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New England District

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Delivery Order No. 44

January 2009

October 27-29, 2008
Field Survey Report

BOSTON HARBOR INNER HARBOR MAINTENANCE DREDGING PROJECT DISPOSAL PLUME MONITORING

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OCTOBER 27-28 2008
FIELD SURVEY REPORT

BOSTON HARBOR INNER HARBOR MAINTENANCE DREDGING PROJECT
DISPOSAL PLUME MONITORING

Submitted to:

Department of the Army
U.S. Army Corps of Engineers
North Atlantic Division
New England District

Contract Number: DACW33-03-D-0004
Delivery Order Number: 44

Prepared by:

Paul Dragos
Battelle
397 Washington Street
Duxbury, MA 02332
(781) 934-0571

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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 (USACE), New England District (NAE) to support a maintenance dredging project for the Boston Harbor Inner Harbor, Boston, Massachusetts. This field report includes a description of work performed during water quality monitoring conducted during disposal of material dredged from the lower portion of the Federal Channel project into the Mystic River Confined Aquatic Deposal (CAD) cell (Figure 1 and Figure 2). This is the fourth Field Report generated for this delivery order; it describes field activities and preliminary results for the survey conducted on October 27-28, 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, the USACE has conducted 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 CAD cell in the Mystic River and the removal of the silty layer over another potential 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 are 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 cell(s), 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 as per the conditions of the Water Quality Certification (WQC) issued for this project. The WQC requires that total suspended solids (TSS) and turbidity be monitored during a minimum of five disposal events. This field operation monitored the disposal plume for the last two required disposal monitoring events. That is, when the CAD cell is 90% full. The turbidity performance goal is $\leq$50 NTU's above background levels, 500 feet down current of the disposal cell, in the densest portion of the plume.

Another monitoring effort was conducted, which was not a requirement of the WQC, to determine if particular, sediment resuspension, transport, and subsequent deposition on potential winter flounder spawning grounds is occurring. These spawning grounds have been identified by the resource agencies as an environmental concern (Figure 2). 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 in real-time migration of dredged material plumes resulting from disposal operations. This information was available to make operational adjustments during disposal operations as may have been necessary to minimize

impacts either to water quality or sediment transport to potential winter flounder spawning habitat.

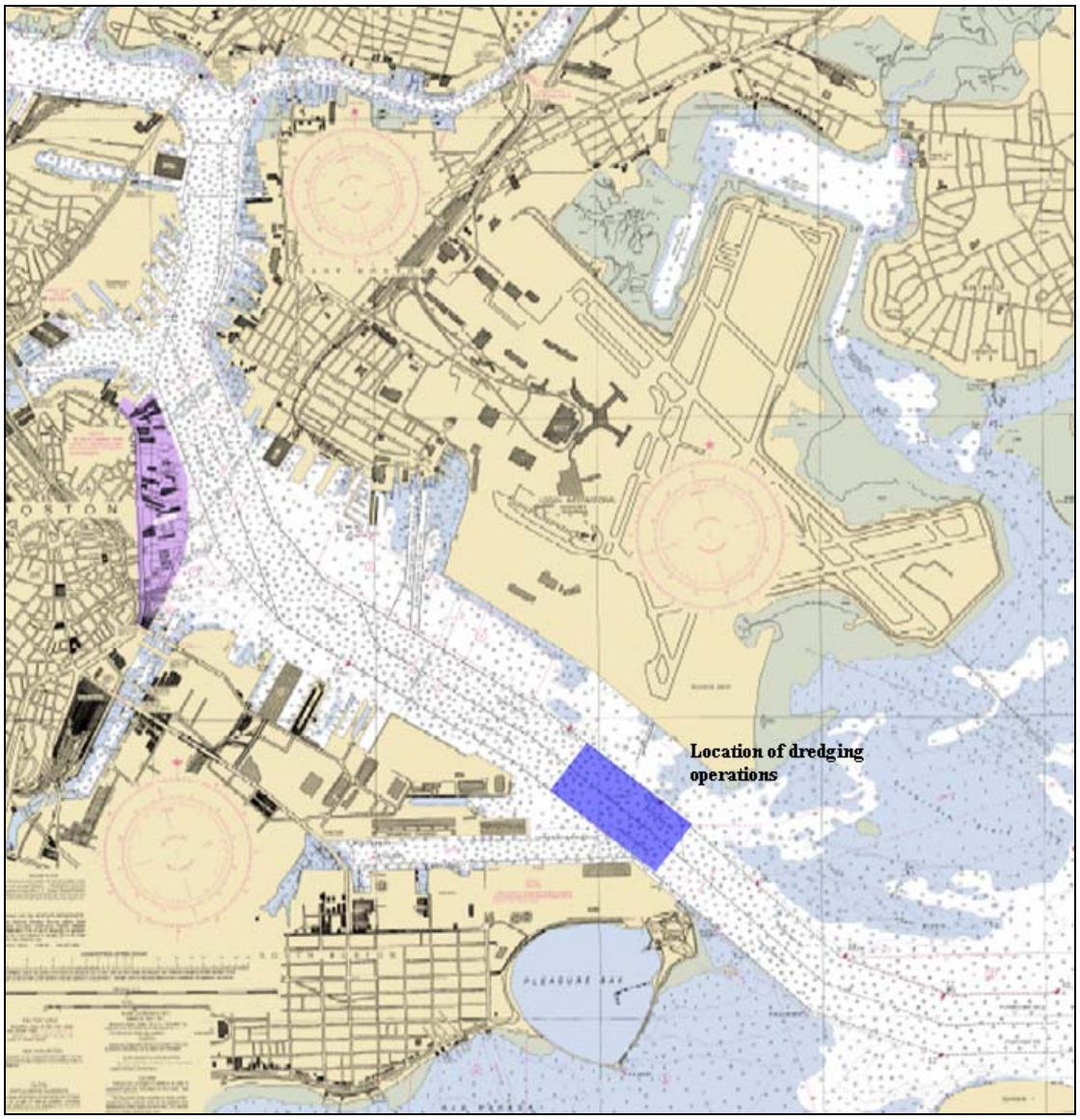

Figure 1. Site Map showing Boston Inner Harbor and the dredging location during the survey in the lower portion of the Federal Channel

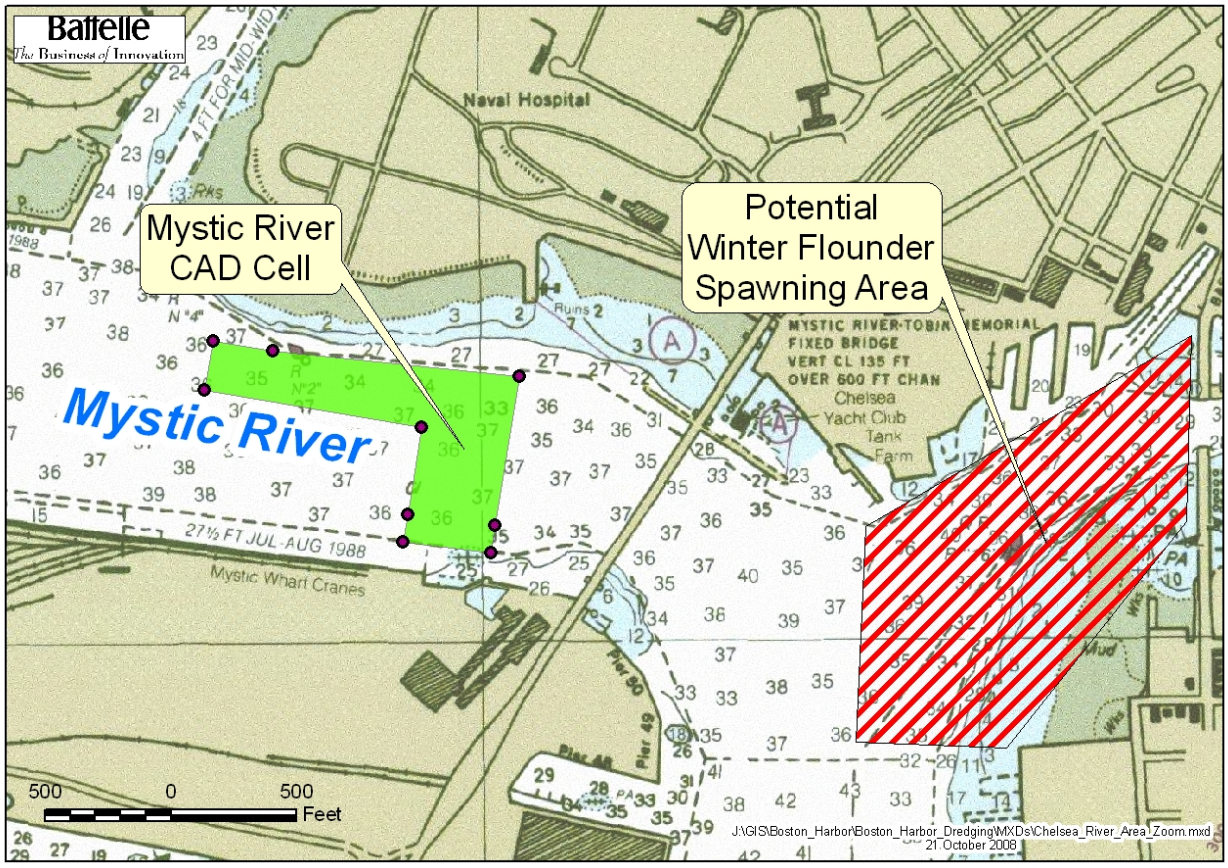

Figure 2. Map of Inner Harbor Confluence Area Showing the Mystic River CAD Cell and Potential Winter Flounder Spawning Area.

1.3 Field Activity Summary

Water quality monitoring was conducted in Boston Harbor's Inner Harbor in the vicinity of the CAD cell located in the Mystic River near the confluence of the Mystic and Chelsea Rivers (Figure 2). All planned field monitoring activities were completed during the placement of dredged material into the CAD cell near slack tide (Figure 3). This included plume tracking and turbidity monitoring during two disposal events. Dredged material plumes were observed during each monitoring event. Turbidity values never exceeded the established threshold criteria[1] and consequently no monitoring exceedance protocols were initiated. All planned samples were collected for laboratory TSS analysis.

Monitoring was performed during two scow releases on October 27 and 28, 2008. The first release occurred after shortly after evening low slack (LS) on October 27 and the second around midday high slack (HS) on October 28. The releases occurred, as required, during the period from 1 hour before to 2 hours after slack tide. Table 1 presents a list of on-site field personnel during the survey. This field report describes field sampling activities and provides a synopsis of

[1] Dredged material plume turbidity greater than 50 NTU above background 500 ft up or down channel from the CAD cell or migration of the plume to areas outside the navigation channel (>25 NTU above background in less than 25 feet depth).

some preliminary observations from the survey. A description of survey methods is provided in Section 2. A chronological summary of survey activities 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 Disposal Plume Monitoring at the Mystic River CAD cell, October 27-28, 2008.

Responsibility	Low Slack 10/27/2008	High Slack 10/28/2008
Chief Scientist	Paul Dragos	Matt Fitzpatrick
Lead Technician	Patrick Curran	Patrick Curran
NAVSAM Operator	Matt Fitzpatrick	Bob Mandeville
Vessel Captain	Bob Carr	Bob Carr

Figure 3. Split Hull Scow Placing Dredged Material into the Mystic River CAD Cell.

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/rosette sampler and 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 an approximation of suspended sediment concentration, at 0.5 meter vertical intervals throughout the water column. ADCP measurements are made while the vessel is underway. As the vessel ran transects across the 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 vertical profile locations. The disposal plumes dissipated quickly. Accordingly, vessel track was determined on-the-fly to maximize the plume coverage and not all planned transects were occupied. Table 2 presents a summary of ADCP transects performed.

The ADCP is designed (and is more typically used) to measure current speed and direction and so the ADCP was also used to provide estimates of the current velocity at the same locations throughout the water column in real-time. The resulting tidal current speed and direction information was used during the survey to plan the plume survey ship tracks and reference locations.

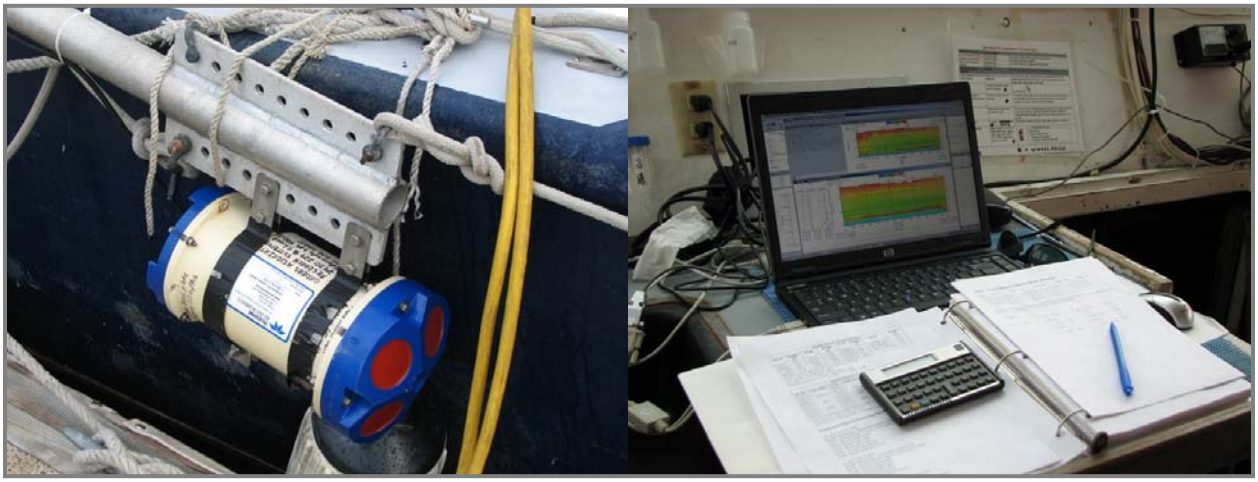

Figure 4. RD Instruments 1200khz Workhorse Sentinel ADCP Mounted on the Battelle R/V *Aquamonitor* and ADCP Real-Time Display / Data Collection Laptop.

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 5) 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 turbidity range (0– 25, 0–125, and 0–500 NTU).

Table 2. Type and Approximate Locations of ADCP Transects.

Tide Stage[a]	Predicted Slack tide[b]	ADCP File ID	Route Start Time	Transect Type and Approximate Locations
LS (weak flood)	16:59	BH084-007	17:36	cross-channel 0, 500, 1000 ft down-current and 500 ft up-current
		BH084-008	17:47	along-channel transect
		BH084-014	18:10	cross-channel 1000 ft down-current
HS (slack)	11:24	BH084-023	12:00	cross-channel 250, 500 ft up-current and 500, 750, and 1000 ft down-current
		BH084-027	12:41	cross-channel 0, 250, 500 ft up-current and 250, 500, and 750 ft down-current

[a] HS = High Slack. LS = Low Slack.
[b] Predicted tides are for Charlestown, Charles River Ma.

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

Figure 6. LaMotte Model 2020e 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 two depths. The designated depths were near-bottom and at the turbidity maximum. If the turbidity maximum was near-bottom then the samples were collected near-bottom and 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 Rosette bottles was also transferred 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 configured to collect two separate readings from each sample and average the results. The result was transcribed onto the field data sheet.

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

Date	Type of Monitoring	Location	Monitoring Period	Number of Profile Stations	Number of TSS Samples (including 5%QC)	Total Number of Samples
10/27/2008	Disposal	Mystic CAD Cell	Low Slack	5	11	21
10/28/2008	Disposal	Mystic CAD Cell	High Slack	5	10	

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 on a dry-weight basis.

2.4 Deviations

There were no method deviations. Other deviations from planned activities are described in Section 5.

3.0 SURVEY CHRONOLOGY

Note: All times are recorded as Eastern Daylight Time

Mystic CAD Cell Disposal Monitoring: Friday, October 27, 2008

1330 Crew arrives at Hewitt's Cove Marina. Perform setup, system checks, navigation check.
1500 Depart Hewitt's Cove Marina.
1542 Pass dredge operating near airport.
1610 Arrive Mystic River CAD cell. Determine current direction and landmarks for preliminary grid.
1615 Begin Low Slack reference (background) sample collection.
1728 Scow releases dredged material. Scow slow to close and depart the area.
1736 ADCP transects begin once the scow is clear of the area. Current ebbing weakly.
1750 Begin CTD profiles and TSS/turbidity sample collection along the 500 ft transect.
1808 CTD profiles and TSS/turbidity sample collection completed.
1810 Begin additional transects at the 1000 ft down-current line.
1822 Low Slack monitoring complete. Depart for Hewitt's Cove Marina.

Mystic CAD Cell Disposal Monitoring: Friday, October 28, 2008

0915 Crew arrives at Hewitt's Cove Marina, begins setup, system checks, navigation check.
0945 Depart Hewitt's Cove Marina.
1045 Arrive Mystic River CAD cell. Determine current direction and landmarks for preliminary grid.
1104 Begin High Slack reference (background) sample collection.
1159 Scow releases dredged material and ADCP transects begin immediately. Current flooding weakly.
1218 Begin ADCP CTD profiles and TSS/turbidity sample collection along a transect approx 500 ft from point of release.
1234 CTD profiles and TSS/turbidity sample collection completed.

1241 Perform additional profile at approx point of release.
1300 High Slack monitoring complete. Depart for Hewitt's Cove Marina.
1405 Arrive Hewitt's Cove Marina, navigation check completed, demobilize.

4.0 SURVEY RESULTS

4.1 Field Observations

On October 27, 2008, one dredged material release occurred during morning LS at the Mystic River CAD cell. A survey was performed beginning approximately 8 minutes after disposal. The disposal plume was tracked using ADCP in the immediate vicinity of the release. A distinct signal was observed using the ADCP but the plume dissipated quickly (i.e. 40 minutes after disposal). The plume was observed using ADCP as far as approximately 1000 ft down-current of the release point within the channel. The plume was concentrated primarily within the northeast corner of the CAD cell over the lower half of the water column. Turbidity measured there using OBS was as high as 47 NTU above background near-bottom. On October 28, 2008, another release occurred during afternoon HS. The HS plume was again observed primarily within the northeast corner of the CAD cell over the lower half of the water column. Although, after the tide changed from flood to slack, the plume was observed at a lower concentration within the cell to the west of the point of release. Turbidity measured within the northeast corner of the cell soon after release was as high as 72 NTU above background near-bottom. Turbidity outside the CAD cell was much lower based on ADCP readings. No exceedances were observed outside the CAD cell during either release.

At the reference locations, the OBS profiles showed a background turbidity level of 3-4 NTU. A background value of 3 NTU was chosen as a conservative representation of the ambient turbidity.

No large vessels passed during the survey.

4.2 Results

CTD/Turbidity profiles and whole water samples were collected at each planned location during 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 (EDT)	Station Bathymetric Depth (ft)	Number of TSS Samples Collected
LS11	Reference	BH084006	-71.04583	42.38322	16:17	43.0	2
LS12	Reference	BH084009	-71.05434	42.38592	16:32	40.7	2
LS13	Plume Centroid at 500ft	BH084012	-71.05427	42.38642	17:52	42.3	2
LS14	N Lateral Extent at 500ft	BH084015	-71.05408	42.38683	17:59	41.0	2
LS15	S Lateral Extent at 500ft	BH084018	-71.05437	42.38620	18:07	42.3	2
HS11	Reference	BH084032	-71.05318	42.38608	11:09	57.4	2
HS12	Reference	BH084036	-71.04623	42.38448	11:18	52.5	2
HS13	Plume Centroid at 500ft	BH084047	-71.05355	42.38623	12:19	53[1]	2
HS14	N Lateral Extent at 500ft	BH084050	-71.05358	42.38680	12:25	48[1]	2
HS15	S Lateral Extent at 500ft	BH084053	-71.05375	42.38517	12:33	54[1]	2

[1] Bathymetric readings not available, bottom depth estimated from CTD pressure and altimeter.

5.0 PROBLEMS EXPERIENCED, ACTIONS TAKEN, AND RECOMMENDATIONS

5.1 Logistical

None.

5.2 Technical

The depth sounder experienced poor quality bathymetric readings sporadically during the high slack survey. As a result, it was necessary to estimate bottom depth from CTD pressure and altimeter readings for three of the stations.

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**: BH084

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

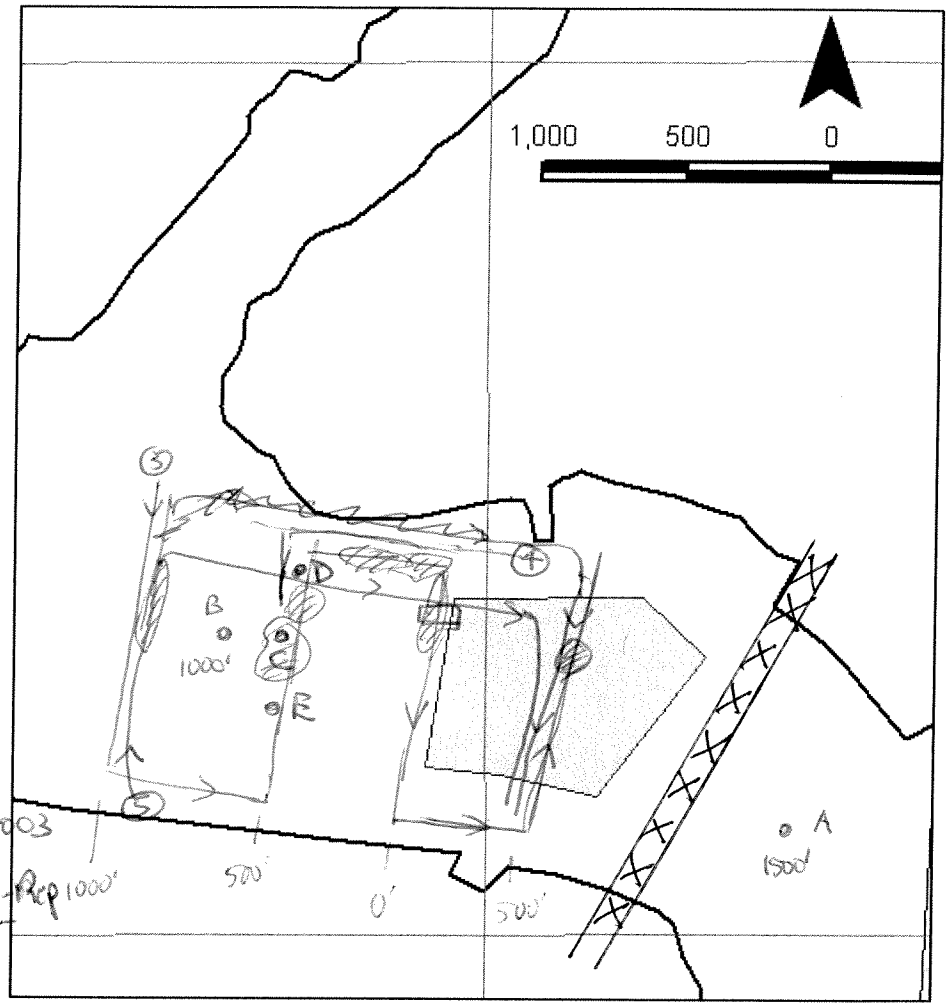
DATE (mm/dd/yy): 10-27-08 **INITIALS:** PMD **WEATHER:** Sunny, 65°, 5-10kt E

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

DREDGING ACTIVITY:

Dredging (Disposal)

☐ PC clocks Syn'ed



ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1609	BH084-002 Bkgd Vel
2	1626	-004 Bkg Vel.
	1728	Release
(3)	1736	007
(4)	1747	008
(5)	1810	-014

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	~~1615~~ 1615	Ref LS11 BH084-003
B	1629	Ref LS12 -005
C	1750	LS13 -Centroid 009 - Rep 1000'
D	1758	LS14-N Lat 011 -
		75NTU
E	1806	LS15 -S Lat 013

FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ ME @ LS @ 16:59 MF @

1330 Arrive Hewitts C. Remob Aqu. from NF Survey. Mob for Plume Tracking Test ADCP. Test Nav. Syn clocks. Cover off.
1500 Depart. 1542 Pass dredge operating near airport. 1610 Ref Profiles OBS 3-4' 1715 Posits jumping near corps ducks. 1728 Release. Tug slow to close scow to move. Centroid profiles oil slicks.
1822 Report for H.C.

DREDGE PLUME WATER QUALITY MONIORING FIELD LOG

BATTELLE **Survey ID**: BH084
Duxbury Project Number: G606444 **Project Title**: Boston Harbor Dredge Plume Monitoring

DATE (mm/dd/yy): 10/25/08 **INITIALS:** MRF **WEATHER:** rain NE wind ~15

MONITORING PERIOD (hh:mm) From: 1057 **To:** 1300 **TIDE STAGE** (HS) ME LS MF

DREDGING ACTIVITY:

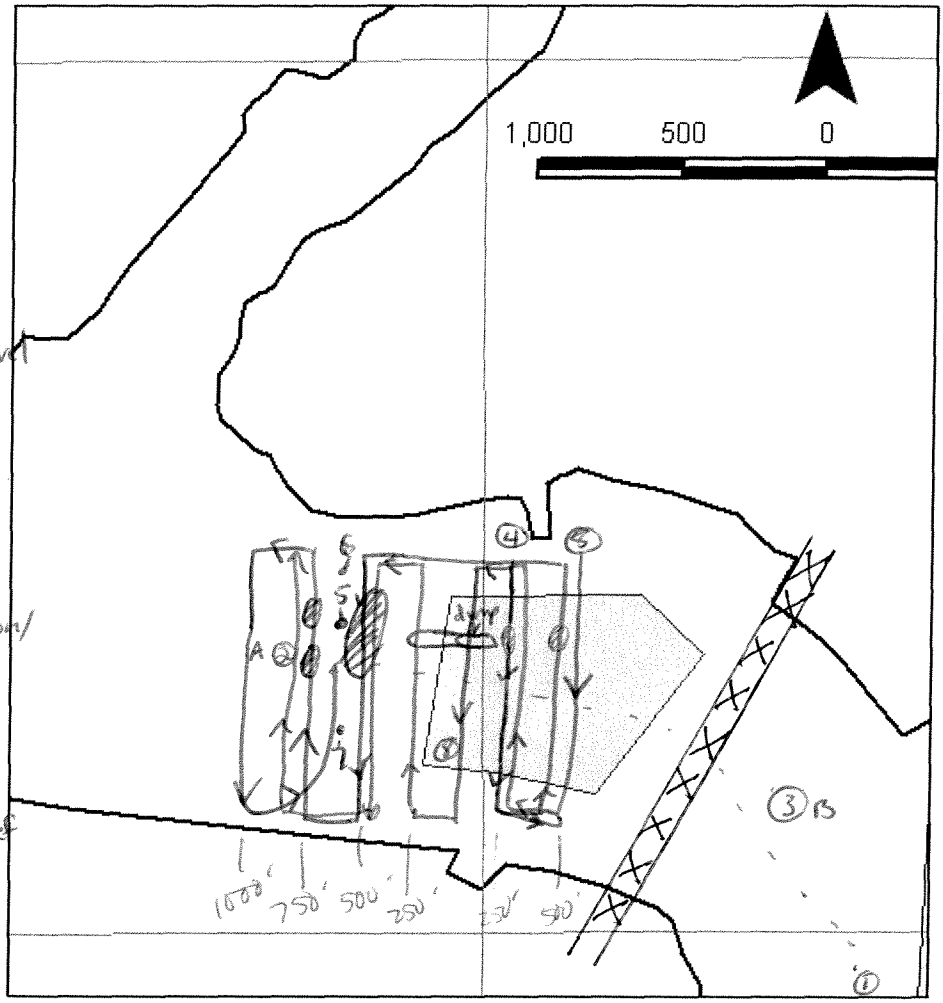
Dredging (Disposal)

ADCP TRANSECTS:

Map Ref	Time	File Name/Notes
1	1057	BH084 019 - Background vel
2	1106	BH084020 - HS17
3	1117	021 - HS12
		022 - back vel
4	1200	023
5	1218	024 HS13
6	1222	025 HS14
7	1230	026 HS15
8	1241	check plume dispersion/ sediment 027

CTD PROFILES:

Map Ref	Time	Station ID/Notes
A	1104	HS11 2.51/2.51 3 ref
B	1116	HS12 3.07/3.4
C	1215	HS13 centroid
D	1225	HS14 N. cut
E	1231	HS15 S. cut



FISH PASSAGE:

NOTES:

PREDICTED TIDES (stage @ hh:mm) HS @ 1124 ME @ LS @ MF @

0915 Arrive HCM + setup
0945 Depart HCM for survey area + synce clocks
1045 Arrive Survey Area
Dump @ 1159
1300 Depart for HCM
1405 Arrive HC

Appendix 2

Chain of Custody Records

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

Today's Date : 10/28/2008 2:10:48

Laboratory : Alpha Analytical

Chain-of-Custody # : BH084-TS-0002
Survey ID : BH084
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
	BH08400DTS1	10/27/2008 4:17:46 PM	LS11	E	☑	☑	☐
	BH08400ETS1	10/27/2008 4:18:12 PM	LS11	C	☑	☑	☐
	BH084016TS1	10/27/2008 4:32:15 PM	LS12	E	☑	☑	☐
	BH084017TS1	10/27/2008 4:32:51 PM	LS12	C	☑	☑	☐
	BH08401FTS1	10/27/2008 5:52:22 PM	LS13	E	☑	☑	☐
	BH08401FTS2	10/27/2008 5:52:22 PM	LS13	E	☑	☑	☐
	BH084020TS1	10/27/2008 5:52:47 PM	LS13	C	☑	☑	☐
	BH084026TS1	10/27/2008 5:59:58 PM	LS14	E	☑	☑	☐
	BH084027TS1	10/27/2008 6:00:31 PM	LS14	C	☑	☑	☐
	BH08402FTS1	10/27/2008 6:07:26 PM	LS15	E	☑	☑	☐
	BH084030TS1	10/27/2008 6:07:55 PM	LS15	C	☑	☑	☐
	BH084054TS1	10/28/2008 11:09:46 AM	HS11	E	☑	☑	☐
	BH084055TS1	10/28/2008 11:10:14 AM	HS11	C	☑	☑	☐
	BH084060TS1	10/28/2008 11:18:20 AM	HS12	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
10-28-08 16:00 Battelle	10/29/08 8:30 BDO
10/29/08 935 BDO	10/29/08 0935

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

Today's Date : 10/28/2008 2:10:48

Laboratory : Alpha Analytical

Chain-of-Custody # : BH084-TS-0002
Survey ID : BH084
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
	BH084061TS1	10/28/2008 11:18:48 AM	HS12	C	☑	☑	☐
	BH084086TS1	10/28/2008 12:19:50 PM	HS13	E	☑	☑	☐
	BH084087TS1	10/28/2008 12:20:18 PM	HS13	C	☑	☑	☐
	BH084090TS1	10/28/2008 12:25:55 PM	HS14	E	☑	☑	☐
	BH084091TS1	10/28/2008 12:26:21 PM	HS14	C	☑	☑	☐
	BH08409ATS1	10/28/2008 12:33:20 PM	HS15	E	☑	☑	☐
	BH08409BTS1	10/28/2008 12:34:00 PM	HS15	C	☑	☑	☐

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
10-28-08/16:00 Battelle	10/29/08 830 BDC
10/29/08 935 BDC	10/29/08 0935

Appendix 3

In situ CTD/Turbidity Profile Results

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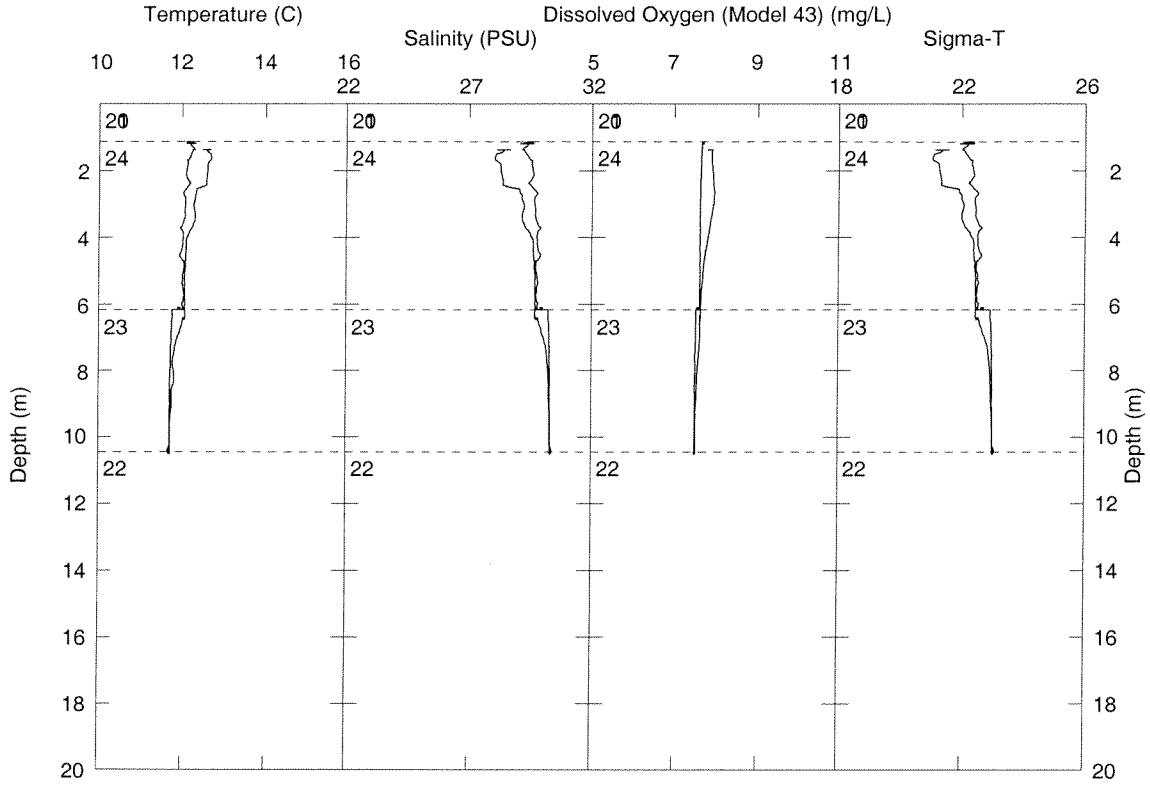

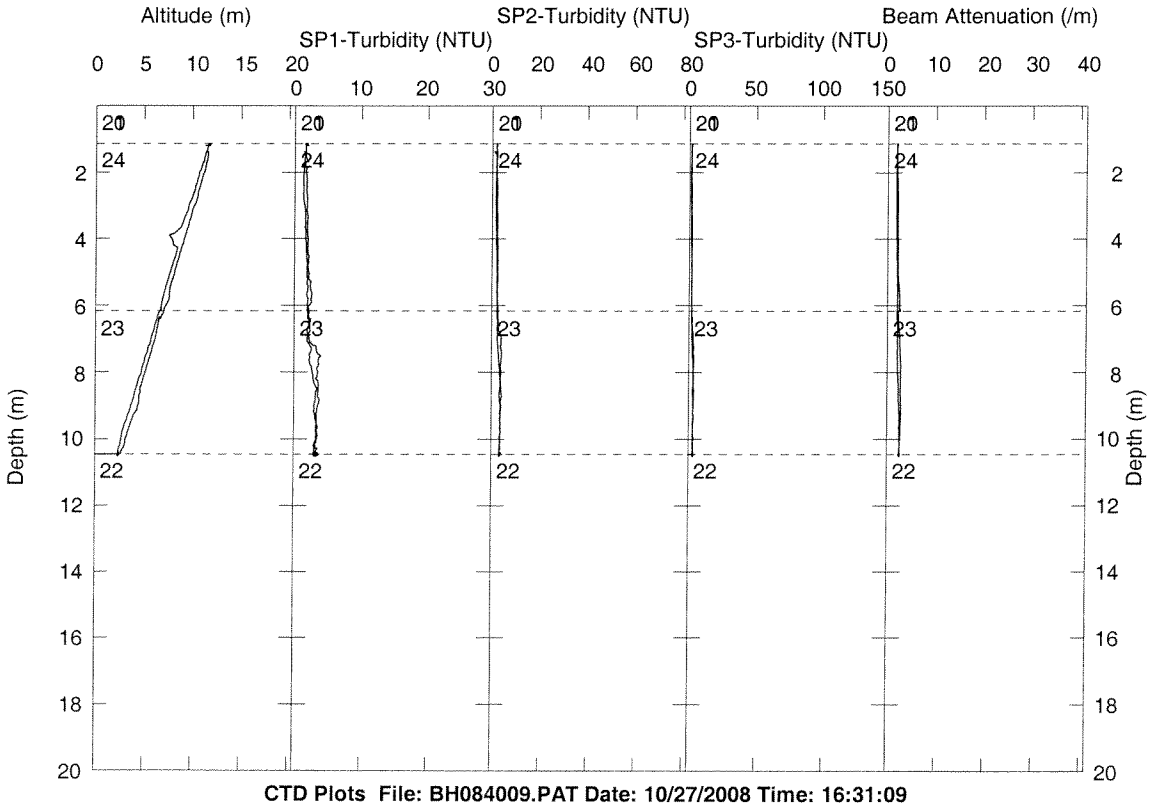

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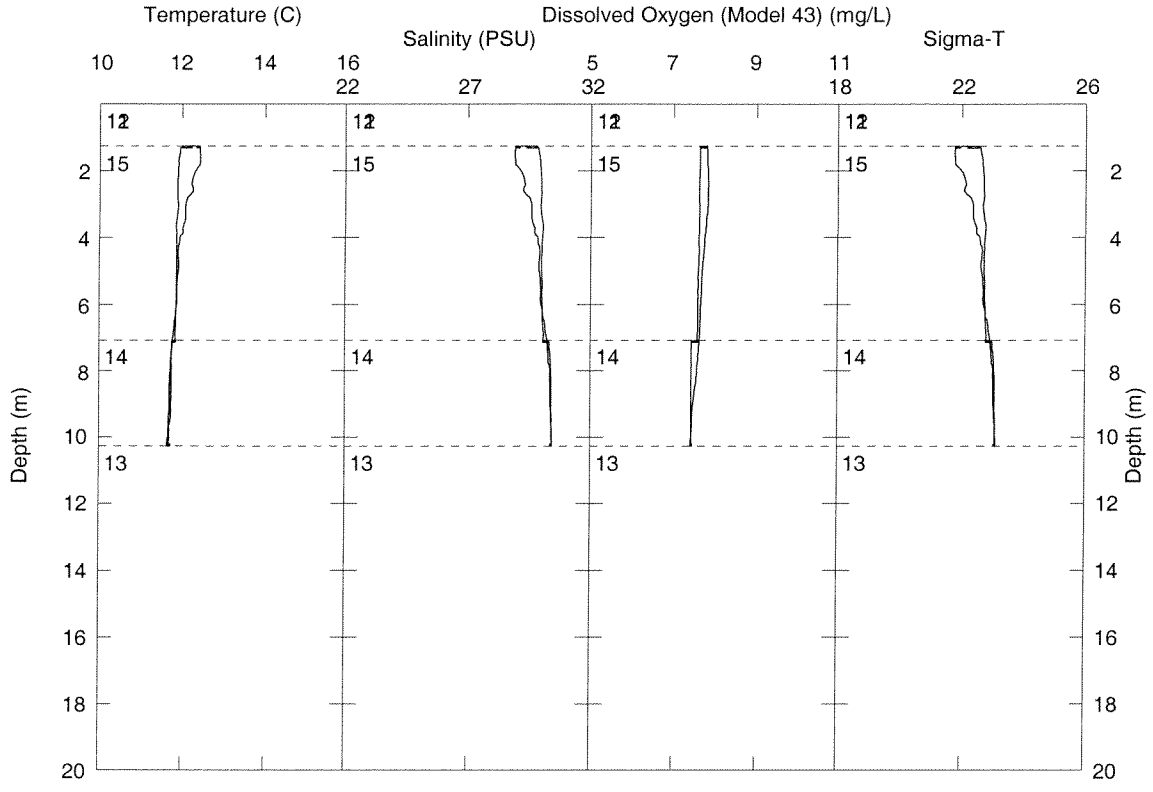

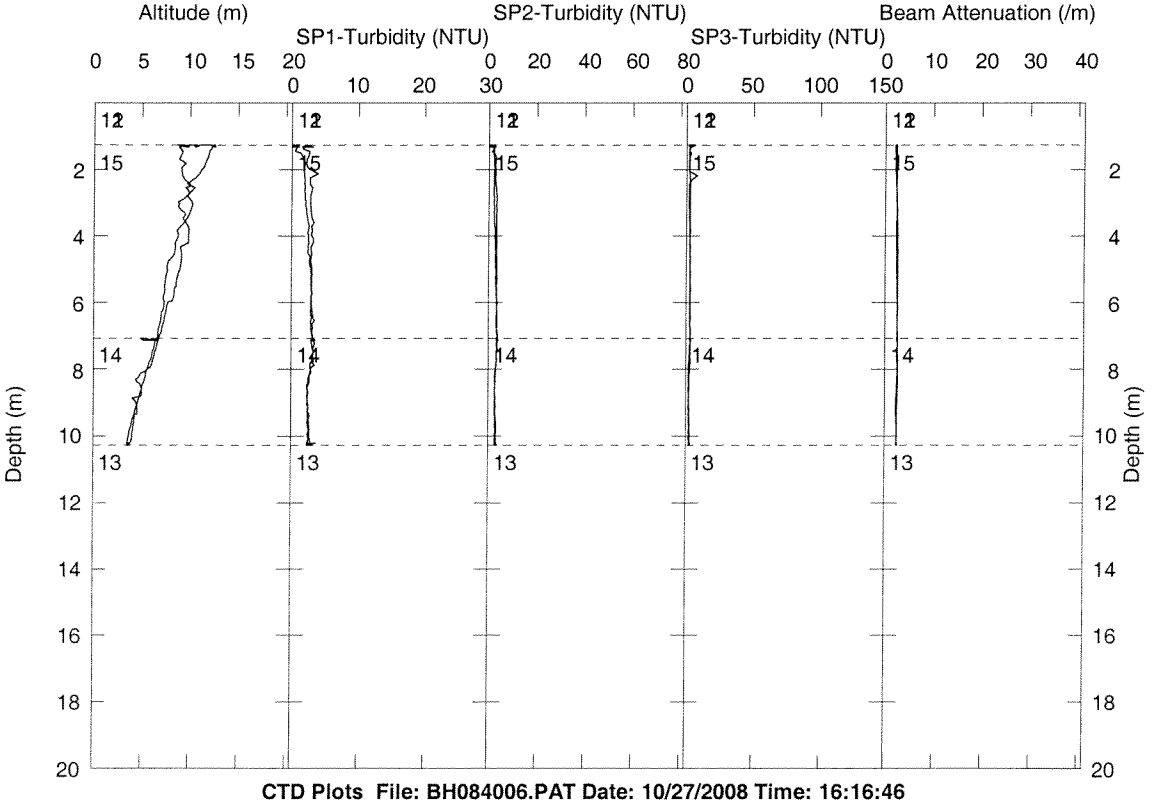

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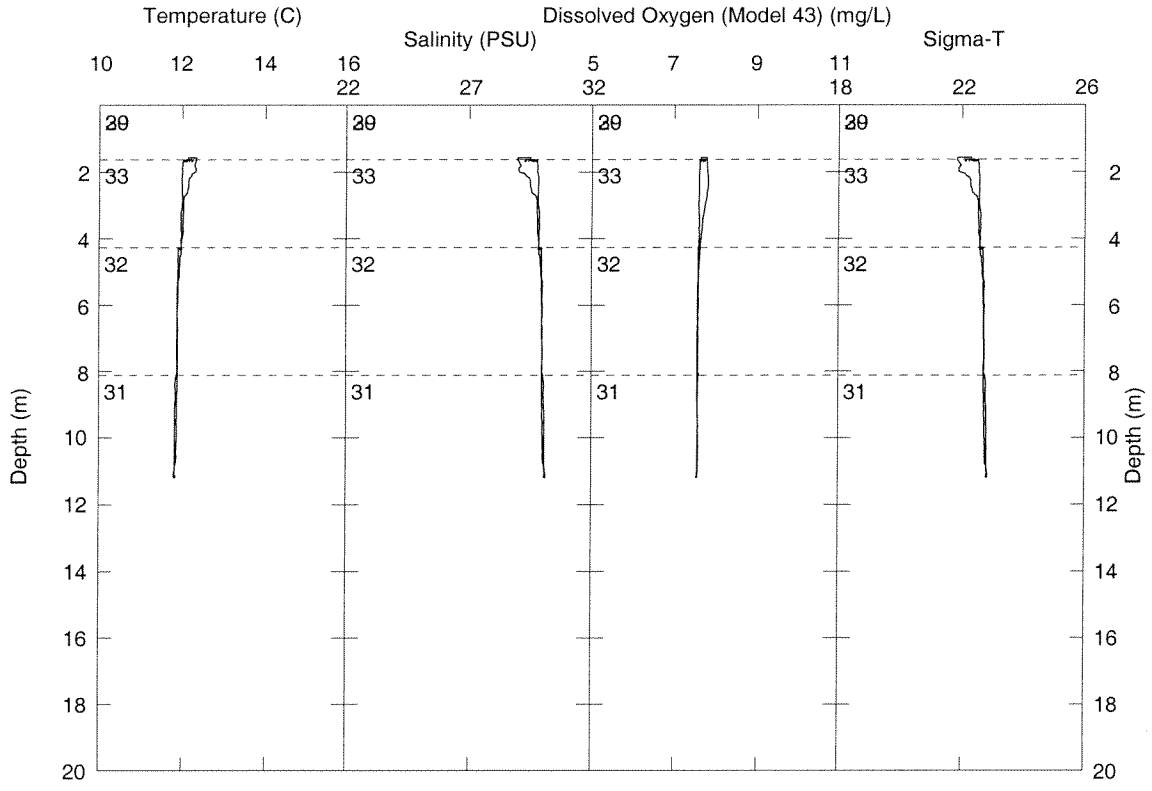

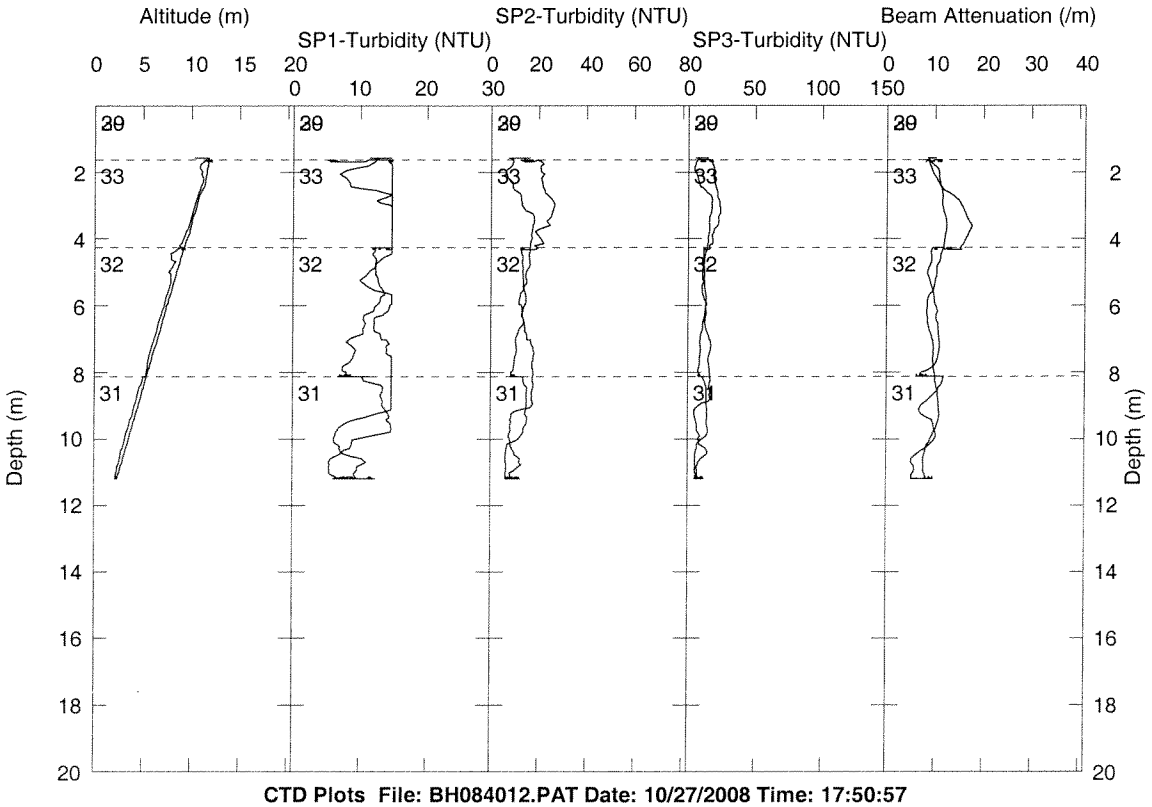

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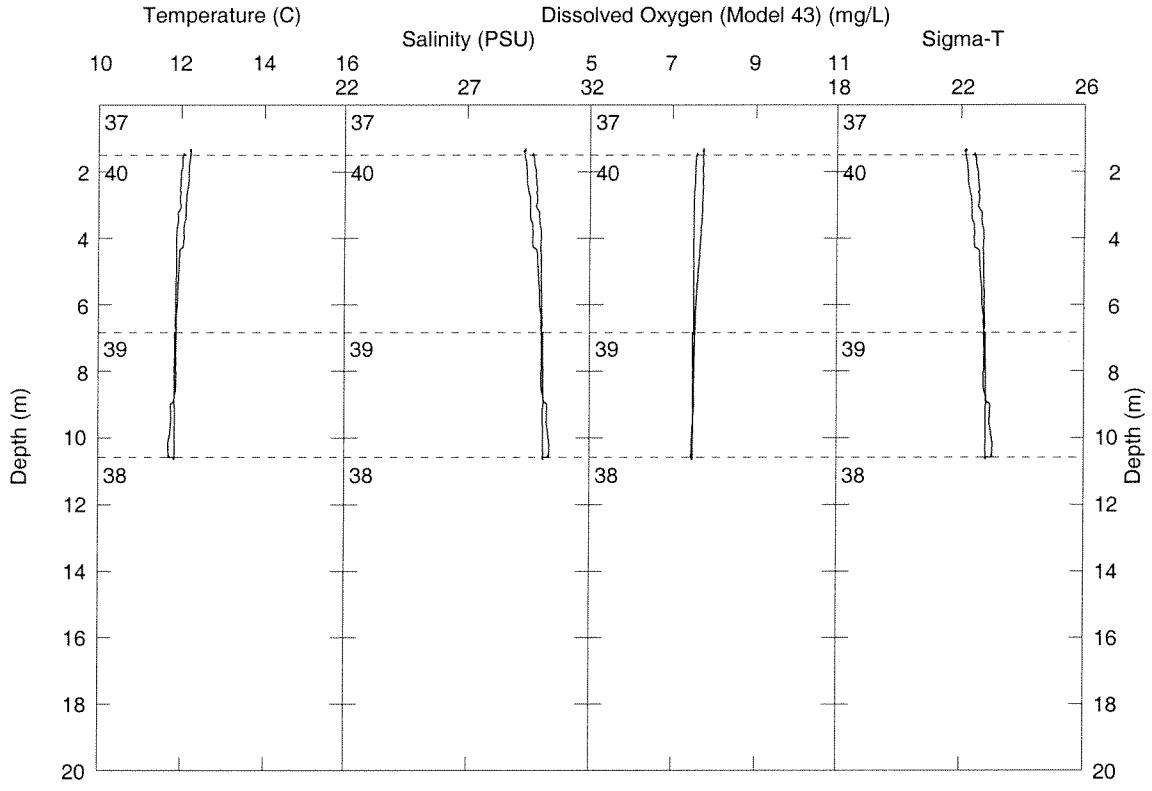

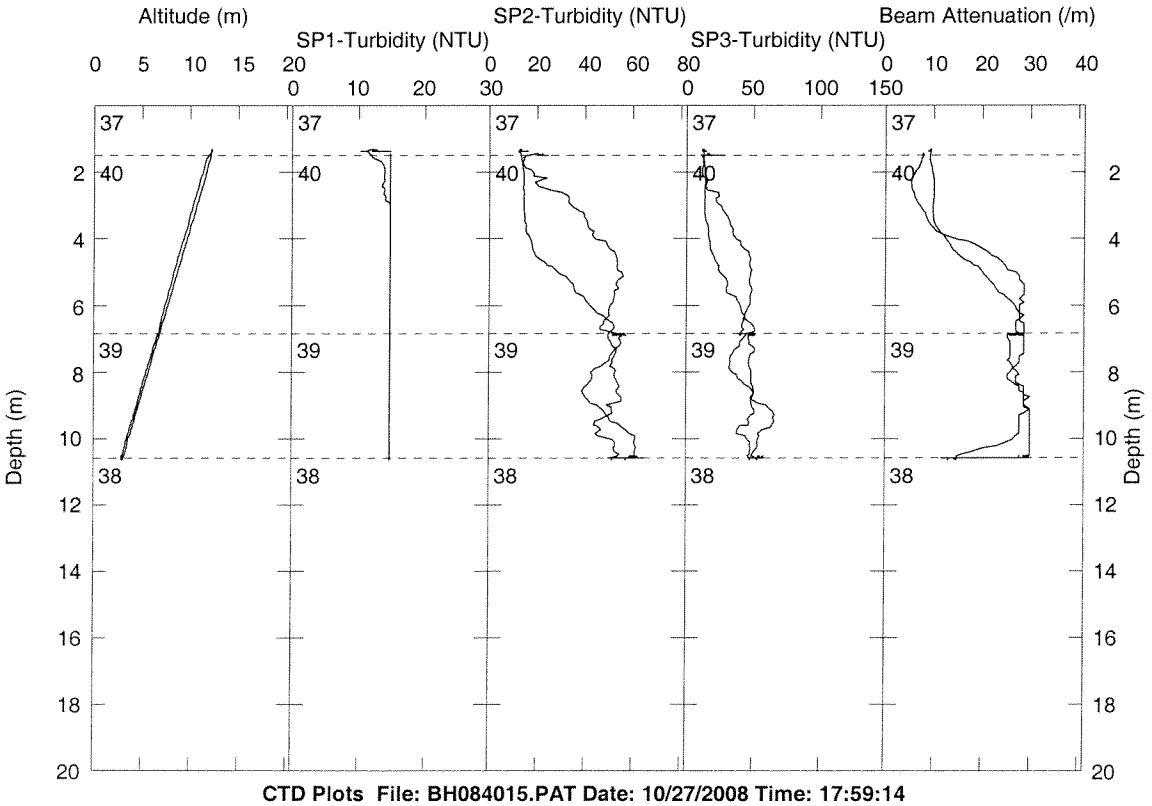

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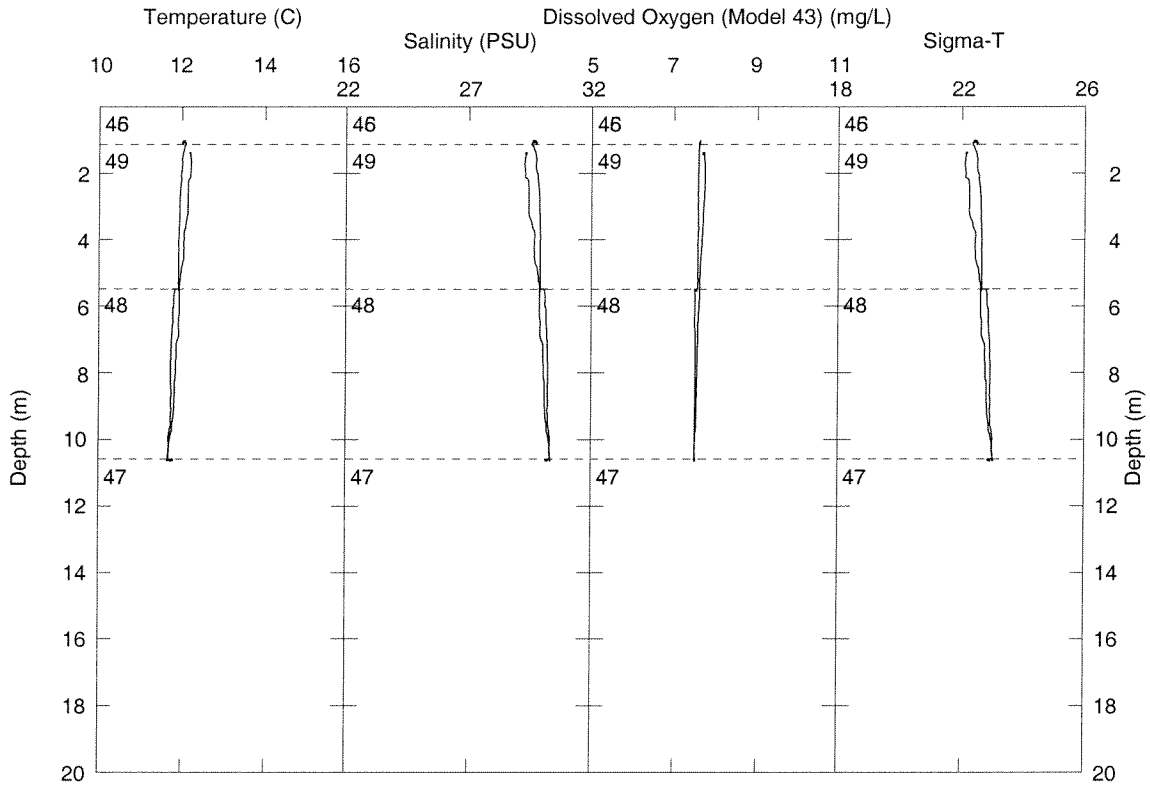

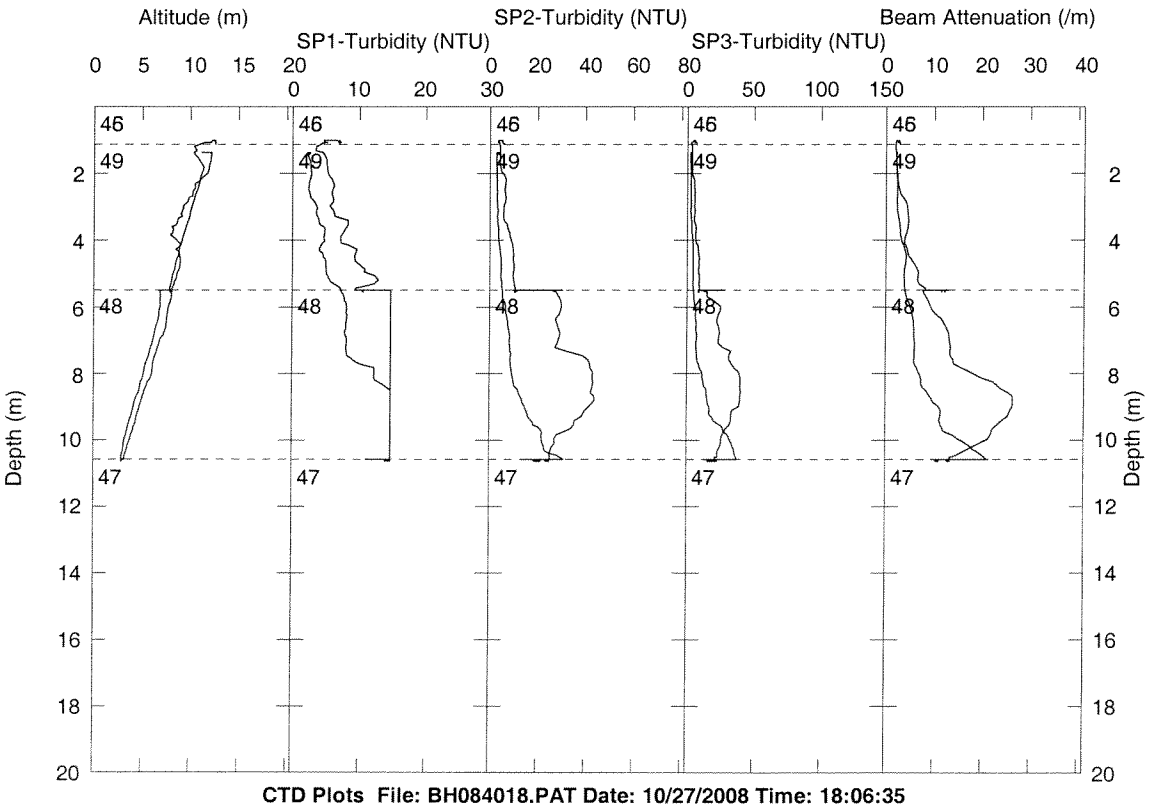

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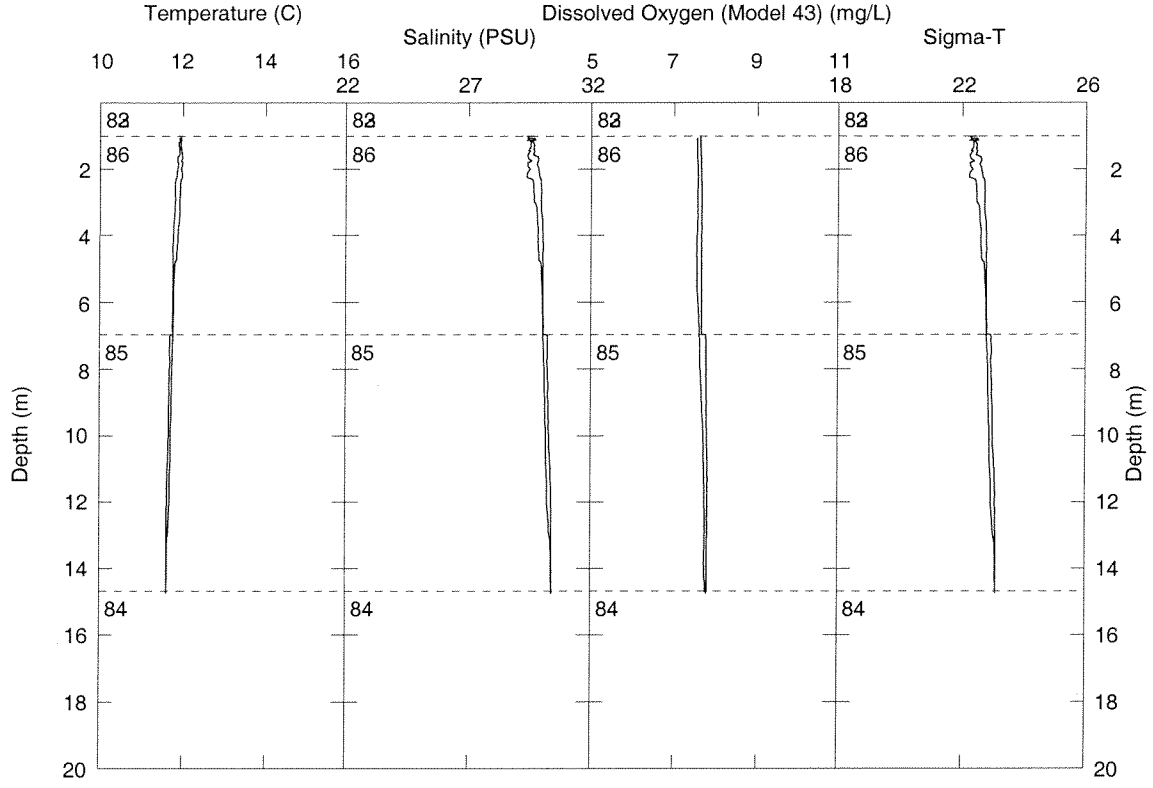

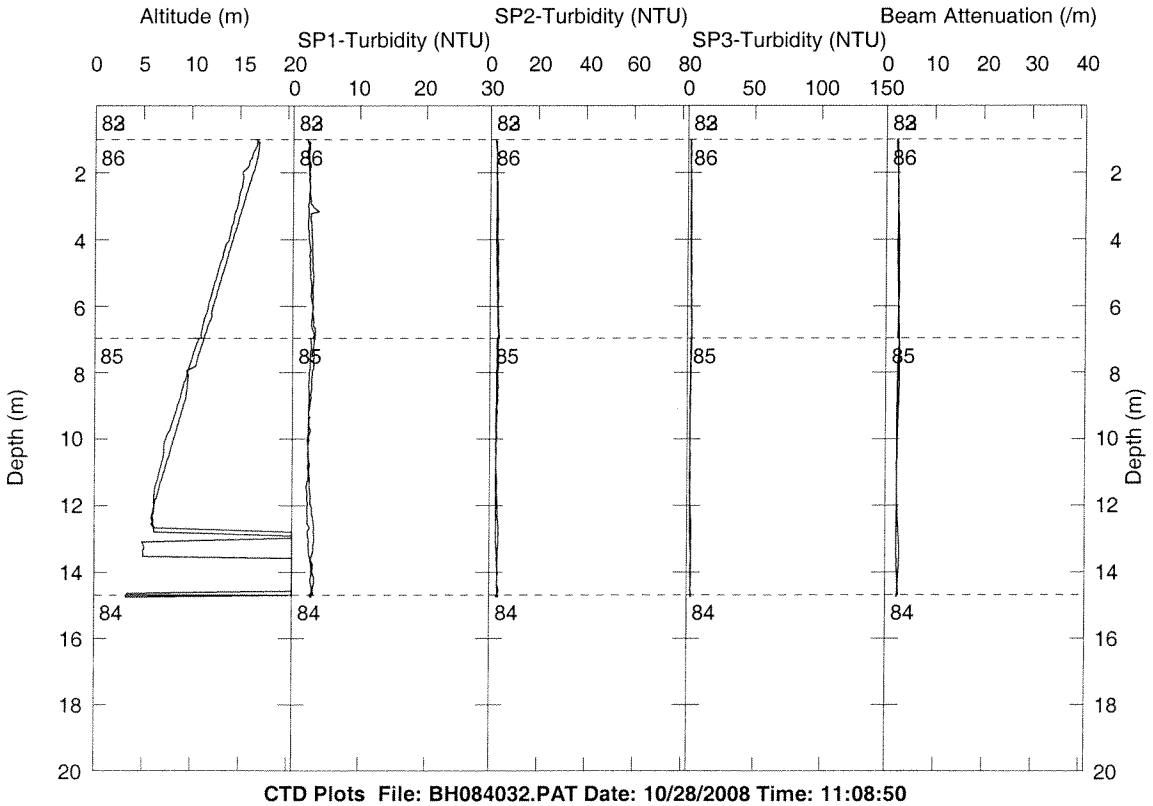

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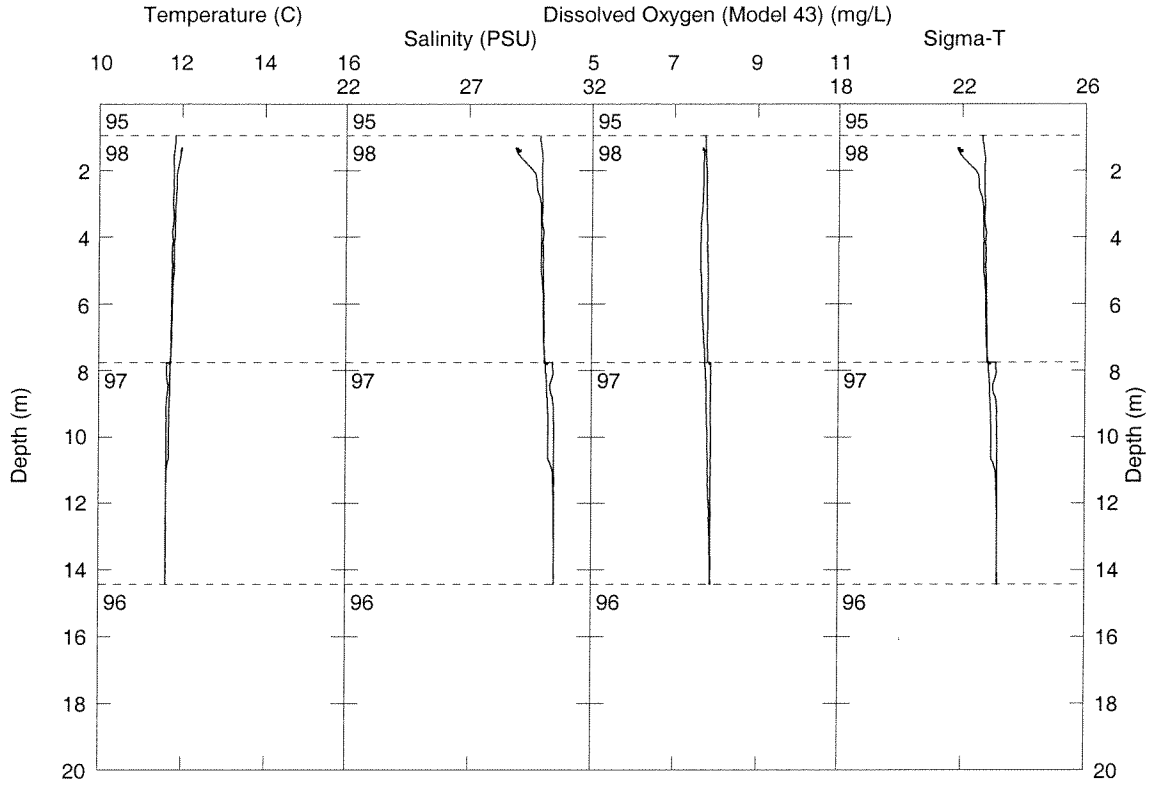

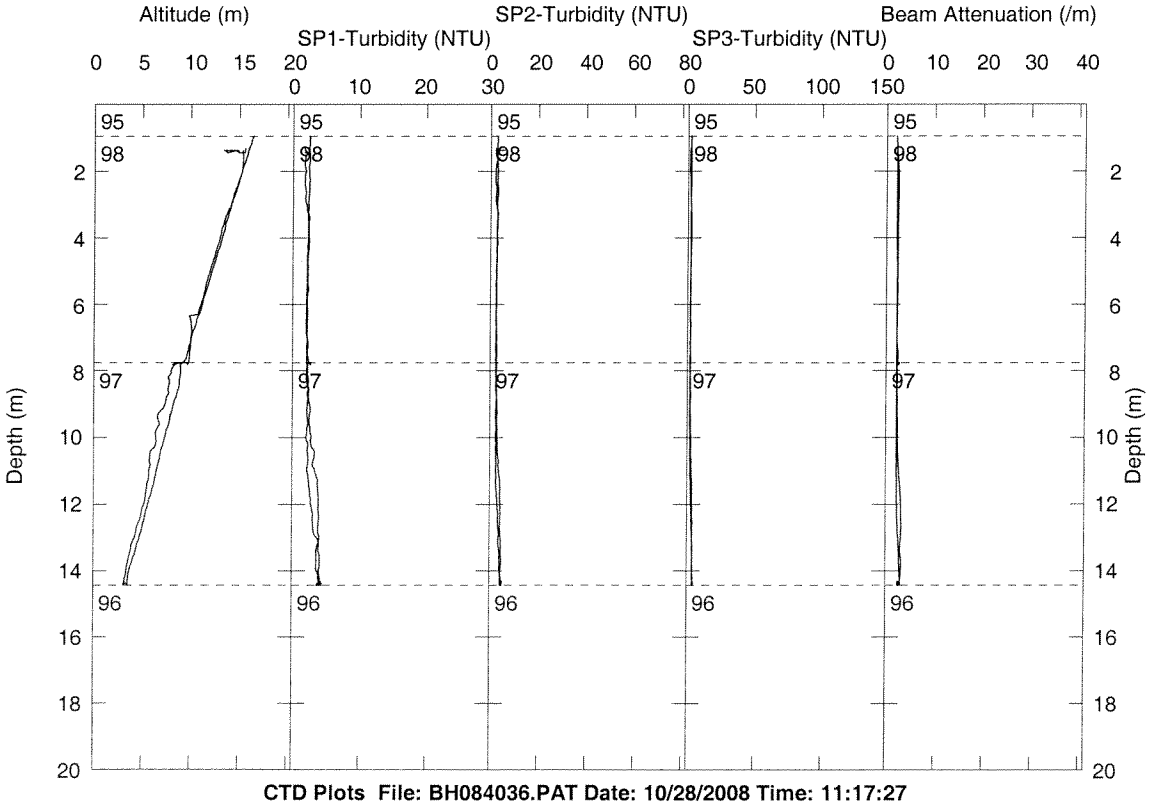

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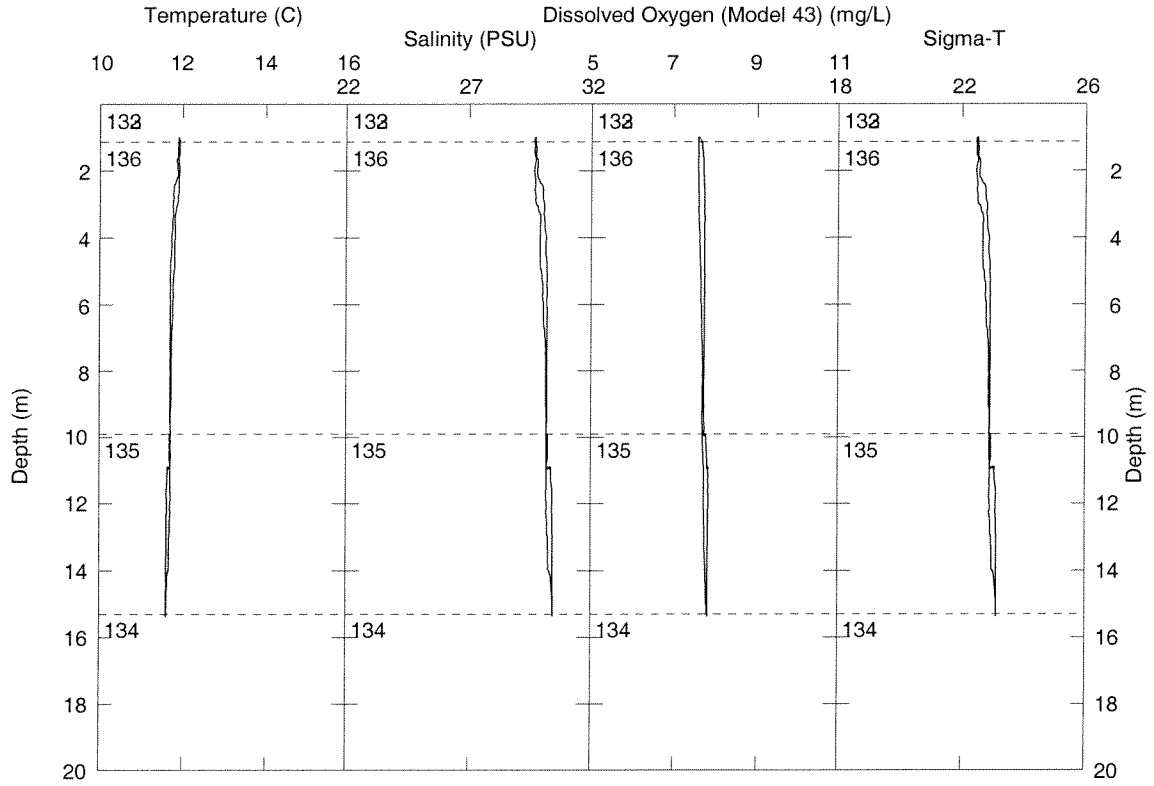

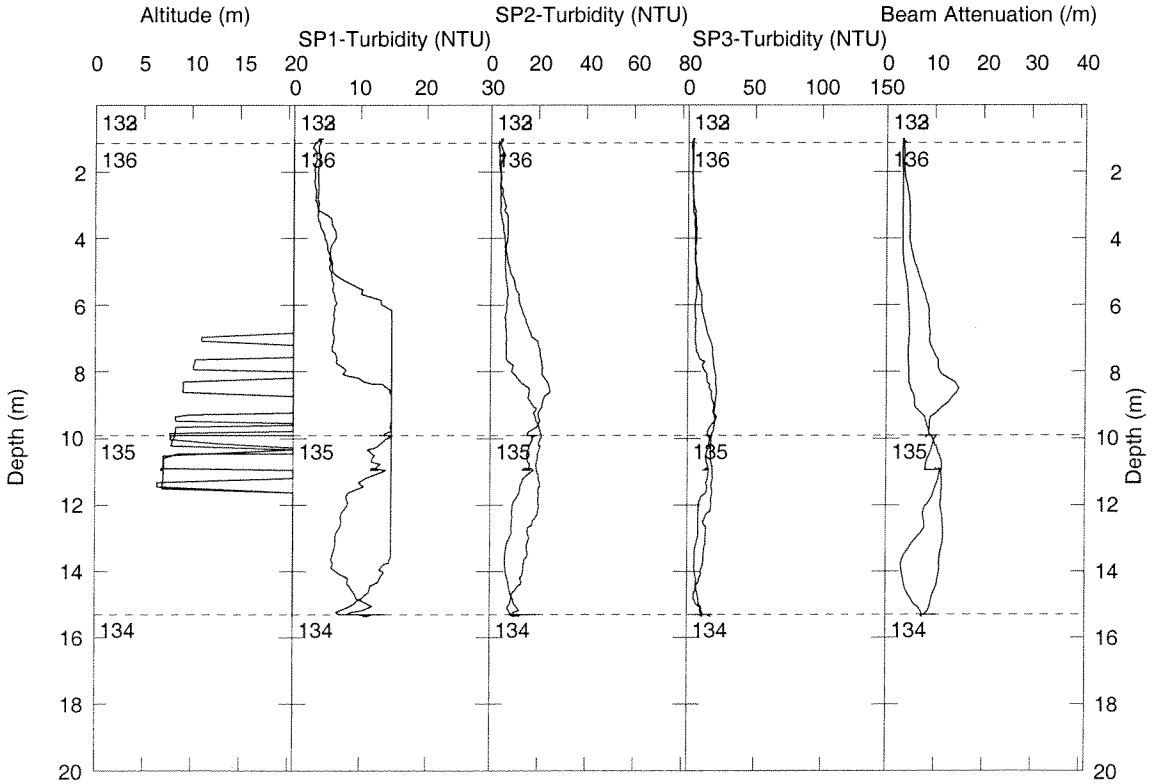

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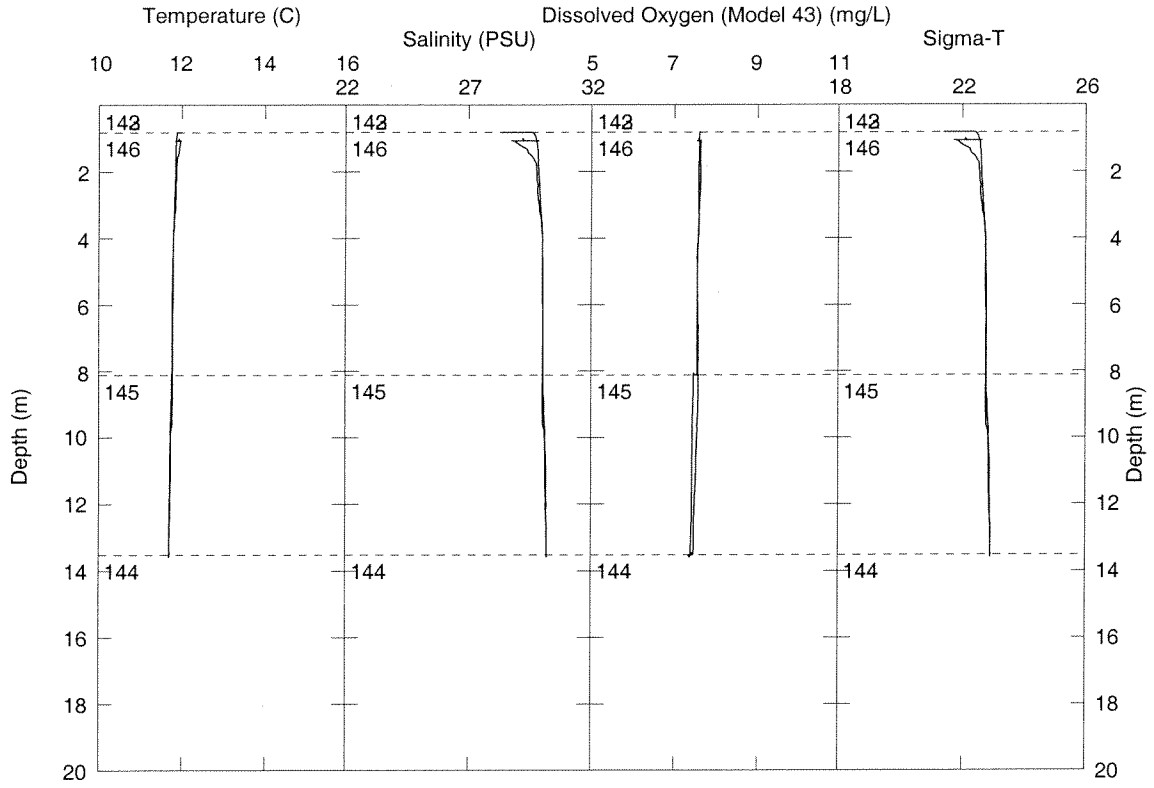

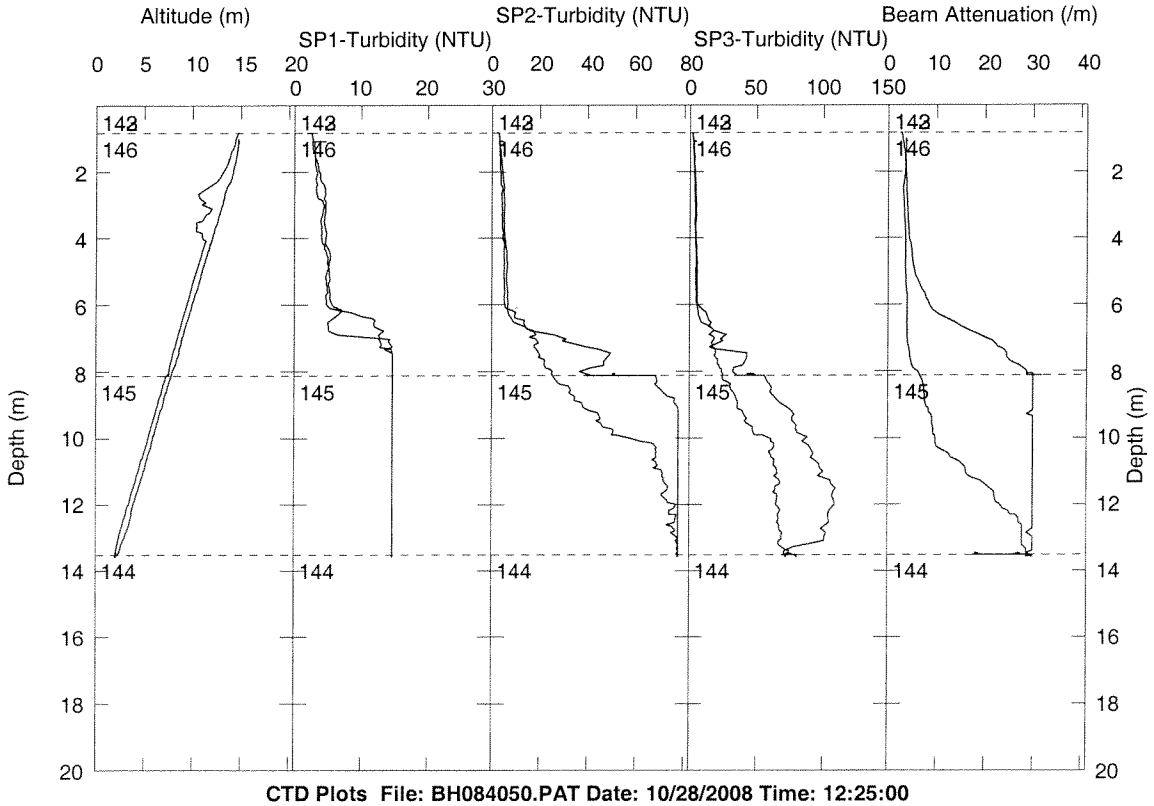

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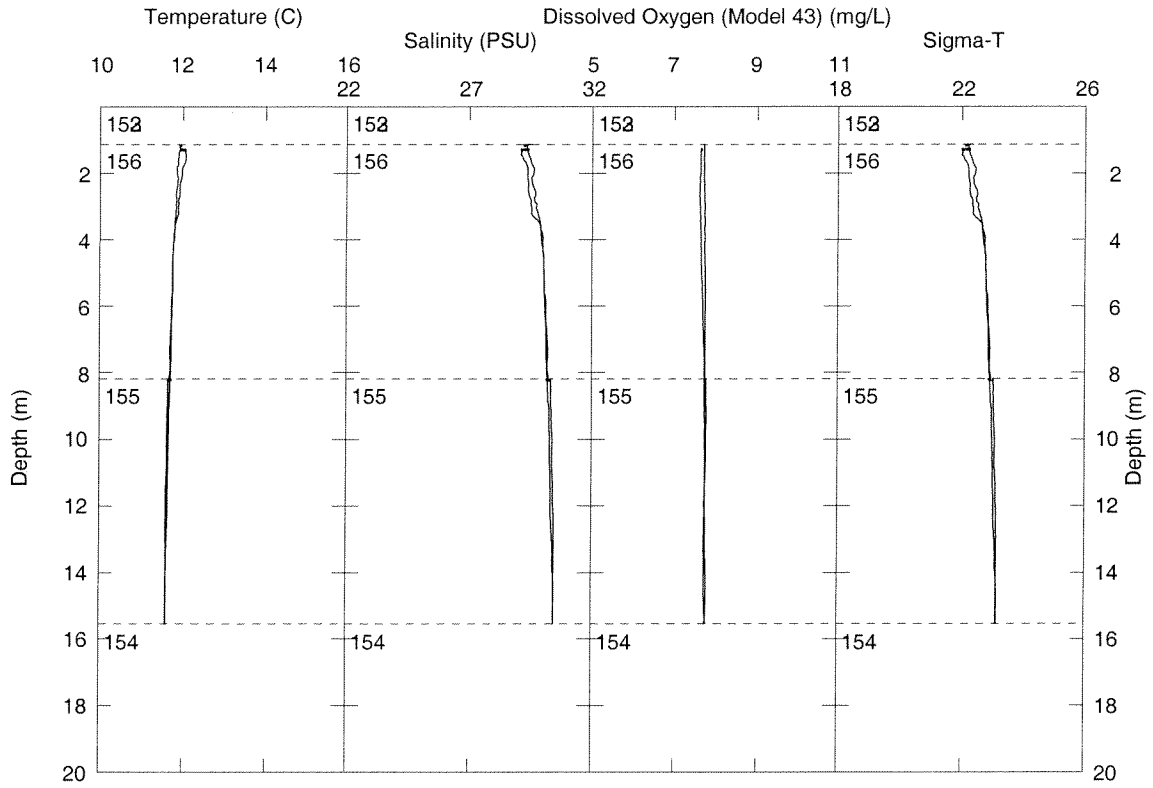

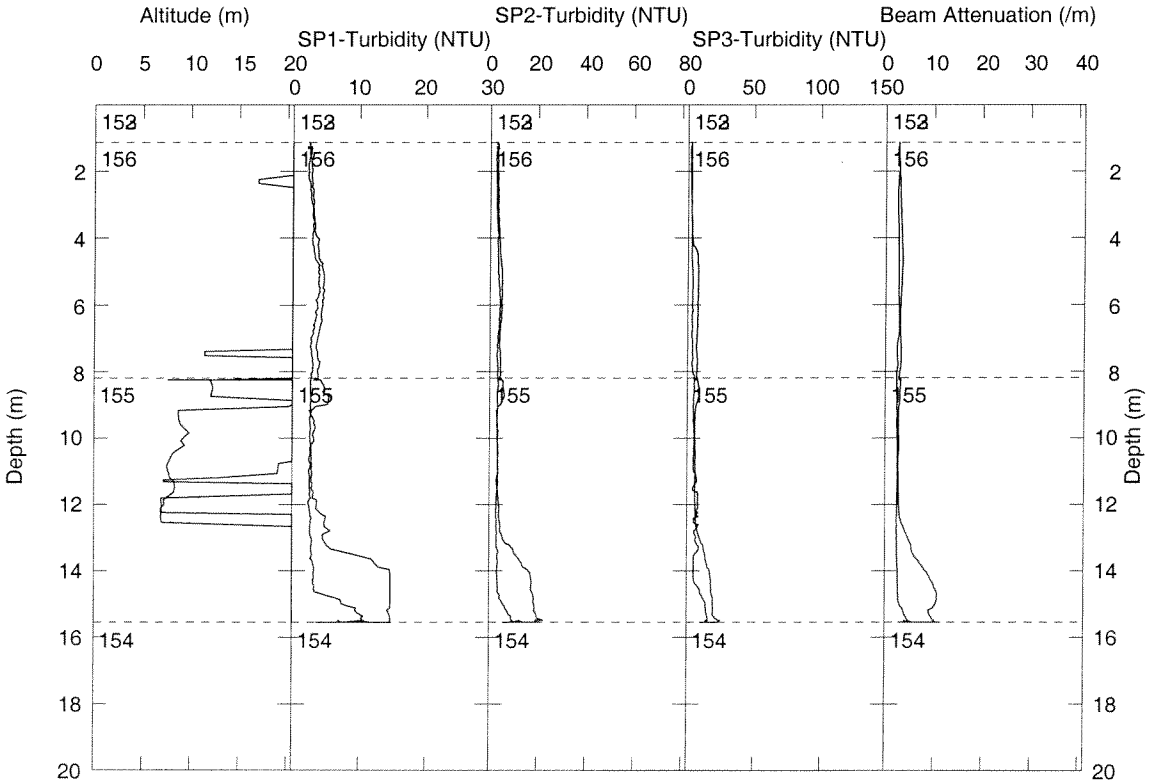

CTD Plots File: BH084053.PAT Date: 10/28/2008 Time: 12:32:06

Appendix 4

Bench Top Turbidimeter Results

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Station	Station Type	SampleID	Sample Depth (ft)	Turbidity	SampleTime	Sample Depth
Mystic River CAD Cell Disposal Plume Monitoring 27-Oct-08						
LS11	Reference	BH08400D	33.7	2.83	16:17	Near Bottom
LS11	Reference	BH08400E	23.2	2.95	16:18	Mid Depth
LS12	Reference	BH084016	34.3	2.65	16:32	Near Bottom
LS12	Reference	BH084017	20.2	3.58	16:32	Mid Depth
LS13	Plume Centroid	BH08401F	26.7	11.5	17:52	Near Bottom
LS13	Plume Centroid	BH084020	14.0	12.8	17:52	Mid Depth
LS14	North Lateral Extent	BH084026	34.7	49.9	17:59	Near Bottom
LS14	North Lateral Extent	BH084027	22.4	43.7	18:00	Mid Depth
LS15	South Lateral Extent	BH08402F	34.7	24.6	18:07	Near Bottom
LS15	South Lateral Extent	BH084030	18.0	23.6	18:07	Mid Depth
Mystic River CAD Cell Disposal Plume Monitoring 28-Oct-08						
HS11	Reference	BH084054	48.2	2.8	11:09	Near Bottom
HS11	Reference	BH084055	22.8	2.5	11:10	Mid Depth
HS12	Reference	BH084060	47.4	3.5	11:18	Near Bottom
HS12	Reference	BH084061	25.5	3.1	11:18	Mid Depth
HS13	Plume Centroid	BH084086	50.2	11.9	12:19	Near Bottom
HS13	Plume Centroid	BH084087	32.5	10.2	12:20	Mid Depth
HS14	North Lateral Extent	BH084090	44.4	56.8	12:25	Near Bottom
HS14	North Lateral Extent	BH084091	26.7	75.1	12:26	Mid Depth
HS15	South Lateral Extent	BH08409A	51.0	6.1	12:33	Near Bottom
HS15	South Lateral Extent	BH08409B	26.9	3.4	12:34	Mid Depth

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Appendix 5

Laboratory TSS Results

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SAMP_ID	RECEIPT_DATE	PREP_METH	ANALYSIS_METH	LAB_QC_CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	UNIT	LAB_QUAL	DETECT_LIMIT	DETECT_LIM_CODE	ANALYSIS_DATE
BH08400DTS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	5.20	MG/L		1.00	RL	11/03/2008
BH08400ETS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	4.30	MG/L		1.00	RL	11/03/2008
BH084016TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	6.20	MG/L		1.00	RL	11/03/2008
BH084017TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	5.30	MG/L		1.00	RL	11/03/2008
BH08401FTS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	21.3	MG/L		1.00	RL	11/03/2008
BH08401FTS2	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	24.5	MG/L		1.00	RL	11/03/2008
BH084020TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	25.7	MG/L		1.00	RL	11/03/2008
BH084026TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	96.0	MG/L		1.00	RL	11/03/2008
BH084027TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	91.2	MG/L		1.00	RL	11/03/2008
BH08402FTS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	56.8	MG/L		1.00	RL	11/03/2008
BH084030TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	63.0	MG/L		1.00	RL	11/03/2008
BH084054TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	6.50	MG/L		1.00	RL	11/03/2008
BH084055TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	5.70	MG/L		1.00	RL	11/03/2008
BH084060TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	6.30	MG/L		1.00	RL	11/03/2008
BH084061TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	4.70	MG/L		1.00	RL	11/03/2008
BH084086TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	28.3	MG/L		1.00	RL	11/03/2008
BH084087TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	24.8	MG/L		1.00	RL	11/03/2008
BH084090TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	181	MG/L		1.00	RL	11/03/2008
BH084091TS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	220	MG/L		1.00	RL	11/03/2008
BH08409ATS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	80.7	MG/L		1.00	RL	11/03/2008
BH08409BTS1	10/29/2008	NO_PREP	160.2	SA	TOTAL	1	TSS	TSS - Membrane	17.2	MG/L		1.00	RL	11/03/2008
		NO_PREP	160.2	MB	TOTAL	1	TSS	TSS - Membrane	1.00	MG/L	U	1.00	RL	11/03/2008
		NO_PREP	160.2	LCS	TOTAL	1	TSS	TSS - Membrane	101	PCT_REC				11/03/2008