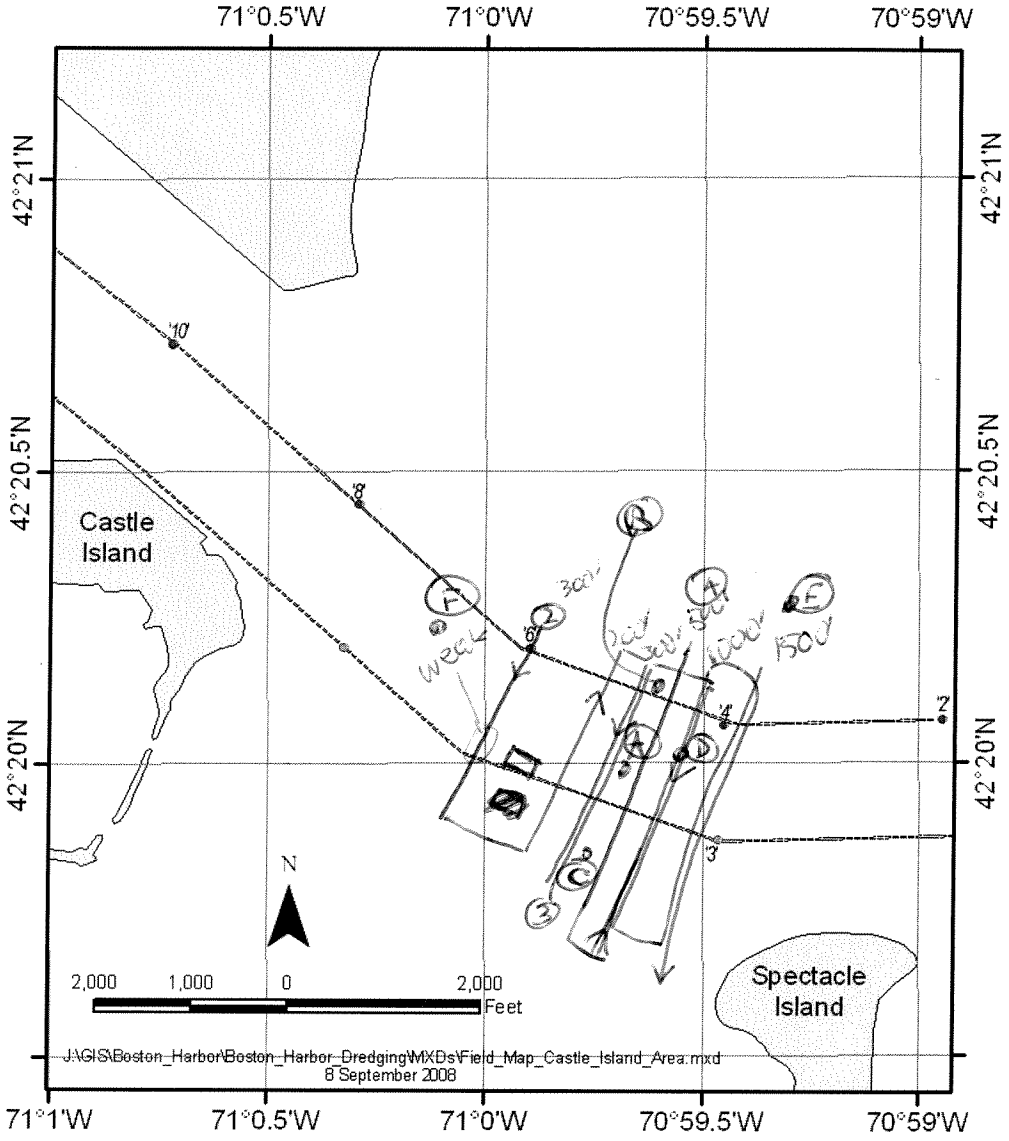
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1121	BH082-066 - Test
	1133	-067 - Test
(2)	1154	-068
(3)	1211	-070
(4)	1237	-073

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1259	-075 ME1-1
B	1313	-077 ME1-2
C	1322	-079 ME1-3
D	1334	-081 ME1-4
E	1345	-083 ME1-5
F	1358	-084 ME1-6



FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ 12:00 LS @ MF @

Depart Hewitts Cove 1035. Lost comm from NAV then lost both. Phone? Fine after reboot. Phone? Files ok.
Problems w/ NAV comm drop at -070, -071, -072
Switched comm lines w/ NAVSUM computer. OK now -073 good NAV

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE | **Survey ID**: BH082

Duxbury Project Number: G606444 | **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09/11/08 **INITIALS:** RMD **WEATHER:** Sunny Wind 10 15 E

MONITORING PERIOD (hh:mm) From: ______ **To:** ______ **TIDE STAGE** HS ME (LS) MF

DREDGING ACTIVITY:

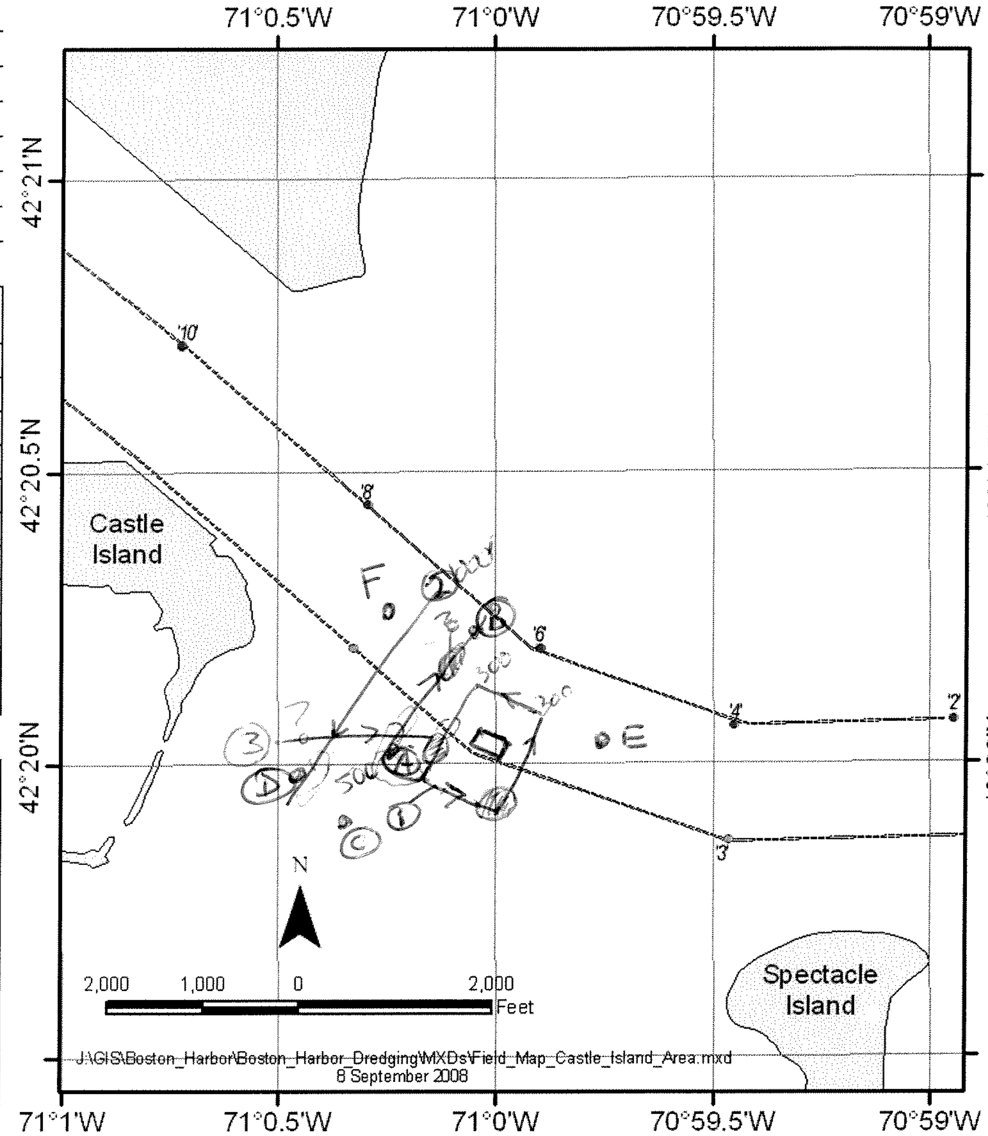
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1607	088 - some Nav dropout
2	1630	089
3	1639	090

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1638	091 LS1-1
B		093 LS1-2
C	1711	095 LS1-3
D	1719	096 LS1-4
E	1736	097 LS1-5
F	1746	098 LS1-6



FISH PASSAGE:

1330 school Menhaden. Schools earlier too (Flats to SW)

Many schools.

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ 15:00 MF @

1500 - scow being changed

1515 - Full scow away. 1530 New scow in place.

1553 - Dredging again!

1530 - Barge moved NW. Plume appears to be mostly in flats to SW. But it was there before they started dredging again

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE
Duxbury Project Number: G606444

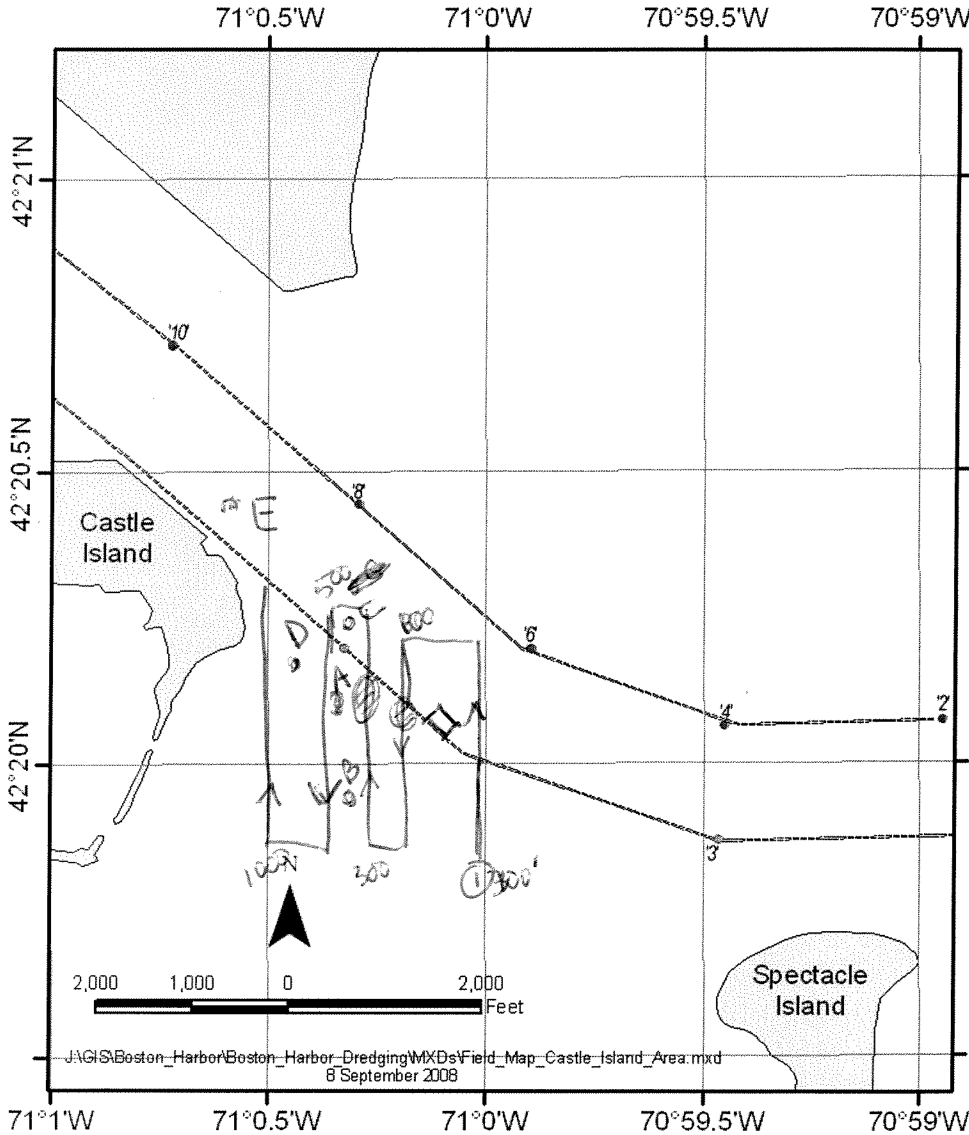
Survey ID: BH082
Project Title: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 9/11/08 **INITIALS:** PMD **WEATHER:** Sunny. Wind 10-15 E

MONITORING PERIOD (hh:mm) From: ______ **To:** ______ **TIDE STAGE** HS ME LS (MF circled)

DREDGING ACTIVITY:

(Dredging circled) Disposal



ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1900	104 Getting Dark
		ran only
		cross lines
		1500' line too
		shallow

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1931	106 MF2-1
B	1940	107 MF2-2
C	1949	109 MF2-3
D	1956	111 MF2-4
E	2005	112 MF2-5
F	2013	114 MF2-6

FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ MF @ 6:00pm

1820 Norwegian ~~Cruise~~ Cruise Ship Passage 'Norwegian Spirit'
File # 100 Transect behind 'Norwegian Spirit'
File # 101 Profile " " "
File # 104 1st 3 legs show bubbles from wake of Cruise ship
Barge moved W along channel ~ 50'-100' during transects

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH082

Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 09-12-08 **INITIALS:** PMD **WEATHER:** Gray. Wind 15-20

MONITORING PERIOD (hh:mm) From: 1435 **To:** 1645 **TIDE STAGE** HS ME (LS) MF

DREDGING ACTIVITY:

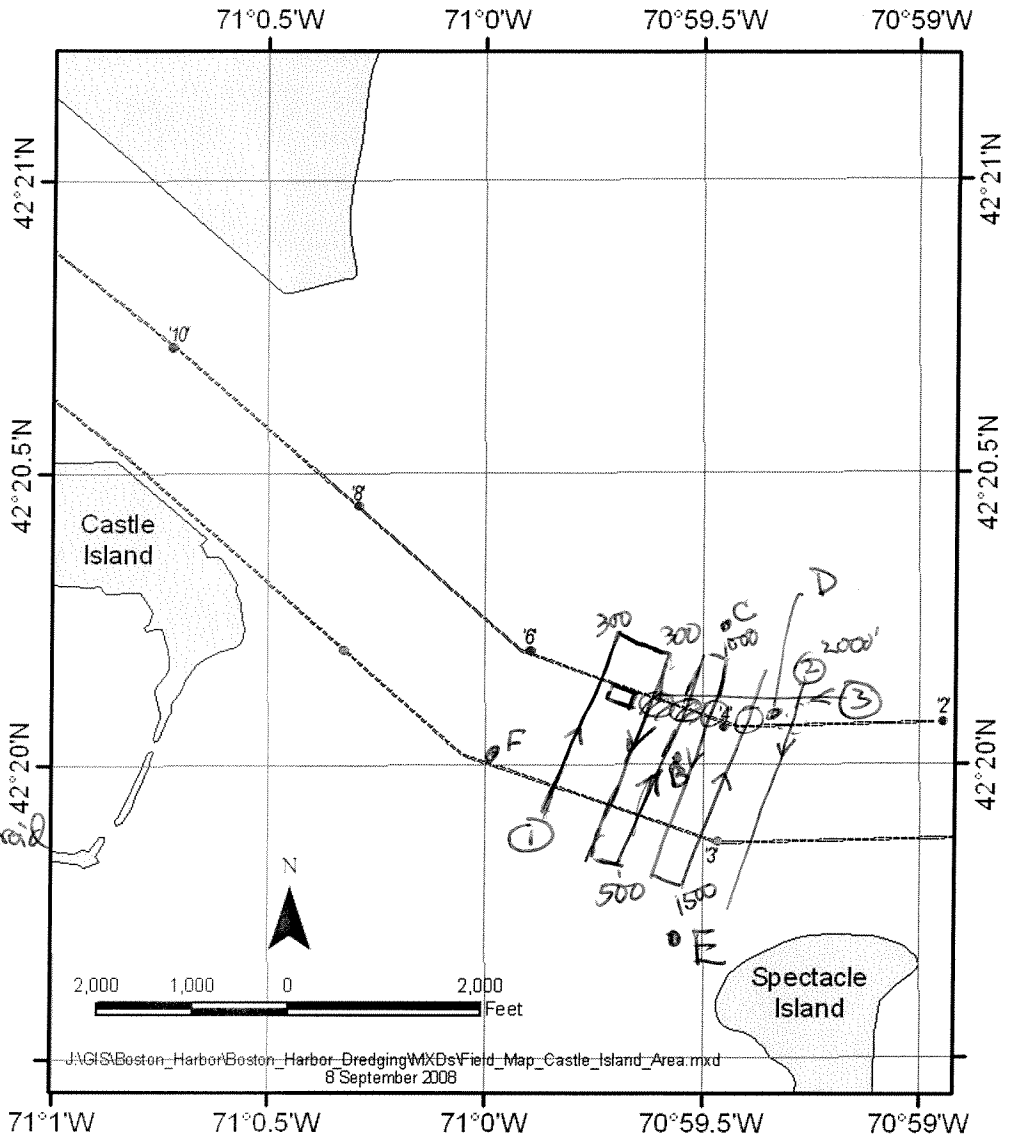
(Dredging) Disposal

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1438	117
2	1509	119
3	1538	121

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1524	122 LS2-1 centroid
B	1535	123 LS2-2
C	1542	125 LS2-3
D	1559	127 LS2-4
E	1607	128 LS2-5
F	1640	130 LS2-6



FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ ~~3:45~~ 5:45 pm MF @

#119 same problem w/ NAV comm drop out?
A - between 500' 1000' line but barge had moved closer
1620 Cruise ship passed. Did not sample but did run Transect #129

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Appendix 2

Chain of Custody Records

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Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/10/2008 6:17:35 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH082062TS1	9/9/2008 8:23:58 AM	HS11	E	☑	☐	☐
	BH082063TS1	9/9/2008 8:24:44 AM	HS11	C	☑	☐	☐
	BH082063TS2	9/9/2008 8:24:44 AM	HS11	C	☑	☐	☐
	BH082066TS1	9/9/2008 8:26:32 AM	HS11	A	☑	☐	☐
	BH082073TS1	9/9/2008 8:35:45 AM	HS12	E	☑	☐	☐
	BH082074TS1	9/9/2008 8:36:14 AM	HS12	C	☑	☐	☐
	BH082075TS1	9/9/2008 8:36:43 AM	HS12	A	☑	☐	☐
	BH08207DTS1	9/9/2008 8:47:30 AM	HS13	E	☑	☐	☐
	BH08207ETS1	9/9/2008 8:48:06 AM	HS13	C	☑	☐	☐
	BH08207FTS1	9/9/2008 8:48:42 AM	HS13	A	☑	☐	☐
	BH082087TS1	9/9/2008 8:57:05 AM	HS14	E	☑	☐	☐
	BH082088TS1	9/9/2008 8:57:42 AM	HS14	C	☑	☐	☐
	BH082089TS1	9/9/2008 8:58:17 AM	HS14	A	☑	☐	☐
	BH082091TS1	9/9/2008 9:05:06 AM	HS15	E	☑	☐	☐
	BH082092TS1	9/9/2008 9:05:44 AM	HS15	C	☑	☐	☐
	BH082093TS1	9/9/2008 9:06:21 AM	HS15	A	☑	☐	☐
	BH08209BTS1	9/9/2008 9:16:02 AM	HS16	E	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9/11/08 1510 BDO	9/11/08 1510 BDO
9/11/08 1607 BDO	9/11/08 1607

Boston Harbor Maintenance Dredge Program
Contract No. G606444
Sample Custody Form

Today's Date : 9/10/2008 6:17:36 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH08209CTS1	9/9/2008 9:16:53 AM	HS16	C	☑	☐	☐
	BH08209DTS1	9/9/2008 9:17:32 AM	HS16	A	☑	☐	☐
	BH0820ACTS1	9/9/2008 11:10:02 AM	SH11	E	☑	☐	☐
	BH0820ADTS1	9/9/2008 11:10:24 AM	SH11	C	☑	☐	☐
	BH0820D0TS1	9/9/2008 1:46:38 PM	SH14	E	☑	☐	☐
	BH0820D1TS1	9/9/2008 1:47:03 PM	SH14	C	☑	☐	☐
	BH0820E9TS1	9/9/2008 3:32:52 PM	MF11	E	☑	☐	☐
	BH0820EATS1	9/9/2008 3:33:23 PM	MF11	C	☑	☐	☐
	BH0820EBTS1	9/9/2008 3:34:06 PM	MF11	A	☑	☐	☐
	BH0820F5TS1	9/9/2008 3:41:11 PM	MF12	E	☑	☐	☐
	BH0820F6TS1	9/9/2008 3:41:40 PM	MF12	A	☑	☐	☐
	BH0820FETS1	9/9/2008 3:48:36 PM	MF13	E	☑	☐	☐
	BH0820FETS2	9/9/2008 3:48:36 PM	MF13	E	☑	☐	☐
	BH0820FFTS1	9/9/2008 3:49:05 PM	MF13	C	☑	☐	☐
	BH082100TS1	9/9/2008 3:49:36 PM	MF13	A	☑	☐	☐
	BH082108TS1	9/9/2008 3:58:49 PM	MF14	E	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9/11/08 1510 BDO	9/11/08 1510 BDO
9/11/08 1607 BDO	9/11/08 1607

Boston Harbor Maintenance Dredge Program
Contract No. G606444
Sample Custody Form

Today's Date : 9/10/2008 6:17:36 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH082109TS1	9/9/2008 3:59:24 PM	MF14	C	☑	☐	☐
	BH08210ATS1	9/9/2008 3:59:58 PM	MF14	A	☑	☐	☐
	BH082112TS1	9/9/2008 4:09:34 PM	MF15	E	☑	☐	☐
	BH082113TS1	9/9/2008 4:10:13 PM	MF15	C	☑	☐	☐
	BH082114TS1	9/9/2008 4:10:43 PM	MF15	A	☑	☐	☐
	BH08211CTS1	9/9/2008 4:22:32 PM	MF16	E	☑	☐	☐
	BH08211DTS1	9/9/2008 4:23:01 PM	MF16	C	☑	☐	☐
	BH08211ETS1	9/9/2008 4:23:30 PM	MF16	A	☑	☐	☐
	BH082146TS1	9/10/2008 10:08:52 AM	HS21	E	☑	☐	☐
	BH082147TS1	9/10/2008 10:09:26 AM	HS21	C	☑	☐	☐
	BH082148TS1	9/10/2008 10:10:00 AM	HS21	A	☑	☐	☐
	BH082150TS1	9/10/2008 10:17:56 AM	HS22	E	☑	☐	☐
	BH082151TS1	9/10/2008 10:18:41 AM	HS22	C	☑	☐	☐
	BH082152TS1	9/10/2008 10:19:11 AM	HS22	A	☑	☐	☐
	BH08215ATS1	9/10/2008 10:27:29 AM	HS23	E	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): ✓ Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9/11/08 1570 BDO	9/11/08 1510 BDO
9/11/08 1607 BDO	9/11/08 1602

Boston Harbor Maintenance Dredge Program
Contract No. G606444
Sample Custody Form

Today's Date : 9/10/2008 6:17:36 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH08215BTS1	9/10/2008 10:28:02 AM	HS23	C	☑	☐	☐
	BH08215CTS1	9/10/2008 10:28:30 AM	HS23	A	☑	☐	☐
	BH082164TS1	9/10/2008 10:36:26 AM	HS24	E	☑	☐	☐
	BH082165TS1	9/10/2008 10:37:01 AM	HS24	C	☑	☐	☐
	BH082165TS2	9/10/2008 10:37:01 AM	HS24	C	☑	☐	☐
	BH082166TS1	9/10/2008 10:37:25 AM	HS24	A	☑	☐	☐
	BH08216ETS1	9/10/2008 10:45:59 AM	HS25	E	☑	☐	☐
	BH08216FTS1	9/10/2008 10:46:34 AM	HS25	C	☑	☐	☐
	BH082170TS1	9/10/2008 10:47:06 AM	HS25	A	☑	☐	☐
	BH082181TS1	9/10/2008 11:06:33 AM	HS26	E	☑	☐	☐
	BH082182TS1	9/10/2008 11:07:07 AM	HS26	C	☑	☐	☐
	BH082183TS1	9/10/2008 11:07:40 AM	HS26	A	☑	☐	☐
	BH08219ETS1	9/10/2008 12:51:22 PM	ME21	E	☑	☐	☐
	BH08219FTS1	9/10/2008 12:52:12 PM	ME21	C	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
[illegible] 9/11/08 1570 BDO	9/11/08 1510 BDO
9/11/08 1607 BDO	9/11/08 1607

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/10/2008 6:17:36 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH0821A0TS1	9/10/2008 12:52:33 PM	ME21	A	☑	☐	☐
	BH0821A8TS1	9/10/2008 12:58:12 PM	ME22	E	☑	☐	☐
	BH0821A9TS1	9/10/2008 12:58:51 PM	ME22	C	☑	☐	☐
	BH0821AATS1	9/10/2008 12:59:22 PM	ME22	A	☑	☐	☐
	BH0821B2TS1	9/10/2008 1:06:54 PM	ME23	E	☑	☐	☐
	BH0821B3TS1	9/10/2008 1:07:23 PM	ME23	C	☑	☐	☐
	BH0821B4TS1	9/10/2008 1:07:52 PM	ME23	A	☑	☐	☐
	BH0821BFTS1	9/10/2008 1:15:13 PM	ME24	E	☑	☐	☐
	BH0821C0TS1	9/10/2008 1:16:00 PM	ME24	C	☑	☐	☐
	BH0821C1TS1	9/10/2008 1:16:40 PM	ME24	A	☑	☐	☐
	BH0821C1TS2	9/10/2008 1:16:40 PM	ME24	A	☑	☐	☐
	BH0821C9TS1	9/10/2008 1:23:45 PM	ME25	E	☑	☐	☐
	BH0821CATS1	9/10/2008 1:24:16 PM	ME25	C	☑	☐	☐
	BH0821CBTS1	9/10/2008 1:24:44 PM	ME25	A	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9/11/08 1510 BDC	9/11/08 1510 BDC
9/11/08 1607 BDC	9/11/08 1607

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/10/2008 6:17:36 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0001
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
[redacted]	BH0821D5TS1	9/10/2008 1:33:27 PM	ME26	E	✓		
[redacted]	BH0821D6TS1	9/10/2008 1:33:57 PM	ME26	C	✓		
[redacted]	BH0821D7TS1	9/10/2008 1:34:24 PM	ME26	A	✓		
[redacted]	BH0821FBTS1	9/10/2008 5:27:57 PM	SH21	E	✓		
[redacted]	BH0821FCTS1	9/10/2008 5:28:33 PM	SH21	C	✓		

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
[redacted] 9/11/08 1510 BDC	[redacted] 9/11/08 1510 BDC
[redacted] 9/11/08 1607 BDC	[redacted] 9/11/08 1607

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/11/2008 8:37:38 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0002
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH08222FTS1	9/11/2008 1:03:22 PM	ME11	C	☑	☑	☐
	BH082230TS1	9/11/2008 1:03:51 PM	ME11	E	☑	☑	☐
	BH082231TS1	9/11/2008 1:04:34 PM	ME11	A	☑	☑	☐
	BH082239TS1	9/11/2008 1:13:56 PM	ME12	E	☑	☑	☐
	BH08223ATS1	9/11/2008 1:14:25 PM	ME12	C	☑	☑	☐
	BH08223BTS1	9/11/2008 1:14:56 PM	ME12	A	☑	☑	☐
	BH082248TS1	9/11/2008 1:23:12 PM	ME13	E	☑	☑	☐
	BH082249TS1	9/11/2008 1:23:49 PM	ME13	C	☑	☑	☐
	BH08224ATS1	9/11/2008 1:24:10 PM	ME13	A	☑	☑	☐
	BH082252TS1	9/11/2008 1:34:56 PM	ME14	E	☑	☑	☐
	BH082253TS1	9/11/2008 1:35:40 PM	ME14	C	☑	☑	☐
	BH082253TS2	9/11/2008 1:35:40 PM	ME14	C	☑	☑	☐
	BH082254TS1	9/11/2008 1:36:07 PM	ME14	A	☑	☑	☐
	BH08225CTS1	9/11/2008 1:44:09 PM	ME15	E	☑	☑	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-11-08 Battelle 2210	9/12/08 915 BDO
9/12/08 BDO 1020	9/12/08 1020

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/11/2008 8:37:38 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0002
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH08225DTS1	9/11/2008 1:44:51 PM	ME15	C	☑	☑	☐
	BH08225ETS1	9/11/2008 1:45:22 PM	ME15	A	☑	☑	☐
	BH082268TS1	9/11/2008 2:01:19 PM	ME16	E	☑	☑	☐
	BH082269TS1	9/11/2008 2:01:58 PM	ME16	C	☑	☑	☐
	BH08226ATS1	9/11/2008 2:02:26 PM	ME16	A	☑	☑	☐
	BH082288TS1	9/11/2008 4:50:30 PM	LS11	E	☑	☑	☐
	BH082289TS1	9/11/2008 4:50:54 PM	LS11	C	☑	☑	☐
	BH08228BTS1	9/11/2008 4:51:22 PM	LS11	A	☑	☑	☐
	BH082293TS1	9/11/2008 4:59:30 PM	LS12	E	☑	☑	☐
	BH082294TS1	9/11/2008 5:00:20 PM	LS12	C	☑	☑	☐
	BH082295TS1	9/11/2008 5:01:04 PM	LS12	A	☑	☑	☐
	BH08229FTS1	9/11/2008 5:11:36 PM	LS13	E	☑	☑	☐
	BH08229FTS2	9/11/2008 5:11:36 PM	LS13	E	☑	☑	☐
	BH0822A0TS1	9/11/2008 5:12:15 PM	LS13	C	☑	☑	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-11-08 Battelle 22:00	9/12/08 9:15 BDO
9/12/08 BDO 1020	9/12/08 1020

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/11/2008 8:37:38 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0002
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH0822A1TS2	9/11/2008 5:12:39 PM	LS13	A	☑	☑	☐
	BH0822A9TS1	9/11/2008 5:21:10 PM	LS14	E	☑	☑	☐
	BH0822AATS1	9/11/2008 5:21:46 PM	LS14	C	☑	☑	☐
	BH0822ABTS1	9/11/2008 5:22:07 PM	LS14	A	☑	☑	☐
	BH0822B3TS1	9/11/2008 5:38:08 PM	LS15	E	☑	☑	☐
	BH0822B4TS1	9/11/2008 5:38:57 PM	LS15	C	☑	☑	☐
	BH0822B5TS1	9/11/2008 5:39:42 PM	LS15	A	☑	☑	☐
	BH0822BDTS1	9/11/2008 5:50:06 PM	LS16	E	☑	☑	☐
	BH0822BETS1	9/11/2008 5:50:43 PM	LS16	C	☑	☑	☐
	BH0822BFTS1	9/11/2008 5:51:16 PM	LS16	A	☑	☑	☐
	BH0822CBTS1	9/11/2008 6:29:51 PM	SH31	E	☑	☑	☐
	BH0822CCTS1	9/11/2008 6:30:32 PM	SH31	C	☑	☑	☐
	BH0822D7TS1	9/11/2008 7:32:17 PM	MF21	E	☑	☑	☐
	BH0822D8TS1	9/11/2008 7:32:44 PM	MF21	C	☑	☑	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-11-08 Battelle 22:10	9/12/08 9:15 BDO
9/12/08 BDO 10:20	9/12/08 1020

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/11/2008 8:37:38 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0002
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH0822D9TS1	9/11/2008 7:33:10 PM	MF21	A	☑	☑	☐
	BH0822E5TS1	9/11/2008 7:40:32 PM	MF22	E	☑	☑	☐
	BH0822E6TS1	9/11/2008 7:41:05 PM	MF22	C	☑	☑	☐
	BH0822E7TS1	9/11/2008 7:41:28 PM	MF22	A	☑	☑	☐
	BH0822EFTS1	9/11/2008 7:49:35 PM	MF23	E	☑	☑	☐
	BH0822F0TS1	9/11/2008 7:50:17 PM	MF23	C	☑	☑	☐
	BH0822F1TS1	9/11/2008 7:51:01 PM	MF23	A	☑	☑	☐
	BH0822F9TS1	9/11/2008 7:57:47 PM	MF24	E	☑	☑	☐
	BH0822FATS1	9/11/2008 7:58:27 PM	MF24	C	☑	☑	☐
	BH0822FBTS1	9/11/2008 7:58:53 PM	MF24	A	☑	☑	☐
	BH082305TS1	9/11/2008 8:08:41 PM	MF25	E	☑	☑	☐
	BH082306TS1	9/11/2008 8:09:22 PM	MF25	C	☑	☑	☐
	BH082307TS1	9/11/2008 8:10:06 PM	MF25	A	☑	☑	☐
	BH082311TS1	9/11/2008 8:21:23 PM	MF26	E	☑	☑	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-11-08 2200 Battelle	9/12/08 BDO
9/12/08 BDO 1020	9/12/08 1020

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/11/2008 8:37:38 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0002
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH082312TS1	9/11/2008 8:22:07 PM	MF26	C	☑	☑	☐
	BH082312TS2	9/11/2008 8:22:07 PM	MF26	C	☑	☑	☐
	BH082313TS1	9/11/2008 8:22:47 PM	MF26	A	☑	☑	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-11-08 22:00 Battelle	9/12/08 915 BDO
9/12/08 1020 BDO	9/12/08 1020

Boston Harbor Maintenance Dredge Program

Contract No. G606444

Sample Custody Form

Today's Date : 9/12/2008 5:07:29 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0004
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH08234ATS1	9/12/2008 3:24:06 PM	LS21	E	☑	☐	☐
	BH08234BTS1	9/12/2008 3:24:48 PM	LS21	C	☑	☐	☐
	BH08234BTS2	9/12/2008 3:24:48 PM	LS21	C	☑	☐	☐
	BH08234CTS1	9/12/2008 3:25:16 PM	LS21	A	☑	☐	☐
	BH082356TS1	9/12/2008 3:34:57 PM	LS22	E	☑	☐	☐
	BH082357TS1	9/12/2008 3:35:39 PM	LS22	C	☑	☐	☐
	BH082358TS1	9/12/2008 3:36:06 PM	LS22	A	☑	☐	☐
	BH082360TS1	9/12/2008 3:43:04 PM	LS23	E	☑	☐	☐
	BH082361TS1	9/12/2008 3:43:34 PM	LS23	C	☑	☐	☐
	BH082363TS1	9/12/2008 3:49:03 PM	LS23	A	☑	☐	☐
	BH08236BTS1	9/12/2008 3:59:31 PM	LS24	E	☑	☐	☐
	BH08236CTS1	9/12/2008 4:00:04 PM	LS24	C	☑	☐	☐
	BH08236DTS1	9/12/2008 4:00:33 PM	LS24	A	☑	☐	☐
	BH082375TS1	9/12/2008 4:07:39 PM	LS25	E	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-12-08 1850 Battelle	9/15/08 1300 BSD
9-15-08 1645 BSD	9/15/08 1645

Boston Harbor Maintenance Dredge Program
Contract No. G606444
Sample Custody Form

Today's Date : 9/12/2008 5:07:29 P

Laboratory : Alpha Analytical

Chain-of-Custody # : BH082-TS-0004
Survey ID : BH082
Analysis ID : TS
Analysis Description : Total Suspended Solids

8 Walkup Drive
Westborough MA 01581
Mr. Nickolas Corso
508-898-9220 (Phone) (Fax)

Bottle ID :	Bottle ID :	Sampling Date :	Station ID :	Depth Code:	Ck 1	Ck 2	Ck 3
	BH082376TS1	9/12/2008 4:08:25 PM	LS25	C	☑	☐	☐
	BH082377TS1	9/12/2008 4:08:57 PM	LS25	A	☑	☐	☐
	BH082380TS1	9/12/2008 4:40:22 PM	LS26	E	☑	☐	☐
	BH082381TS1	9/12/2008 4:40:55 PM	LS26	C	☑	☐	☐
	BH082382TS1	9/12/2008 4:41:24 PM	LS26	A	☑	☐	☐

Shipping Condition - Room Temperature: _____ Cold(ice): X Frozen(dry ice): _____
Received Condition - Room Temperature: _____ Cold(ice): _____ Frozen(dry ice): _____

Relinquished By / Date / Time / Company / Transport-Airbill #	Received By / Date / Time / Company
9-12-08 18:50 Battelle	9/15/08 1300 BDO
Jessica M Judy 9-15-08 16:45 BDO	9/15/08 1645

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Appendix 3

In situ CTD/Turbidity Profile Results

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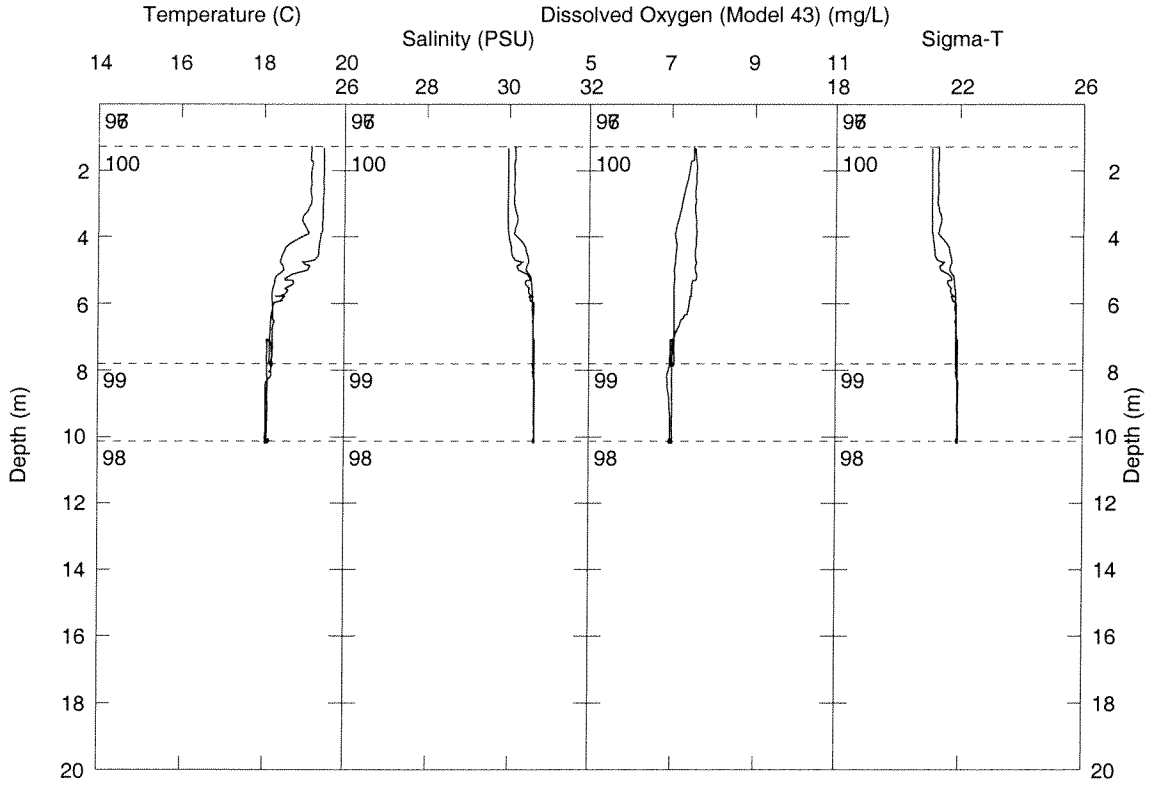

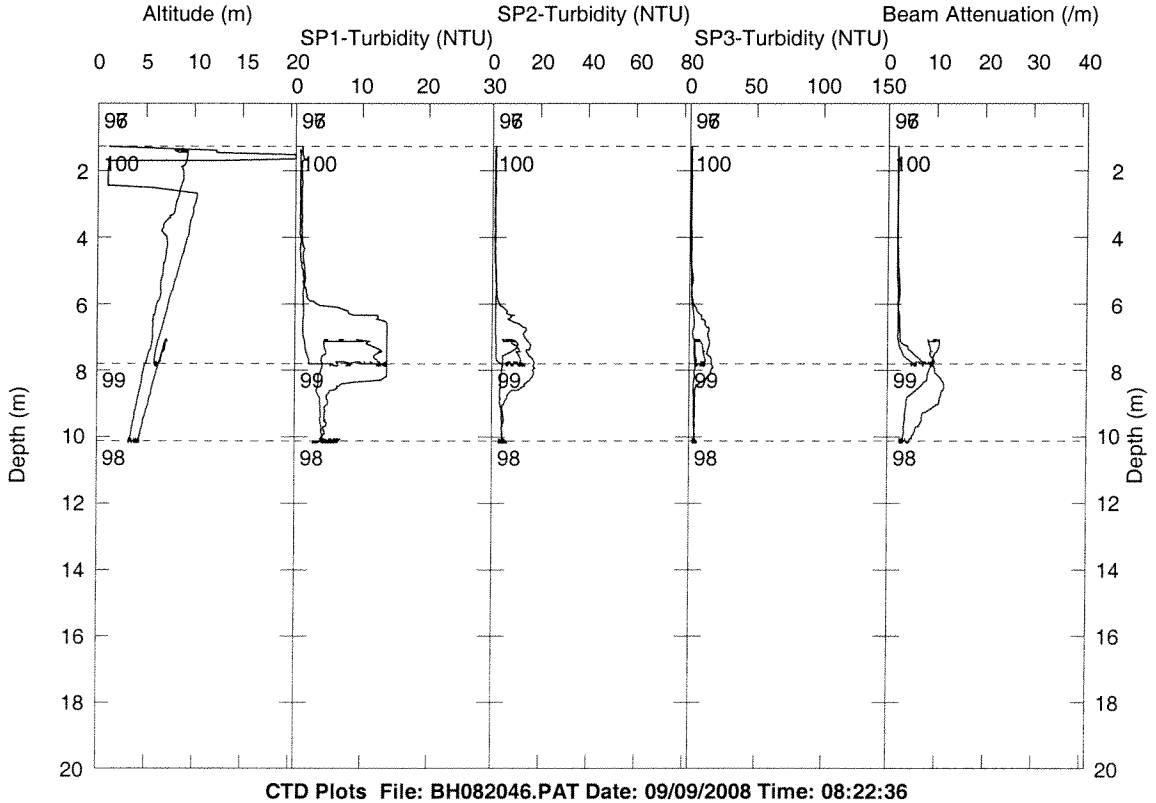

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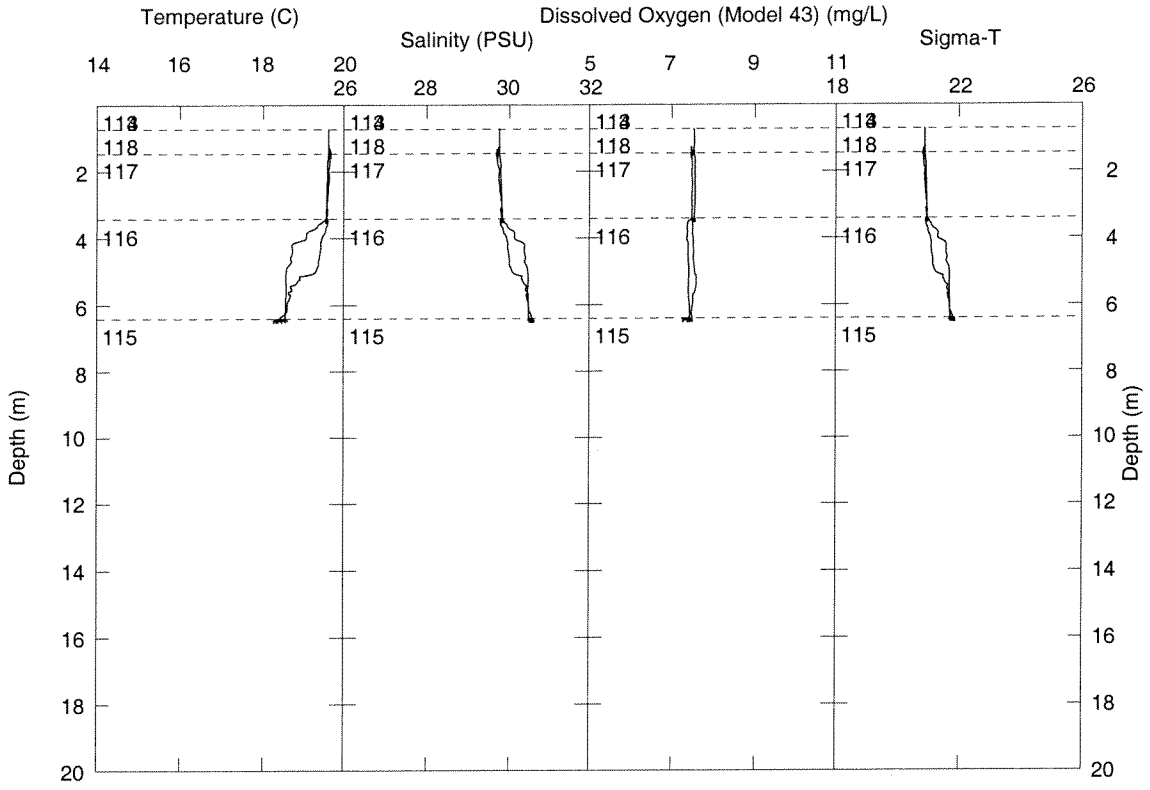

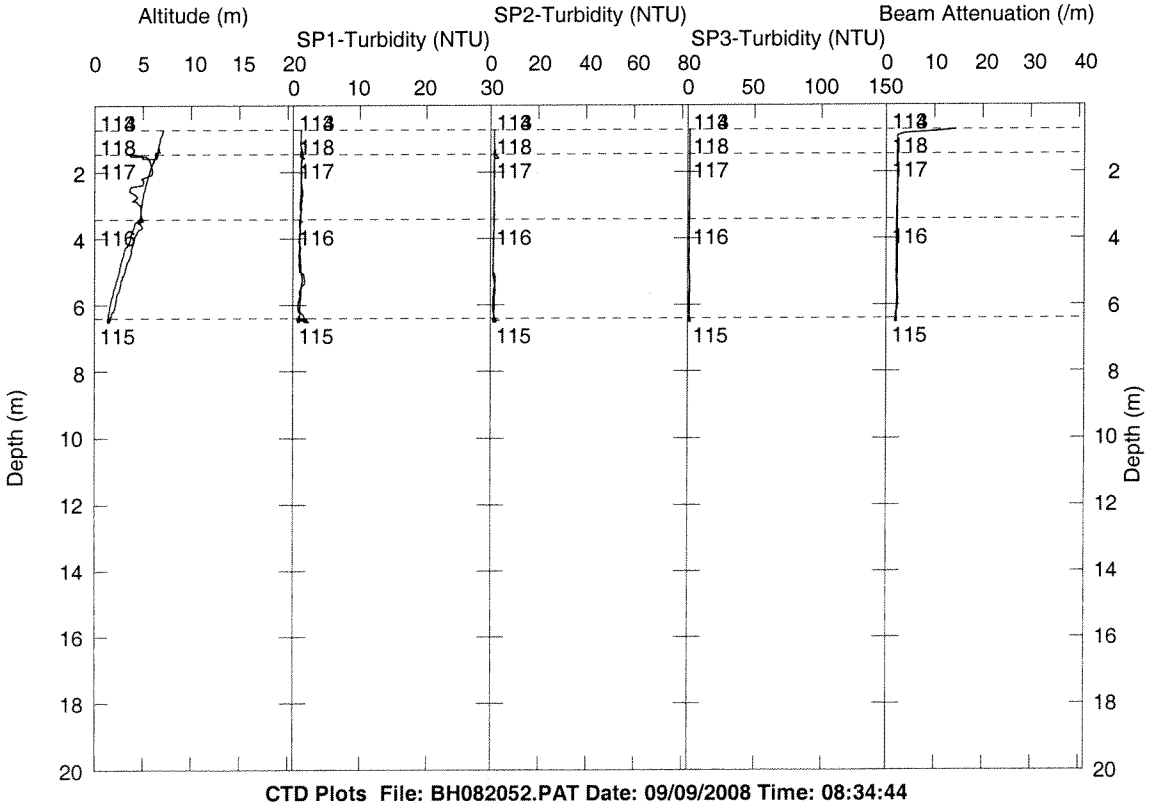

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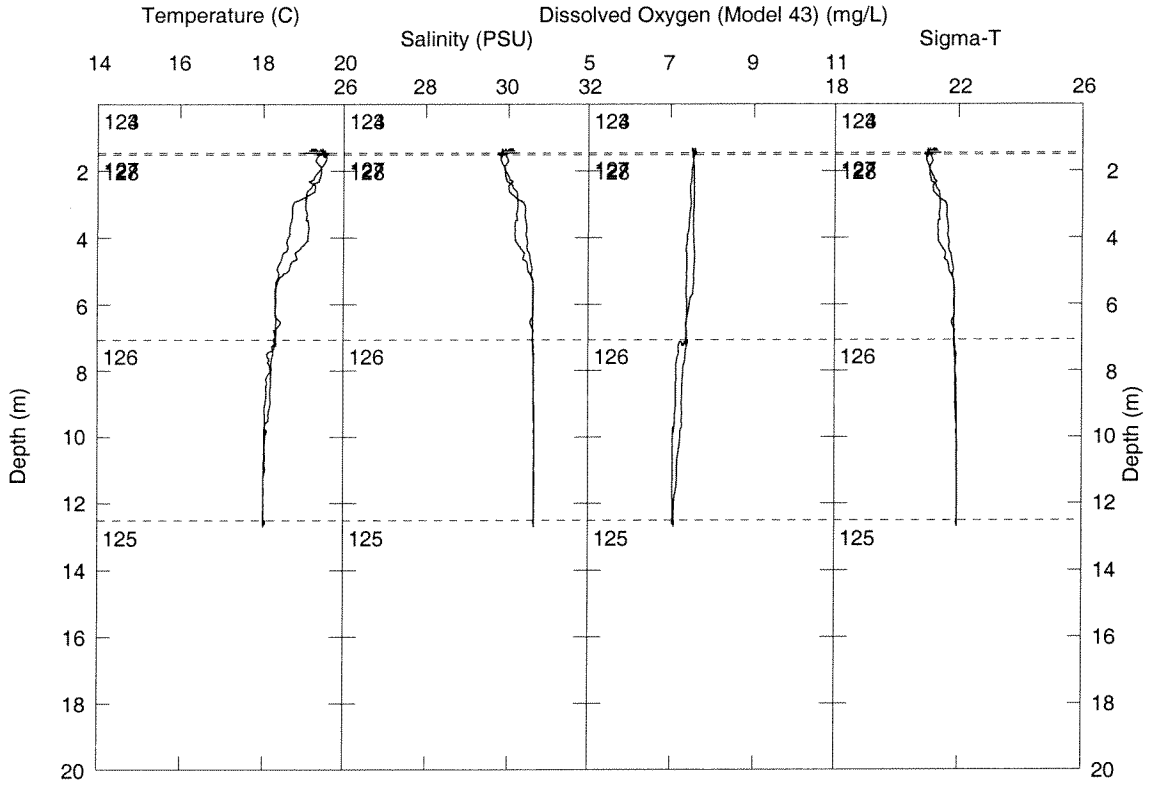

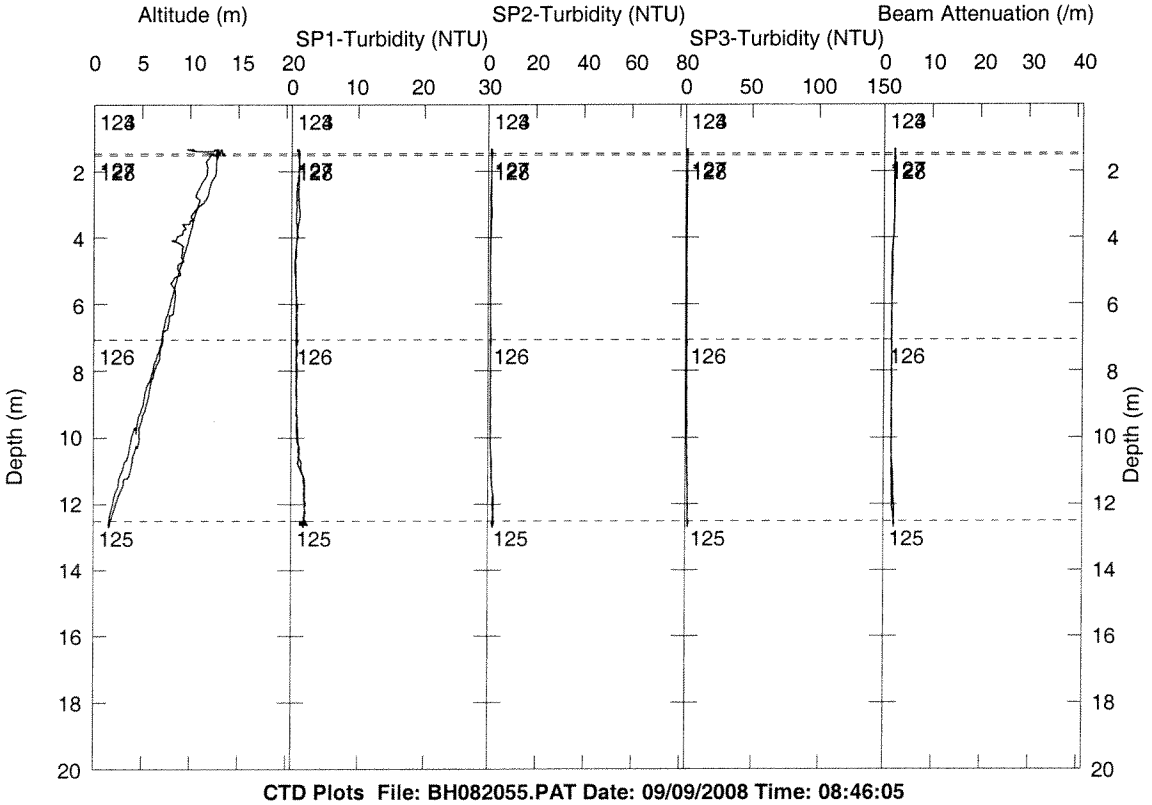

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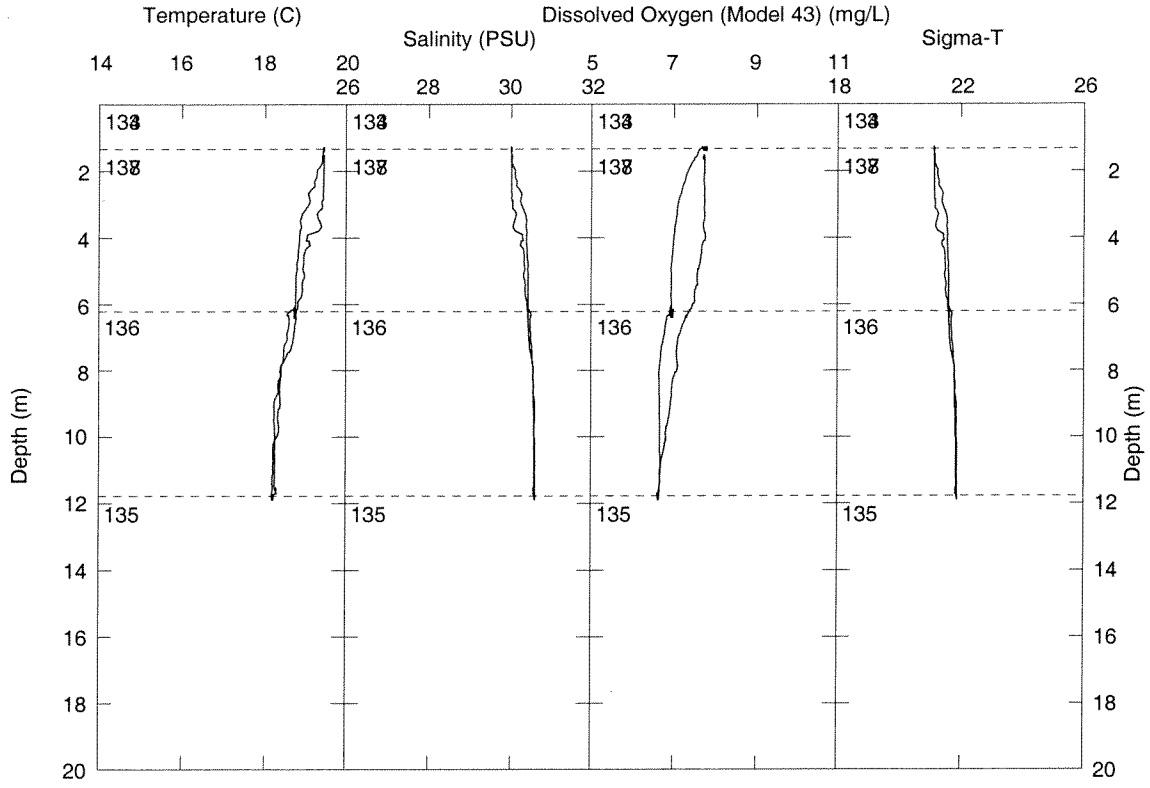

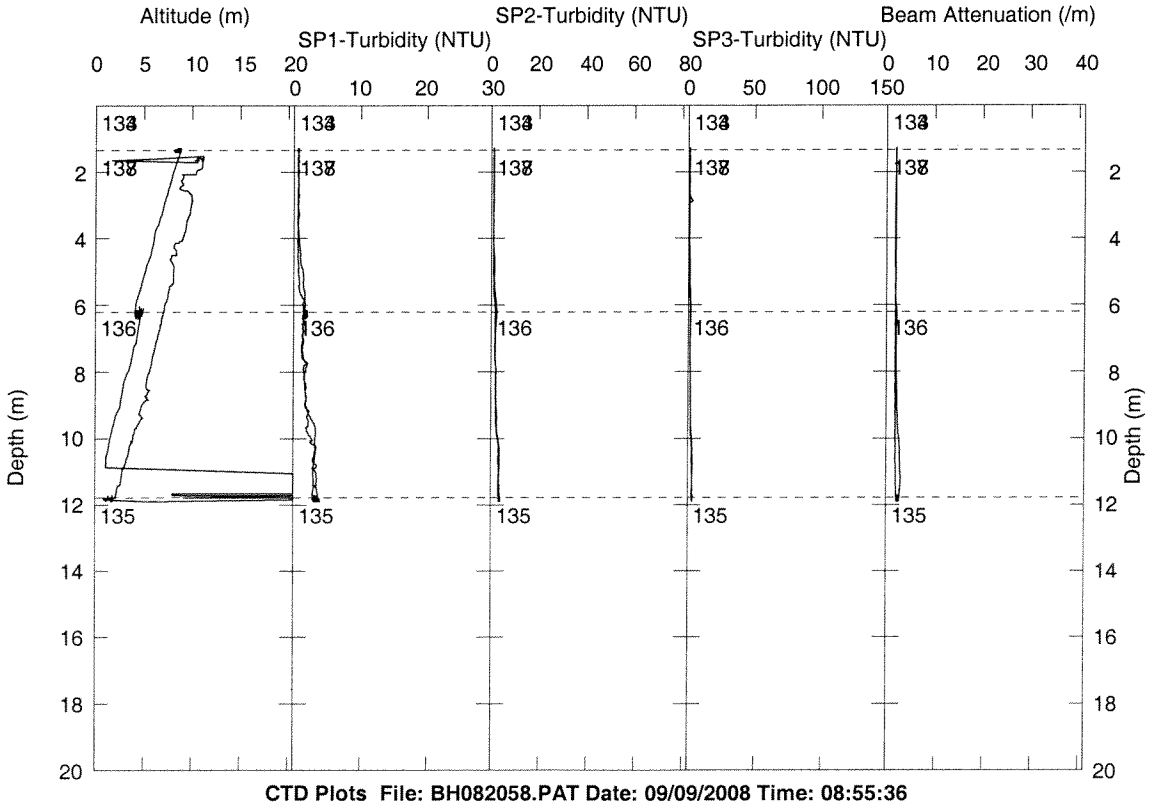

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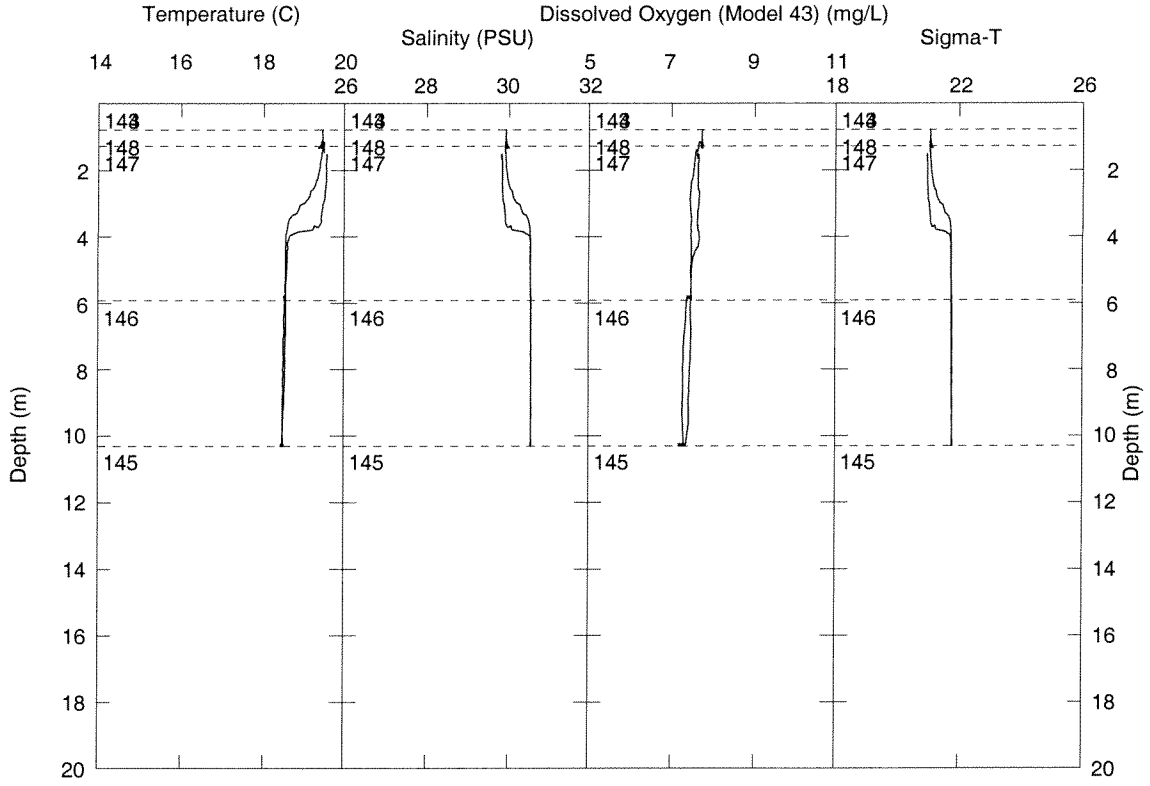

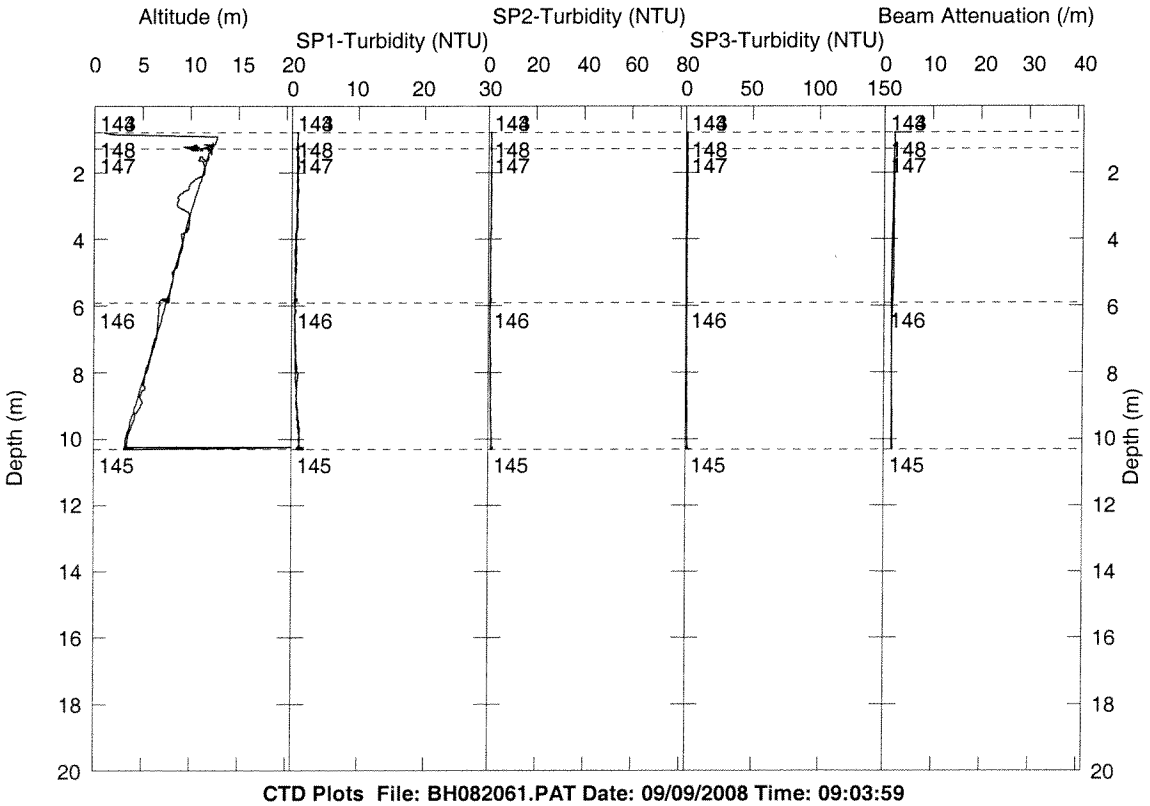

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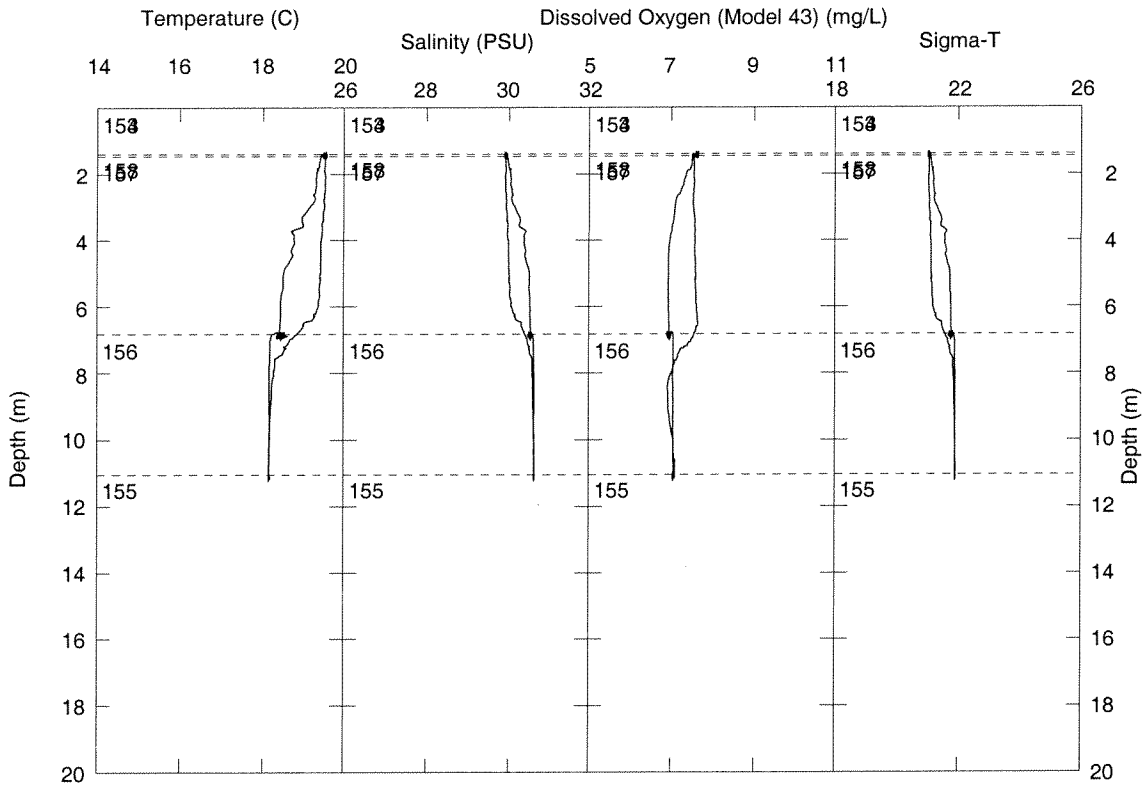

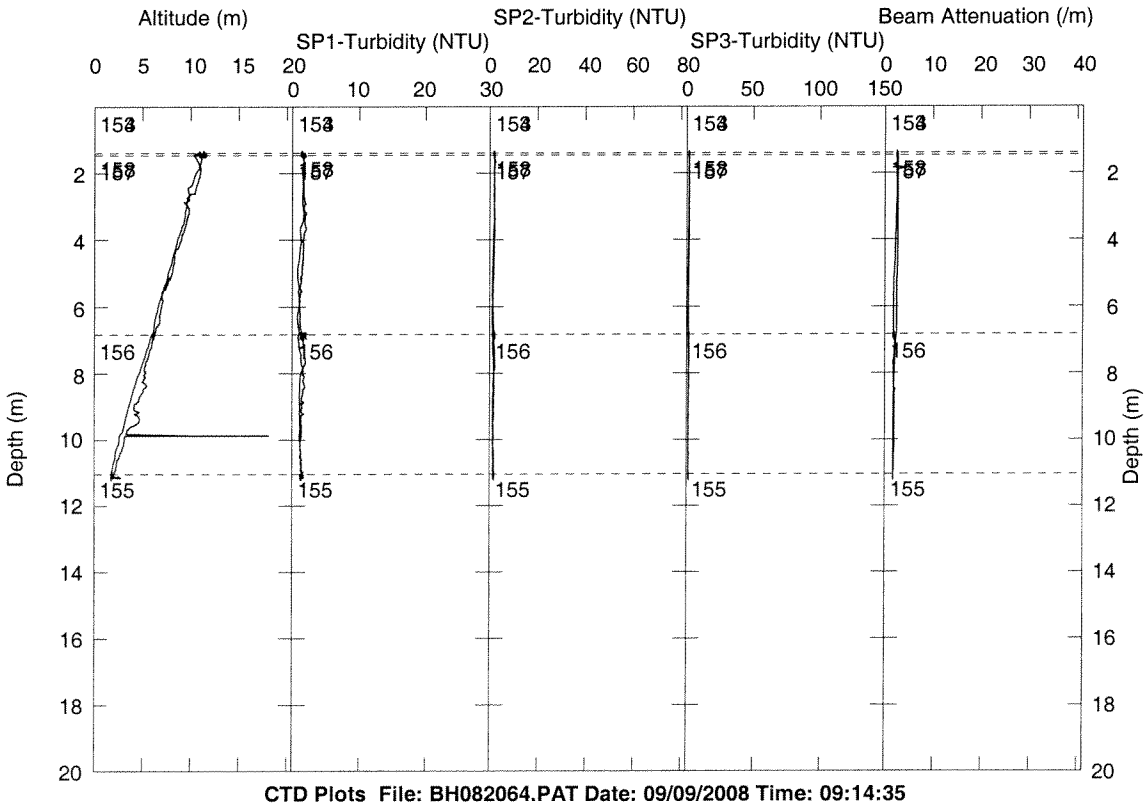

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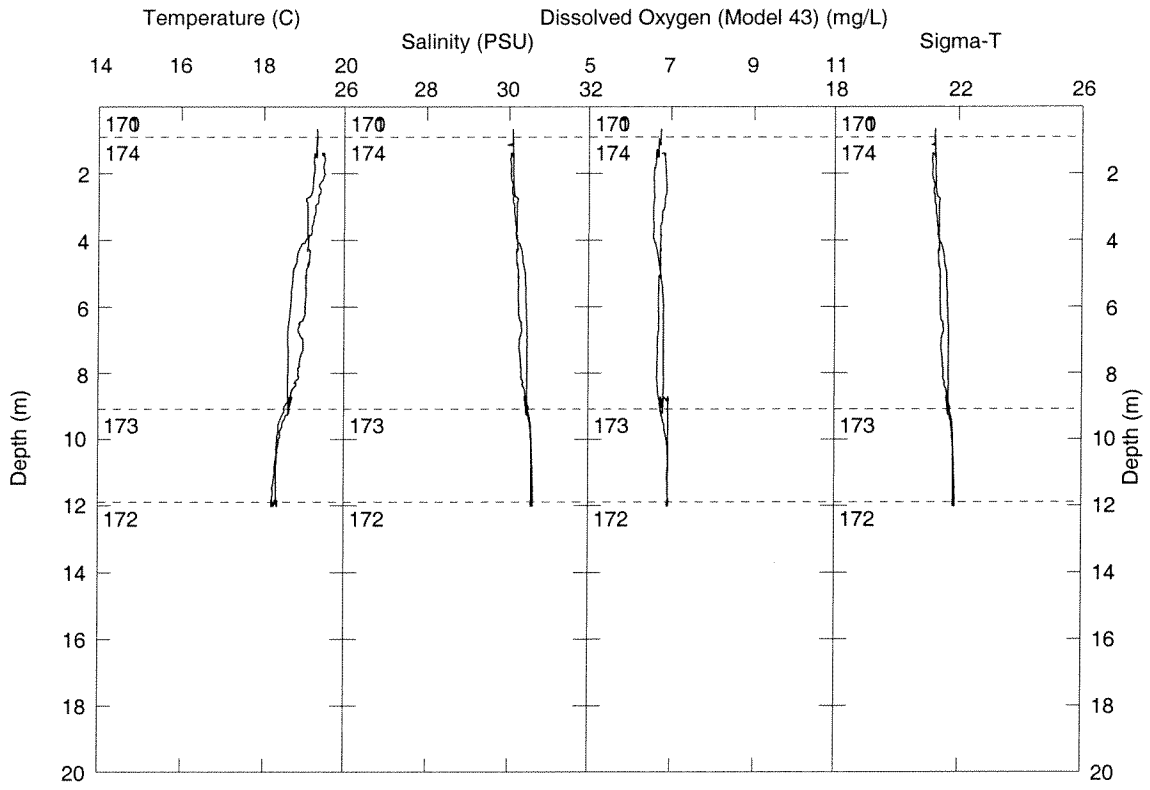

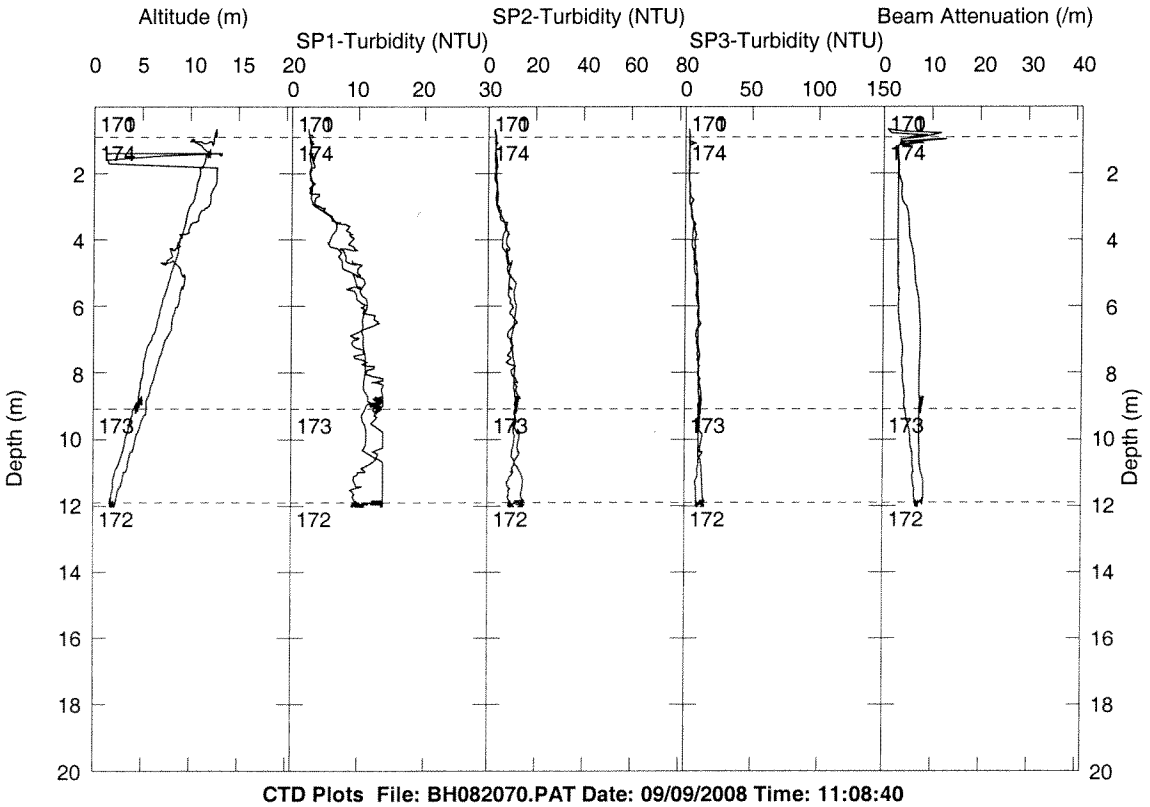

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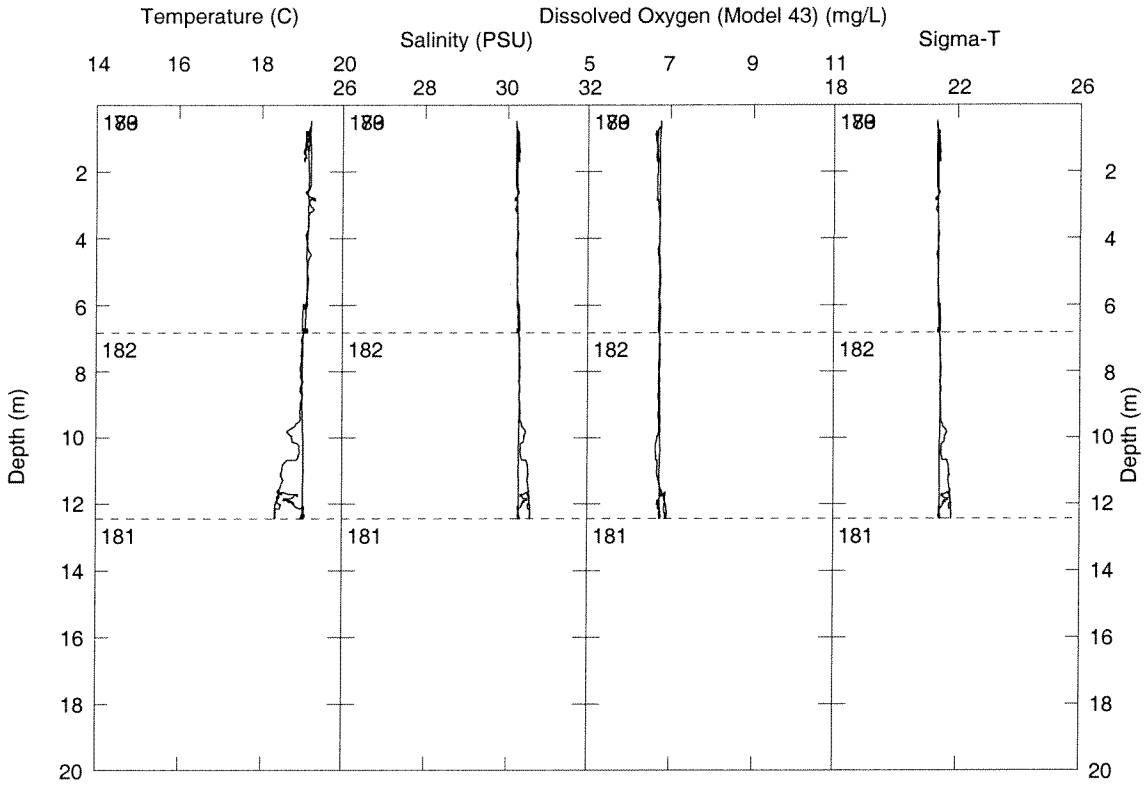

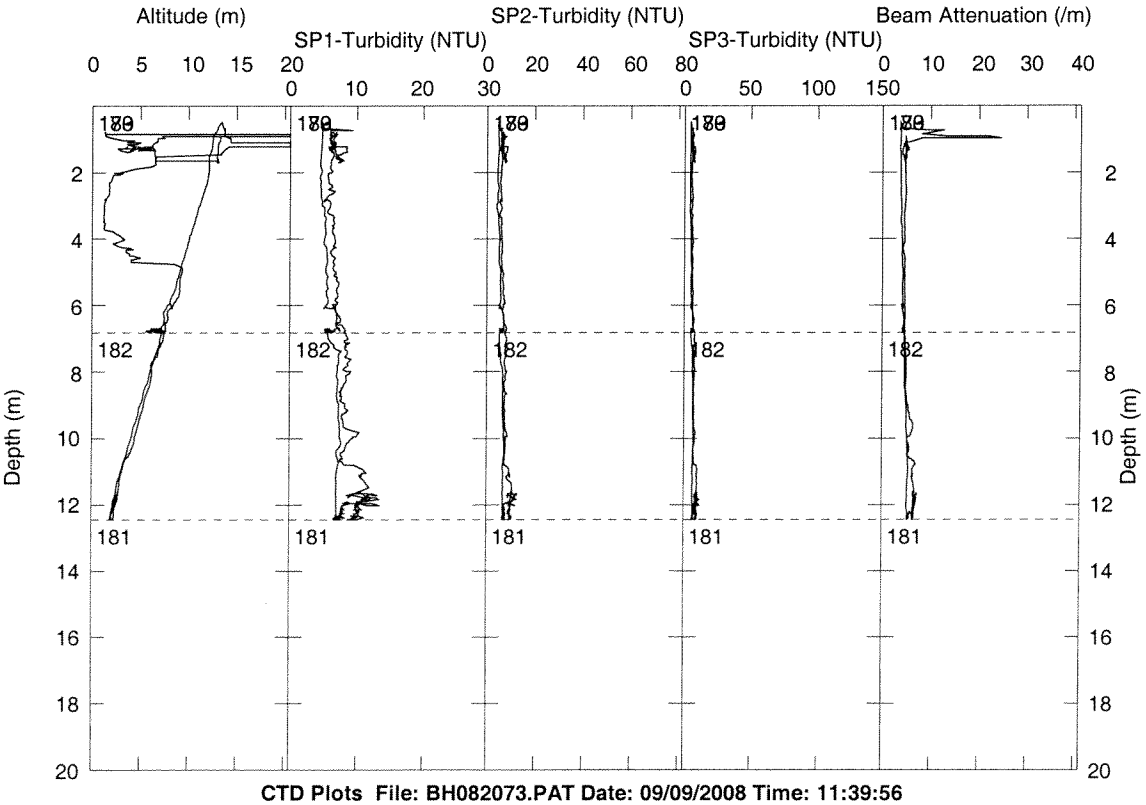

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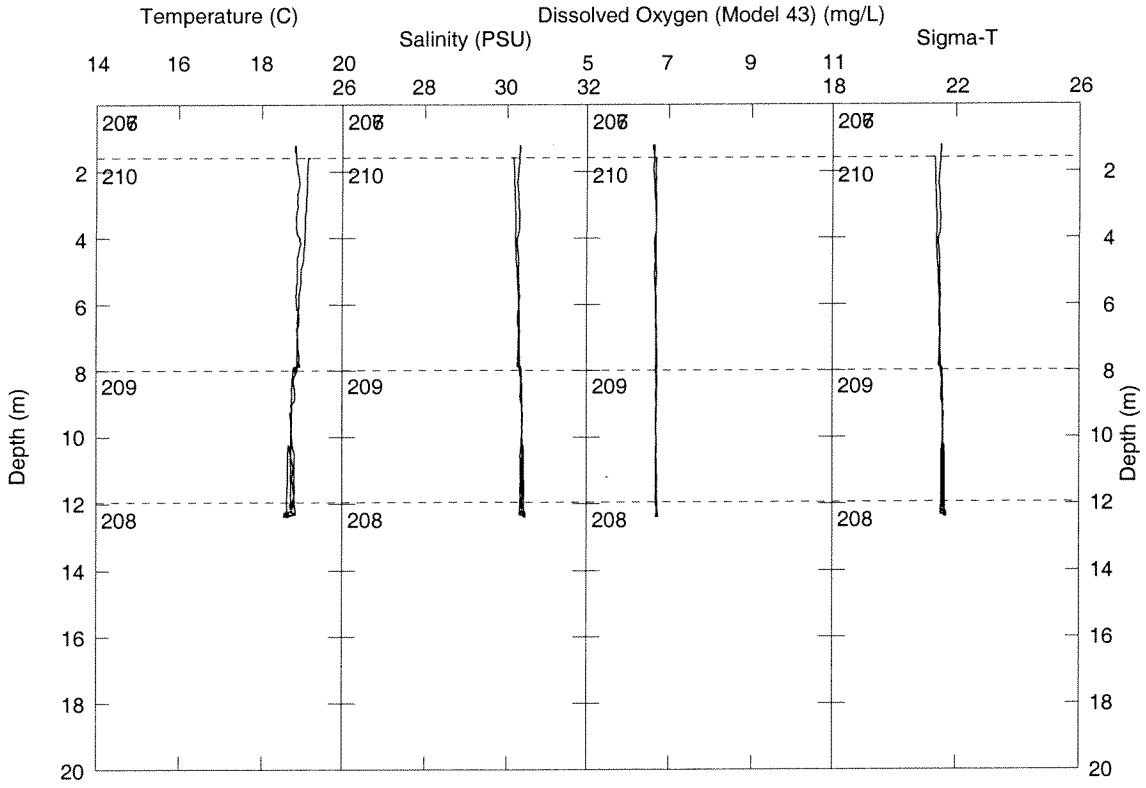

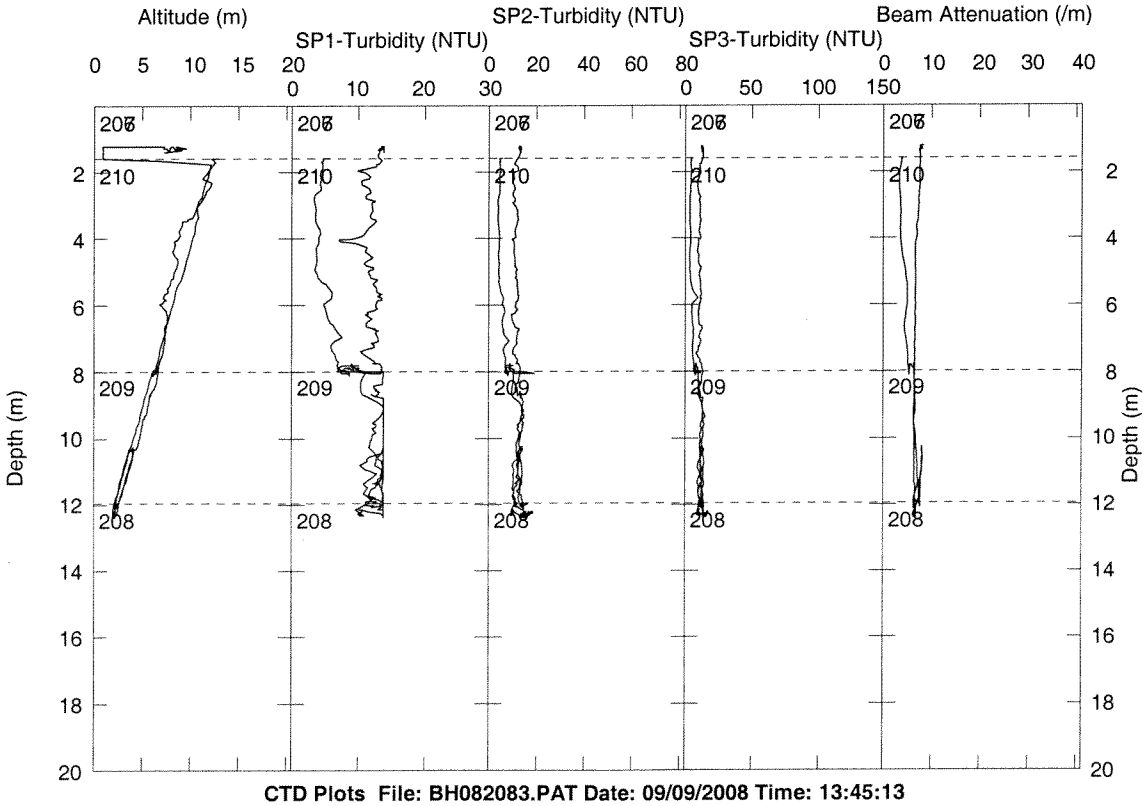

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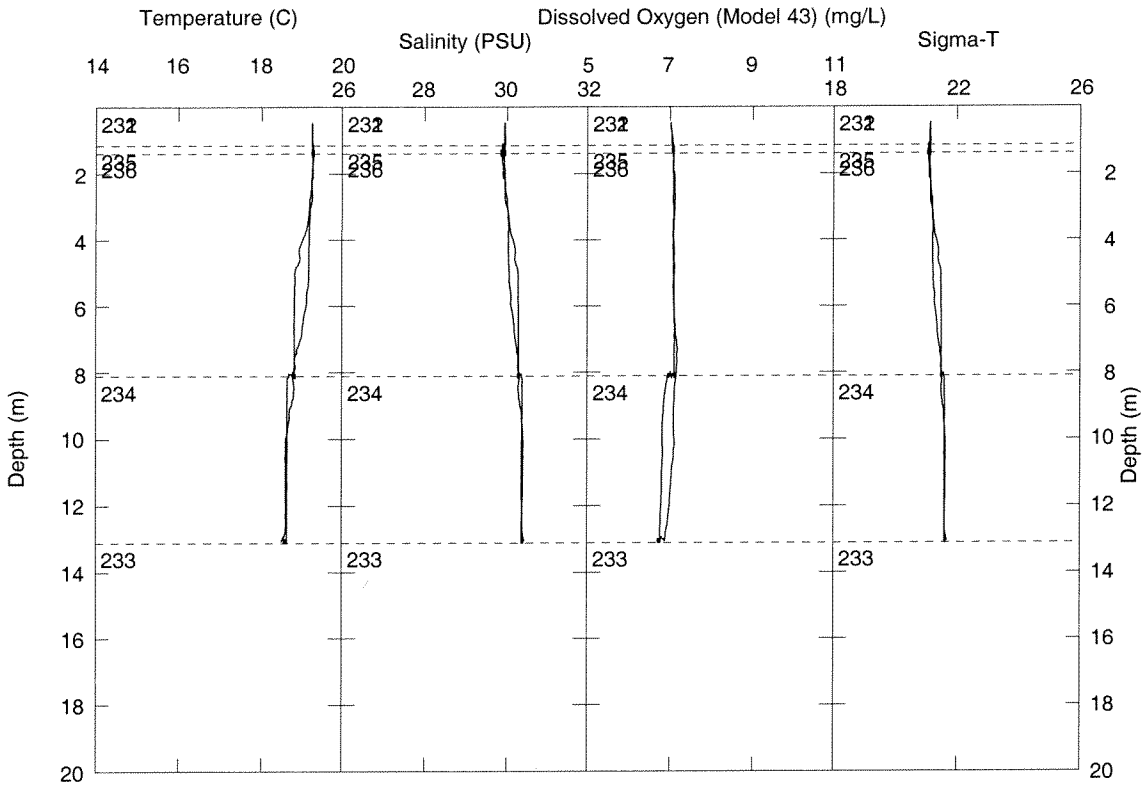

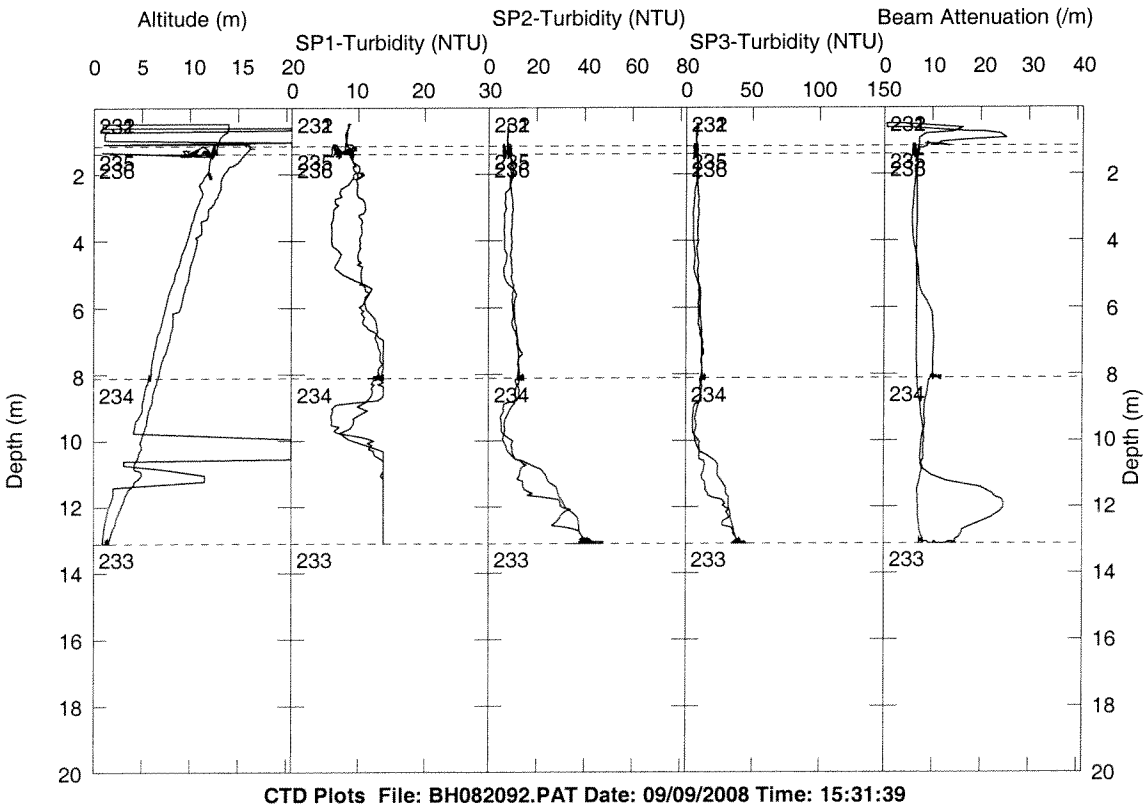

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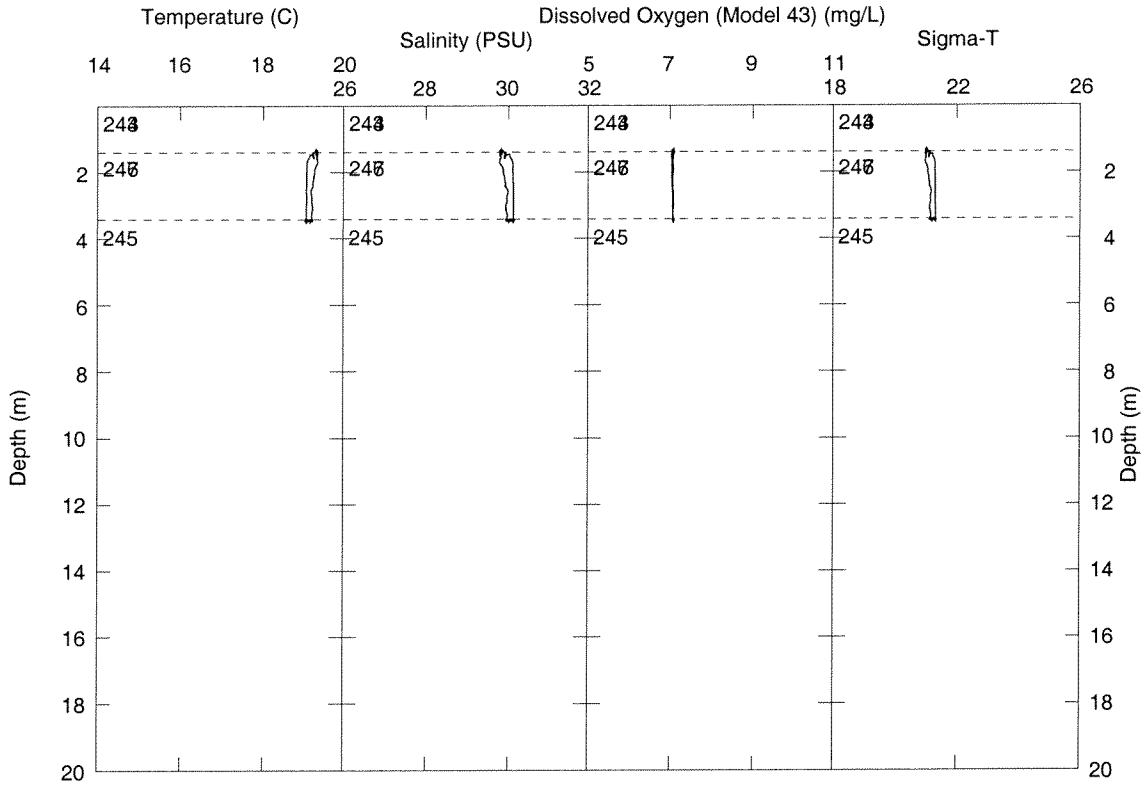

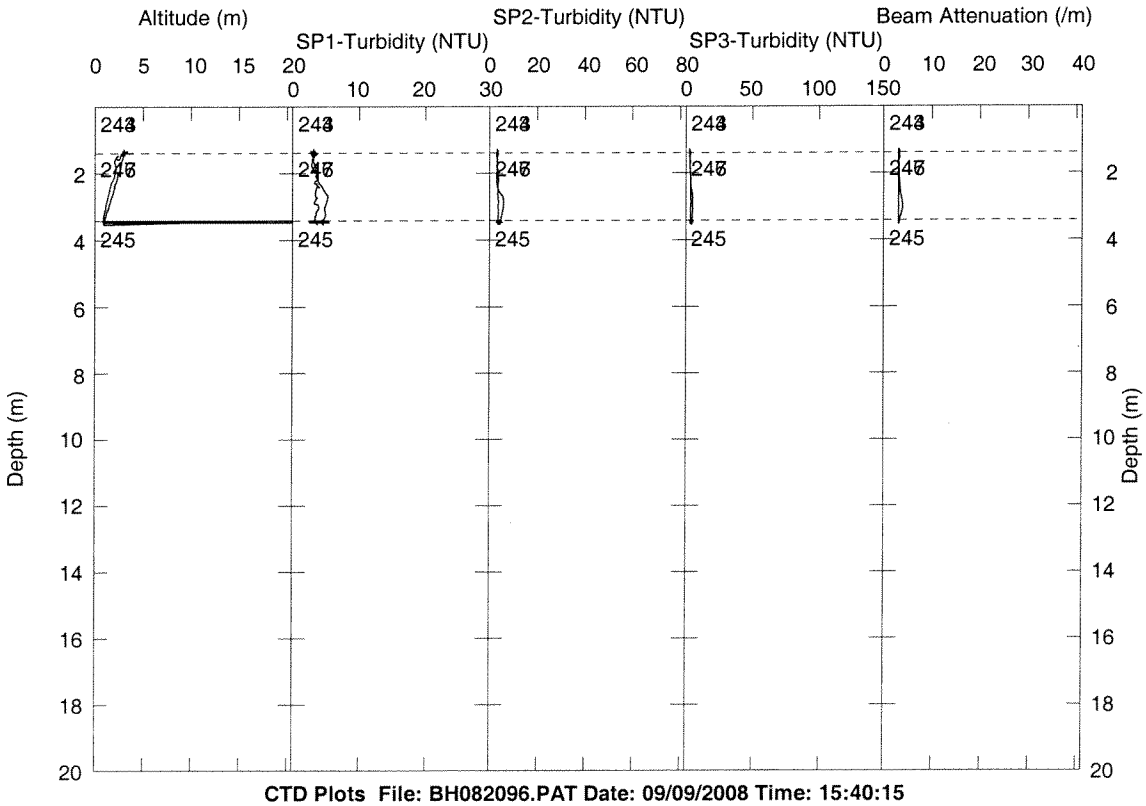

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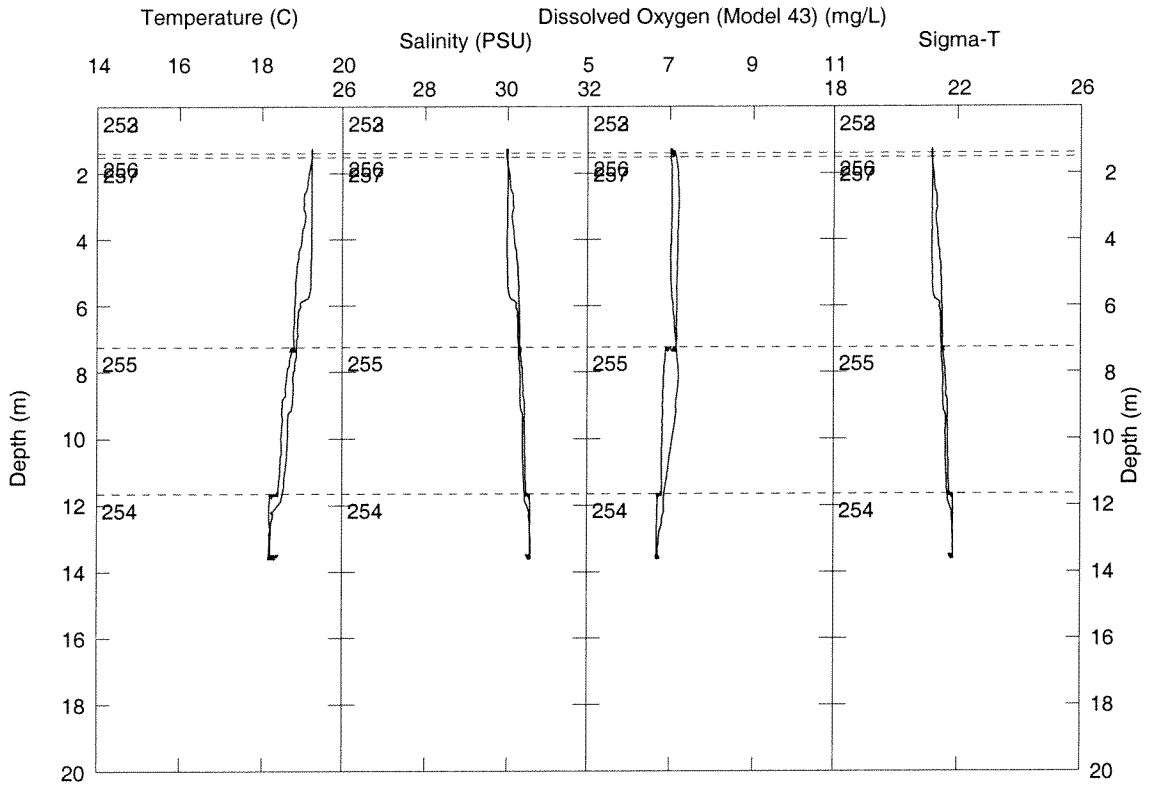

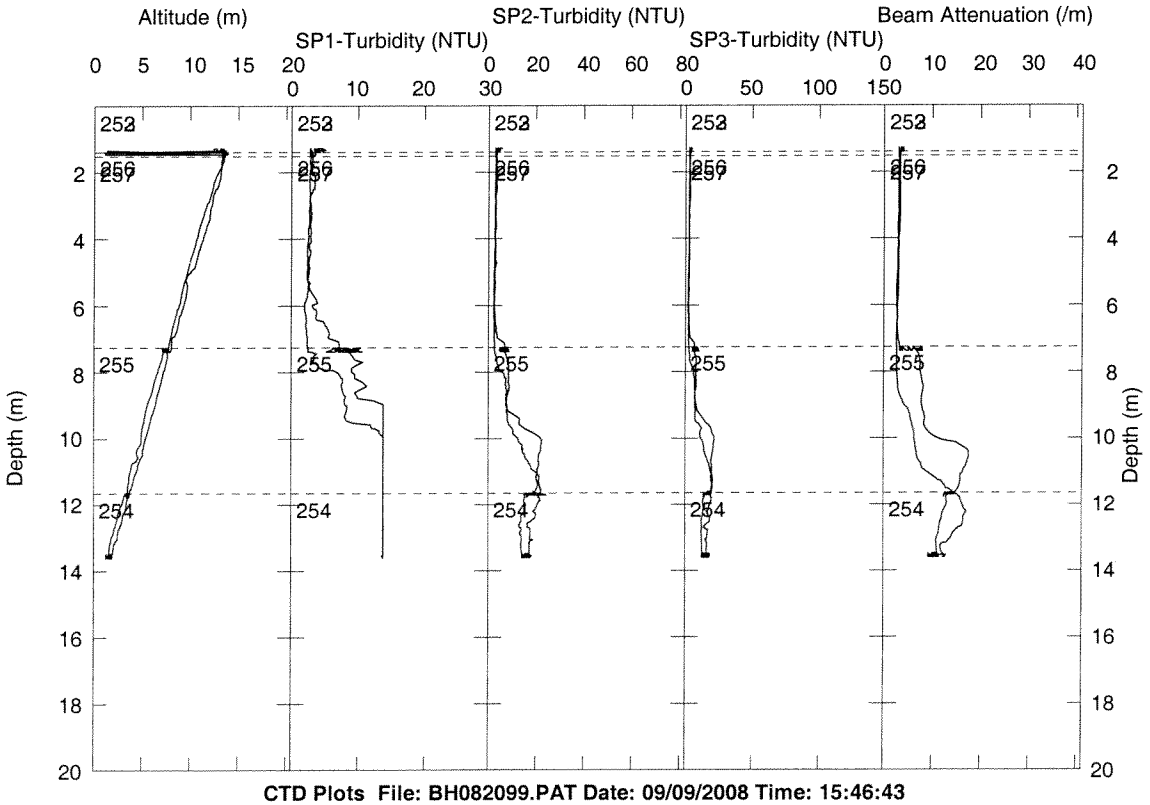

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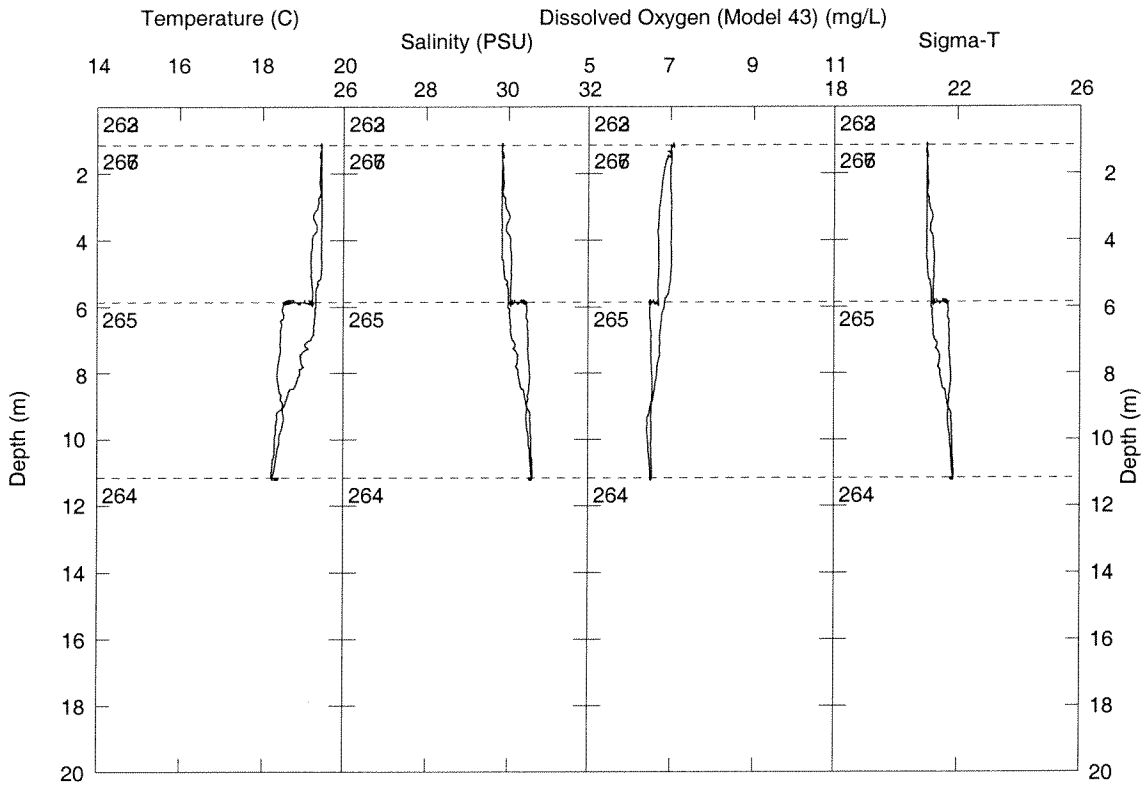

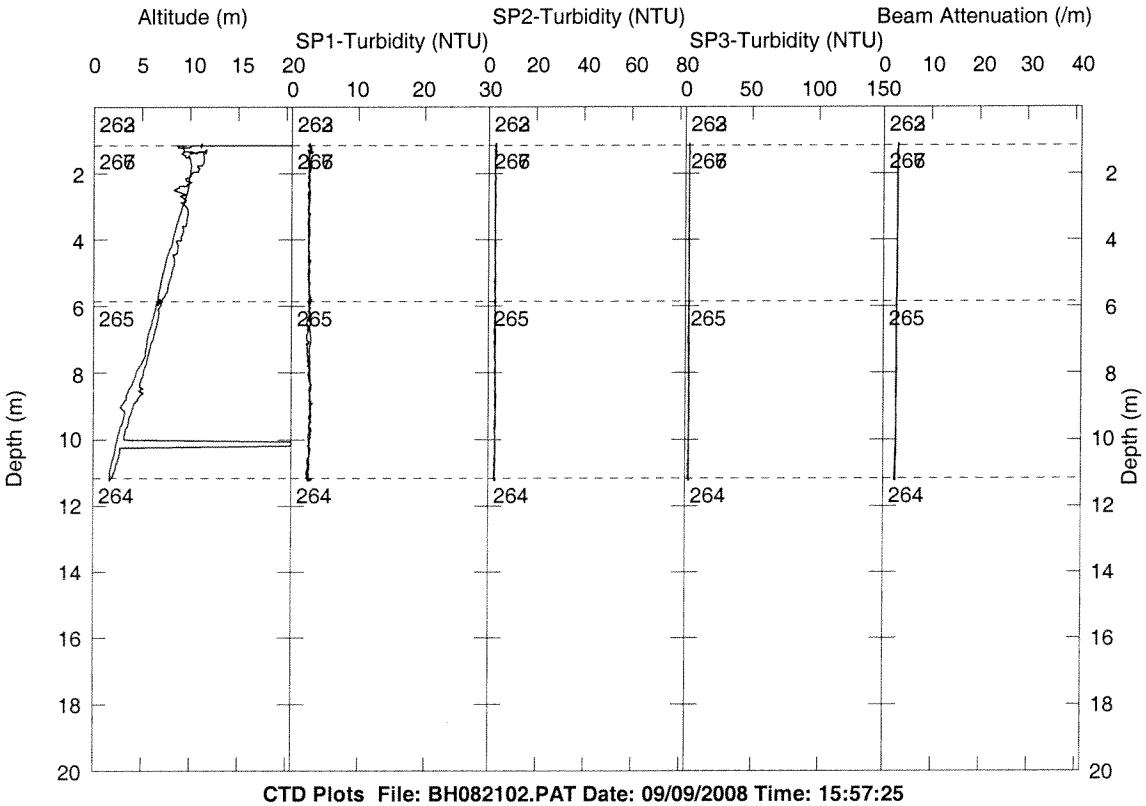

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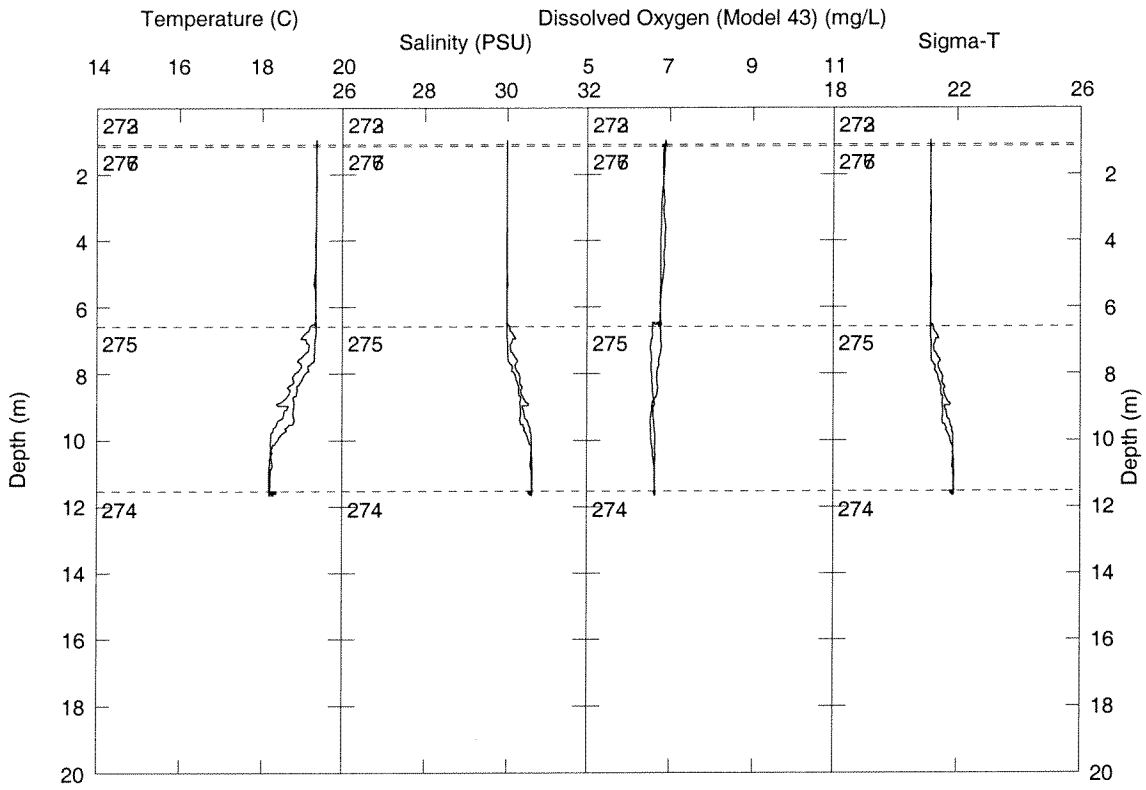

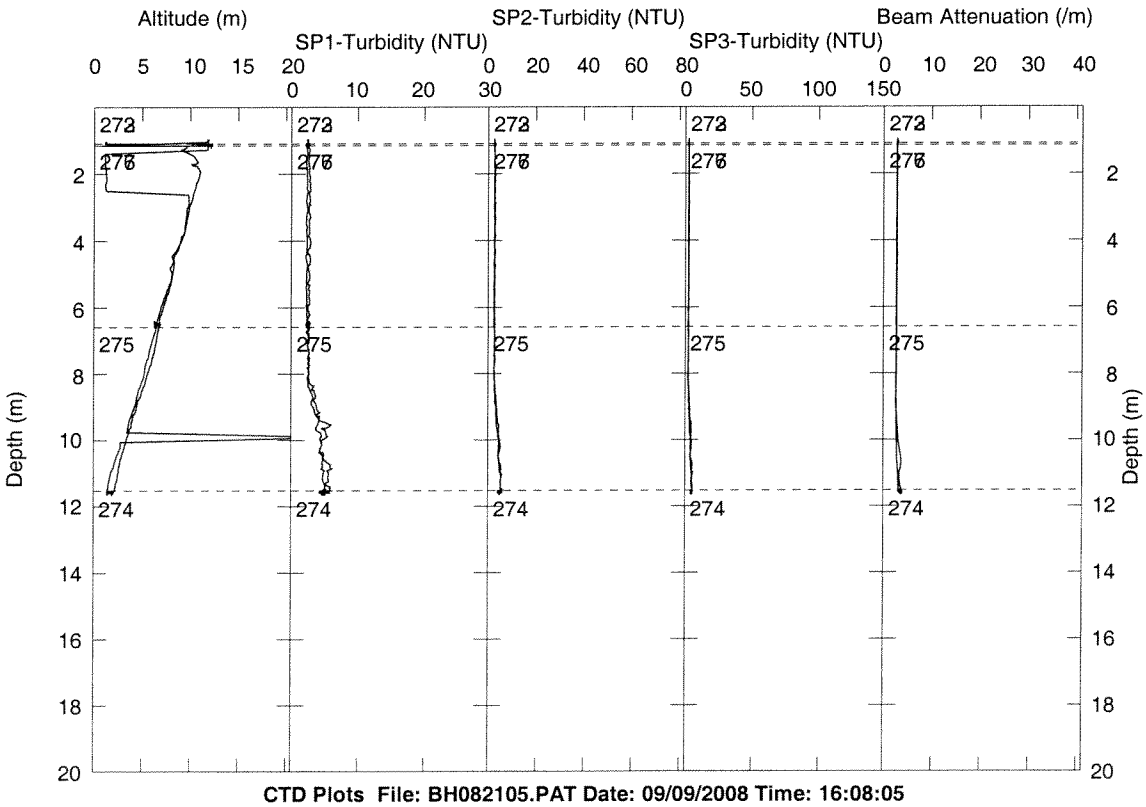

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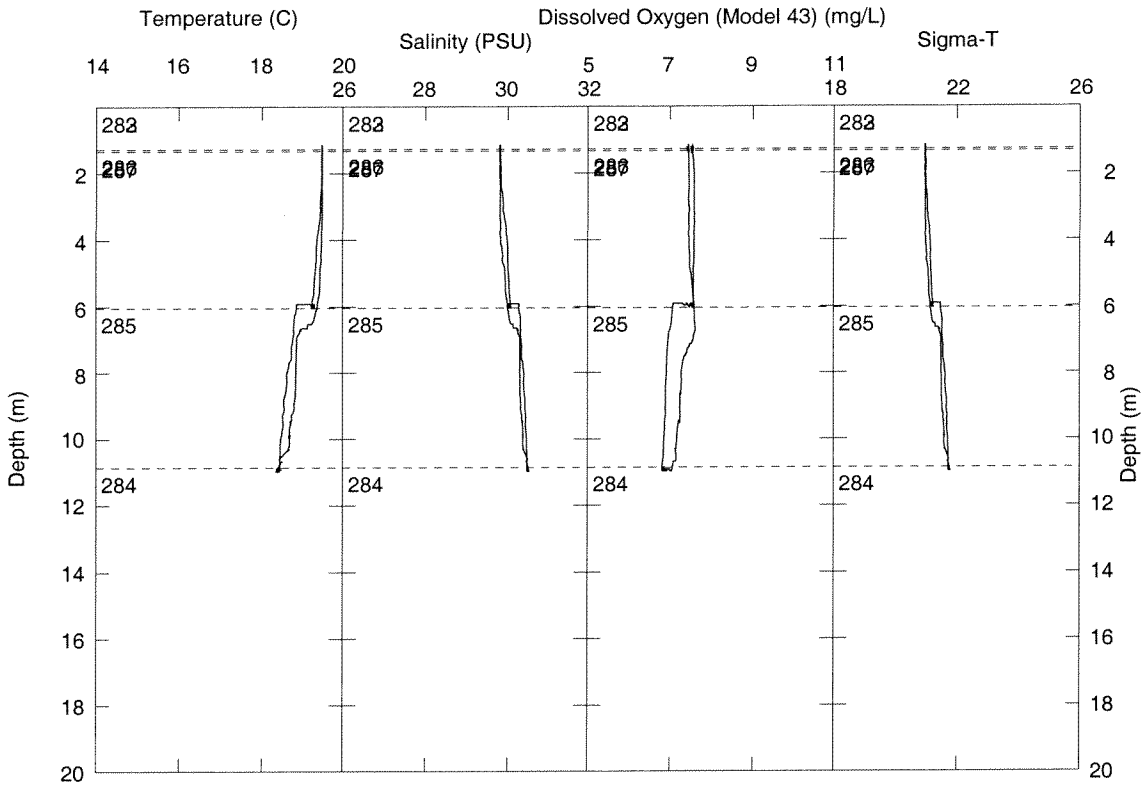

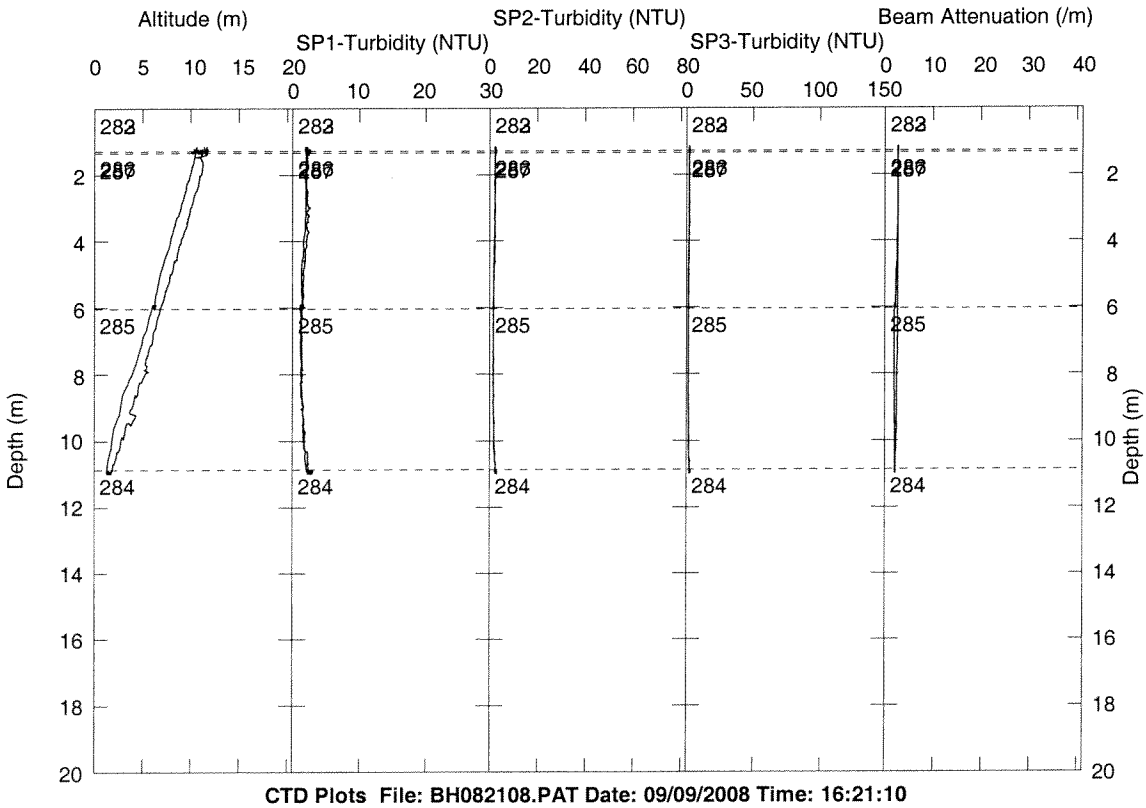

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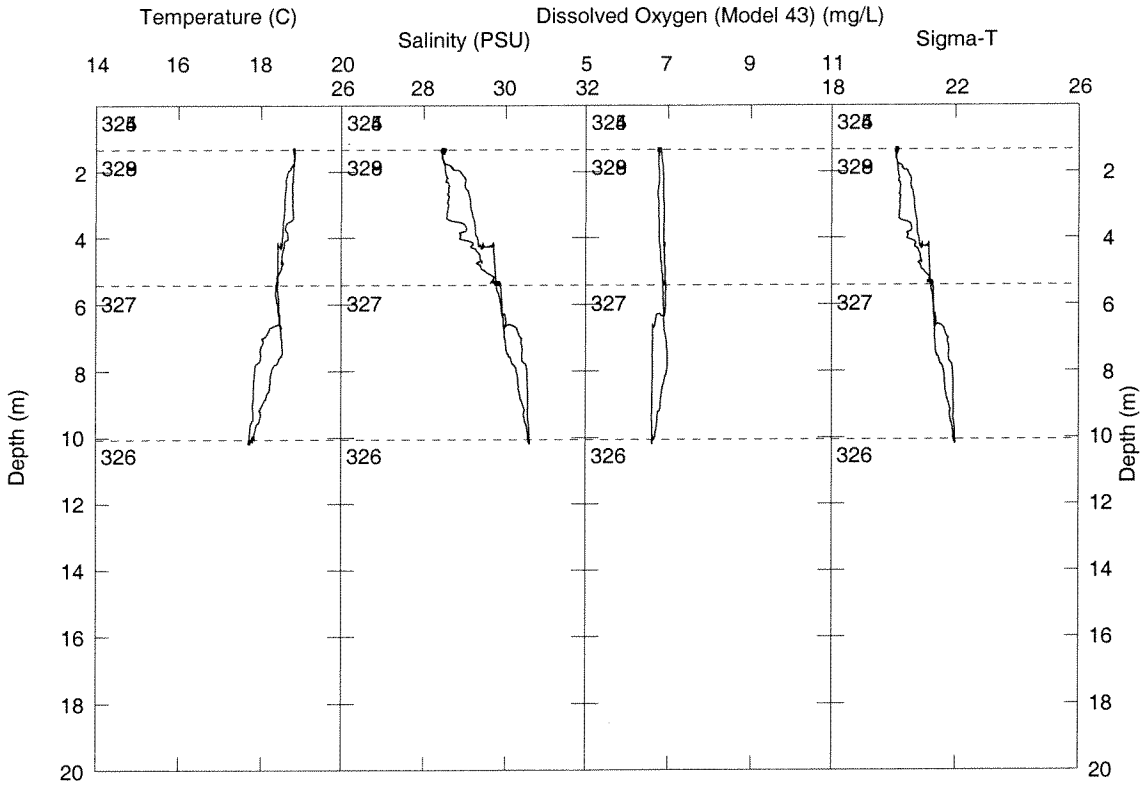

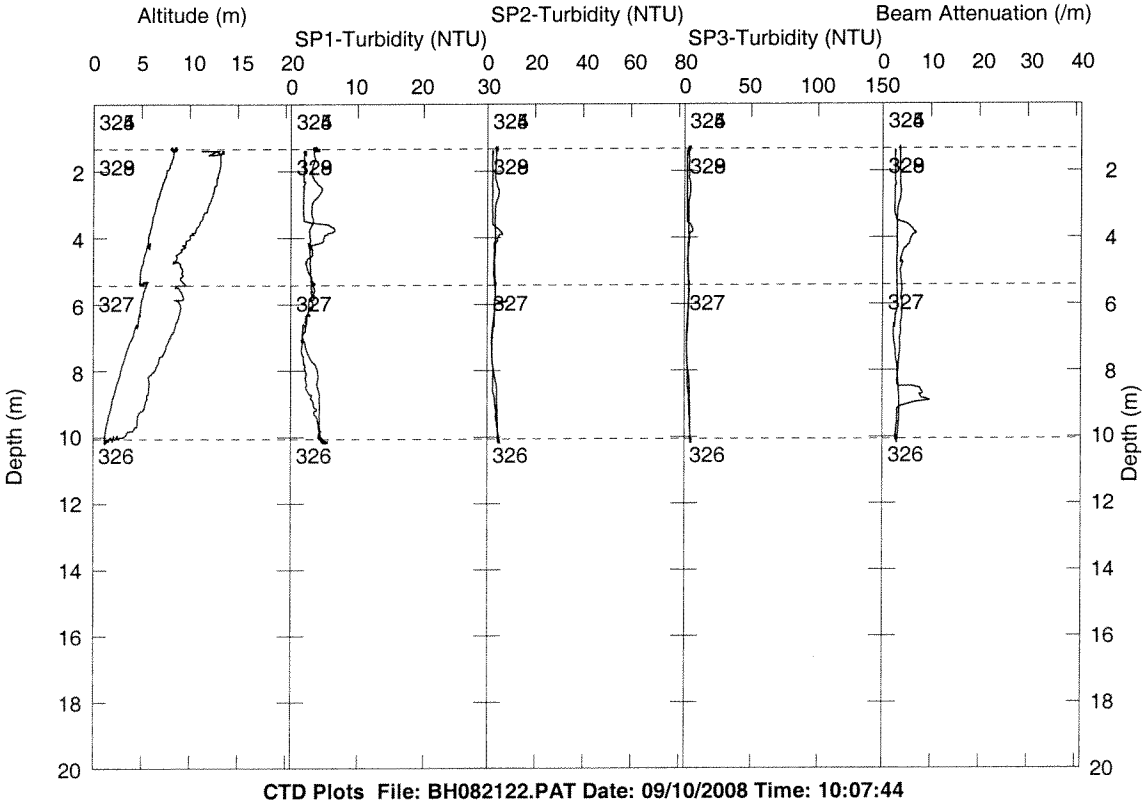

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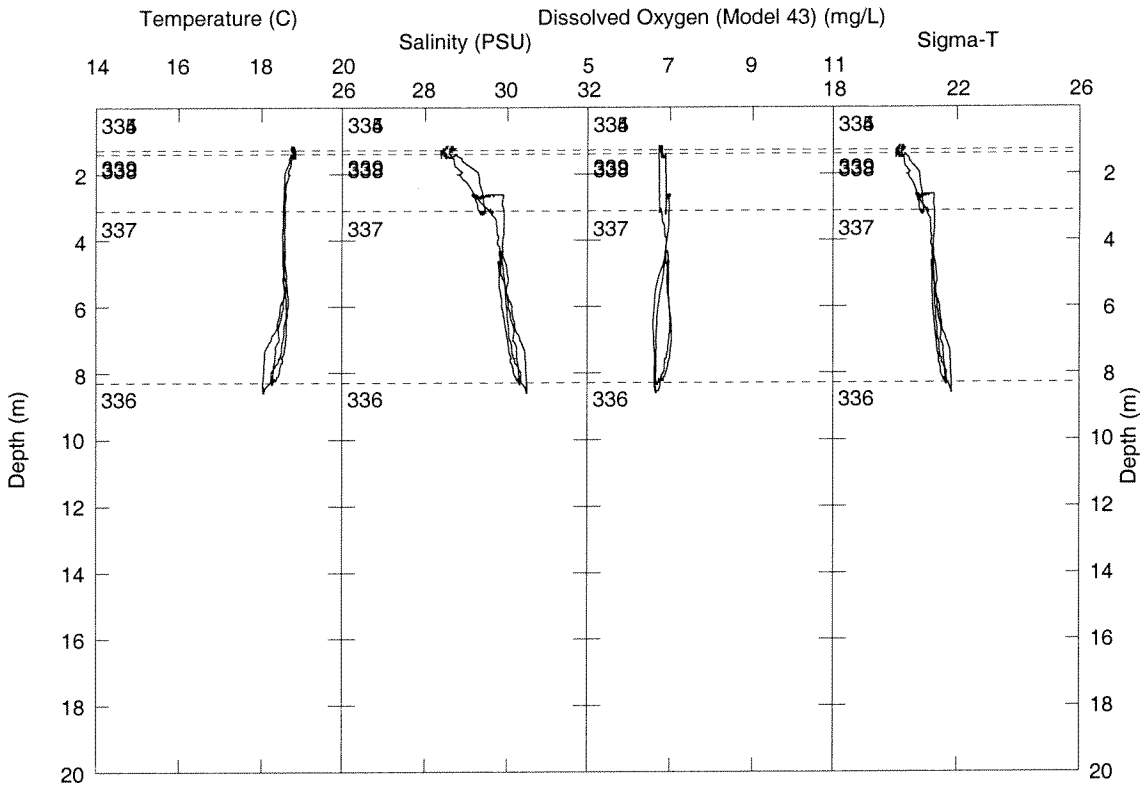

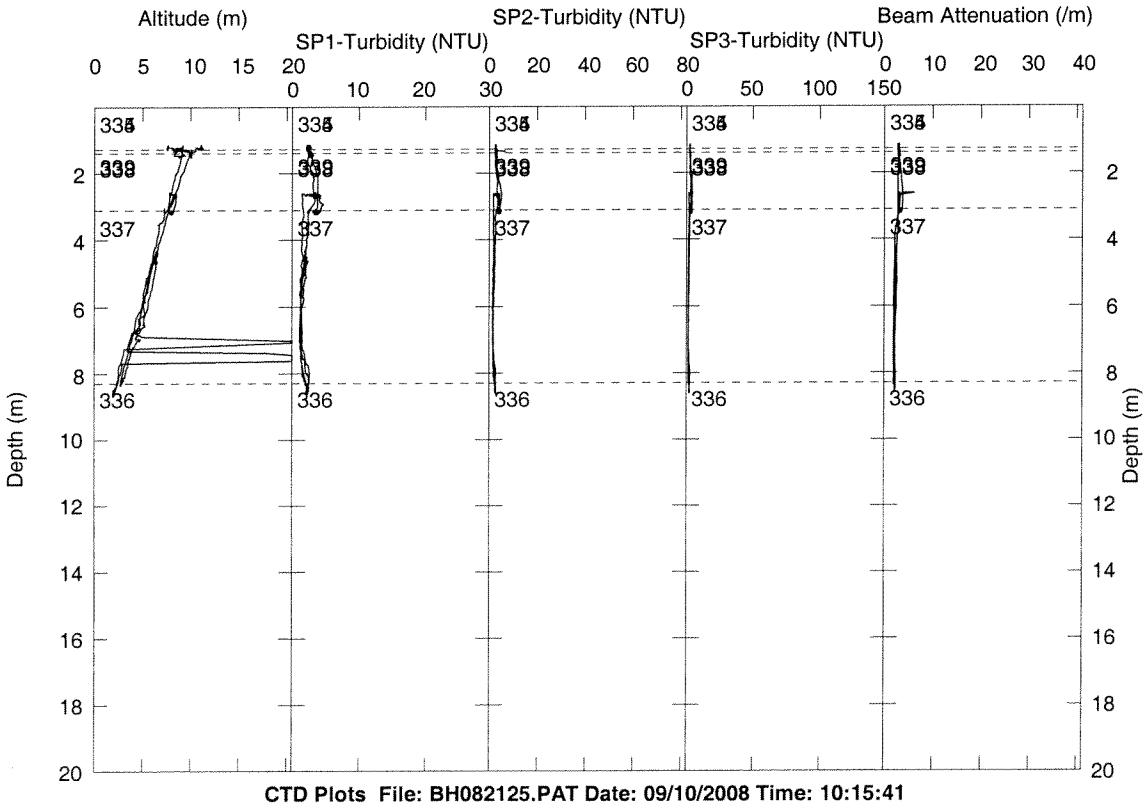

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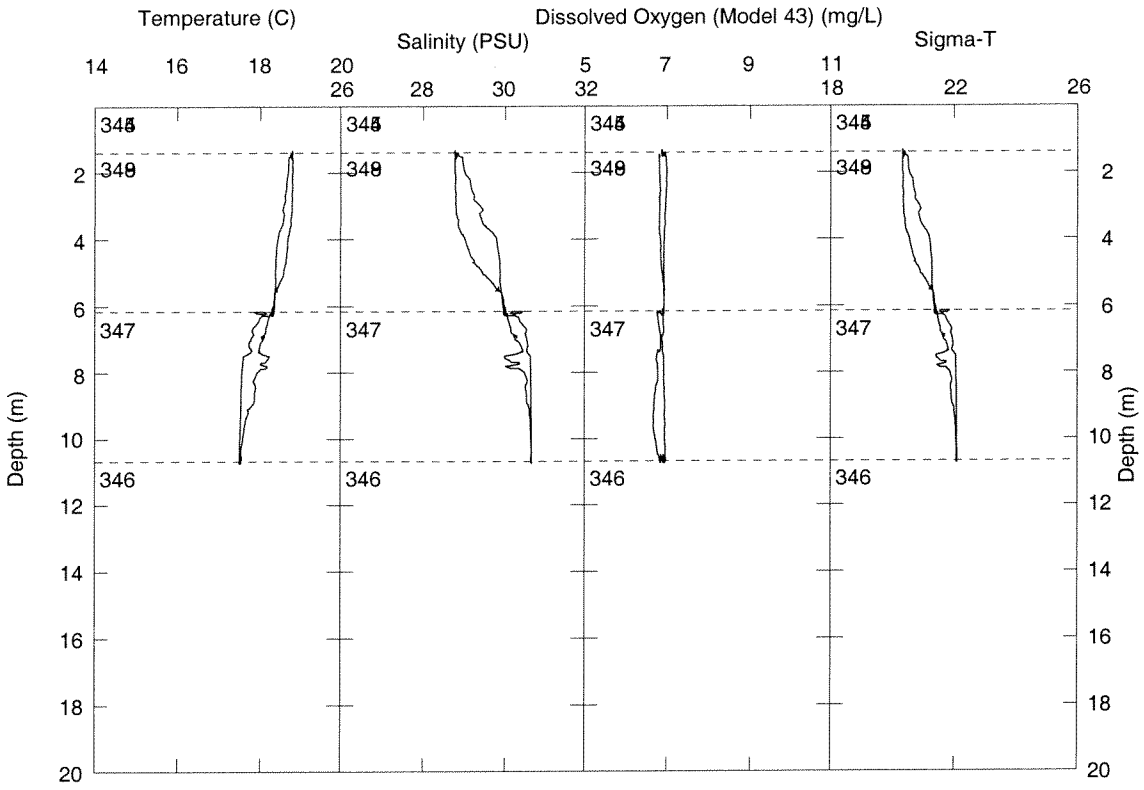

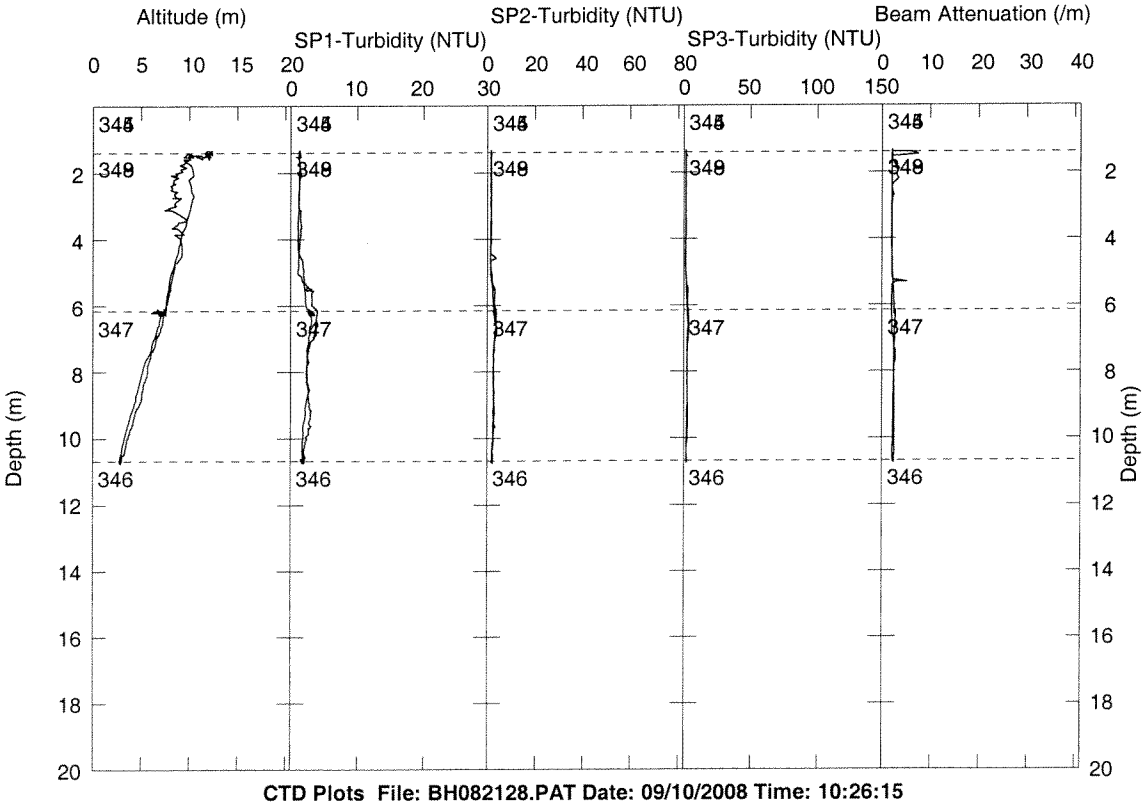

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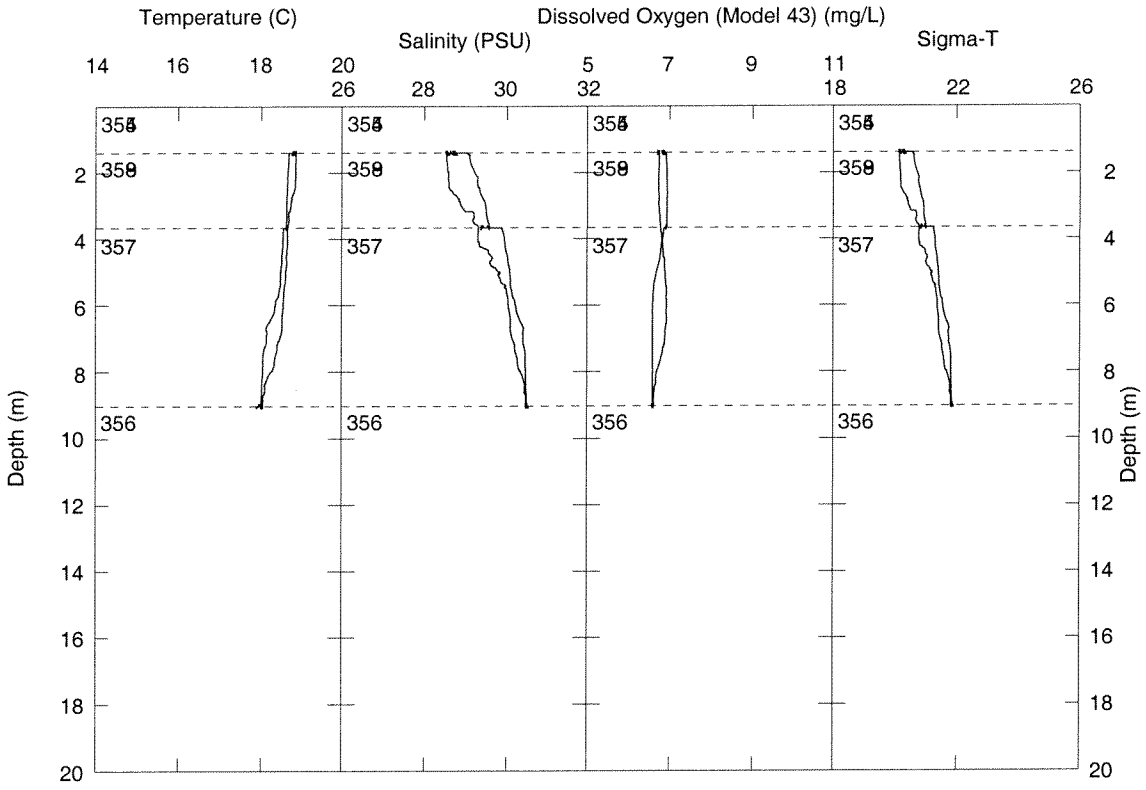

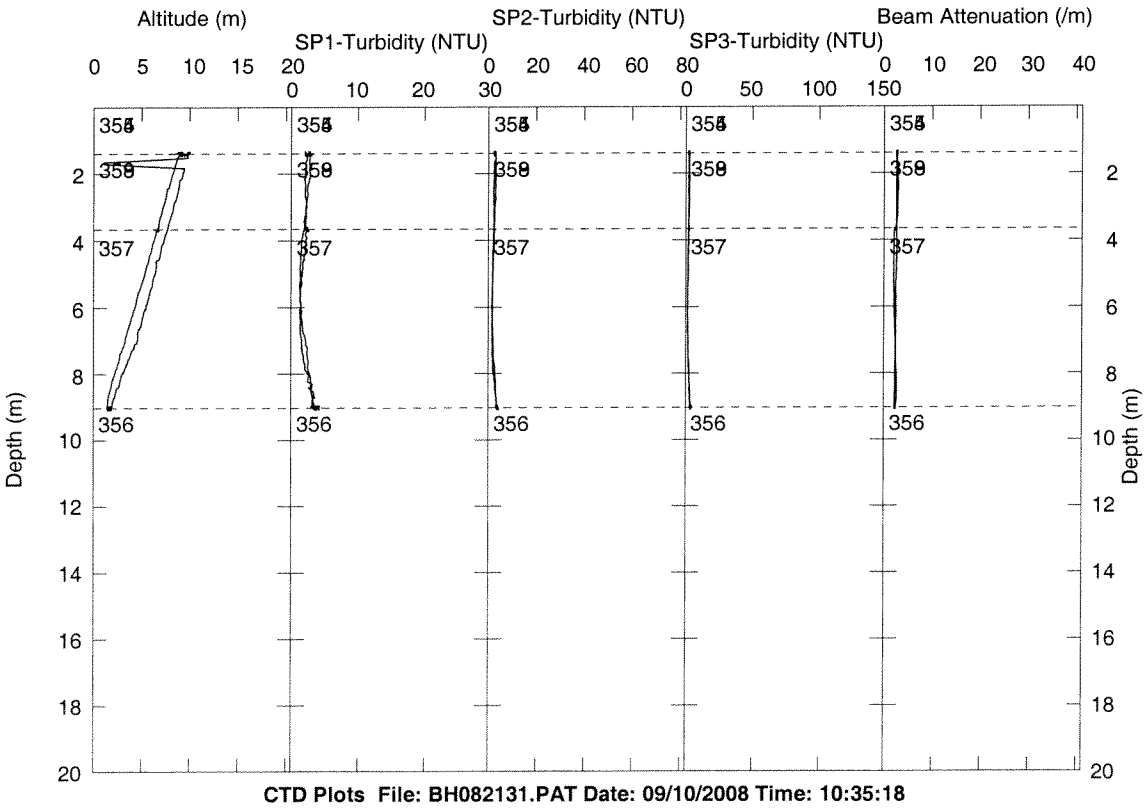

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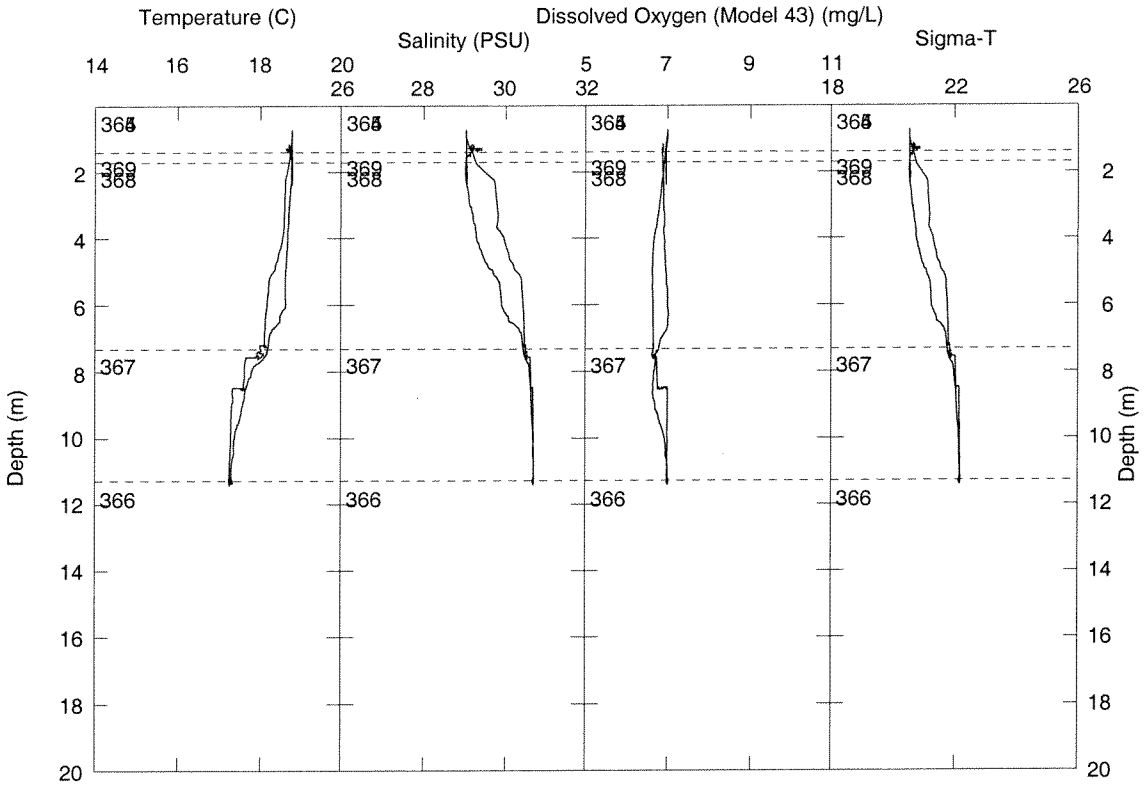

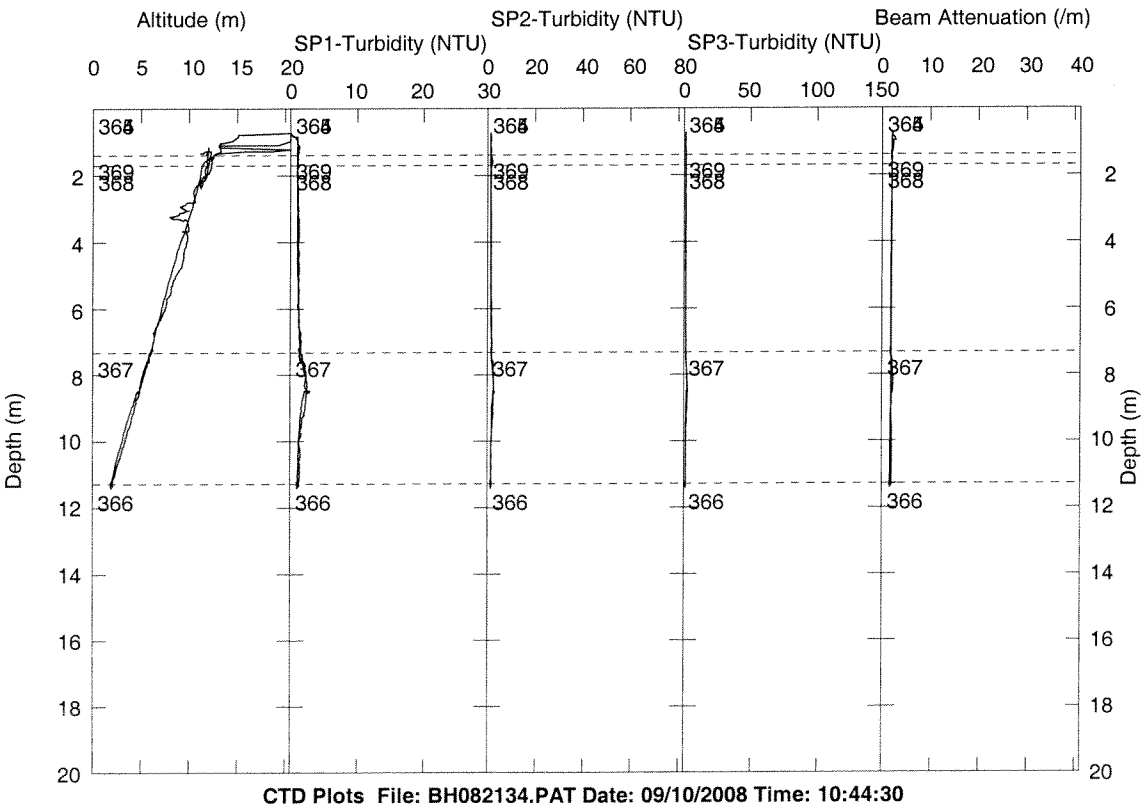

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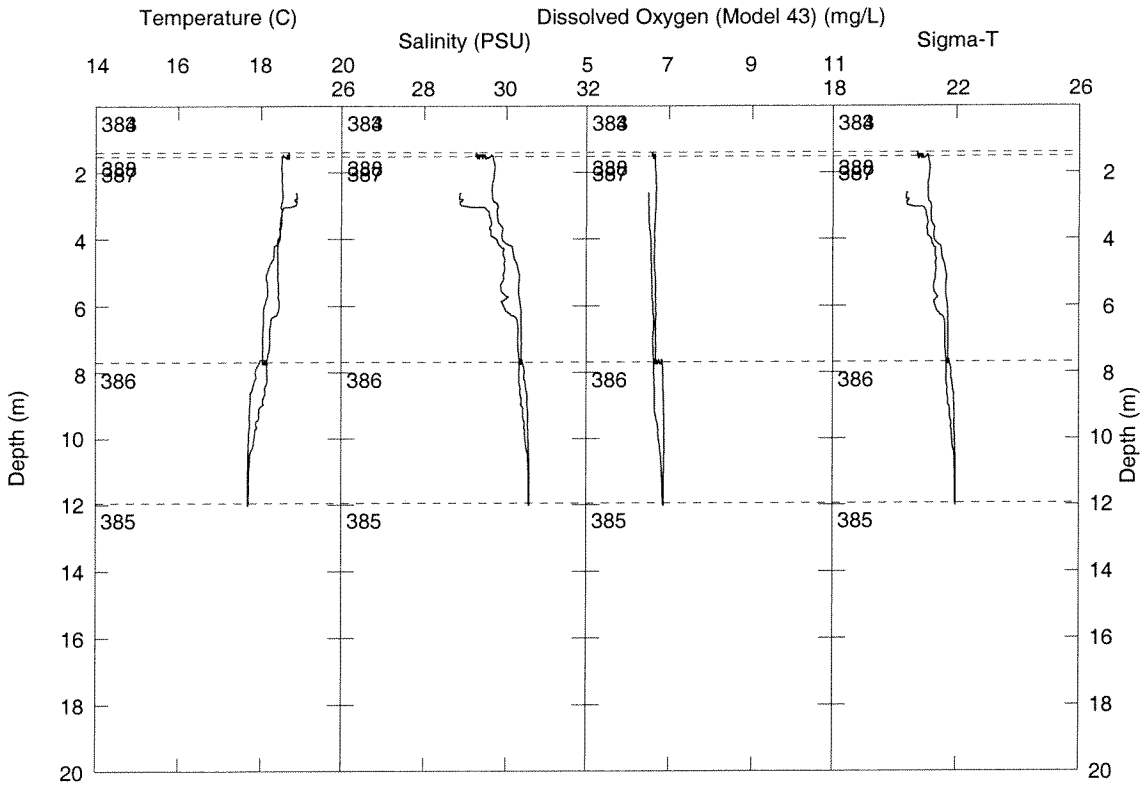
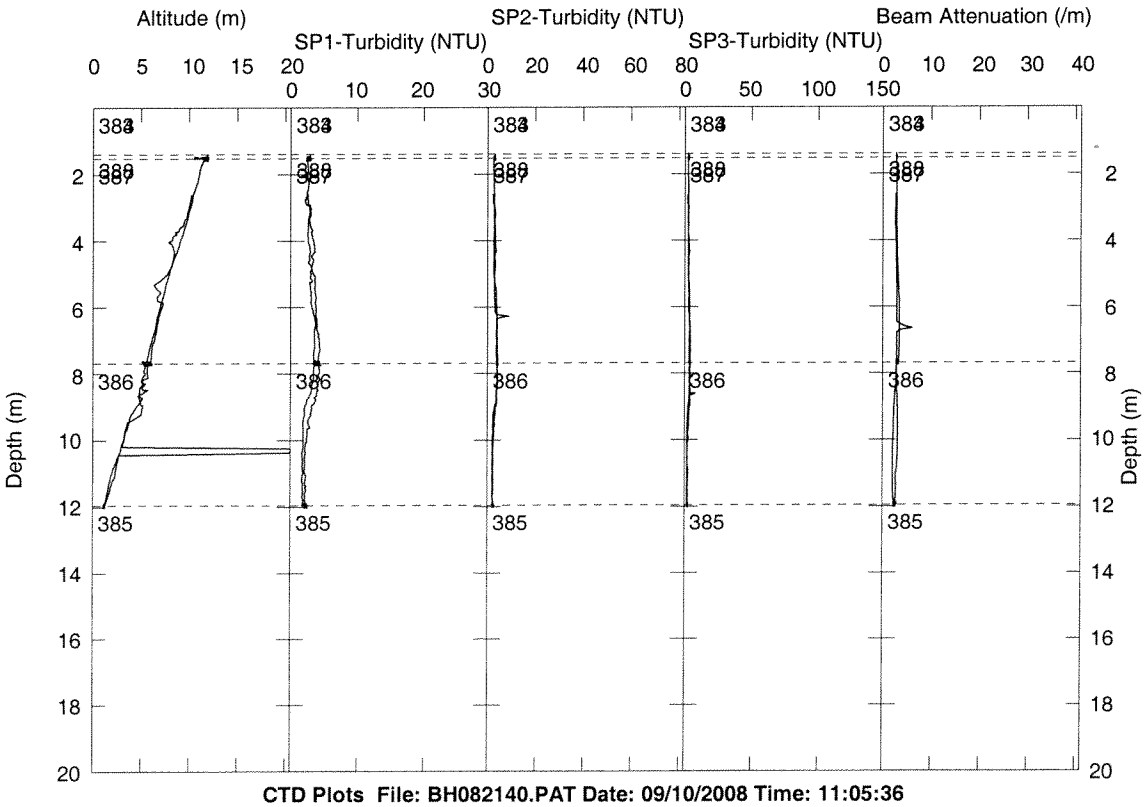
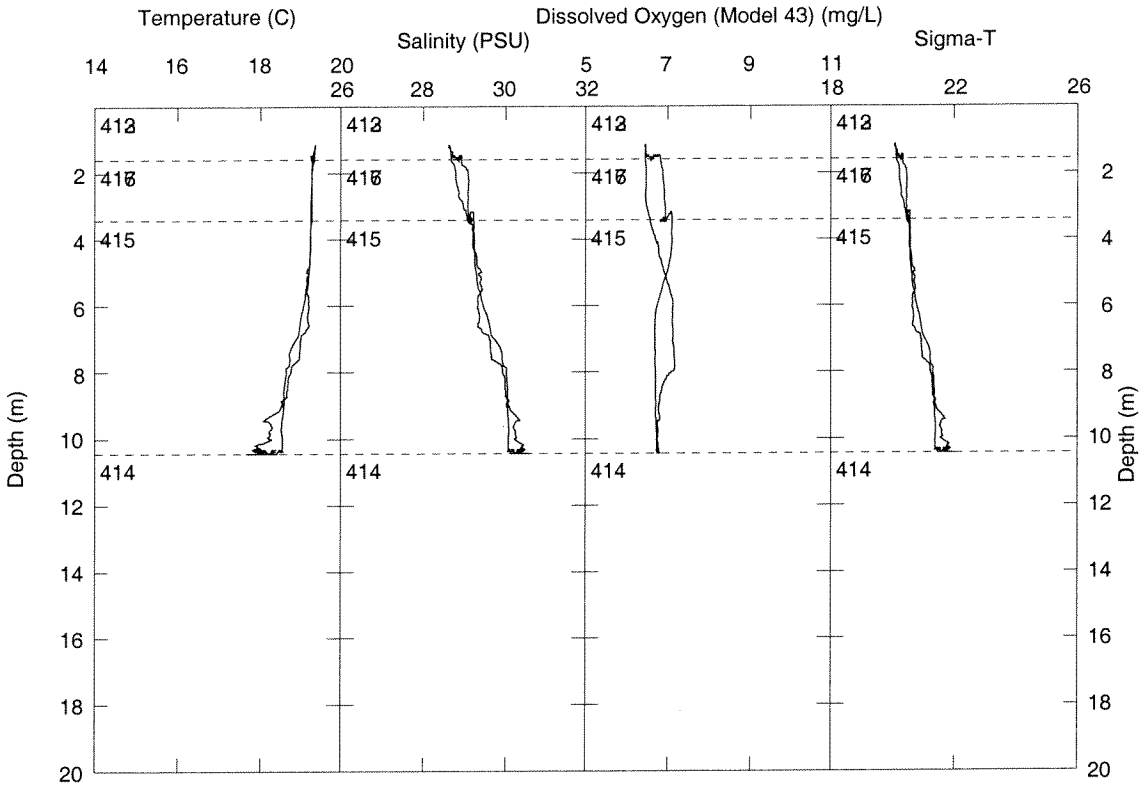
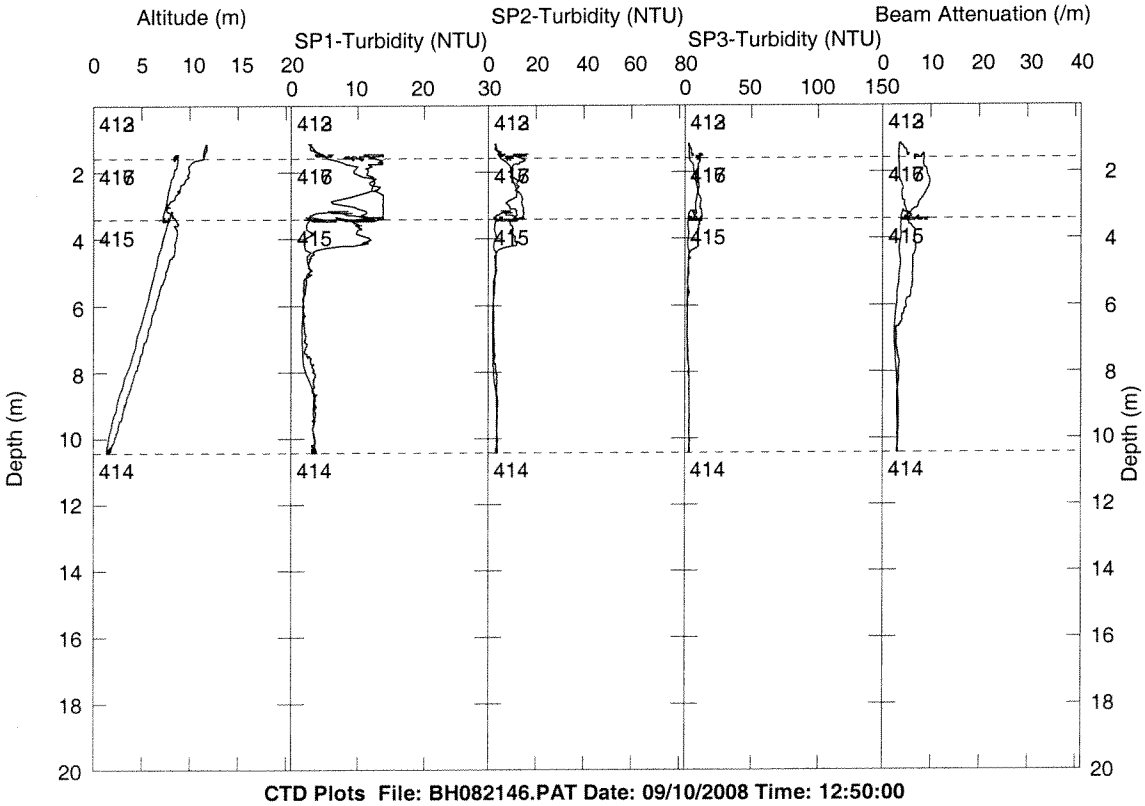


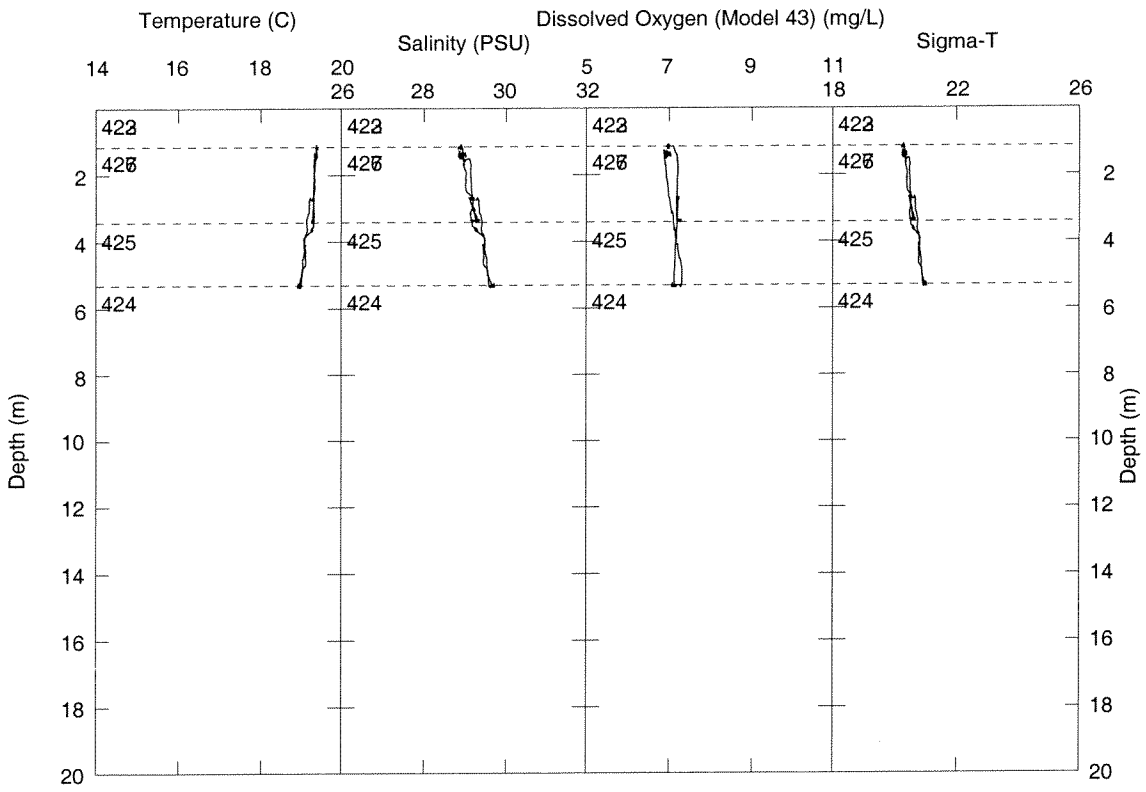


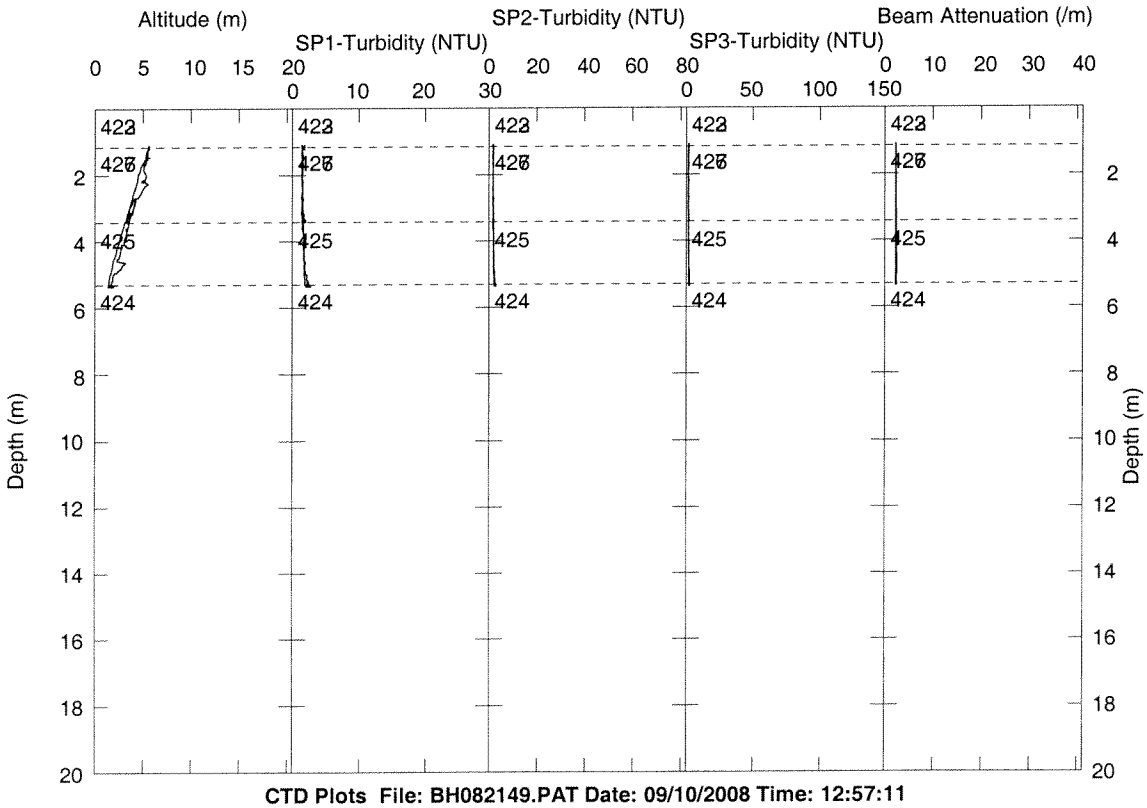
CTD Plots File: BH082140.PAT Date: 09/10/2008 Time: 11:05:36



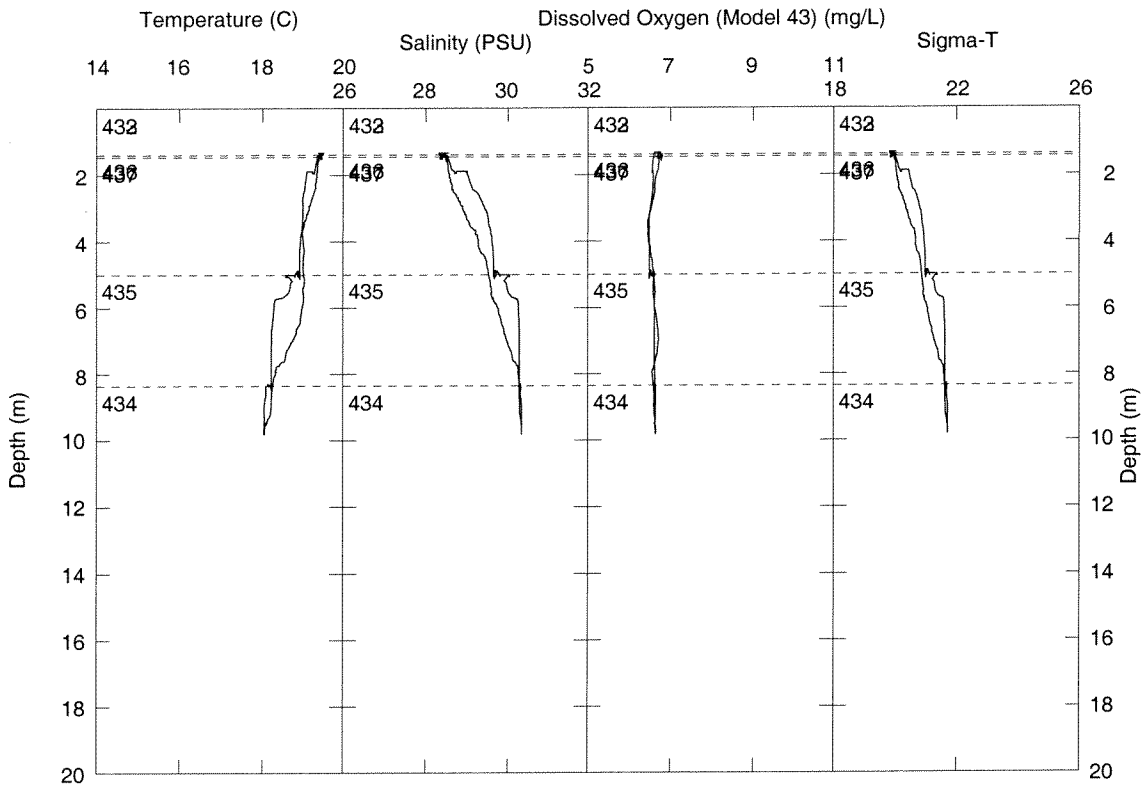


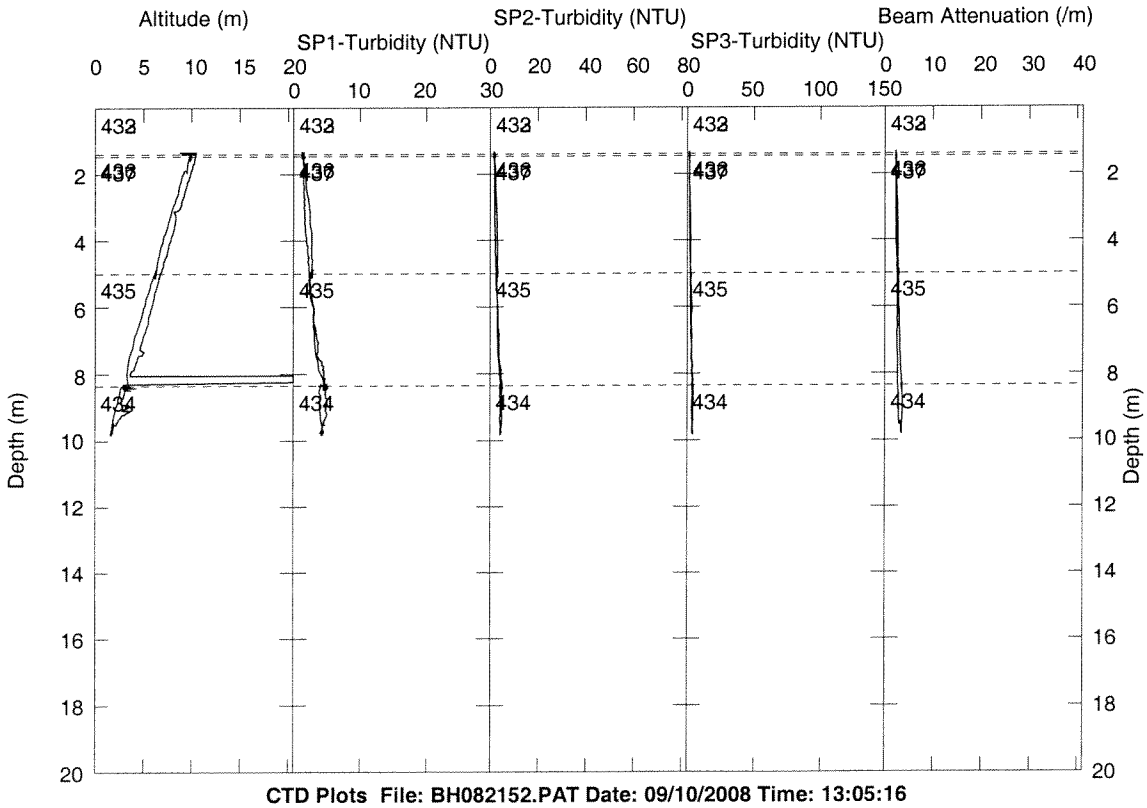
CTD Plots File: BH082146.PAT Date: 09/10/2008 Time: 12:50:00





CTD Plots File: BH082149.PAT Date: 09/10/2008 Time: 12:57:11





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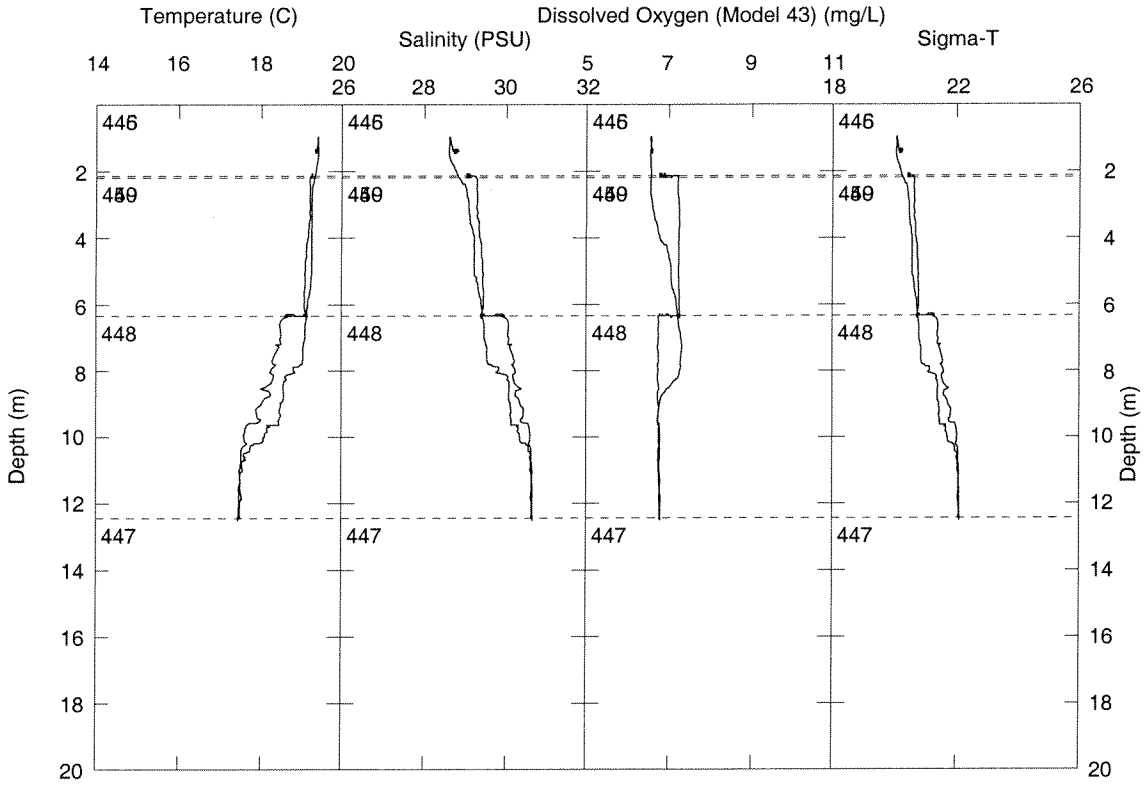

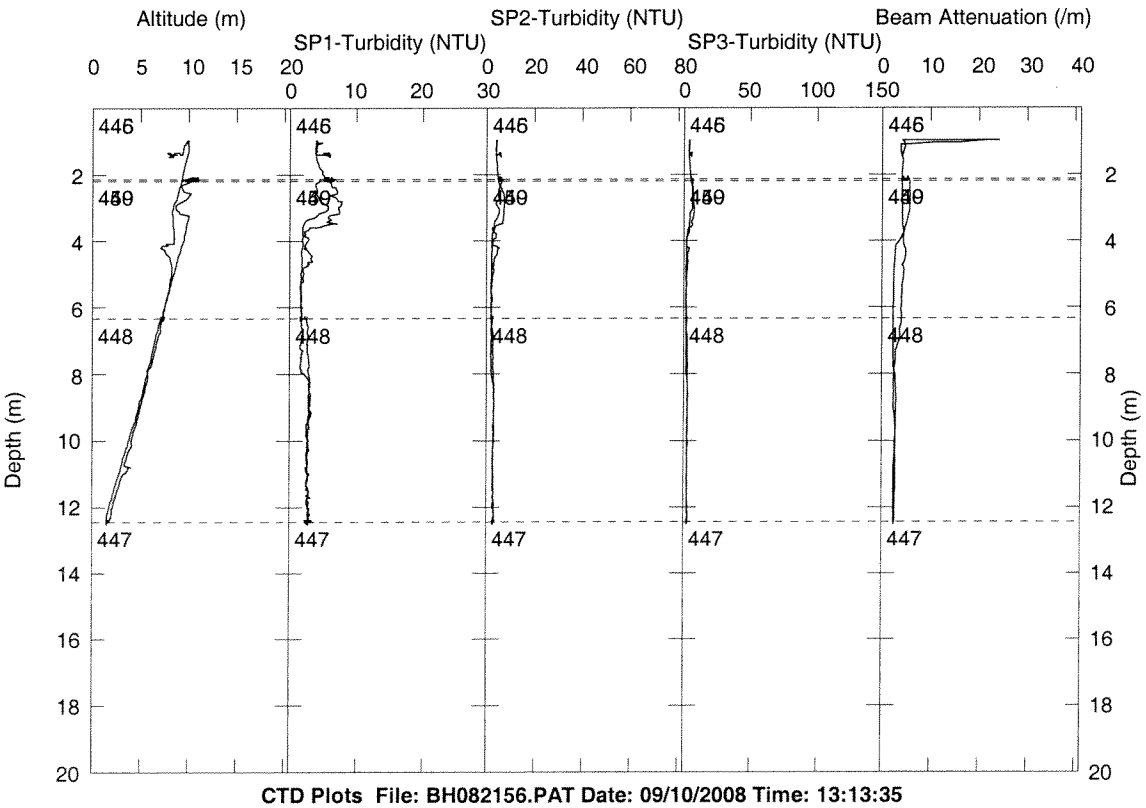

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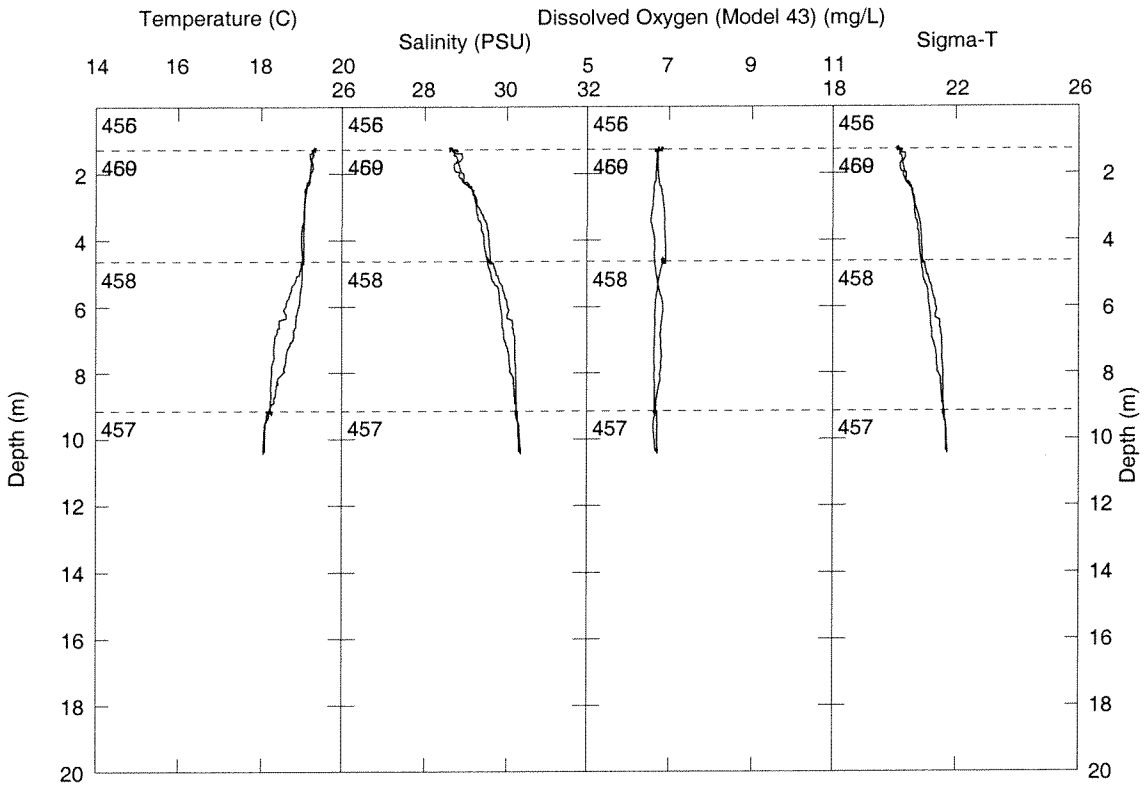

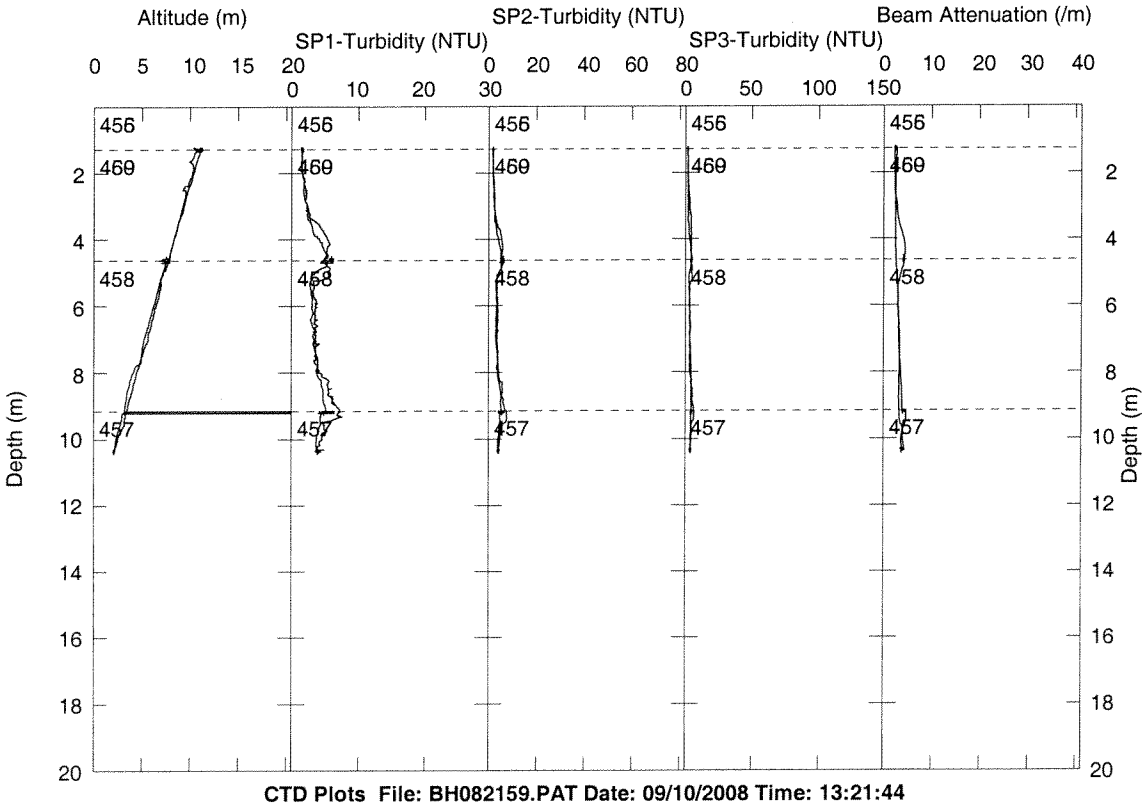

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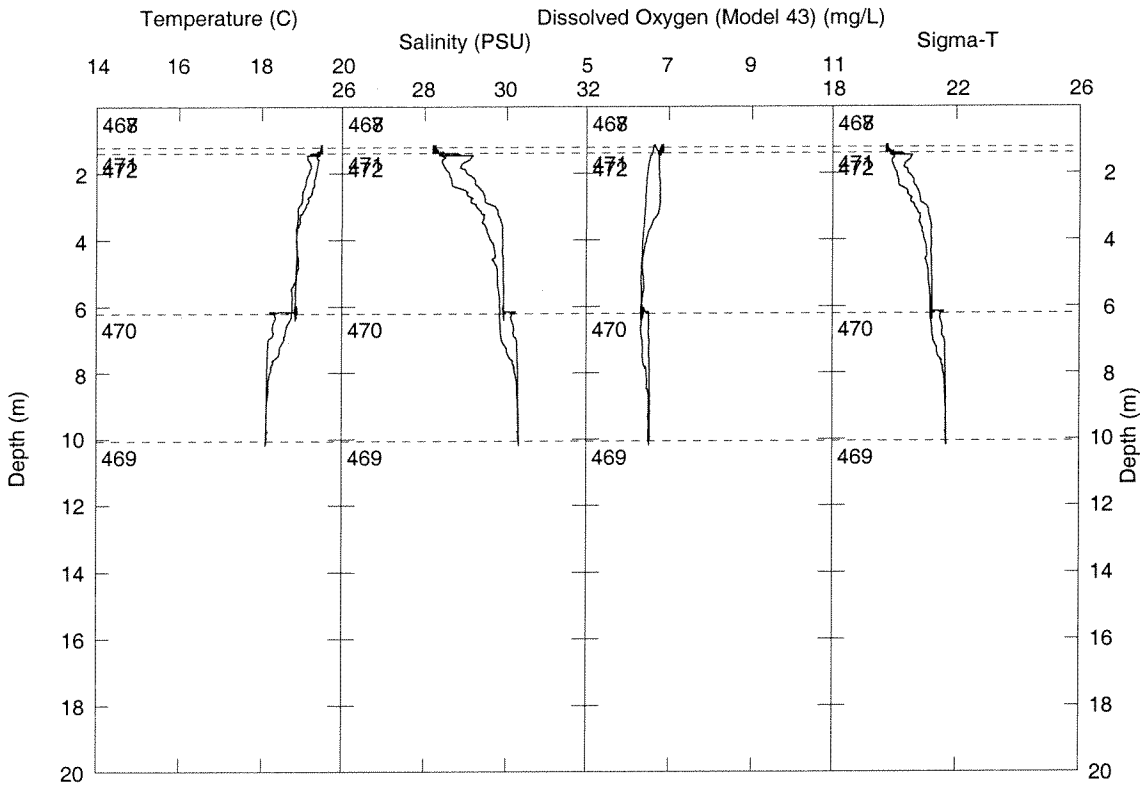
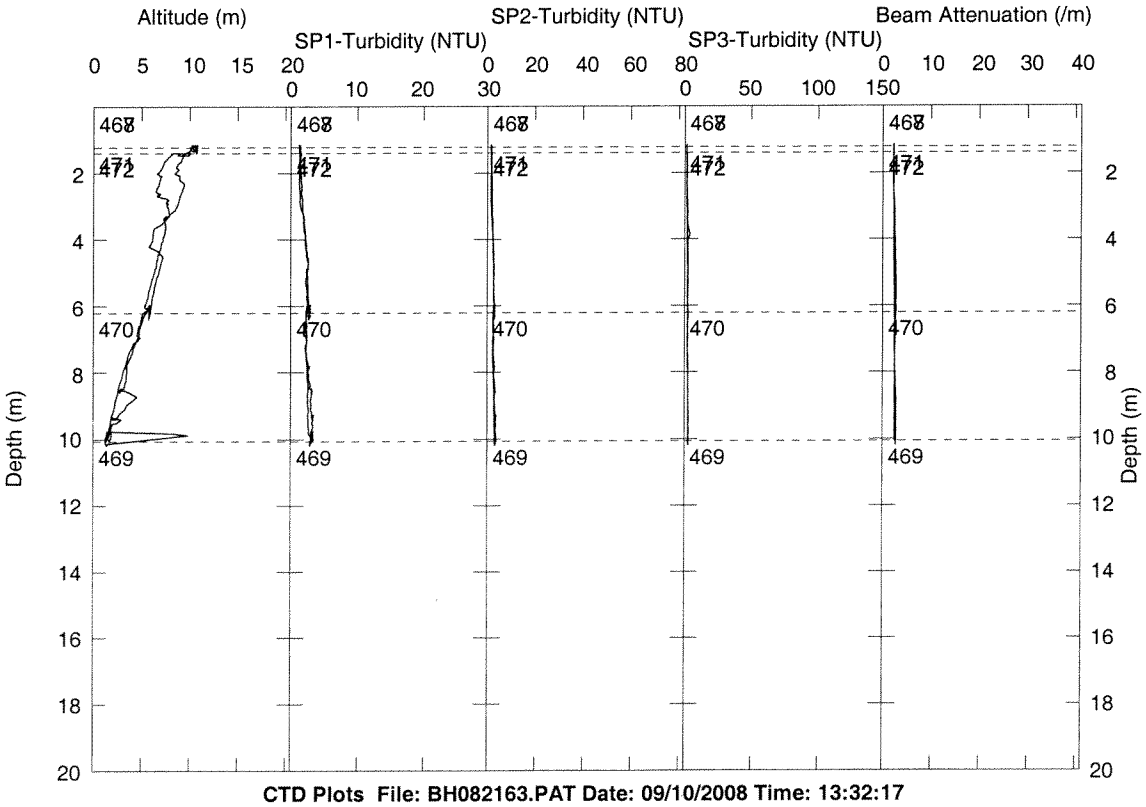
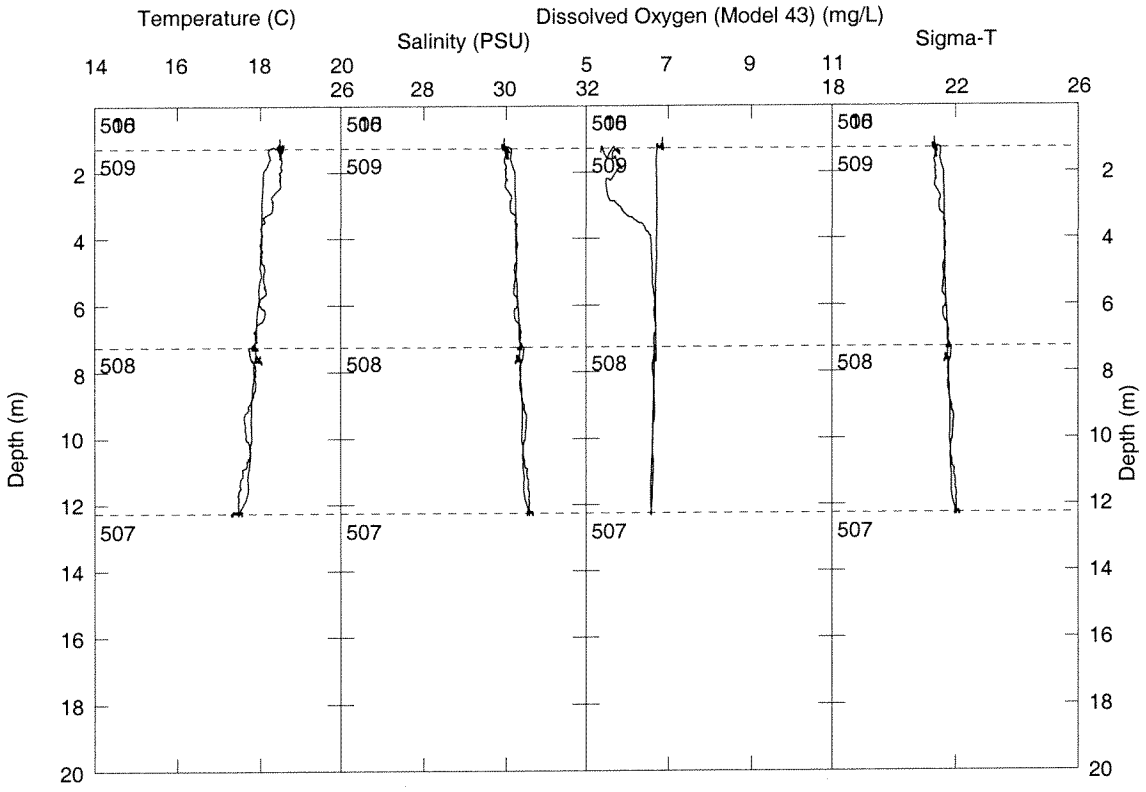
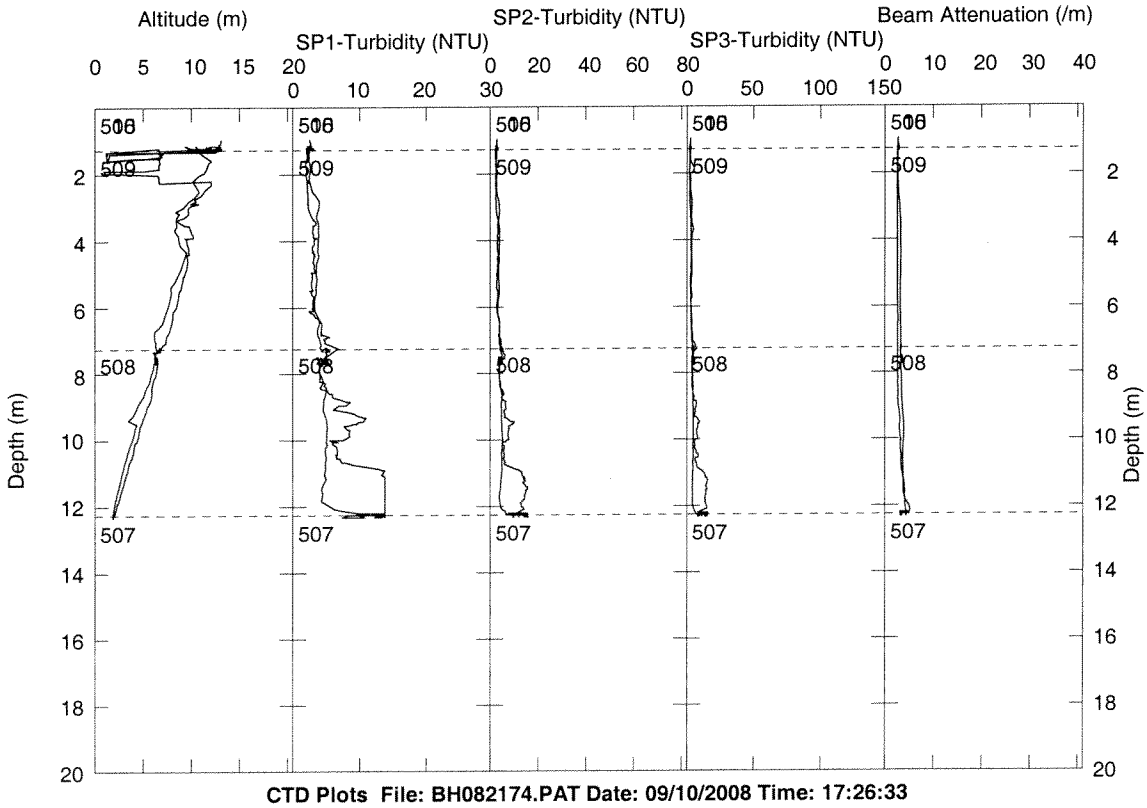




CTD Plots File: BH082163.PAT Date: 09/10/2008 Time: 13:32:17





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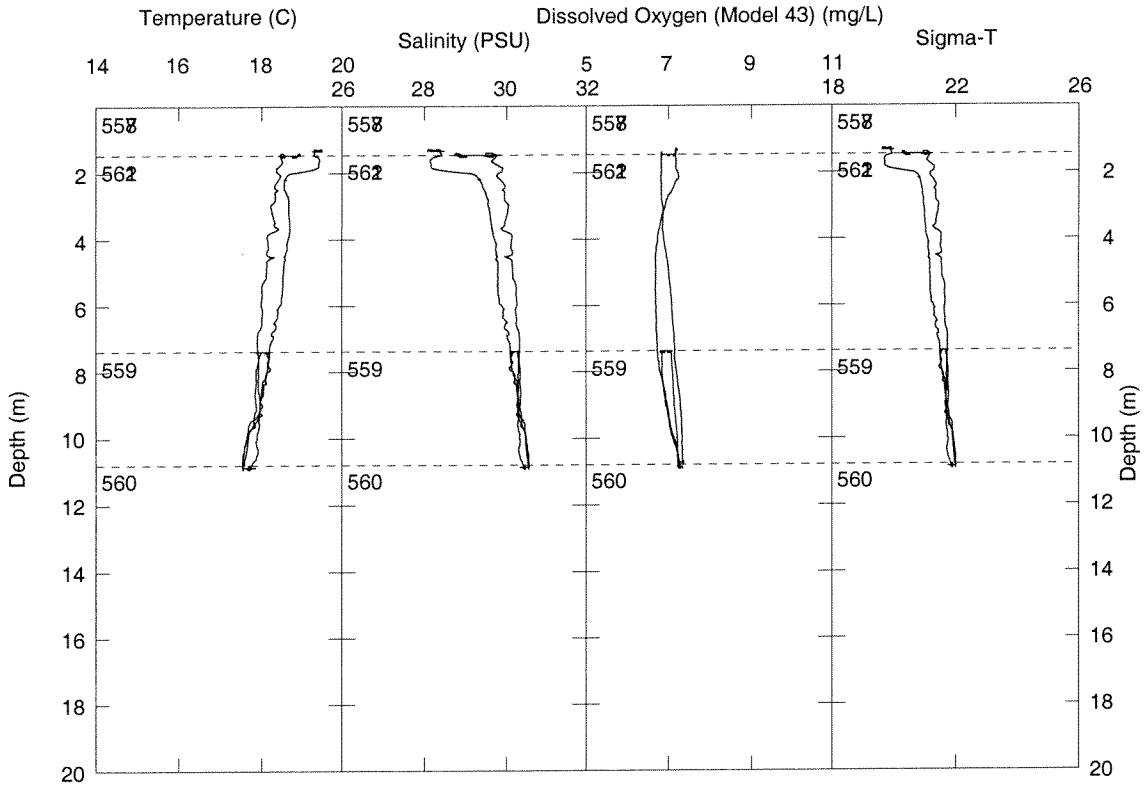

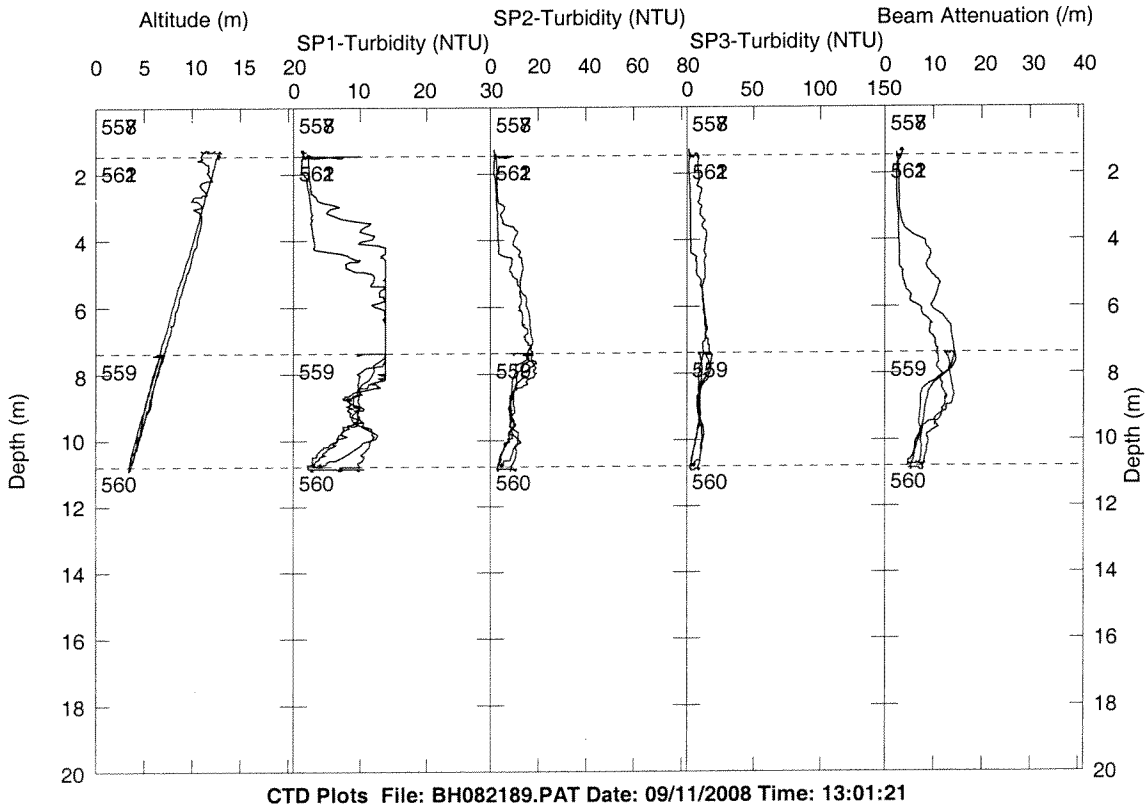

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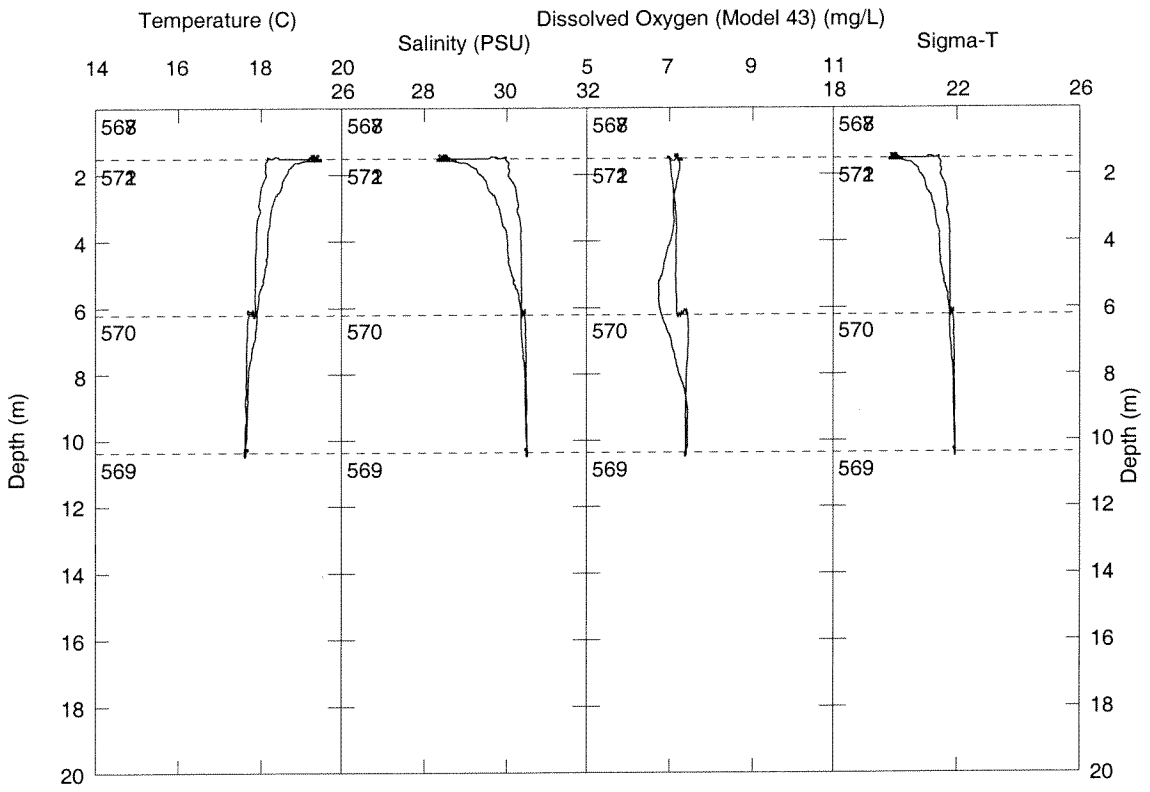

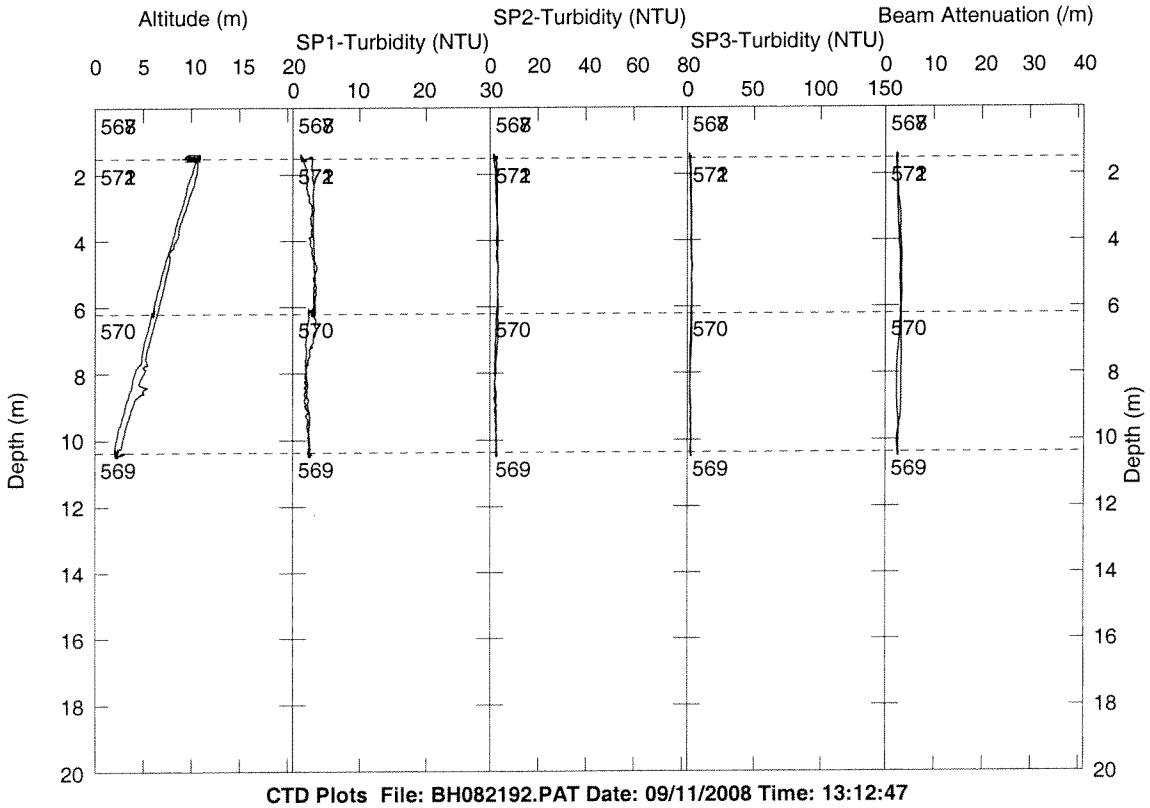

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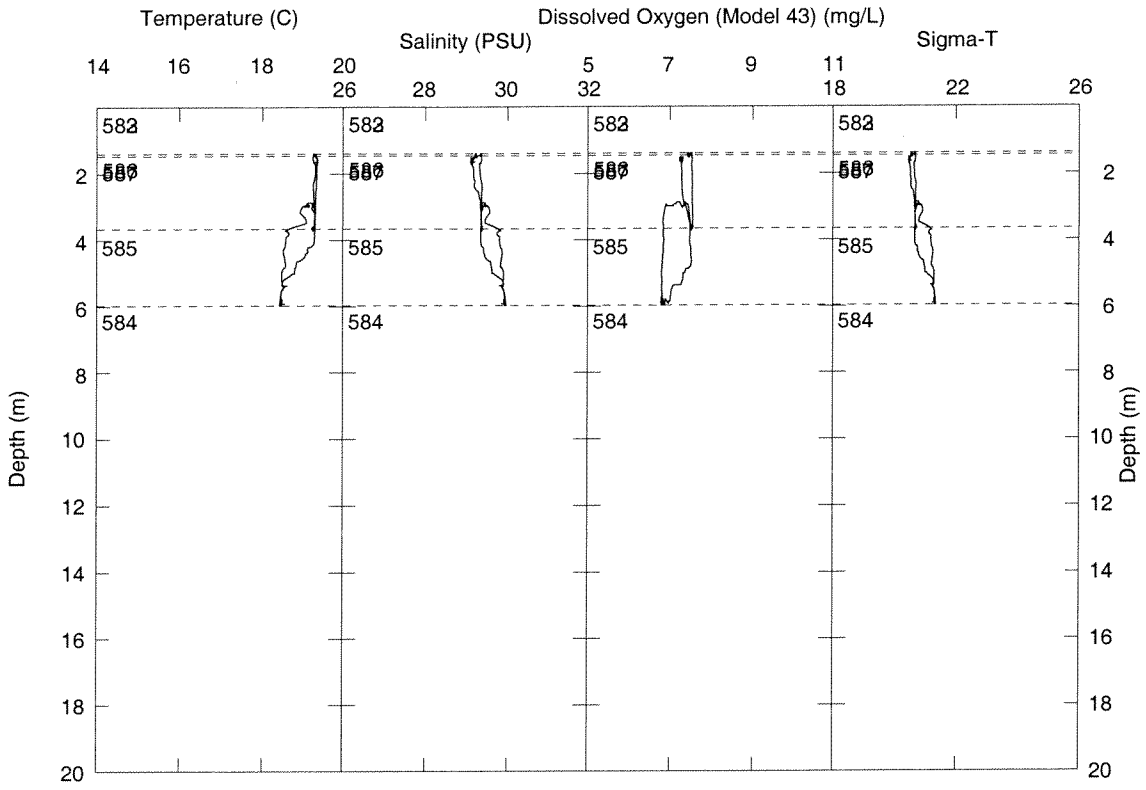

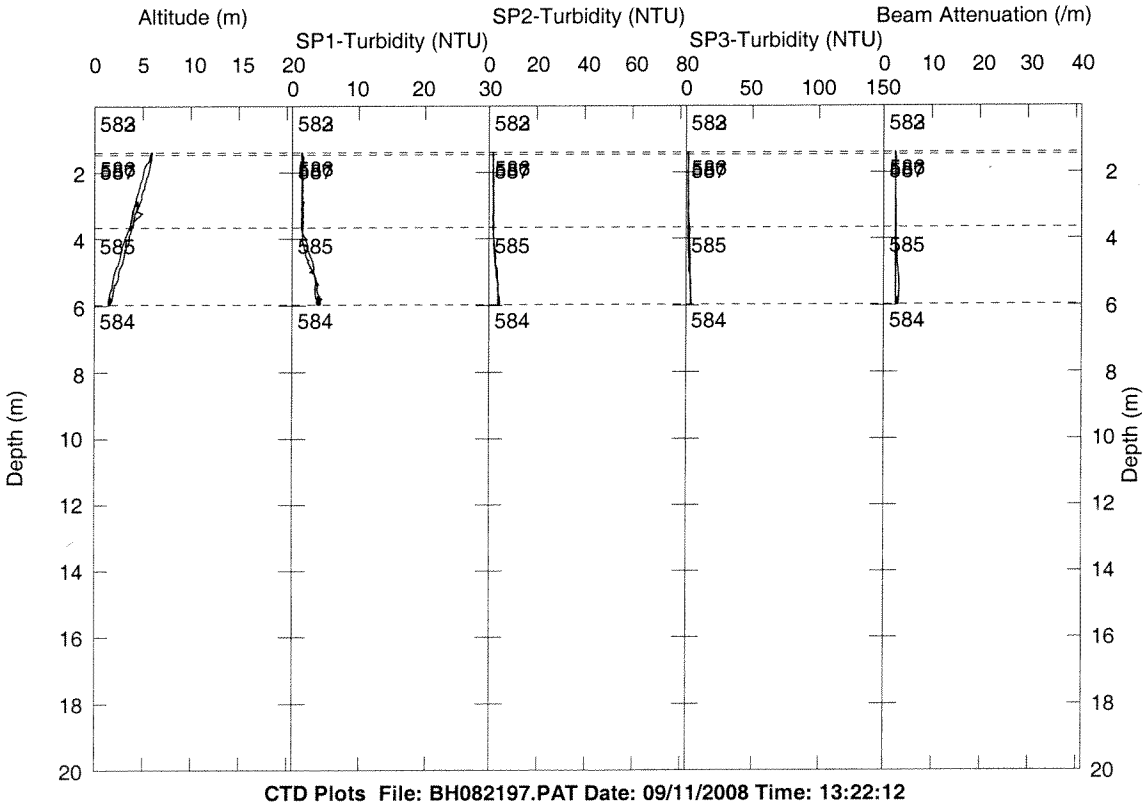

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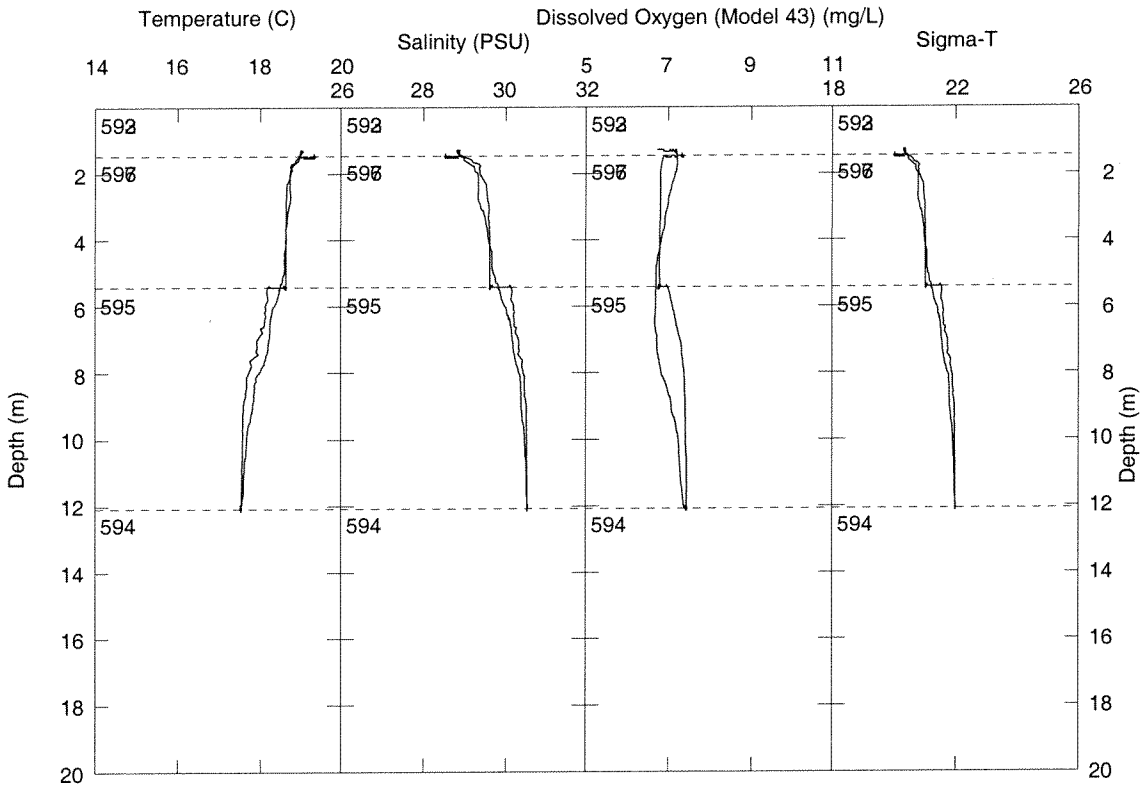

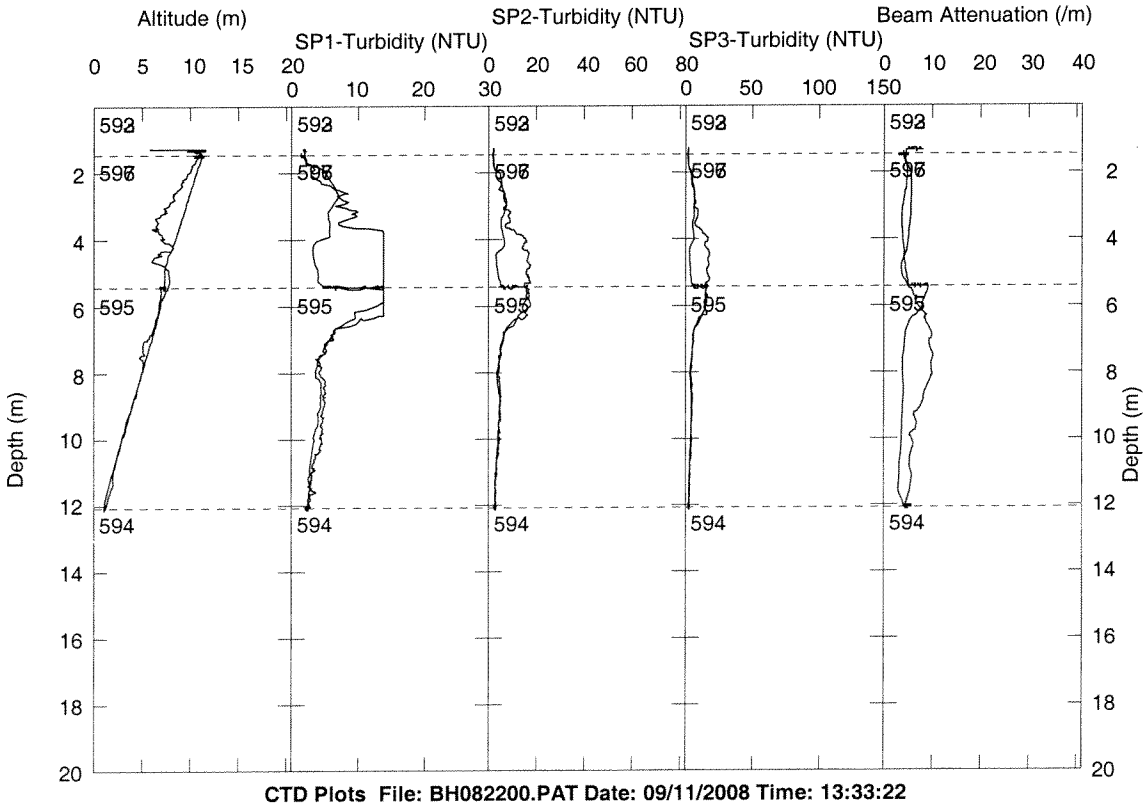

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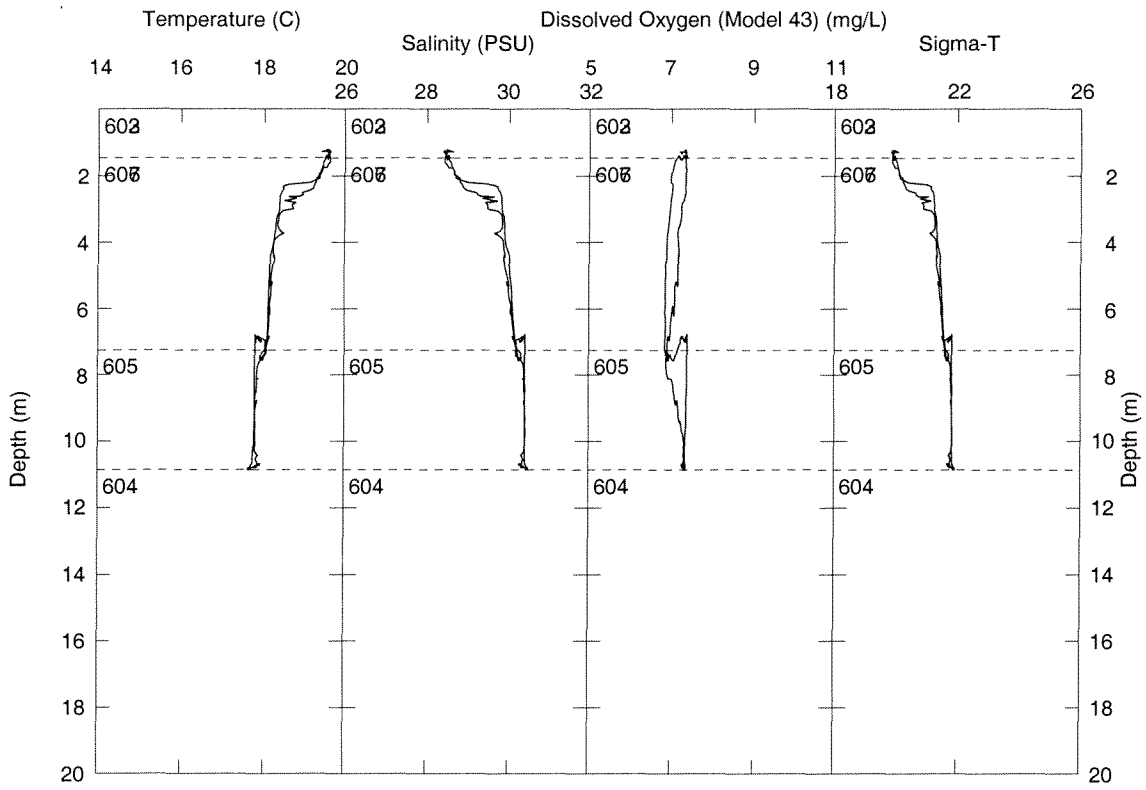
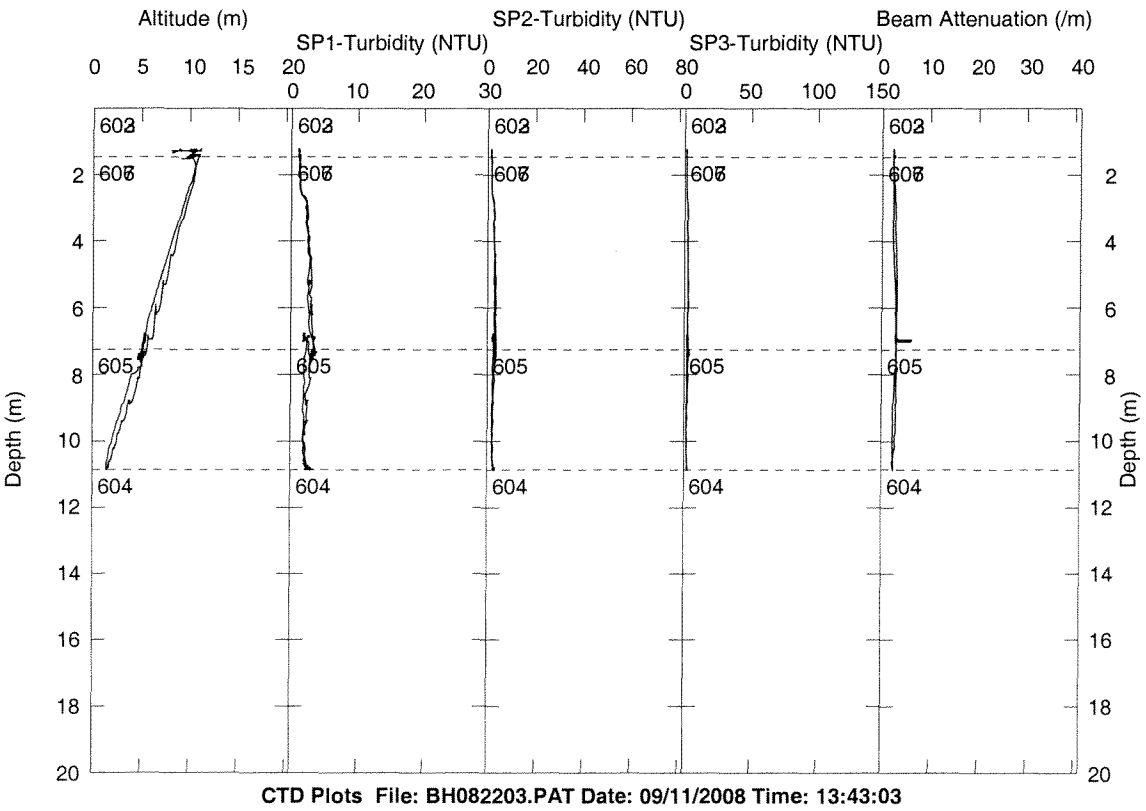
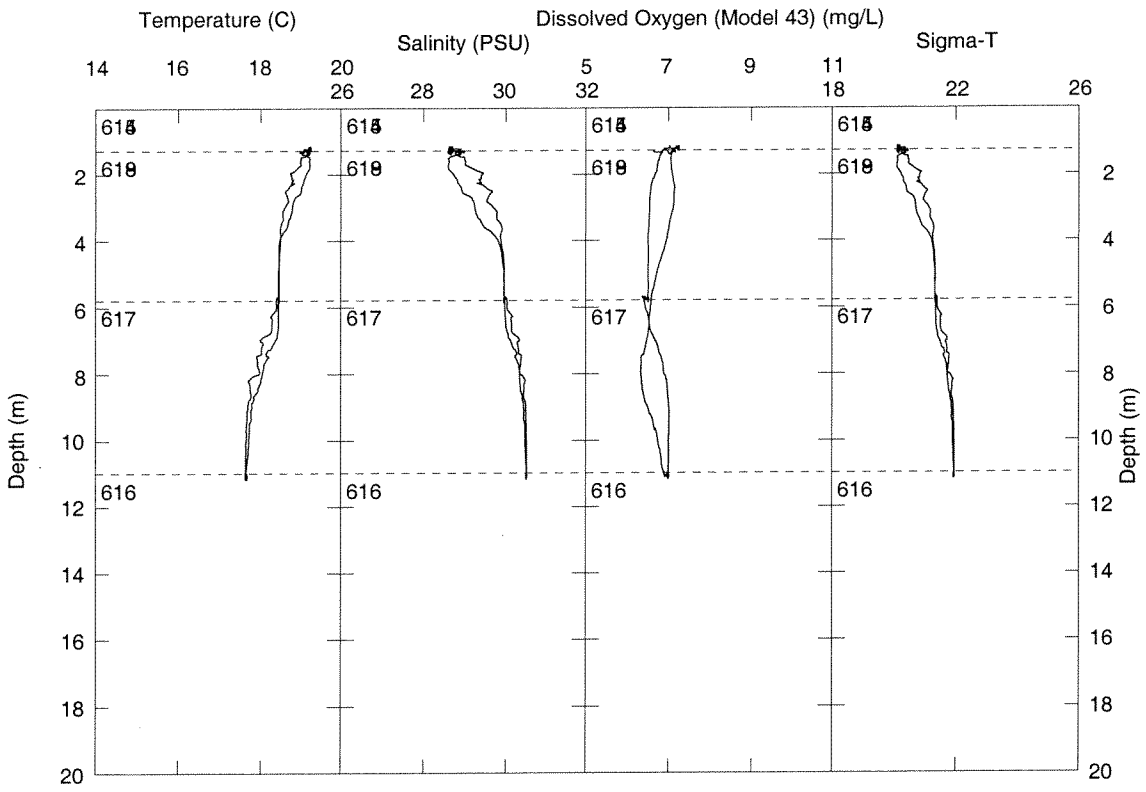
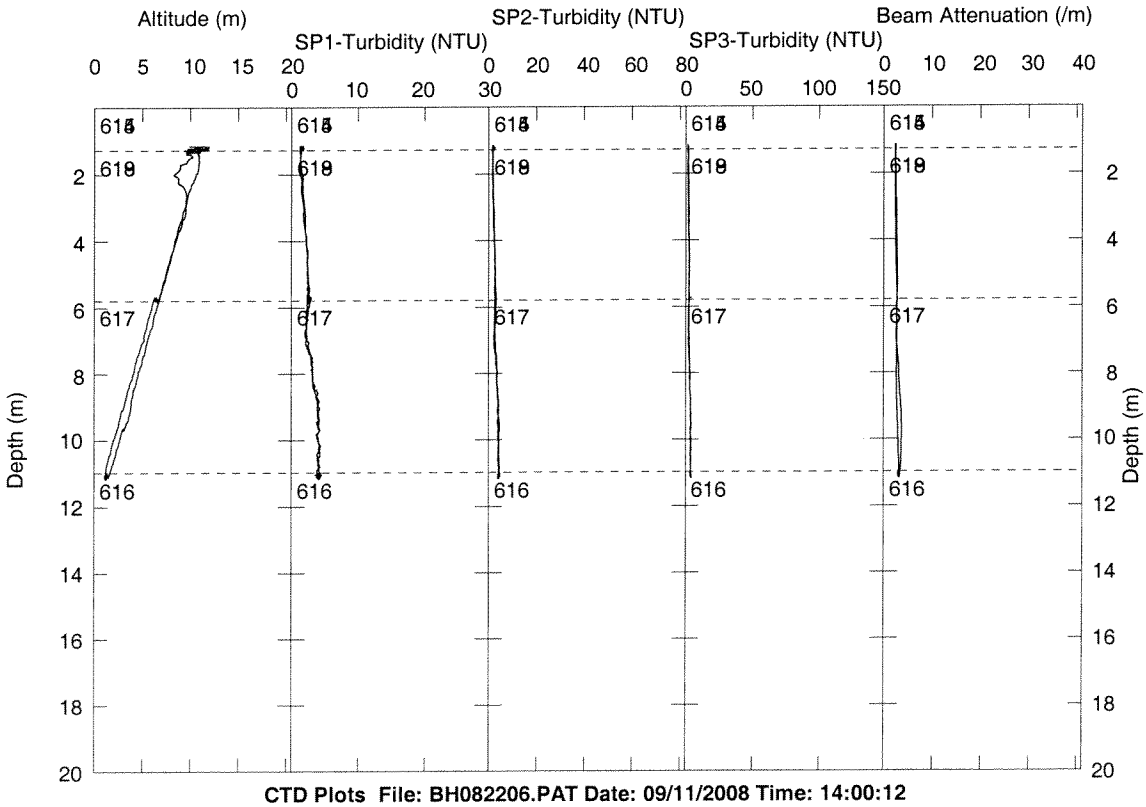




CTD Plots File: BH082203.PAT Date: 09/11/2008 Time: 13:43:03





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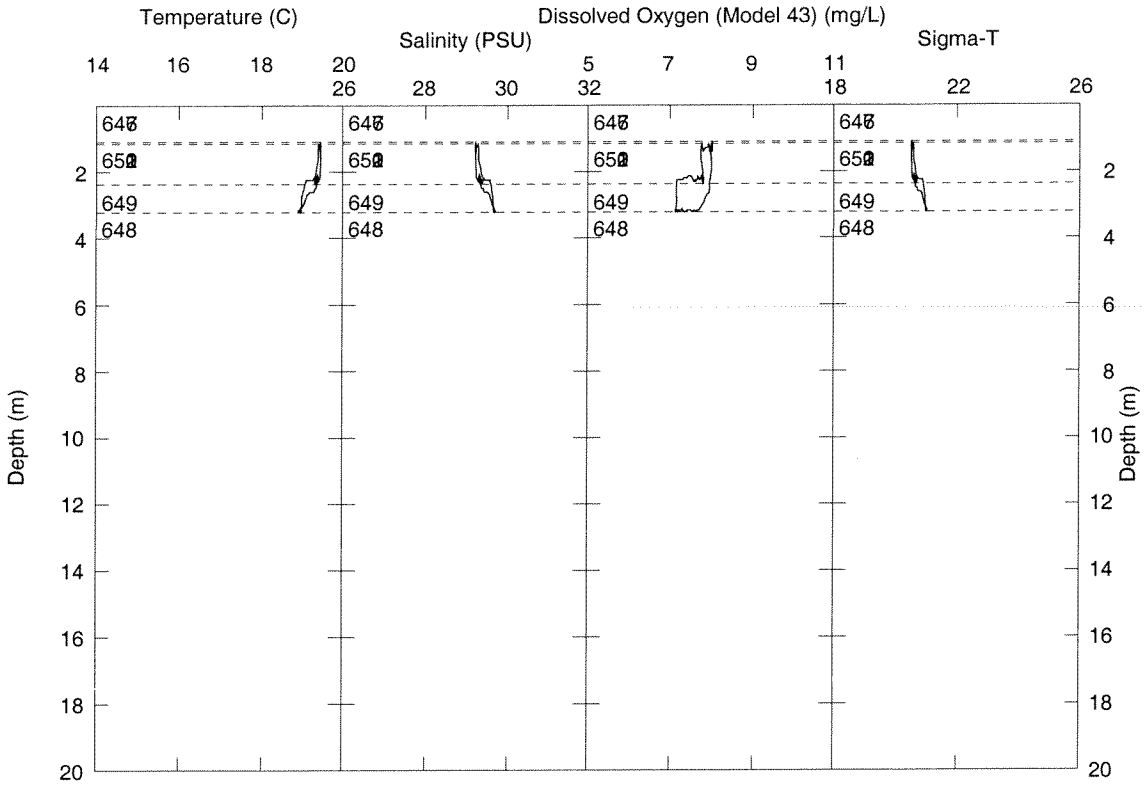

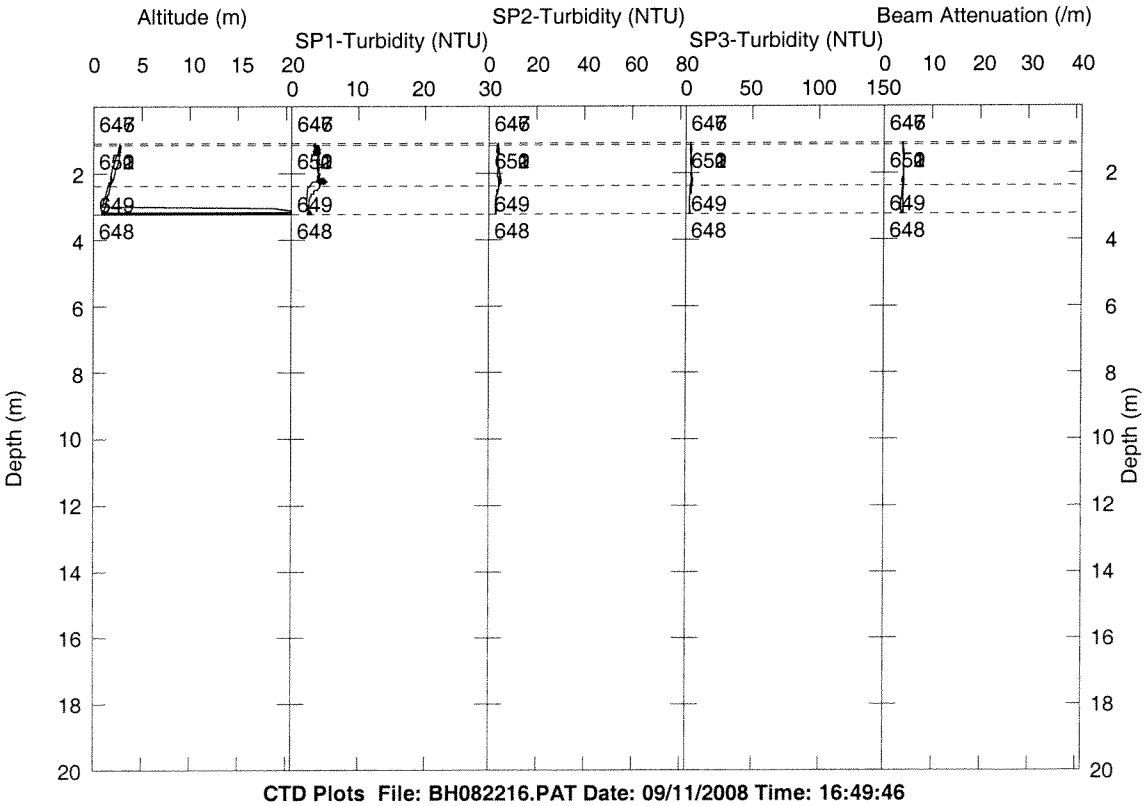

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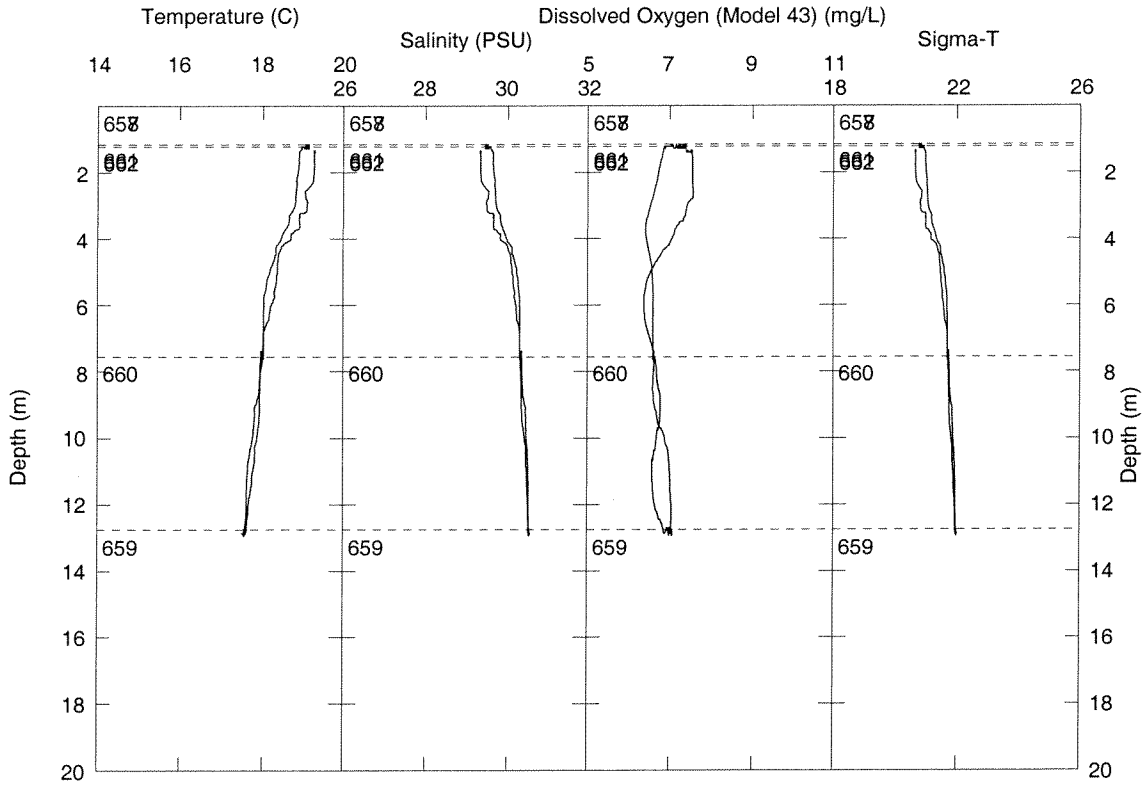

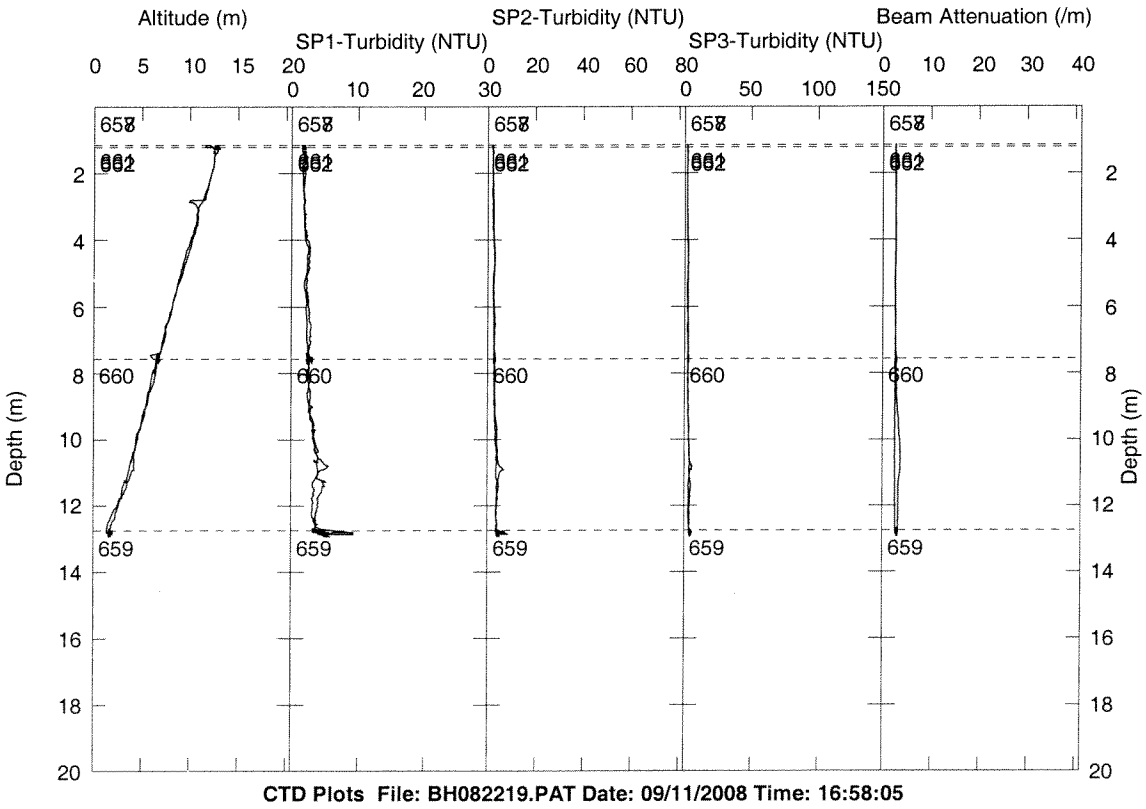

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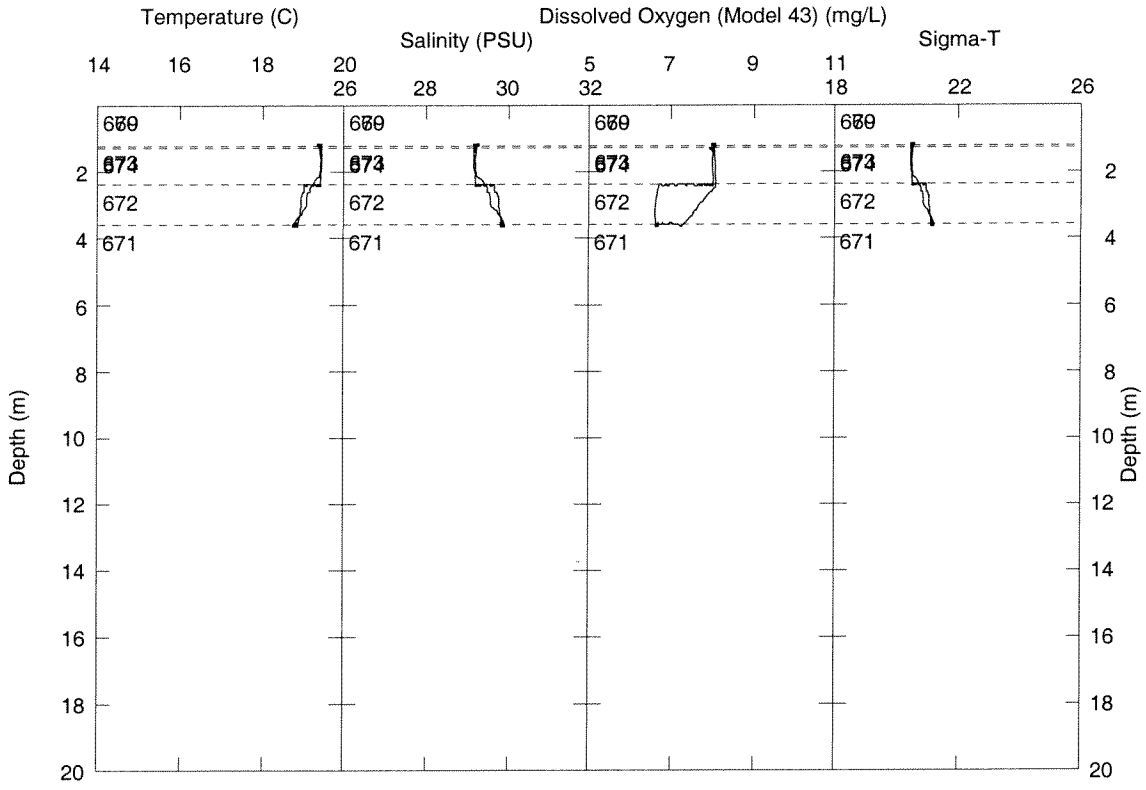

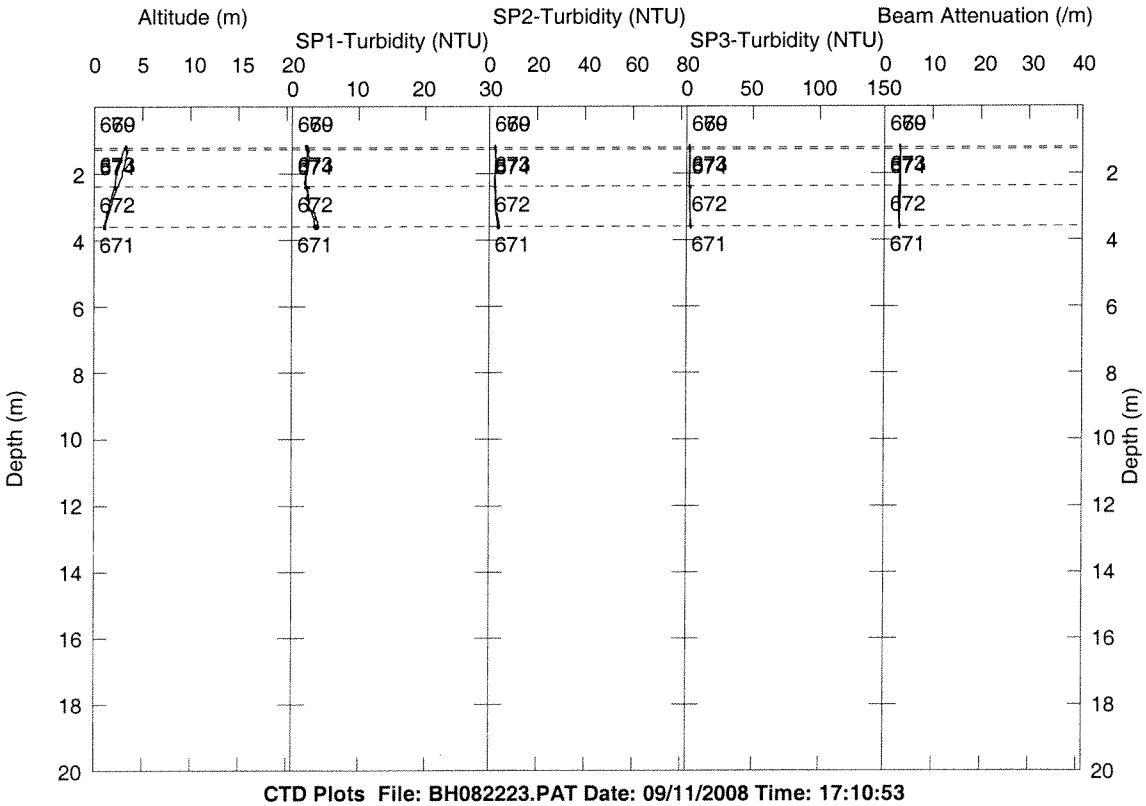

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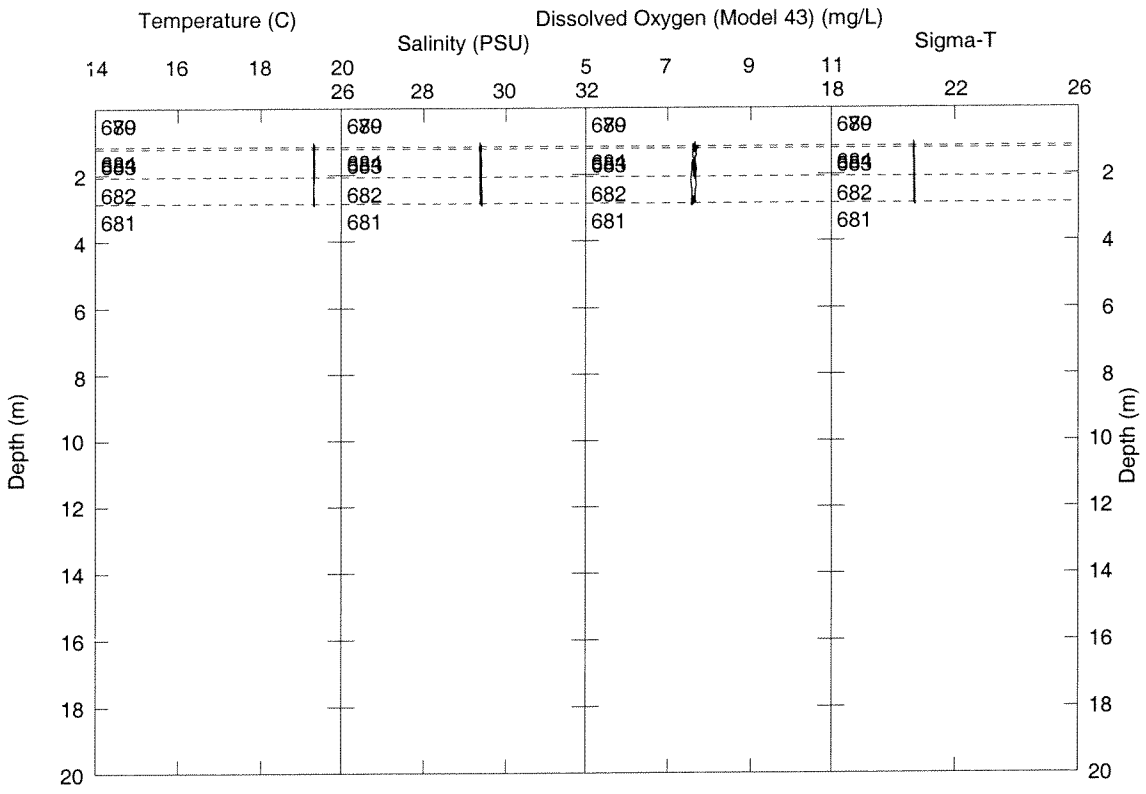

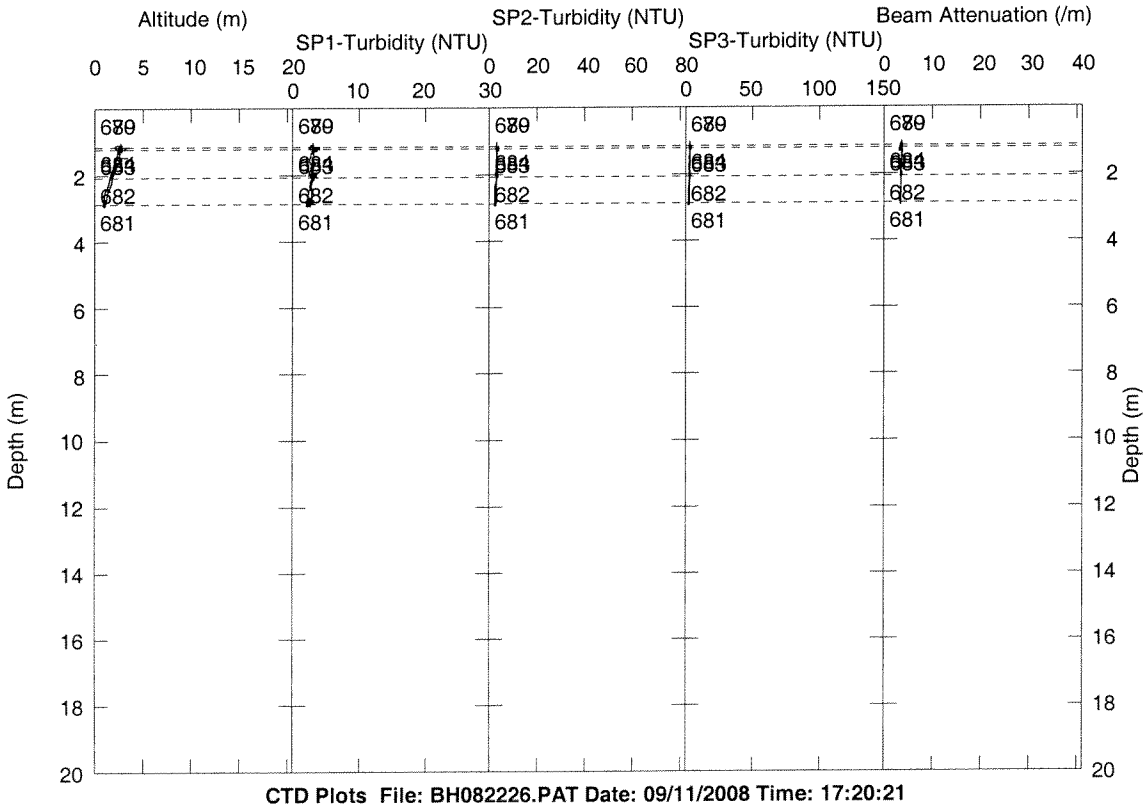

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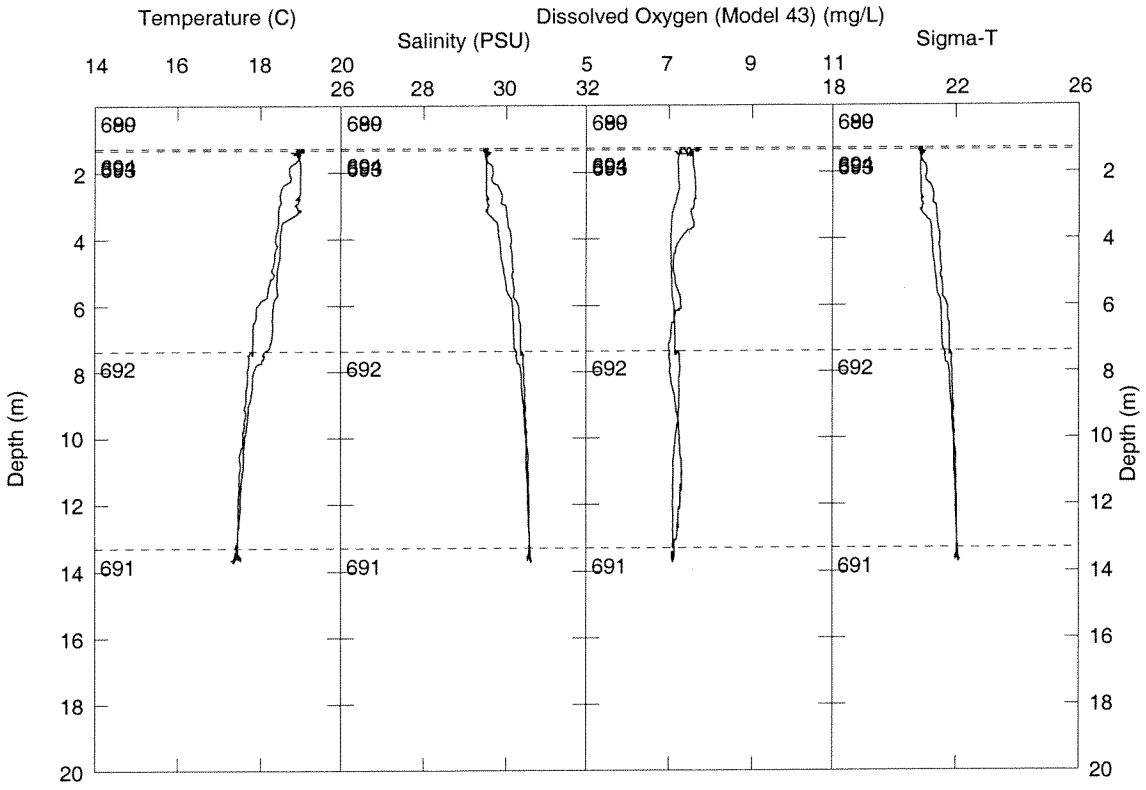

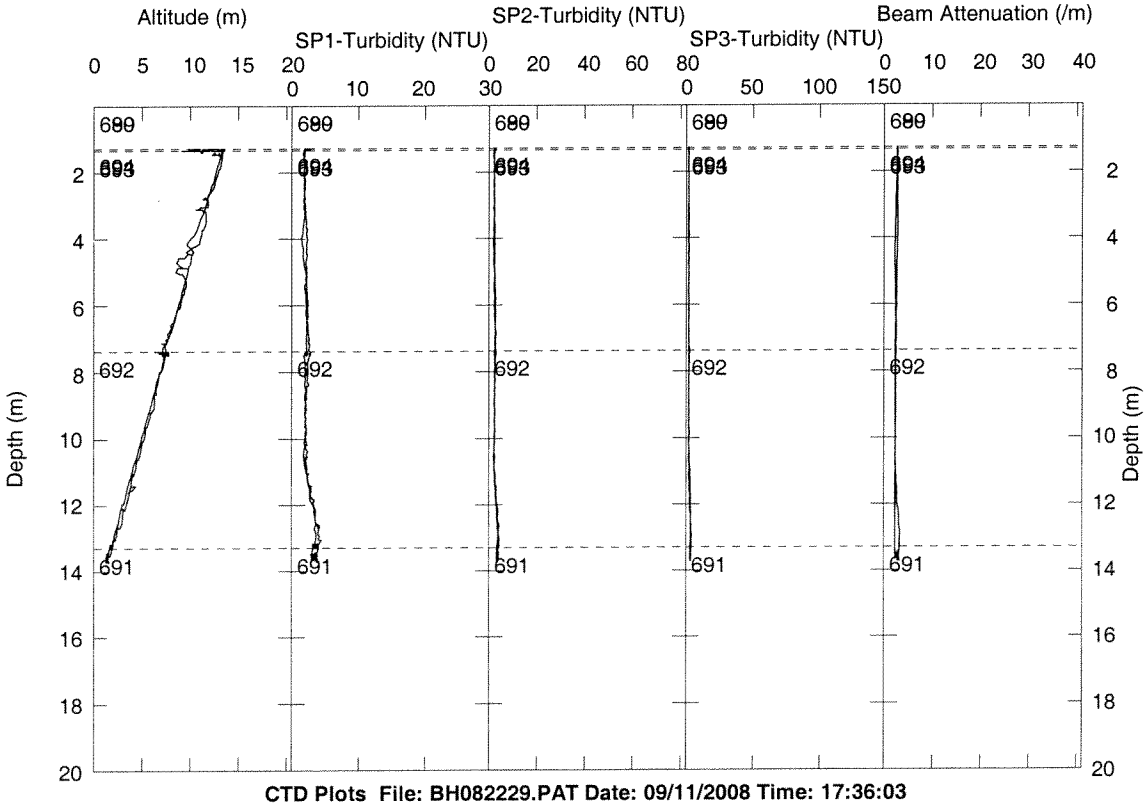

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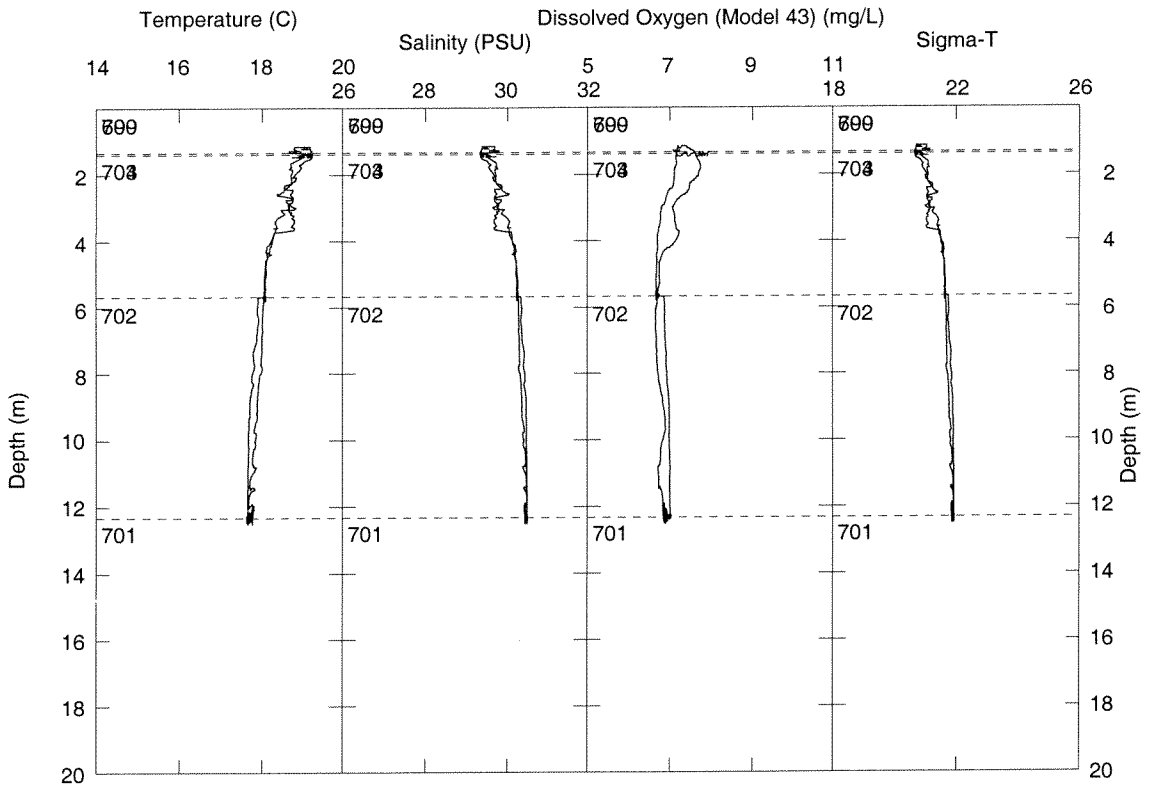
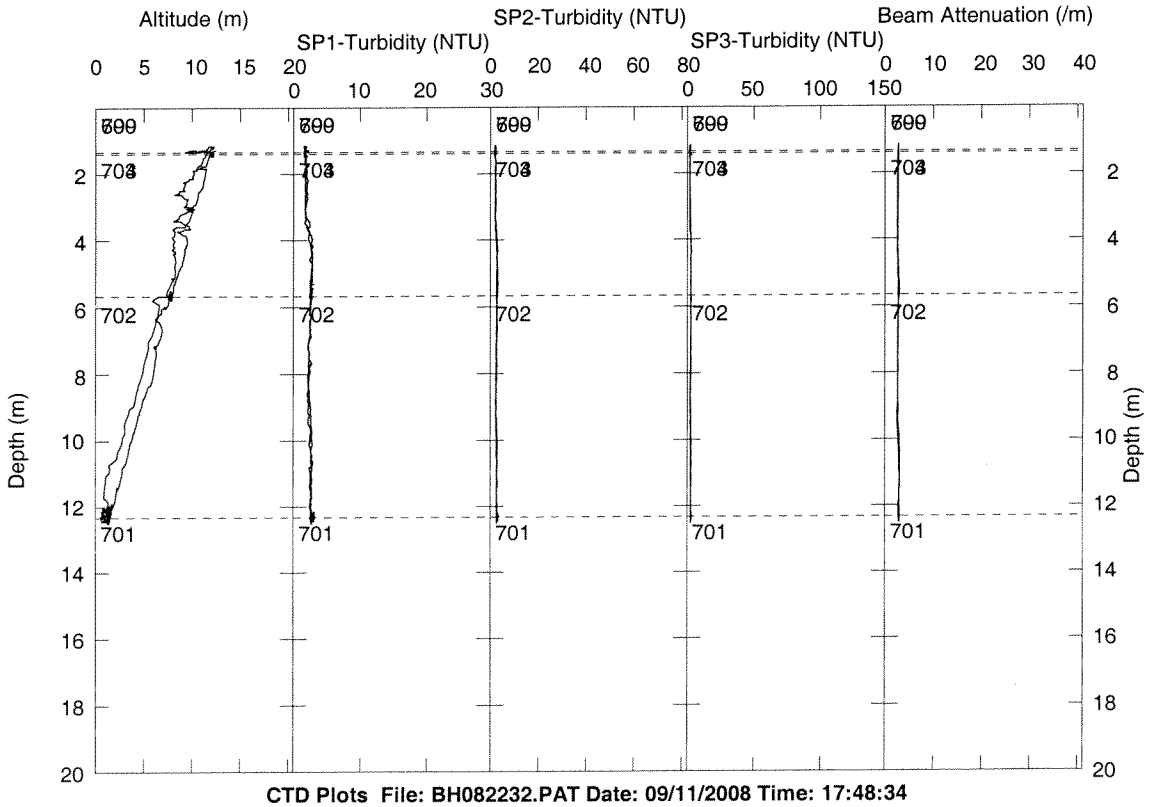
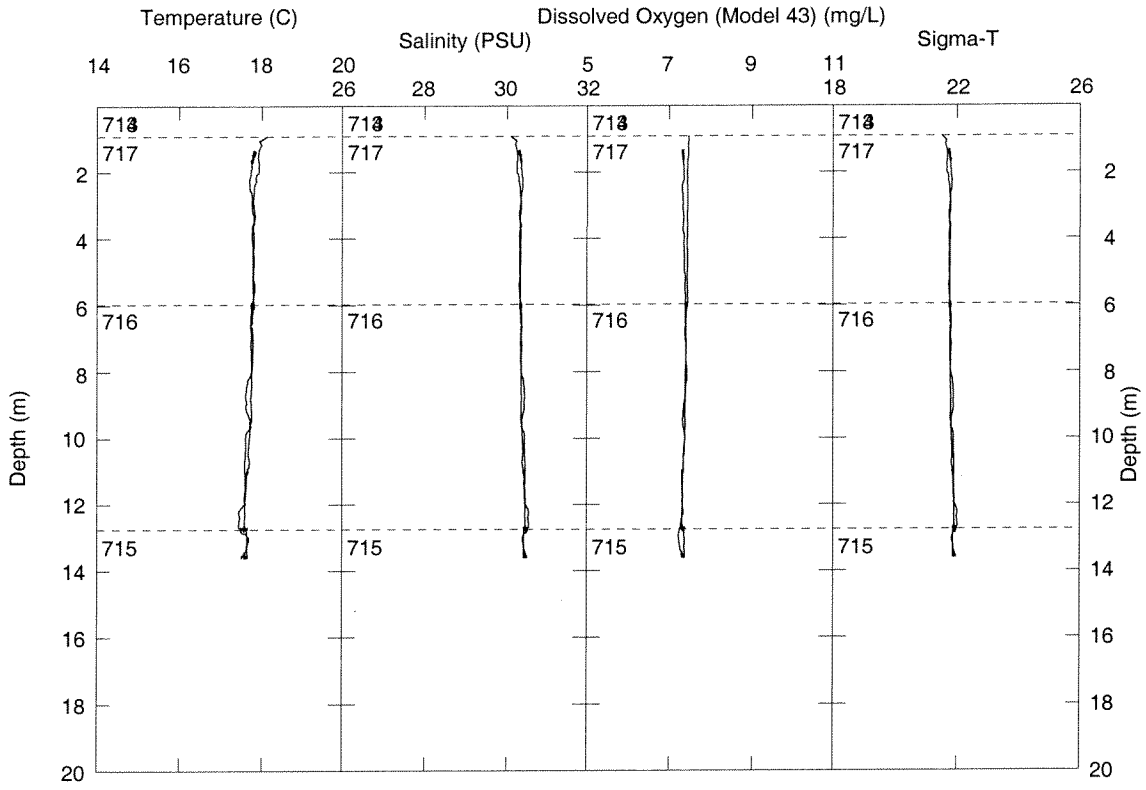
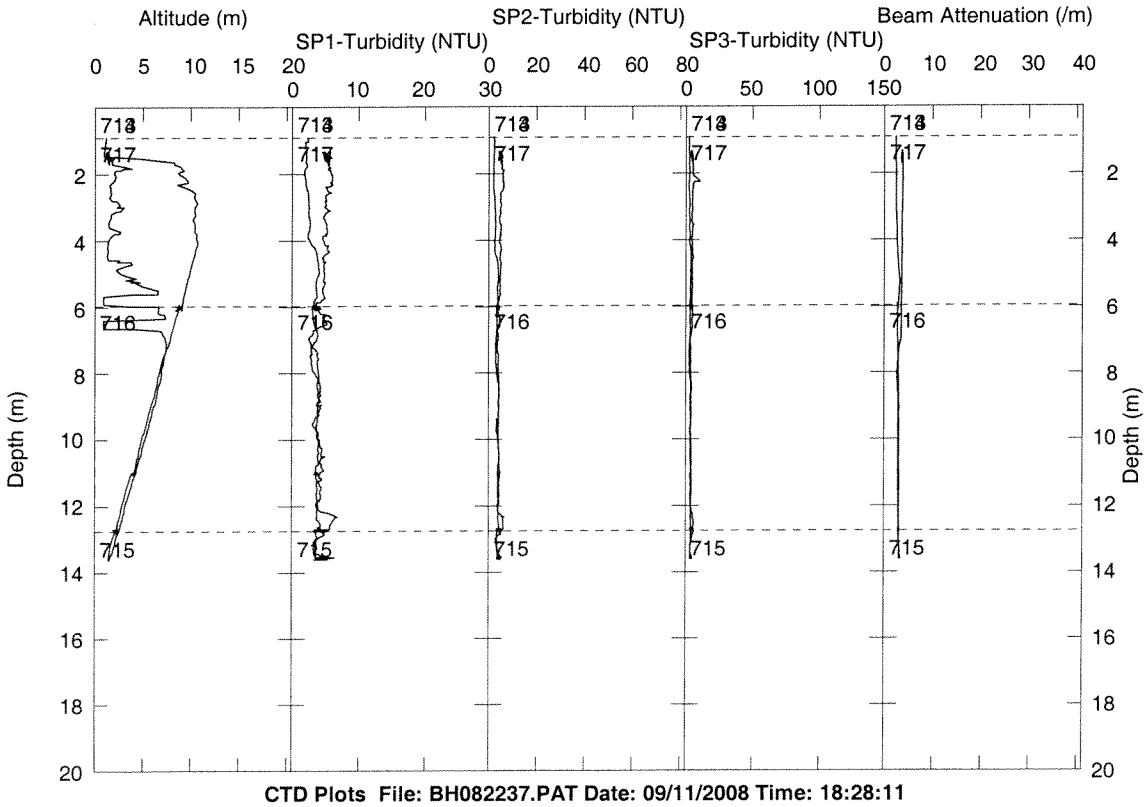




CTD Plots File: BH082232.PAT Date: 09/11/2008 Time: 17:48:34





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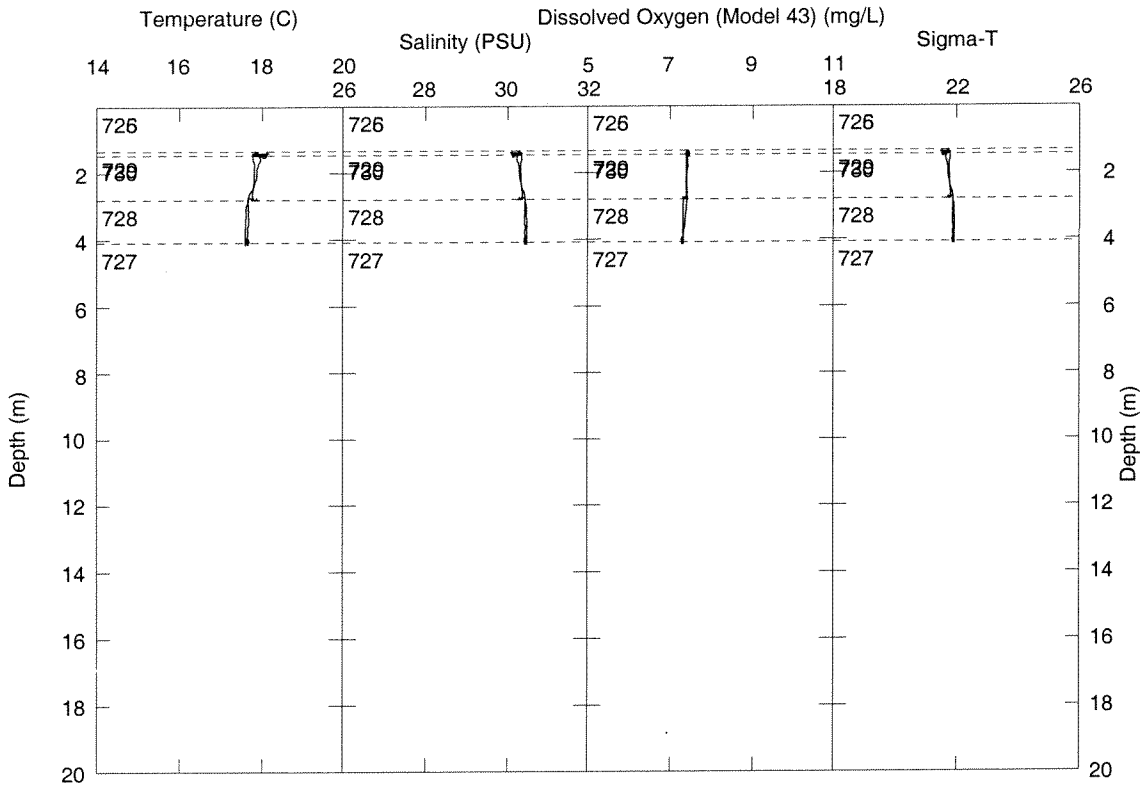

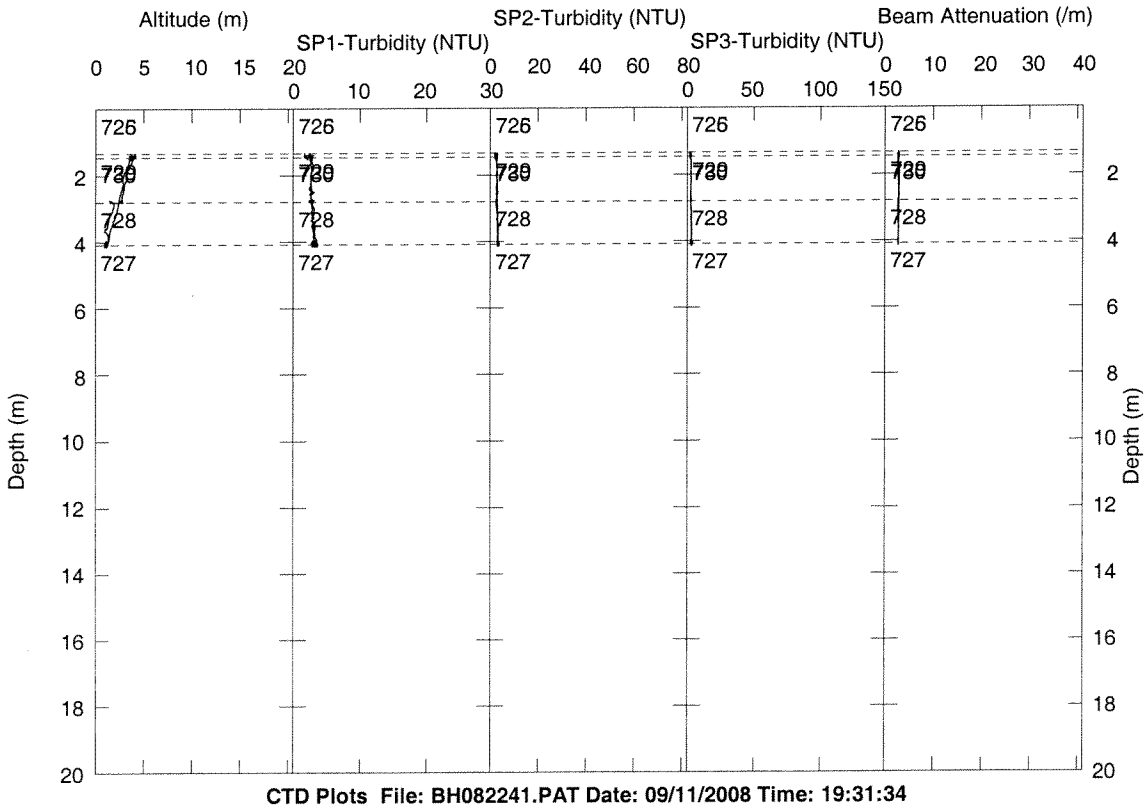

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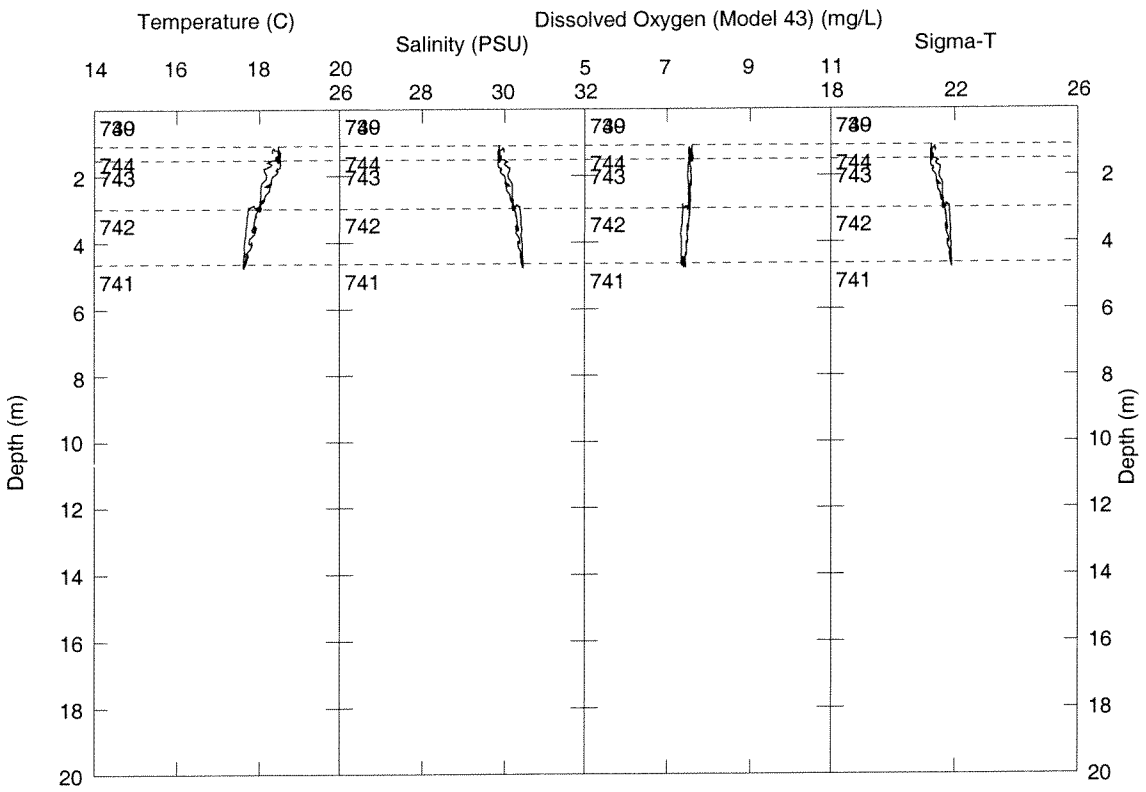

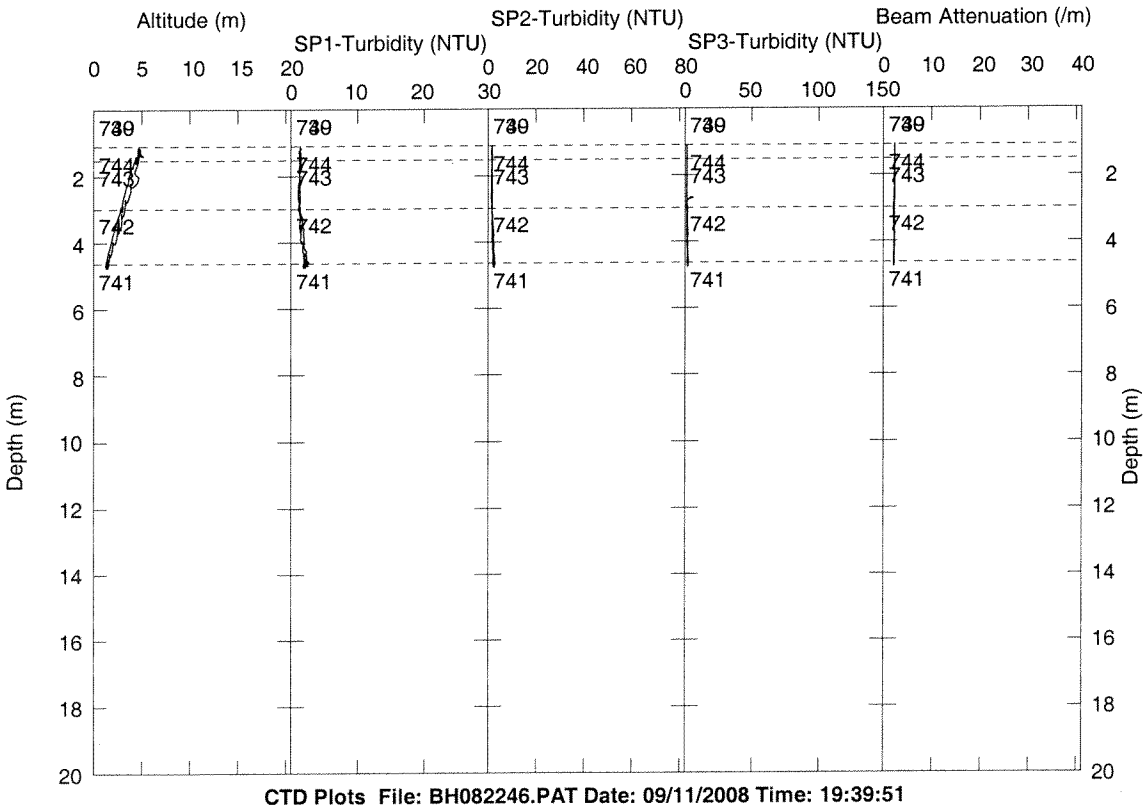

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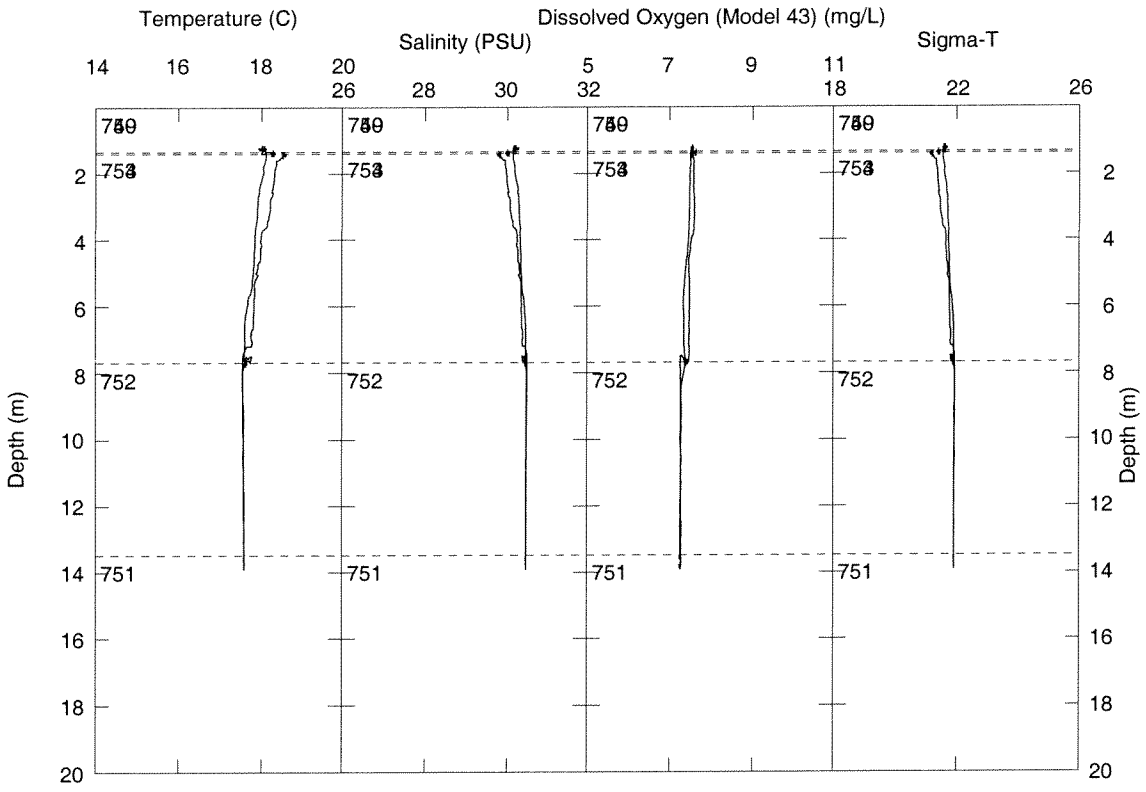
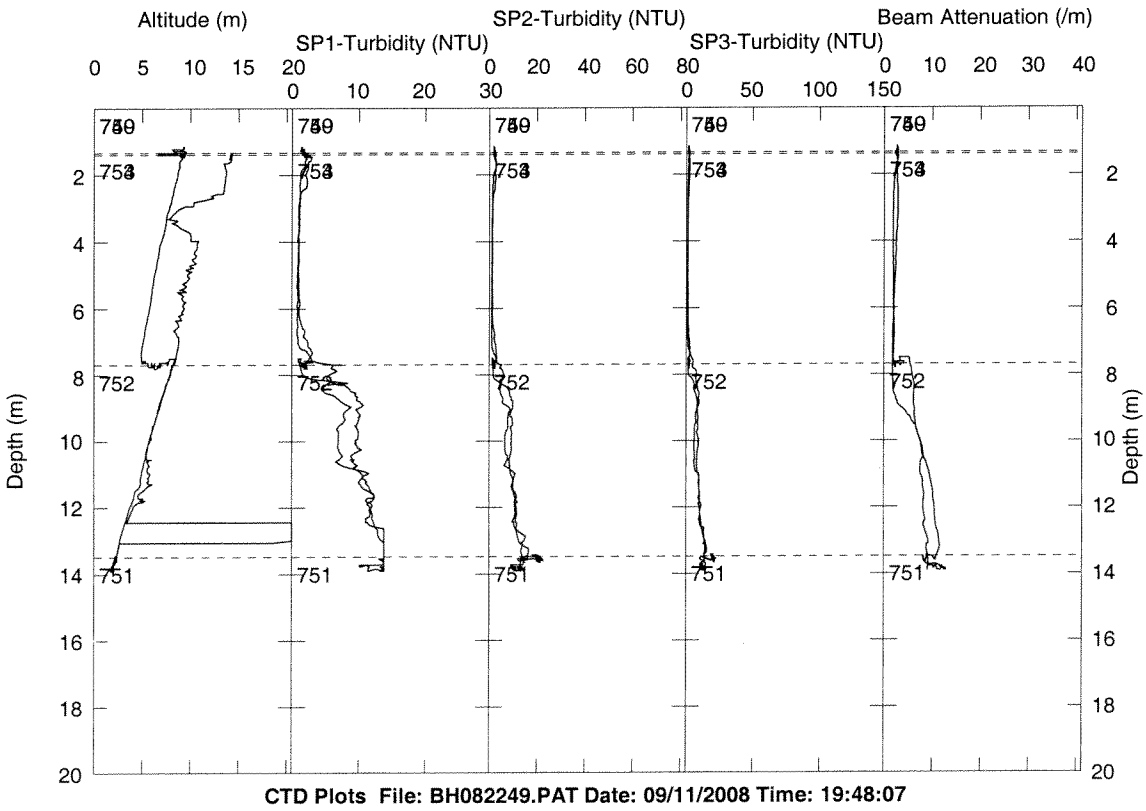
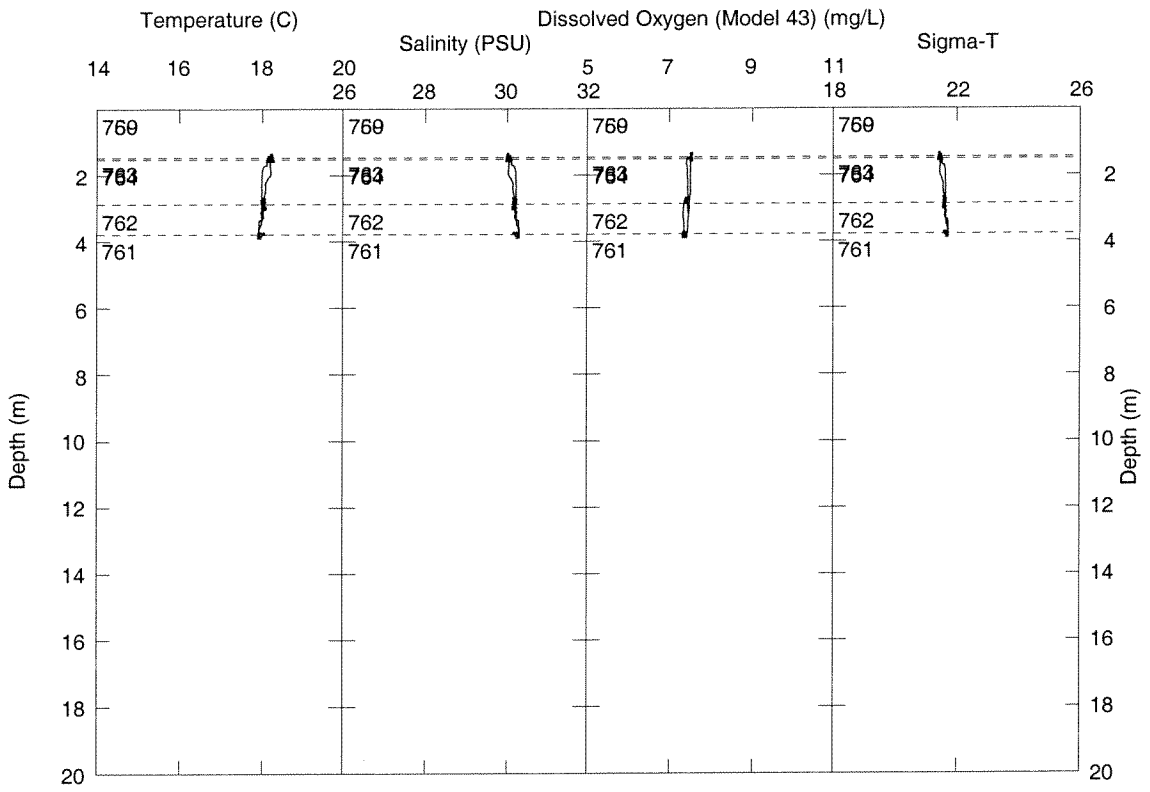
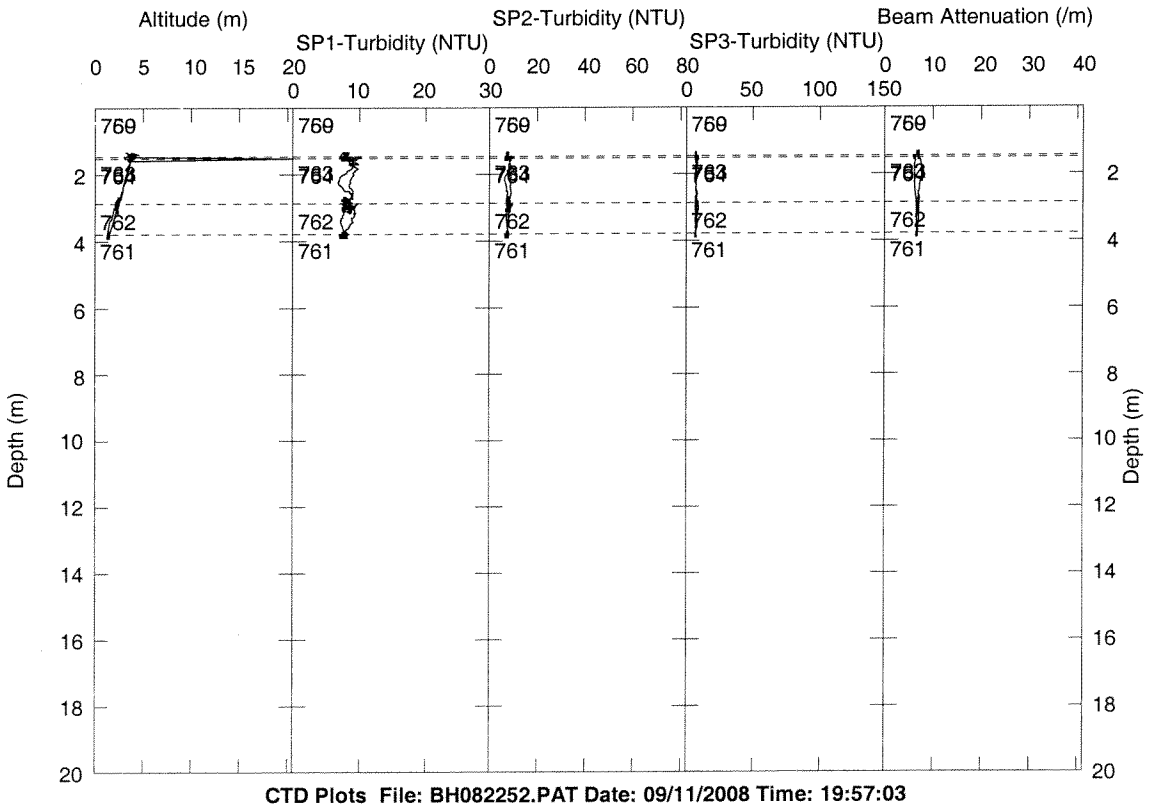


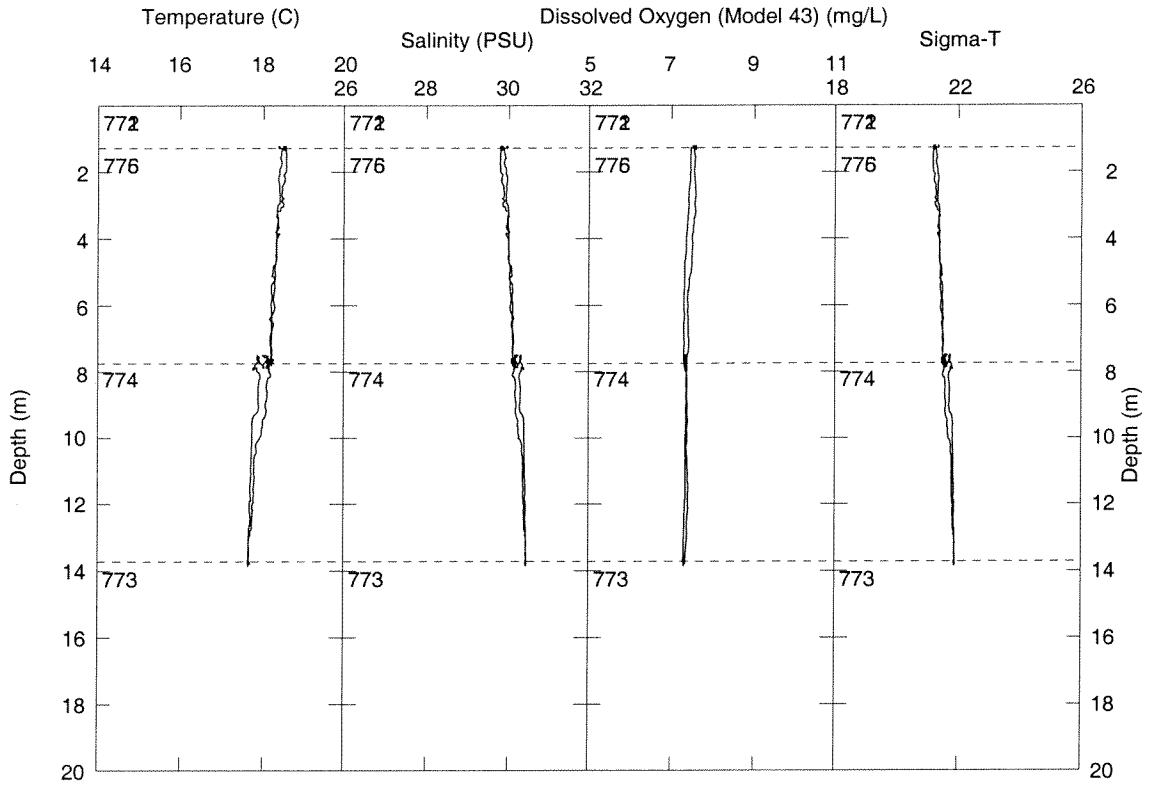


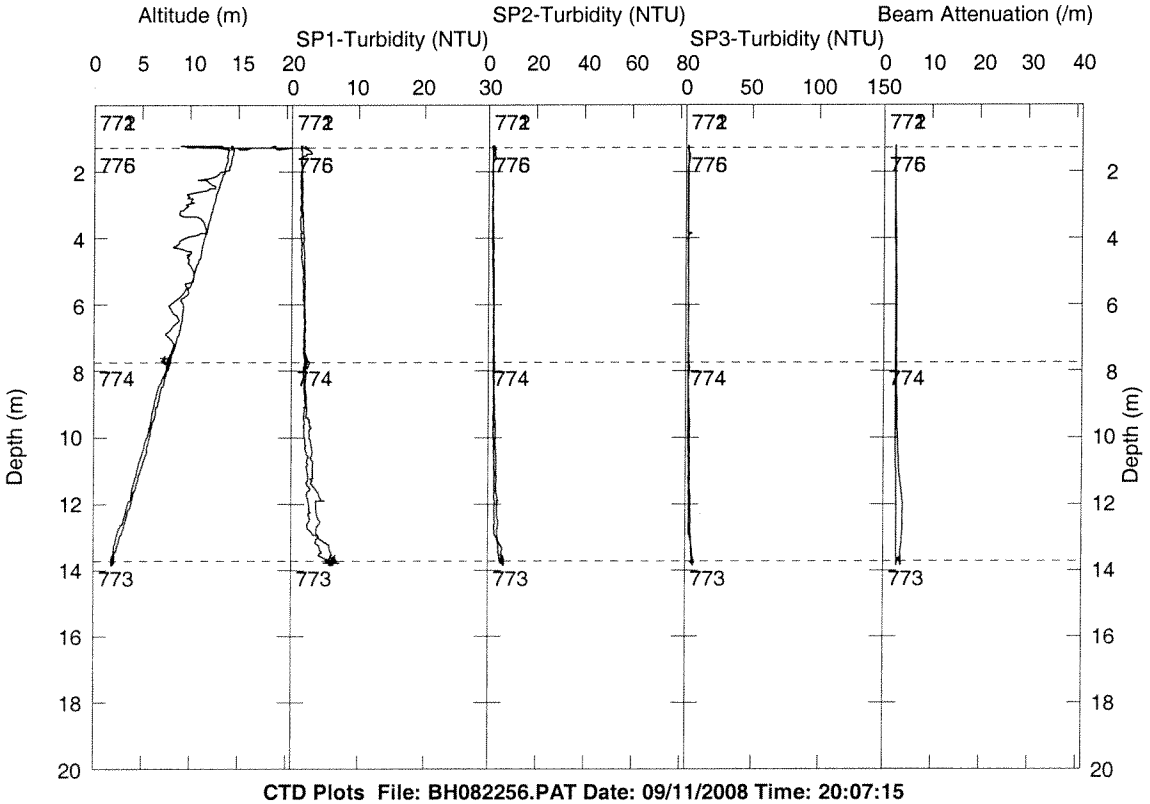
CTD Plots File: BH082249.PAT Date: 09/11/2008 Time: 19:48:07



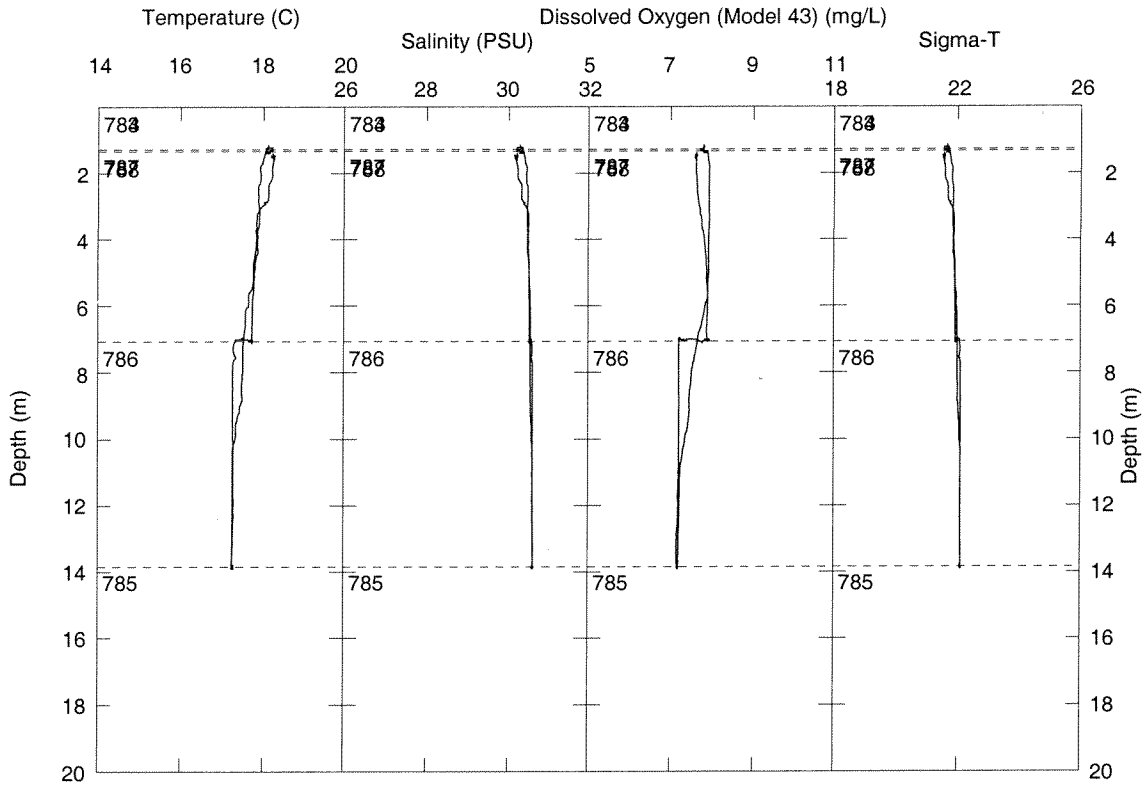


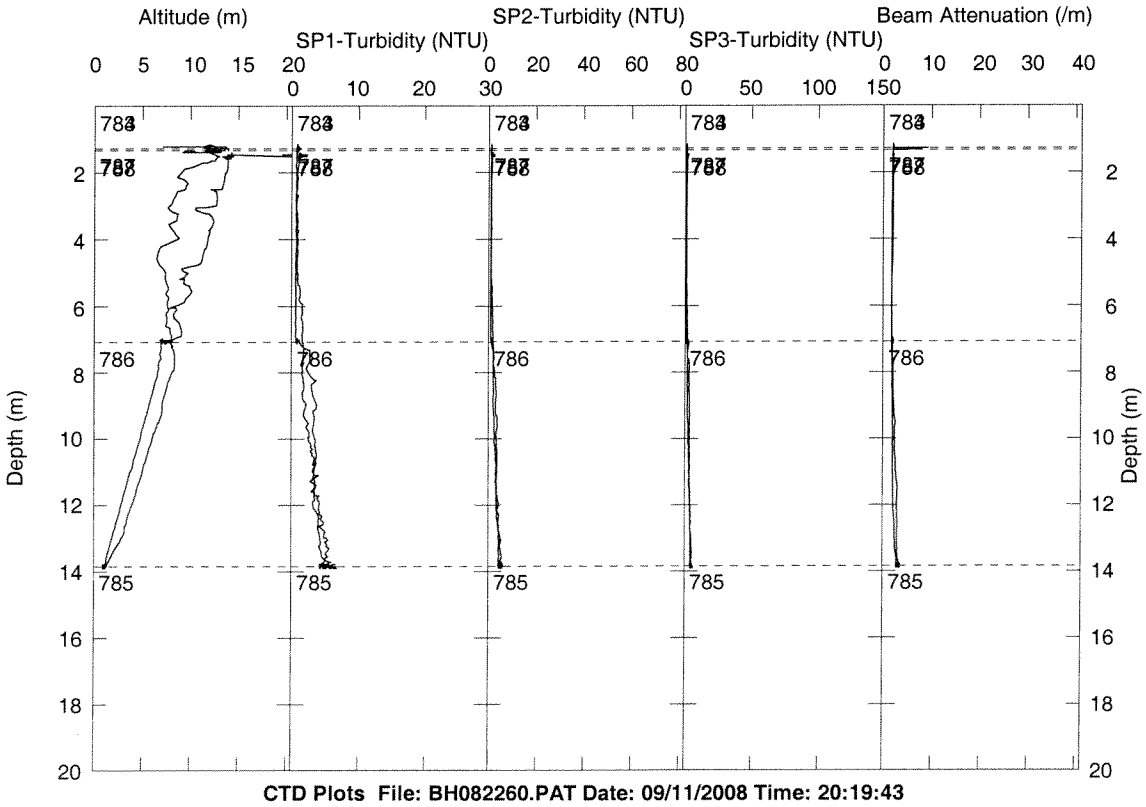
CTD Plots File: BH082252.PAT Date: 09/11/2008 Time: 19:57:03





CTD Plots File: BH082256.PAT Date: 09/11/2008 Time: 20:07:15





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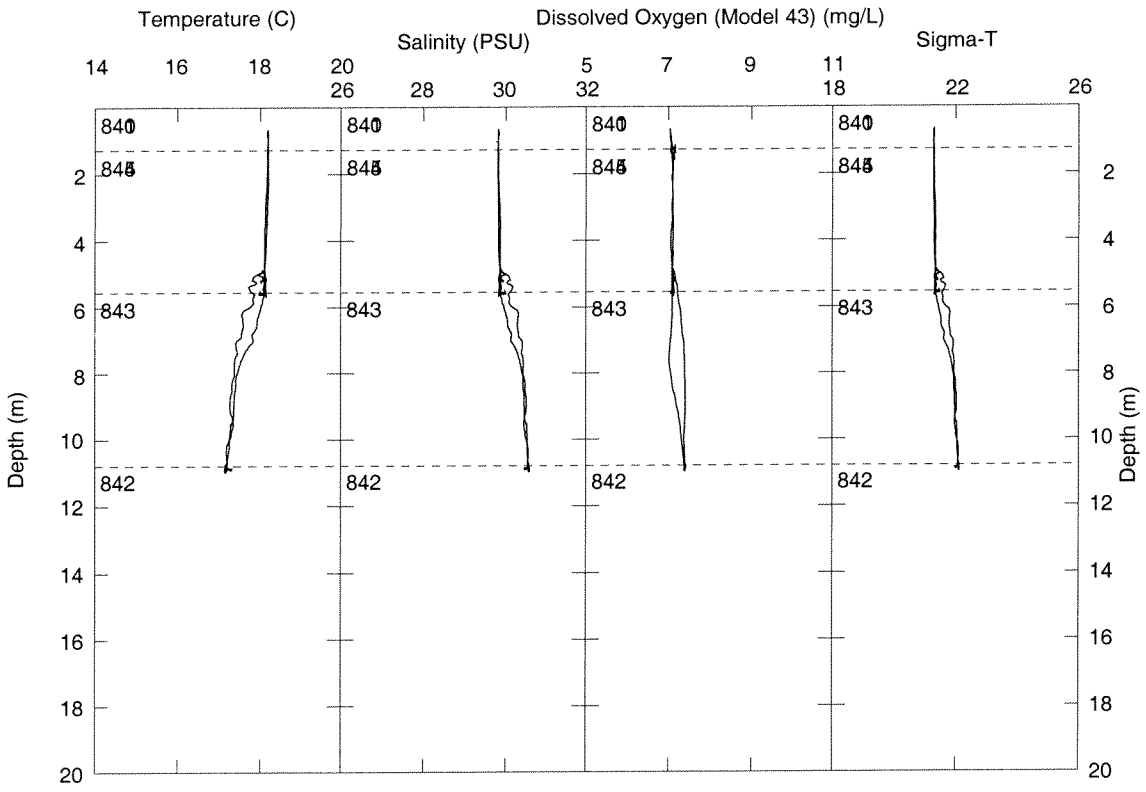
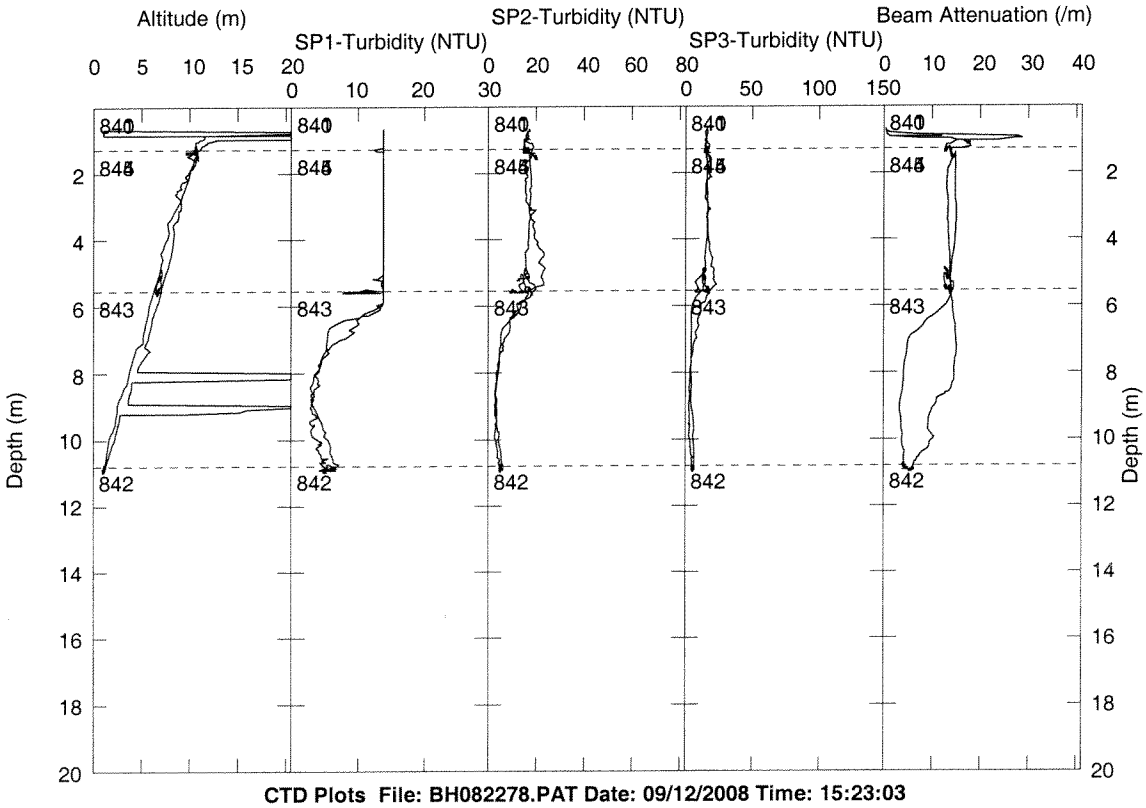
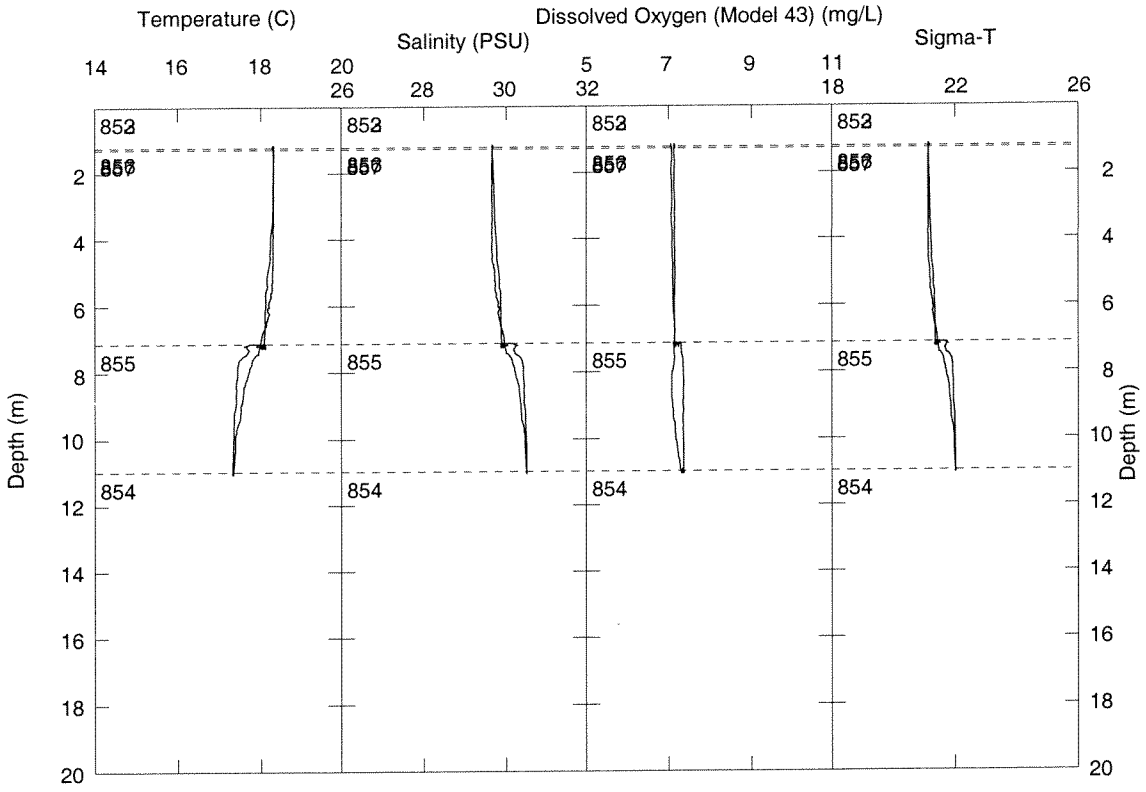
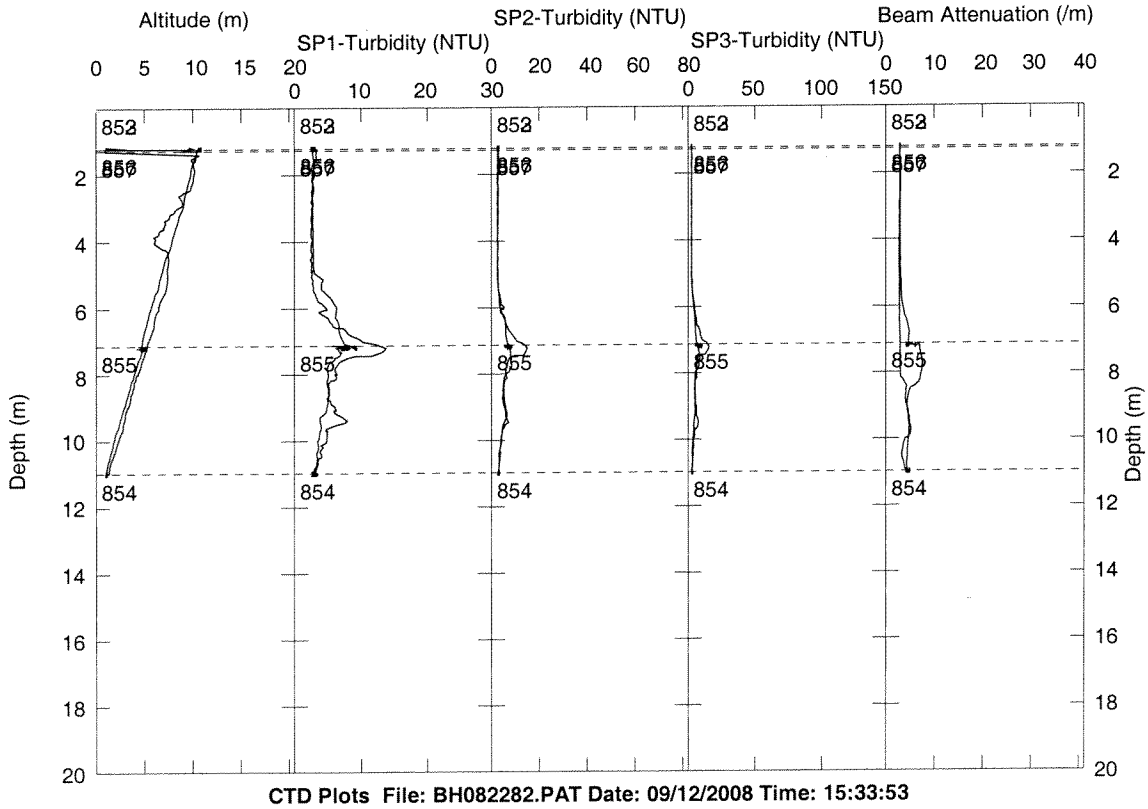


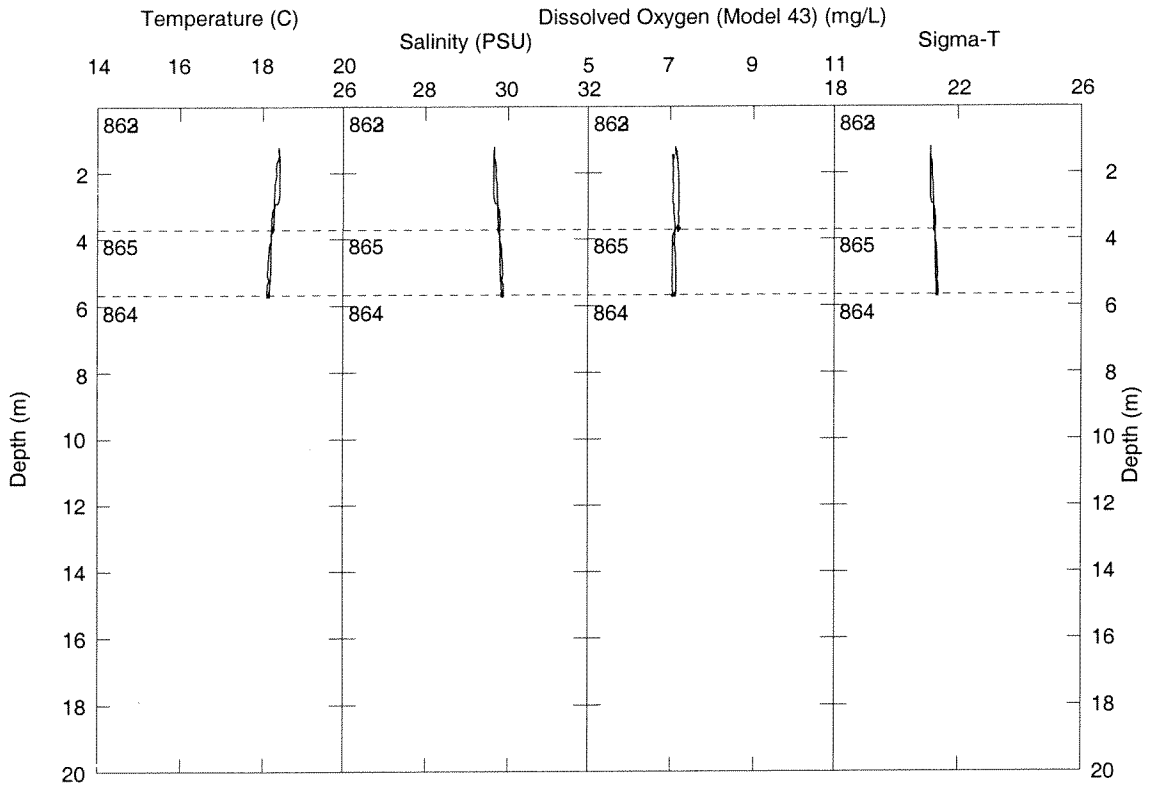


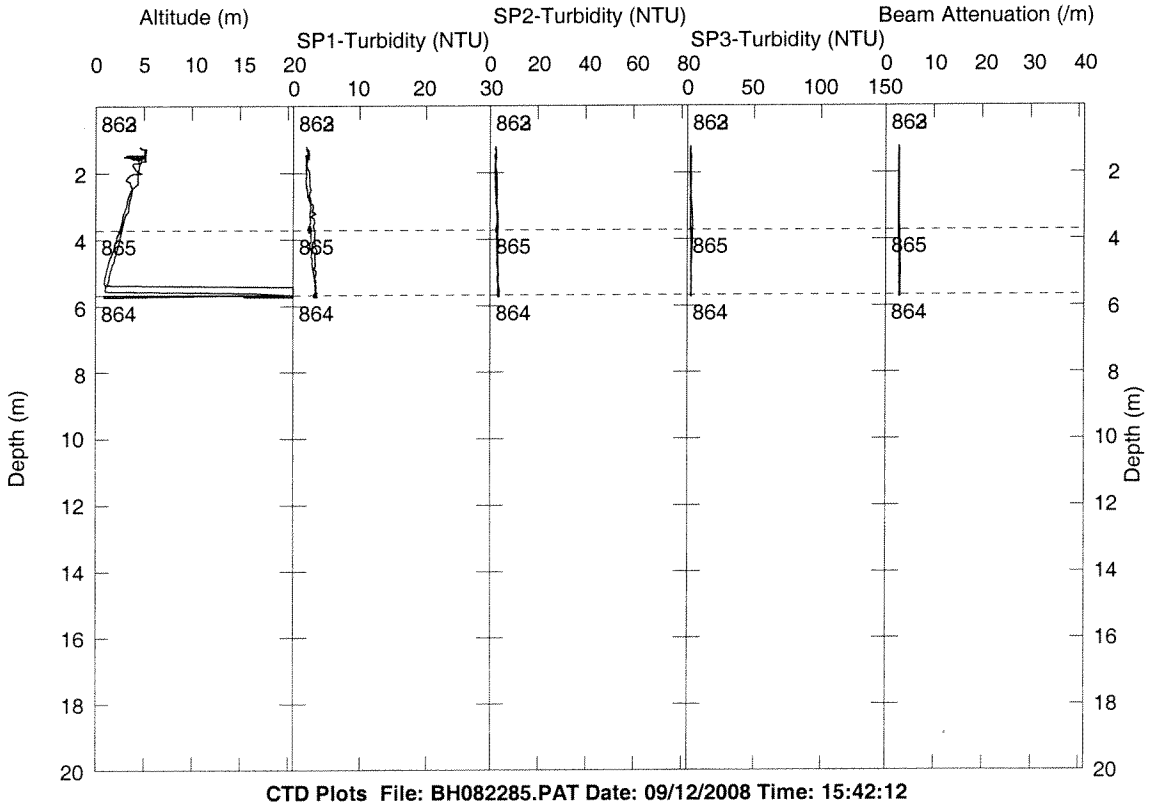
CTD Plots File: BH082278.PAT Date: 09/12/2008 Time: 15:23:03



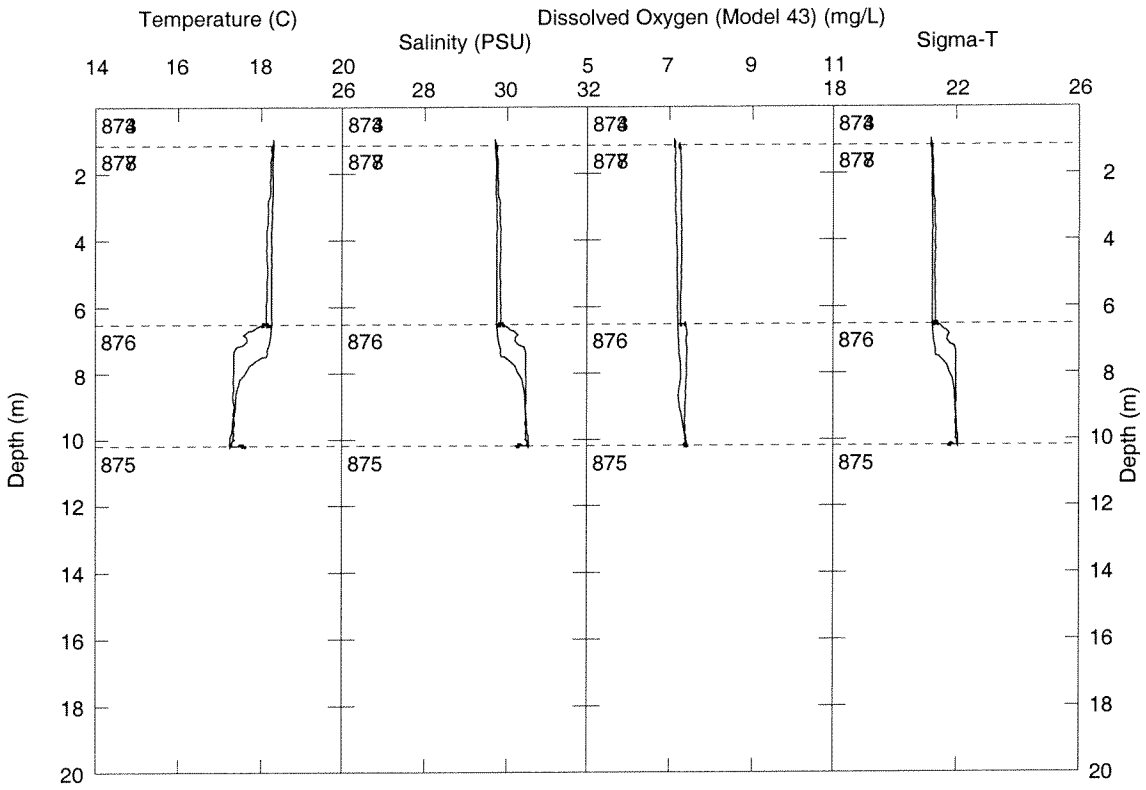


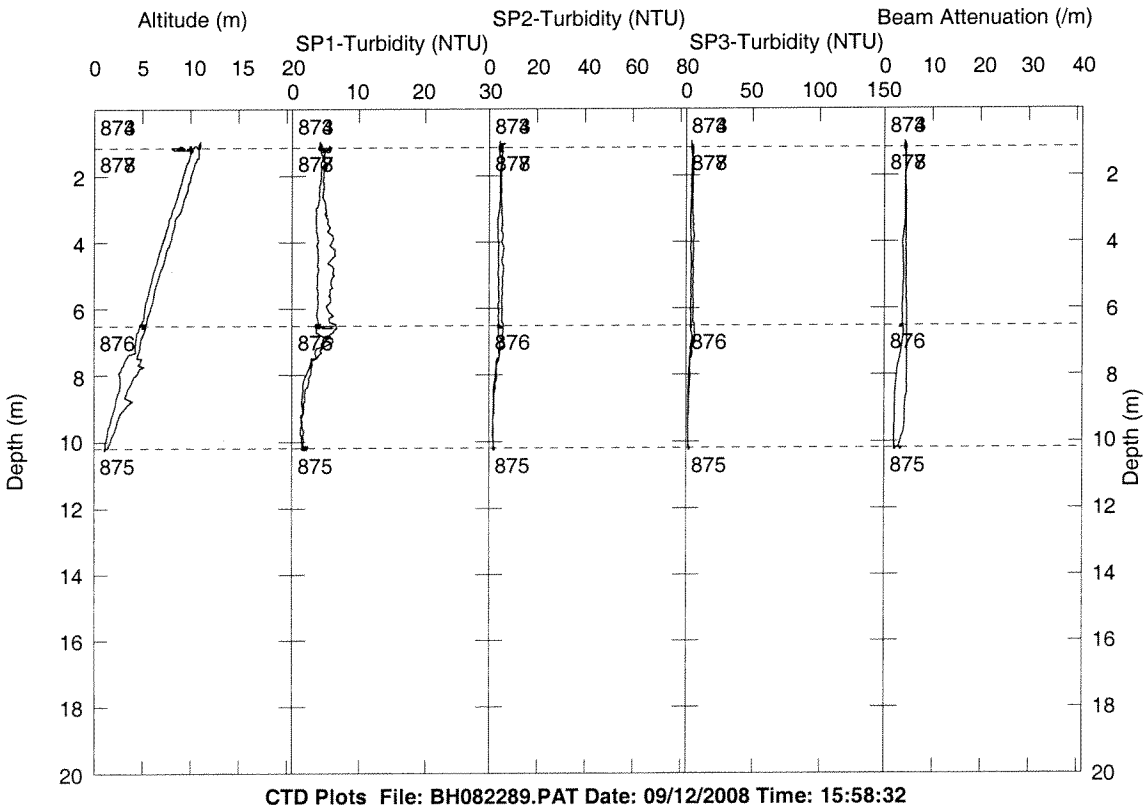
CTD Plots File: BH082282.PAT Date: 09/12/2008 Time: 15:33:53



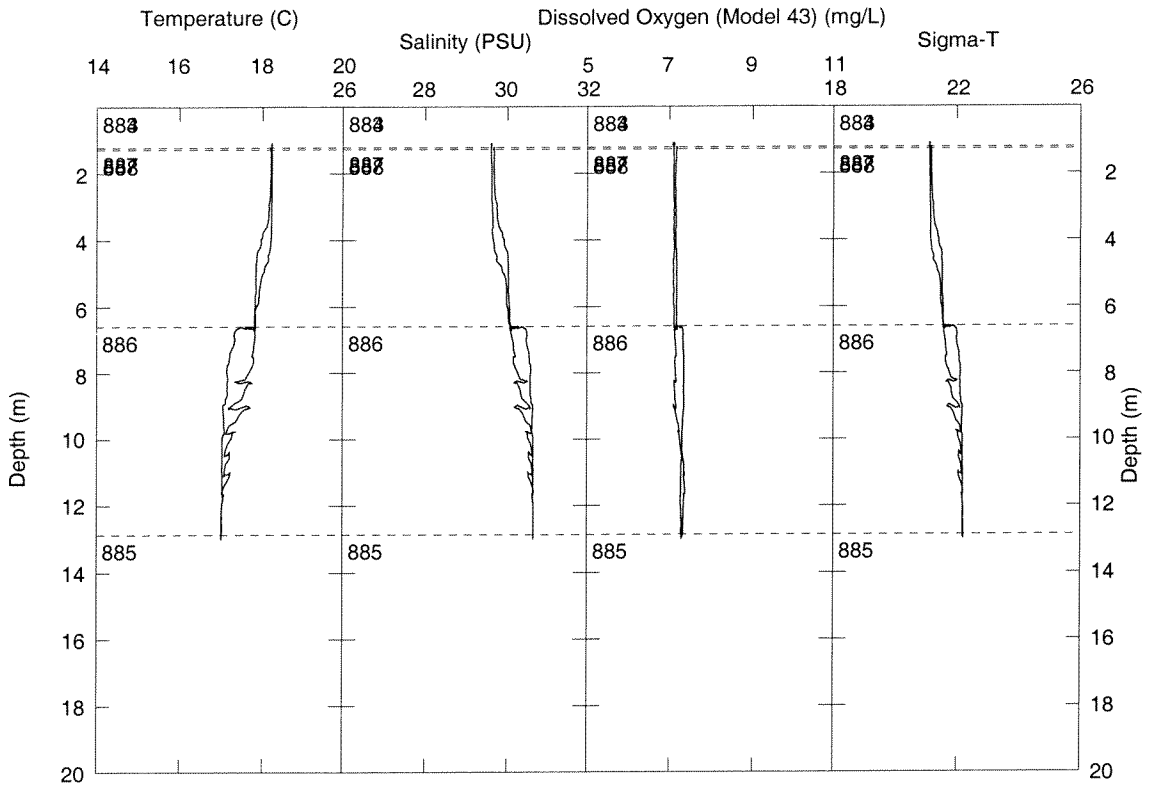


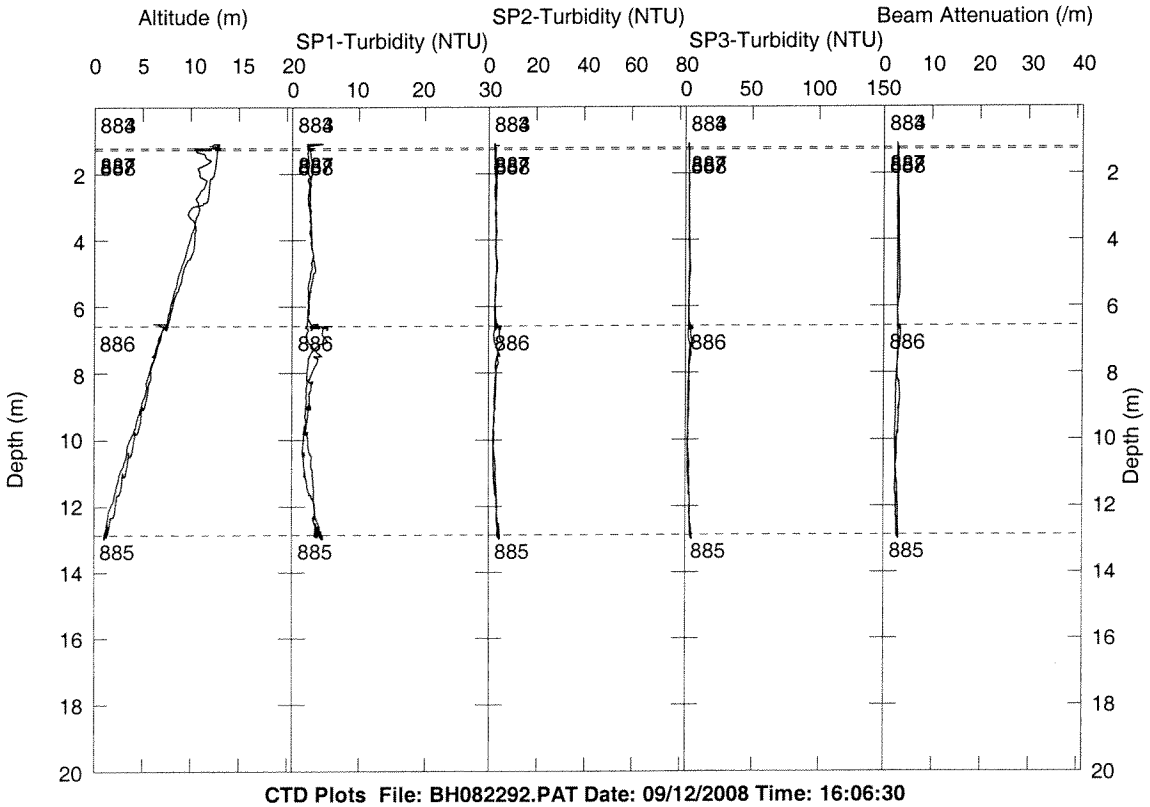
CTD Plots File: BH082285.PAT Date: 09/12/2008 Time: 15:42:12



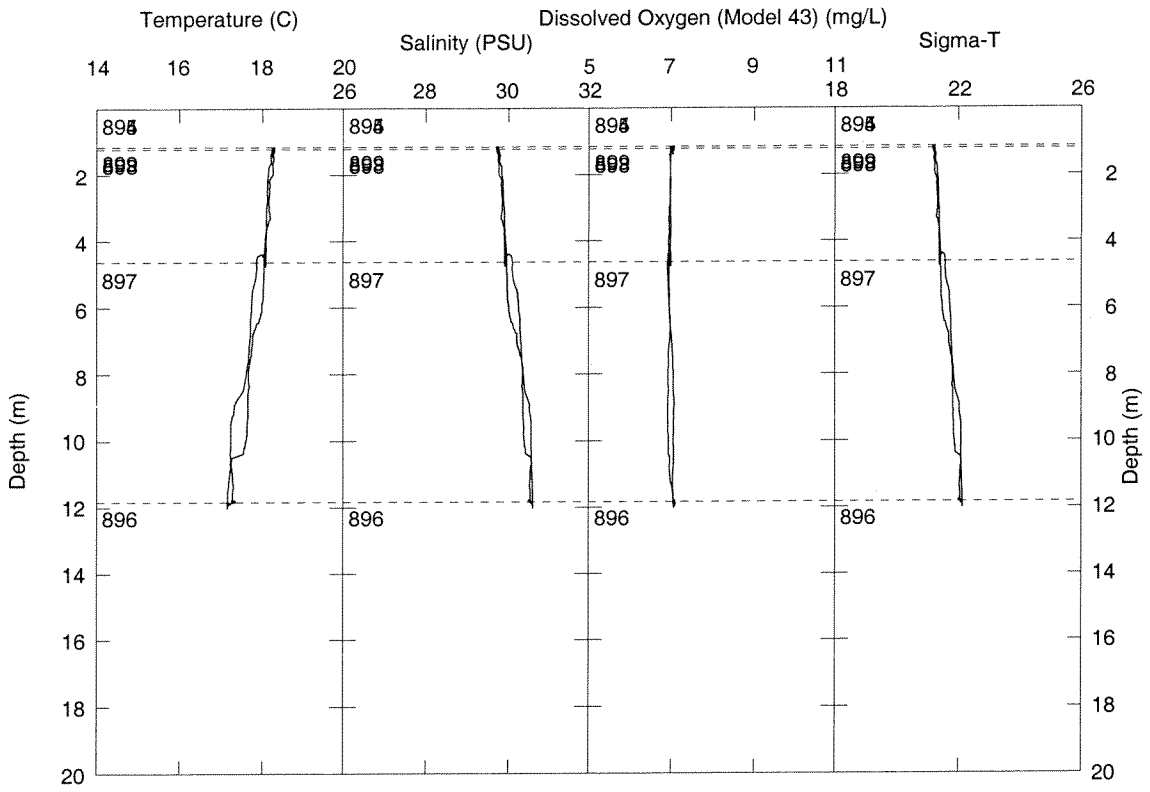


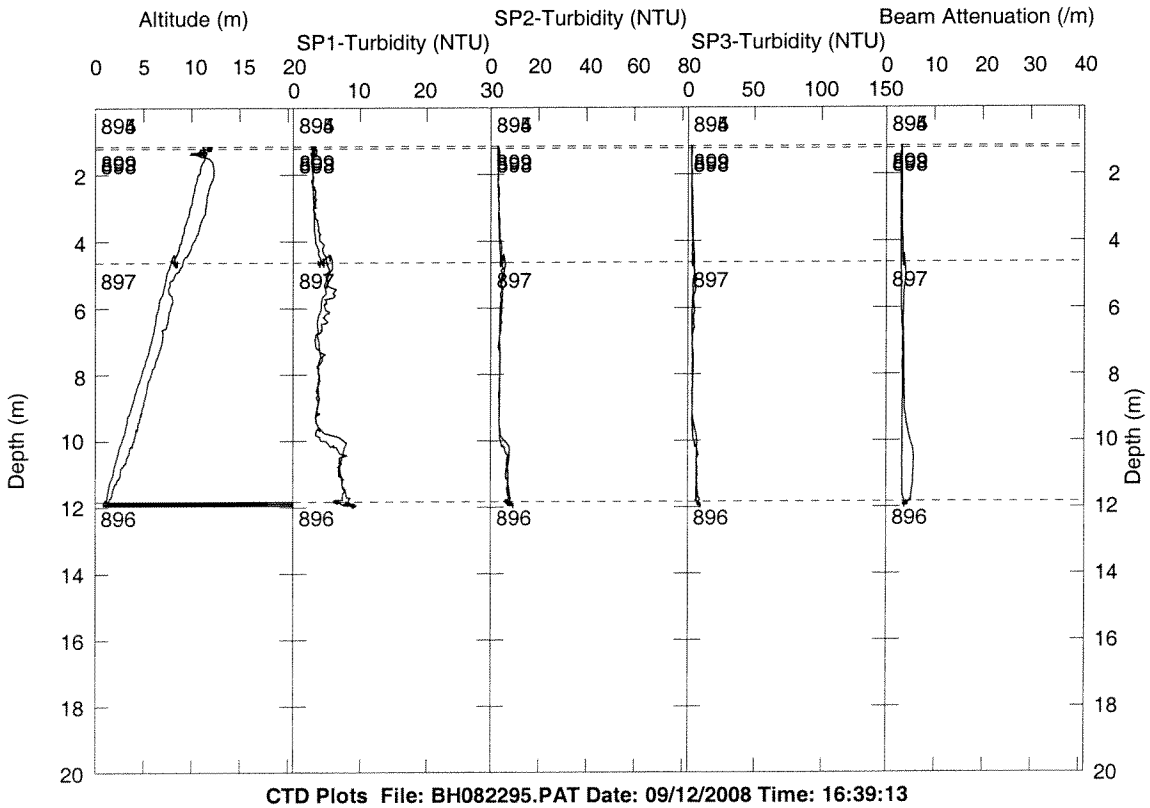
CTD Plots File: BH082289.PAT Date: 09/12/2008 Time: 15:58:32





CTD Plots File: BH082292.PAT Date: 09/12/2008 Time: 16:06:30





CTD Plots File: BH082295.PAT Date: 09/12/2008 Time: 16:39:13

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Appendix 4

Bench Top Turbidimeter Results

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Station	Station Type	SampleID	Depth (ft)	Turbidity	SampleDateTime	Sample Depth
Lower Harbor Dredge Monitoring 9-Sept-08						
HS11	Plume Centroid	BH082062	38.10	6	9/9/08 8:23	Near Bottom
HS11	Plume Centroid	BH082063	38.10	8.07	9/9/08 8:24	Mid Depth
HS12	Lateral Extent	BH082073	23.60	1.24	9/9/08 8:35	Near Bottom
HS12	Lateral Extent	BH082074	24.00	1.61	9/9/08 8:36	Mid Depth
HS13	Plume Down Current	BH08207D	44.30	1.89	9/9/08 8:47	Near Bottom
HS13	Plume Down Current	BH08207E	44.60	1.45	9/9/08 8:48	Mid Depth
HS14	Lateral Extent	BH082087	37.10	2.99	9/9/08 8:57	Near Bottom
HS14	Lateral Extent	BH082088	31.80	2.07	9/9/08 8:57	Mid Depth
HS15	Reference	BH082091	42.00	1.17	9/9/08 9:05	Near Bottom
HS15	Reference	BH082092	42.30	1.14	9/9/08 9:05	Mid Depth
HS16	Reference	BH08209B	40.40	1.45	9/9/08 9:16	Near Bottom
HS16	Reference	BH08209C	40.40	1.67	9/9/08 9:16	Mid Depth
SH11	Ship Passage	BH0820AC	42.70	8.4	9/9/08 11:10	Near Bottom
SH11	Ship Passage	BH0820AD	41.70	11.7	9/9/08 11:10	Mid Depth
SH12	Ship Passage	BH0820B5	44.90	8.6	9/9/08 11:41	Near Bottom
SH12	Ship Passage	BH0820B6	44.90	6.52	9/9/08 11:42	Mid Depth
SH14	Ship Passage	BH0820D0	44.60	9.48	9/9/08 13:46	Near Bottom
SH14	Ship Passage	BH0820D1	45.60	11	9/9/08 13:47	Mid Depth
MF11	Plume Centroid	BH0820E9	44.60	19.4	9/9/08 15:32	Near Bottom
MF11	Plume Centroid	BH0820EA	44.60	14.2	9/9/08 15:33	Mid Depth
MF12	Lateral Extent	BH0820F5	12.10	17.7	9/9/08 15:41	Near Bottom
MF12	Lateral Extent	BH0820F6	12.10	3.49	9/9/08 15:41	Surface
MF13	Plume Down Current	BH0820FE	47.20	15	9/9/08 15:48	Near Bottom
MF13	Plume Down Current	BH0820FF	47.20	11.1	9/9/08 15:49	Mid Depth
MF14	Lateral Extent	BH082108	38.70	2.97	9/9/08 15:58	Near Bottom
MF14	Lateral Extent	BH082109	39.40	2.77	9/9/08 15:59	Mid Depth
MF15	Reference	BH082112	40.70	4.49	9/9/08 16:09	Near Bottom
MF15	Reference	BH082113	42.00	2.98	9/9/08 16:10	Mid Depth
MF16	Reference	BH08211C	38.10	1.71	9/9/08 16:22	Near Bottom
MF16	Reference	BH08211D	38.40	1.97	9/9/08 16:23	Mid Depth
Lower Harbor Dredge Monitoring 10-Sept-08						
HS21	Plume Centroid	BH082146	35.10	3.44	9/10/08 10:08	Near Bottom
HS21	Plume Centroid	BH082147	33.50	3.62	9/10/08 10:09	Mid Depth
HS22	Lateral Extent	BH082150	34.10	1.78	9/10/08 10:17	Near Bottom
HS22	Lateral Extent	BH082151	34.80	1.81	9/10/08 10:18	Mid Depth
HS23	Lateral Extent	BH08215A	41.70	1.88	9/10/08 10:27	Near Bottom
HS23	Lateral Extent	BH08215B	41.70	2.47	9/10/08 10:28	Mid Depth
HS24	Plume Down Current	BH082164	34.40	2.85	9/10/08 10:36	Near Bottom
HS24	Plume Down Current	BH082165	32.20	2.4	9/10/08 10:37	Mid Depth
HS25	Reference	BH08216E	41.00	1.63	9/10/08 10:45	Near Bottom
HS25	Reference	BH08216F	41.30	2.16	9/10/08 10:46	Mid Depth
HS26	Reference	BH082181	41.00	2.59	9/10/08 11:06	Near Bottom
HS26	Reference	BH082182	41.30	2.87	9/10/08 11:07	Mid Depth
ME21	Plume Centroid	BH08219E	34.80	3.71	9/10/08 12:51	Near Bottom
ME21	Plume Centroid	BH08219F	33.10	5.25	9/10/08 12:52	Mid Depth
ME22	Lateral Extent	BH0821A8	19.70	2.06	9/10/08 12:58	Near Bottom
ME22	Lateral Extent	BH0821A9	20.00	1.97	9/10/08 12:58	Mid Depth
ME23	Lateral Extent	BH0821B2	34.40	4.14	9/10/08 13:06	Near Bottom
ME23	Lateral Extent	BH0821B3	34.40	3.1	9/10/08 13:07	Mid Depth
ME24	Plume Down Current	BH0821BF	42.70	2.37	9/10/08 13:15	Near Bottom
ME24	Plume Down Current	BH0821C0	43.60	2.51	9/10/08 13:16	Mid Depth
ME25	Reference	BH0821C9	37.70	4.57	9/10/08 13:23	Near Bottom
ME25	Reference	BH0821CA	38.10	3.92	9/10/08 13:24	Mid Depth
ME26	Reference	BH0821D5	35.40	2.74	9/10/08 13:33	Near Bottom
ME26	Reference	BH0821D6	37.40	2.69	9/10/08 13:33	Mid Depth
SH21	Ship Passage	BH0821FB	44.30	9.09	9/10/08 17:27	Near Bottom

Station	Station Type	SampleID	Depth (ft)	Turbidity	SampleDateTime	Sample Depth
SH21	Ship Passage	BH0821FC	44.30	4.71	9/10/08 17:28	Mid Depth
Lower Harbor Dredge Monitoring 11-Sept-08						
ME11	Plume Centroid	BH08222F	44.90	11.3	9/11/08 13:03	Mid Depth
ME11	Plume Centroid	BH082230	44.30	8.03	9/11/08 13:03	Near Bottom
ME12	Lateral Extent	BH082239	37.70	3.55	9/11/08 13:13	Near Bottom
ME12	Lateral Extent	BH08223A	38.10	3.43	9/11/08 13:14	Mid Depth
ME13	Lateral Extent	BH082248	21.70	3.09	9/11/08 13:23	Near Bottom
ME13	Lateral Extent	BH082249	21.70	2.89	9/11/08 13:23	Mid Depth
ME14	Plume Down Current	BH082252	41.00	4.01	9/11/08 13:34	Near Bottom
ME14	Plume Down Current	BH082253	40.70	6.65	9/11/08 13:35	Mid Depth
ME15	Reference	BH08225C	37.70	2.85	9/11/08 13:44	Near Bottom
ME15	Reference	BH08225D	38.70	3.14	9/11/08 13:44	Mid Depth
ME16	Reference	BH082268	37.40	3.68	9/11/08 14:01	Near Bottom
ME16	Reference	BH082269	37.70	3.52	9/11/08 14:01	Mid Depth
LS11	Plume Centroid	BH082288	10.80	3.06	9/11/08 16:50	Near Bottom
LS11	Plume Centroid	BH082289	10.50	3.63	9/11/08 16:50	Mid Depth
LS12	Lateral Extent	BH082293	44.30	3.75	9/11/08 16:59	Near Bottom
LS12	Lateral Extent	BH082294	44.30	3.2	9/11/08 17:00	Mid Depth
LS13	Lateral Extent	BH08229F	13.10	3.26	9/11/08 17:11	Near Bottom
LS13	Lateral Extent	BH0822A0	13.10	3.34	9/11/08 17:12	Mid Depth
LS14	Plume Down Current	BH0822A9	10.50	3.27	9/11/08 17:21	Near Bottom
LS14	Plume Down Current	BH0822AA	10.20	2.97	9/11/08 17:21	Mid Depth
LS15	Reference	BH0822B3	45.90	3.86	9/11/08 17:38	Near Bottom
LS15	Reference	BH0822B4	46.30	2.42	9/11/08 17:38	Mid Depth
LS16	Reference	BH0822BD	42.30	3.2	9/11/08 17:50	Near Bottom
LS16	Reference	BH0822BE	42.70	3.17	9/11/08 17:50	Mid Depth
SH31	Ship Passage	BH0822CB	46.60	4.81	9/11/08 18:29	Near Bottom
SH31	Ship Passage	BH0822CC	47.20	3.86	9/11/08 18:30	Mid Depth
MF21	Plume Centroid	BH0822D7	16.10	3.25	9/11/08 19:32	Near Bottom
MF21	Plume Centroid	BH0822D8	16.10	2.6	9/11/08 19:32	Mid Depth
MF22	Lateral Extent	BH0822E5	17.10	1.73	9/11/08 19:40	Near Bottom
MF22	Lateral Extent	BH0822E6	16.70	1.73	9/11/08 19:41	Mid Depth
MF23	Lateral Extent	BH0822EF	48.90	7.94	9/11/08 19:49	Near Bottom
MF23	Lateral Extent	BH0822F0	37.70	4.89	9/11/08 19:50	Mid Depth
MF24	Plume Down Current	BH0822F9	14.40	6.87	9/11/08 19:57	Near Bottom
MF24	Plume Down Current	BH0822FA	14.80	8.51	9/11/08 19:58	Mid Depth
MF25	Reference	BH082305	50.50	4.14	9/11/08 20:08	Near Bottom
MF25	Reference	BH082306	49.20	3.5	9/11/08 20:09	Mid Depth
MF26	Reference	BH082311	47.60	4.75	9/11/08 20:21	Near Bottom
MF26	Reference	BH082312	49.20	3.02	9/11/08 20:22	Mid Depth
Lower Harbor Dredge Monitoring 12-Sept-08						
LS21	Plume Centroid	BH08234A	36.70	7.53	9/12/08 15:24	Near Bottom
LS21	Plume Centroid	BH08234B	37.70	14.1	9/12/08 15:24	Mid Depth
LS22	Lateral Extent	BH082356	37.40	4.23	9/12/08 15:34	Near Bottom
LS22	Lateral Extent	BH082357	37.70	6.22	9/12/08 15:35	Mid Depth
LS23	Lateral Extent	BH082360	19.40	2.67	9/12/08 15:43	Near Bottom
LS23	Lateral Extent	BH082361	19.40	2.68	9/12/08 15:43	Mid Depth
LS24	Plume Down Current	BH08236B	35.80	2.6	9/12/08 15:59	Near Bottom
LS24	Plume Down Current	BH08236C	35.10	2.82	9/12/08 16:00	Mid Depth
LS25	Reference	BH082375	43.60	3.55	9/12/08 16:07	Near Bottom
LS25	Reference	BH082376	44.30	2.94	9/12/08 16:08	Mid Depth
LS26	Reference	BH082380	32.80	5.87	9/12/08 16:40	Near Bottom
LS26	Reference	BH082381	34.80	3.85	9/12/08 16:40	Mid Depth

Appendix 5

Laboratory TSS Results

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SAMP_ID	ANALYSIS_METH	LAB_QC_CODE	DILUTION	ANALYTE	VALUE	LAB_QUAL	DETECT_LIMIT	UNIT	ANALYSIS_DATE
BH082062TS1	160.2	SA	1	TSS - Membrane	12.2		1.00	MG/L	09/12/2008
BH082062TS1DUP	160.2	DUP	1	TSS - Membrane	12.3		1.00	MG/L	09/12/2008
BH082063TS1	160.2	SA	1	TSS - Membrane	17.5		1.00	MG/L	09/12/2008
BH082063TS2	160.2	SA	1	TSS - Membrane	16.3		1.00	MG/L	09/12/2008
BH082066TS1	160.2	SA	1	TSS - Membrane	2.30		1.00	MG/L	09/12/2008
BH082073TS1	160.2	SA	1	TSS - Membrane	2.20		1.00	MG/L	09/12/2008
BH082074TS1	160.2	SA	1	TSS - Membrane	3.30		1.00	MG/L	09/12/2008
BH082075TS1	160.2	SA	1	TSS - Membrane	2.50		1.00	MG/L	09/12/2008
BH08207DTS1	160.2	SA	1	TSS - Membrane	3.30		1.00	MG/L	09/12/2008
BH08207ETS1	160.2	SA	1	TSS - Membrane	3.30		1.00	MG/L	09/12/2008
BH08207FTS1	160.2	SA	1	TSS - Membrane	3.70		1.00	MG/L	09/12/2008
BH082087TS1	160.2	SA	1	TSS - Membrane	4.30		1.00	MG/L	09/12/2008
BH082088TS1	160.2	SA	1	TSS - Membrane	3.00		1.00	MG/L	09/12/2008
BH082089TS1	160.2	SA	1	TSS - Membrane	4.00		1.00	MG/L	09/12/2008
BH082091TS1	160.2	SA	1	TSS - Membrane	1.70		1.00	MG/L	09/12/2008
BH082092TS1	160.2	SA	1	TSS - Membrane	2.70		1.00	MG/L	09/12/2008
BH082093TS1	160.2	SA	1	TSS - Membrane	1.70		1.00	MG/L	09/12/2008
BH08209BTS1	160.2	SA	1	TSS - Membrane	5.30		1.00	MG/L	09/12/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/12/2008
	160.2	LCS	1	TSS - Membrane	89.0			PCT_REC	09/12/2008
BH08209CTS1	160.2	SA	1	TSS - Membrane	3.00		1.00	MG/L	09/12/2008
BH08209CTS1DUP	160.2	DUP	1	TSS - Membrane	3.30		1.00	MG/L	09/12/2008
BH08209DTS1	160.2	SA	1	TSS - Membrane	2.80		1.00	MG/L	09/12/2008
BH0820ACTS1	160.2	SA	1	TSS - Membrane	24.2		1.00	MG/L	09/12/2008
BH0820ADTS1	160.2	SA	1	TSS - Membrane	26.8		1.00	MG/L	09/12/2008
BH0820D0TS1	160.2	SA	1	TSS - Membrane	32.0		1.00	MG/L	09/12/2008
BH0820D1TS1	160.2	SA	1	TSS - Membrane	28.7		1.00	MG/L	09/12/2008
BH0820E9TS1	160.2	SA	1	TSS - Membrane	68.3		1.00	MG/L	09/12/2008
BH0820EATS1	160.2	SA	1	TSS - Membrane	42.2		1.00	MG/L	09/12/2008
BH0820EBTS1	160.2	SA	1	TSS - Membrane	23.3		1.00	MG/L	09/12/2008
BH0820F5TS1	160.2	SA	1	TSS - Membrane	45.6		1.00	MG/L	09/12/2008
BH0820F6TS1	160.2	SA	1	TSS - Membrane	14.2		1.00	MG/L	09/12/2008
BH0820FETS1	160.2	SA	1	TSS - Membrane	39.3		1.00	MG/L	09/12/2008
BH0820FETS2	160.2	SA	1	TSS - Membrane	43.4		1.00	MG/L	09/12/2008
BH0820FFTS1	160.2	SA	1	TSS - Membrane	29.0		1.00	MG/L	09/12/2008
BH082100TS1	160.2	SA	1	TSS - Membrane	14.7		1.00	MG/L	09/12/2008
BH082108TS1	160.2	SA	1	TSS - Membrane	9.20		1.00	MG/L	09/12/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/12/2008
	160.2	LCS	1	TSS - Membrane	102			PCT_REC	09/12/2008
BH082109TS1	160.2	SA	1	TSS - Membrane	13.2		1.00	MG/L	09/15/2008
BH082109TS1DUP	160.2	DUP	1	TSS - Membrane	13.7		1.00	MG/L	09/15/2008
BH08210ATS1	160.2	SA	1	TSS - Membrane	9.30		1.00	MG/L	09/15/2008
BH082112TS1	160.2	SA	1	TSS - Membrane	11.2		1.00	MG/L	09/15/2008
BH082113TS1	160.2	SA	1	TSS - Membrane	5.50		1.00	MG/L	09/15/2008
BH082114TS1	160.2	SA	1	TSS - Membrane	5.50		1.00	MG/L	09/15/2008
BH08211CTS1	160.2	SA	1	TSS - Membrane	4.20		1.00	MG/L	09/15/2008
BH08211DTS1	160.2	SA	1	TSS - Membrane	4.00		1.00	MG/L	09/15/2008
BH08211ETS1	160.2	SA	1	TSS - Membrane	3.50		1.00	MG/L	09/15/2008
BH082146TS1	160.2	SA	1	TSS - Membrane	9.00		1.00	MG/L	09/15/2008

SAMP_ID	ANALYSIS_METH	LAB_QC_CODE	DILUTION	ANALYTE	VALUE	LAB_QUAL	DETECT_LIMIT	UNIT	ANALYSIS_DATE
BH082147TS1	160.2	SA	1	TSS - Membrane	12.2		1.00	MG/L	09/15/2008
BH082148TS1	160.2	SA	1	TSS - Membrane	10.2		1.00	MG/L	09/15/2008
BH082150TS1	160.2	SA	1	TSS - Membrane	3.30		1.00	MG/L	09/15/2008
BH082151TS1	160.2	SA	1	TSS - Membrane	5.20		1.00	MG/L	09/15/2008
BH082152TS1	160.2	SA	1	TSS - Membrane	6.80		1.00	MG/L	09/15/2008
BH08215ATS1	160.2	SA	1	TSS - Membrane	4.80		1.00	MG/L	09/15/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/15/2008
	160.2	LCS	1	TSS - Membrane	103			PCT_REC	09/15/2008
BH08215BTS1	160.2	SA	1	TSS - Membrane	17.7		1.00	MG/L	09/15/2008
BH08215BTS1DUP	160.2	DUP	1	TSS - Membrane	19.5		1.00	MG/L	09/15/2008
BH08215CTS1	160.2	SA	1	TSS - Membrane	6.20		1.00	MG/L	09/15/2008
BH082164TS1	160.2	SA	1	TSS - Membrane	8.20		1.00	MG/L	09/15/2008
BH082165TS1	160.2	SA	1	TSS - Membrane	6.20		1.00	MG/L	09/15/2008
BH082165TS2	160.2	SA	1	TSS - Membrane	4.80		1.00	MG/L	09/15/2008
BH082166TS1	160.2	SA	1	TSS - Membrane	6.20		1.00	MG/L	09/15/2008
BH08216ETS1	160.2	SA	1	TSS - Membrane	7.50		1.00	MG/L	09/15/2008
BH08216FTS1	160.2	SA	1	TSS - Membrane	5.30		1.00	MG/L	09/15/2008
BH082170TS1	160.2	SA	1	TSS - Membrane	3.30		1.00	MG/L	09/15/2008
BH082181TS1	160.2	SA	1	TSS - Membrane	7.80		1.00	MG/L	09/15/2008
BH082182TS1	160.2	SA	1	TSS - Membrane	6.50		1.00	MG/L	09/15/2008
BH082183TS1	160.2	SA	1	TSS - Membrane	7.80		1.00	MG/L	09/15/2008
BH08219ETS1	160.2	SA	1	TSS - Membrane	8.20		1.00	MG/L	09/15/2008
BH08219FTS1	160.2	SA	1	TSS - Membrane	15.7		1.00	MG/L	09/15/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/15/2008
	160.2	LCS	1	TSS - Membrane	100			PCT_REC	09/15/2008
BH08225DTS1	160.2	SA	1	TSS - Membrane	9.60		1.00	MG/L	09/16/2008
BH08225DTS1DUP	160.2	DUP	1	TSS - Membrane	9.20		1.00	MG/L	09/16/2008
BH08225ETS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/16/2008
BH082268TS1	160.2	SA	1	TSS - Membrane	10.2		1.00	MG/L	09/16/2008
BH082269TS1	160.2	SA	1	TSS - Membrane	8.30		1.00	MG/L	09/16/2008
BH08226ATS1	160.2	SA	1	TSS - Membrane	5.80		1.00	MG/L	09/16/2008
BH082288TS1	160.2	SA	1	TSS - Membrane	9.00		1.00	MG/L	09/16/2008
BH082289TS1	160.2	SA	1	TSS - Membrane	9.80		1.00	MG/L	09/16/2008
BH08228BTS1	160.2	SA	1	TSS - Membrane	8.80		1.00	MG/L	09/16/2008
BH082293TS1	160.2	SA	1	TSS - Membrane	8.00		1.00	MG/L	09/16/2008
BH082294TS1	160.2	SA	1	TSS - Membrane	7.20		1.00	MG/L	09/16/2008
BH082295TS1	160.2	SA	1	TSS - Membrane	4.20		1.00	MG/L	09/16/2008
BH08229FTS1	160.2	SA	1	TSS - Membrane	6.70		1.00	MG/L	09/16/2008
BH08229FTS2	160.2	SA	1	TSS - Membrane	7.00		1.00	MG/L	09/16/2008
BH0822A0TS1	160.2	SA	1	TSS - Membrane	5.00		1.00	MG/L	09/16/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/16/2008
	160.2	LCS	1	TSS - Membrane	91.0			PCT_REC	09/16/2008
BH0821A0TS1	160.2	SA	1	TSS - Membrane	40.6		1.00	MG/L	09/16/2008
BH0821A0TS1DUP	160.2	DUP	1	TSS - Membrane	40.0		1.00	MG/L	09/16/2008
BH0821A8TS1	160.2	SA	1	TSS - Membrane	7.00		1.00	MG/L	09/16/2008
BH0821A9TS1	160.2	SA	1	TSS - Membrane	9.30		1.00	MG/L	09/16/2008
BH0821AATS1	160.2	SA	1	TSS - Membrane	5.30		1.00	MG/L	09/16/2008
BH0821B2TS1	160.2	SA	1	TSS - Membrane	13.5		1.00	MG/L	09/16/2008
BH0821B3TS1	160.2	SA	1	TSS - Membrane	10.2		1.00	MG/L	09/16/2008

SAMP_ID	ANALYSIS_METH	LAB_QC_CODE	DILUTION	ANALYTE	VALUE	LAB_QUAL	DETECT_LIMIT	UNIT	ANALYSIS_DATE
BH0821B4TS1	160.2	SA	1	TSS - Membrane	9.00		1.00	MG/L	09/16/2008
BH0821BFTS1	160.2	SA	1	TSS - Membrane	8.70		1.00	MG/L	09/16/2008
BH0821C0TS1	160.2	SA	1	TSS - Membrane	9.80		1.00	MG/L	09/16/2008
BH0821C1TS1	160.2	SA	1	TSS - Membrane	9.80		1.00	MG/L	09/16/2008
BH0821C1TS2	160.2	SA	1	TSS - Membrane	8.30		1.00	MG/L	09/16/2008
BH0821C9TS1	160.2	SA	1	TSS - Membrane	10.7		1.00	MG/L	09/16/2008
BH0821CATS1	160.2	SA	1	TSS - Membrane	9.30		1.00	MG/L	09/16/2008
BH0821CBTS1	160.2	SA	1	TSS - Membrane	5.50		1.00	MG/L	09/16/2008
BH0821D5TS1	160.2	SA	1	TSS - Membrane	6.30		1.00	MG/L	09/16/2008
BH0821D6TS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/16/2008
BH0821D7TS1	160.2	SA	1	TSS - Membrane	5.50		1.00	MG/L	09/16/2008
BH0821FBTS1	160.2	SA	1	TSS - Membrane	29.5		1.00	MG/L	09/16/2008
BH0821FCTS1	160.2	SA	1	TSS - Membrane	13.5		1.00	MG/L	09/16/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/16/2008
	160.2	LCS	1	TSS - Membrane	87.0			PCT_REC	09/16/2008
BH08222FTS1	160.2	SA	1	TSS - Membrane	36.2		1.00	MG/L	09/16/2008
BH08222FTS1DUP	160.2	DUP	1	TSS - Membrane	40.7		1.00	MG/L	09/16/2008
BH082230TS1	160.2	SA	1	TSS - Membrane	31.7		1.00	MG/L	09/16/2008
BH082231TS1	160.2	SA	1	TSS - Membrane	18.3		1.00	MG/L	09/16/2008
BH082239TS1	160.2	SA	1	TSS - Membrane	7.20		1.00	MG/L	09/16/2008
BH08223ATS1	160.2	SA	1	TSS - Membrane	8.20		1.00	MG/L	09/16/2008
BH08223BTS1	160.2	SA	1	TSS - Membrane	9.00		1.00	MG/L	09/16/2008
BH082248TS1	160.2	SA	1	TSS - Membrane	7.20		1.00	MG/L	09/16/2008
BH082249TS1	160.2	SA	1	TSS - Membrane	6.80		1.00	MG/L	09/16/2008
BH08224ATS1	160.2	SA	1	TSS - Membrane	4.50		1.00	MG/L	09/16/2008
BH082252TS1	160.2	SA	1	TSS - Membrane	7.00		1.00	MG/L	09/16/2008
BH082253TS1	160.2	SA	1	TSS - Membrane	20.2		1.00	MG/L	09/16/2008
BH082253TS2	160.2	SA	1	TSS - Membrane	14.8		1.00	MG/L	09/16/2008
BH082254TS1	160.2	SA	1	TSS - Membrane	13.2		1.00	MG/L	09/16/2008
BH08225CTS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/16/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/16/2008
	160.2	LCS	1	TSS - Membrane	89.0			PCT_REC	09/16/2008
BH0822D9TS1	160.2	SA	1	TSS - Membrane	20.8		1.00	MG/L	09/18/2008
BH0822D9TS1DUP	160.2	DUP	1	TSS - Membrane	19.0		1.00	MG/L	09/18/2008
BH0822E5TS1	160.2	SA	1	TSS - Membrane	5.70		1.00	MG/L	09/18/2008
BH0822E6TS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/18/2008
BH0822E7TS1	160.2	SA	1	TSS - Membrane	4.30		1.00	MG/L	09/18/2008
BH0822EFTS1	160.2	SA	1	TSS - Membrane	26.0		1.00	MG/L	09/18/2008
BH0822F0TS1	160.2	SA	1	TSS - Membrane	17.0		1.00	MG/L	09/18/2008
BH0822F1TS1	160.2	SA	1	TSS - Membrane	9.20		1.00	MG/L	09/18/2008
BH0822F9TS1	160.2	SA	1	TSS - Membrane	20.5		1.00	MG/L	09/18/2008
BH0822FATS1	160.2	SA	1	TSS - Membrane	20.8		1.00	MG/L	09/18/2008
BH0822FBTS1	160.2	SA	1	TSS - Membrane	21.8		1.00	MG/L	09/18/2008
BH082305TS1	160.2	SA	1	TSS - Membrane	8.70		1.00	MG/L	09/18/2008
BH082306TS1	160.2	SA	1	TSS - Membrane	9.20		1.00	MG/L	09/18/2008
BH082307TS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/18/2008
BH082311TS1	160.2	SA	1	TSS - Membrane	16.8		1.00	MG/L	09/18/2008
BH082312TS1	160.2	SA	1	TSS - Membrane	7.70		1.00	MG/L	09/18/2008
BH082312TS2	160.2	SA	1	TSS - Membrane	7.50		1.00	MG/L	09/18/2008

SAMP_ID	ANALYSIS_METH	LAB_QC_CODE	DILUTION	ANALYTE	VALUE	LAB_QUAL	DETECT_LIMIT	UNIT	ANALYSIS_DATE
BH082313TS1	160.2	SA	1	TSS - Membrane	25.9		1.00	MG/L	09/18/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/18/2008
	160.2	LCS	1	TSS - Membrane	87.0			PCT_REC	09/18/2008
BH0822A1TS2	160.2	SA	1	TSS - Membrane	18.1		1.00	MG/L	09/18/2008
BH0822A1TS2DUP	160.2	DUP	1	TSS - Membrane	16.6		1.00	MG/L	09/18/2008
BH0822A9TS1	160.2	SA	1	TSS - Membrane	6.30		1.00	MG/L	09/18/2008
BH0822AATS1	160.2	SA	1	TSS - Membrane	10.7		1.00	MG/L	09/18/2008
BH0822ABTS1	160.2	SA	1	TSS - Membrane	45.3		1.00	MG/L	09/18/2008
BH0822B3TS1	160.2	SA	1	TSS - Membrane	12.0		1.00	MG/L	09/18/2008
BH0822B4TS1	160.2	SA	1	TSS - Membrane	6.80		1.00	MG/L	09/18/2008
BH0822B5TS1	160.2	SA	1	TSS - Membrane	3.00		1.00	MG/L	09/18/2008
BH0822BDTS1	160.2	SA	1	TSS - Membrane	15.3		1.00	MG/L	09/18/2008
BH0822BETS1	160.2	SA	1	TSS - Membrane	7.30		1.00	MG/L	09/18/2008
BH0822BFTS1	160.2	SA	1	TSS - Membrane	7.80		1.00	MG/L	09/18/2008
BH0822CBTS1	160.2	SA	1	TSS - Membrane	16.2		1.00	MG/L	09/18/2008
BH0822CCTS1	160.2	SA	1	TSS - Membrane	18.7		1.00	MG/L	09/18/2008
BH0822D7TS1	160.2	SA	1	TSS - Membrane	10.8		1.00	MG/L	09/18/2008
BH0822D8TS1	160.2	SA	1	TSS - Membrane	11.3		1.00	MG/L	09/18/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/18/2008
	160.2	LCS	1	TSS - Membrane	93.0			PCT_REC	09/18/2008
BH08234ATS1	160.2	SA	1	TSS - Membrane	37.6		1.00	MG/L	09/19/2008
BH08234ATS1DUP	160.2	DUP	1	TSS - Membrane	33.9		1.00	MG/L	09/19/2008
BH08234BTS1	160.2	SA	1	TSS - Membrane	41.8		1.00	MG/L	09/19/2008
BH08234BTS2	160.2	SA	1	TSS - Membrane	42.3		1.00	MG/L	09/19/2008
BH08234CTS1	160.2	SA	1	TSS - Membrane	46.8		1.00	MG/L	09/19/2008
BH082356TS1	160.2	SA	1	TSS - Membrane	15.2		1.00	MG/L	09/19/2008
BH082357TS1	160.2	SA	1	TSS - Membrane	16.8		1.00	MG/L	09/19/2008
BH082358TS1	160.2	SA	1	TSS - Membrane	10.7		1.00	MG/L	09/19/2008
BH082360TS1	160.2	SA	1	TSS - Membrane	6.20		1.00	MG/L	09/19/2008
BH082361TS1	160.2	SA	1	TSS - Membrane	6.20		1.00	MG/L	09/19/2008
BH082363TS1	160.2	SA	1	TSS - Membrane	6.30		1.00	MG/L	09/19/2008
BH08236BTS1	160.2	SA	1	TSS - Membrane	7.70		1.00	MG/L	09/19/2008
BH08236CTS1	160.2	SA	1	TSS - Membrane	7.80		1.00	MG/L	09/19/2008
BH08236DTS1	160.2	SA	1	TSS - Membrane	10.2		1.00	MG/L	09/19/2008
BH082375TS1	160.2	SA	1	TSS - Membrane	9.00		1.00	MG/L	09/19/2008
BH082376TS1	160.2	SA	1	TSS - Membrane	6.00		1.00	MG/L	09/19/2008
BH082377TS1	160.2	SA	1	TSS - Membrane	8.80		1.00	MG/L	09/19/2008
BH082380TS1	160.2	SA	1	TSS - Membrane	36.7		1.00	MG/L	09/19/2008
BH082381TS1	160.2	SA	1	TSS - Membrane	10.4		1.00	MG/L	09/19/2008
BH082382TS1	160.2	SA	1	TSS - Membrane	8.00		1.00	MG/L	09/19/2008
	160.2	MB	1	TSS - Membrane	1.00	U	1.00	MG/L	09/19/2008
	160.2	LCS	1	TSS - Membrane	102			PCT_REC	09/19/2008