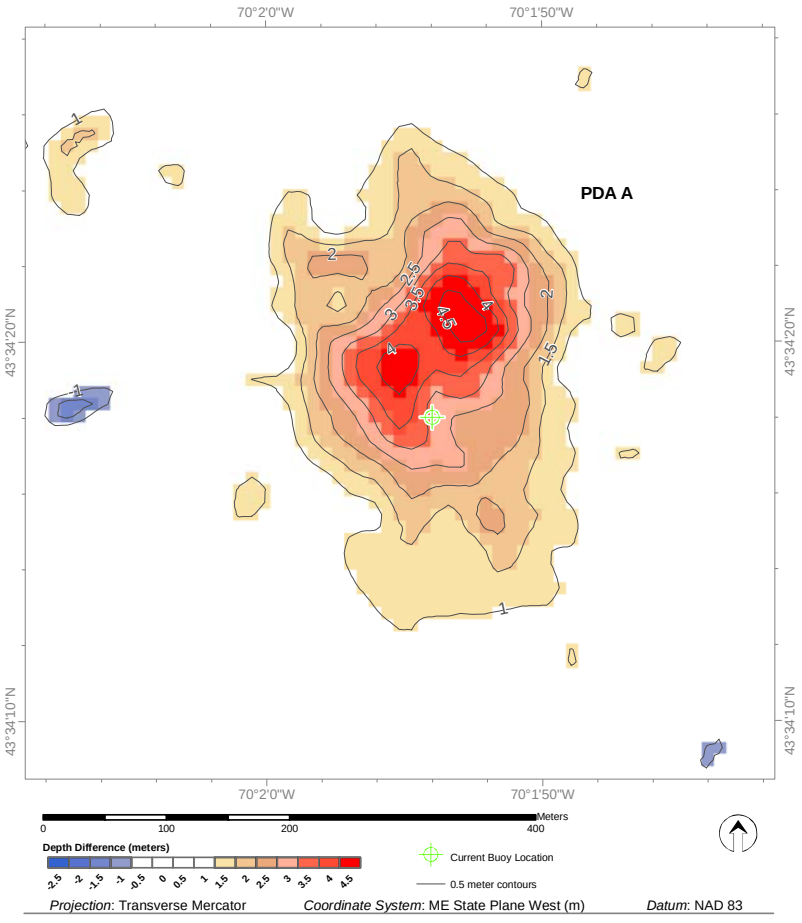
Monitoring Survey at the Portland Disposal Site
August 2007

Disposal Area Monitoring System DAMOS



DISPOSAL AREA MONITORING SYSTEM

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February 2009

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AECOM
2 Technology Park Drive
Westford, MA 01886

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13. ABSTRACT

A monitoring survey was conducted in August 2007 at the Portland Disposal Site (PDS) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2007 field effort consisted of bathymetric, sediment-profile imaging, and plan view imaging surveys designed to characterize the seafloor topography of the disposal site, document the distribution of dredged material around recent and historic disposal locations, and assess the benthic conditions over recently formed and historic disposal mounds.

The August 2007 bathymetric survey was performed over a 2100 x 2100 m area encompassing the entire PDS. Placement of approximately 369,000 m^3 of dredged material at the site marker buoy from 2001 to 2007 resulted in an increase in height and diameter of the PDA A Mound. The height of the mound increased approximately 4.5 m, and the diameter increased 250 to 400 m. No other significant bathymetric changes were observed.

The August 2007 sediment-profile imaging and plan view imaging survey was performed at the recently augmented PDA A Mound and the historical mounds PDA 95 and PDA 98. Recolonization at the older mounds (PDA 95 and PDA 98) has continued as expected, with mature, Stage III communities found at every station. The infaunal community at each of these mounds is now considered to be fully recovered with habitat conditions similar to those found at the reference stations.

The PDA A Mound displayed a recolonization pattern consistent with newly disturbed areas or recently formed disposal mounds. Little to no evidence of deep burrowing or bioturbational activity was detected in any of the profile images from this site, and successional stages were confined to initial opportunistic assemblages (Stage I) or shallow-dwelling deposit feeders (Stage II). No evidence of organic enrichment or subsurface methane was found at any of the stations on any of the three mounds, so there is little reason to suspect that recolonization on the PDA A Mound would not follow the same progression as that documented on the PDA 95 and PDA 98 Mounds.

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U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Prepared by:
AECOM, CoastalVision, Germano & Associates,
and CR Environmental

Submitted by:
AECOM
2 Technology Park Drive
Westford, MA 01886
(978) 589-3000

US Army Corps
of Engineers ®
New England District

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

Page

Page

Page

EXECUTIVE SUMMARY

A monitoring survey was conducted in August 2007 at the Portland Disposal Site (PDS) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2007 field effort consisted of bathymetric, sediment-profile imaging, and plan view imaging surveys designed to characterize the seafloor topography of the disposal site, document the distribution of dredged material around recent and historic disposal locations, and assess the benthic conditions over recently formed and historic disposal mounds.

The August 2007 bathymetric survey was performed over a 2100 x 2100 m area encompassing the entire PDS. Placement of a total of 369,000 m^3 of dredged material at the site marker buoy from 2001 to 2007 resulted in an increase in height and diameter of the PDA A Mound. The height of the mound increased approximately 4.5 m, and the diameter increased 250 to 400 m. No other significant bathymetric changes were observed. Consolidation was not apparent at the historic mounds PDA 95 and PDA 98.

The August 2007 sediment-profile imaging and plan view imaging survey was performed at the recently augmented PDA A Mound and the historical mounds PDA 95 and PDA 98. Recolonization at the older mounds (PDA 95 and PDA 98) has continued as expected, with mature, Stage III communities found at every station. The infaunal community at each of these mounds is now considered to be fully recovered with habitat conditions similar to those found at the reference stations.

The PDA A Mound displayed a recolonization pattern consistent with newly disturbed areas or recently formed disposal mounds. Little to no evidence of deep burrowing or bioturbational activity was detected in any of the profile images from this site, and successional stages were confined to initial opportunistic assemblages (Stage I) or shallow-dwelling deposit feeders (Stage II). No evidence of organic enrichment or subsurface methane was found at any of the stations on any of the three mounds, so there is little reason to suspect that recolonization on the PDA A Mound would not follow the same progression as that documented on the PDA 95 and PDA 98 Mounds.

While future monitoring surveys at the site should include the PDA A Mound to document the completion of the recolonization sequence, frequent monitoring of either the PDA 95 or PDA 98 Mounds is determined to be unnecessary.

1.0 INTRODUCTION

A monitoring survey was conducted at the Portland Disposal Site in August 2007 as part of the U.S. Army Corps of Engineers (USACE) New England District Disposal Area Monitoring System (DAMOS). DAMOS is a comprehensive monitoring and management program designed and conducted to address environmental concerns associated with use of open-water disposal sites throughout the New England region. An introduction to the DAMOS Program and the Portland Disposal Site, including a brief description of previous dredged material disposal activities and previous monitoring surveys, is provided below.

1.1 Overview of the DAMOS Program

DAMOS is a comprehensive monitoring and management program designed and conducted to ensure environmental protection at open-water disposal sites throughout the New England region. For over 30 years, the DAMOS Program has collected and evaluated disposal site data throughout New England. Patterns of physical, chemical, and biological responses of seafloor environments to dredged material disposal activity have been documented based on these data (Fredette and French 2004).

DAMOS monitoring surveys are designed to test hypotheses related to expected physical and ecological response patterns following placement of dredged material on the seafloor at established disposal sites. The data collected and evaluated during DAMOS monitoring surveys provide answers to strategic management questions in determining the next step in the disposal site environmental management process.

Two primary goals of DAMOS monitoring surveys are to document the physical location of dredged material placed on the seafloor and to evaluate the environmental impact of placement of the dredged material. Sequential bathymetric measurements are made to characterize the height and spread of discrete dredged material deposits or mounds created at disposal sites, and sediment-profile imaging (SPI) and plan view imaging surveys are performed to support evaluation of seafloor (benthic) habitat conditions and recovery over time. Each type of data collection activity is conducted periodically at disposal sites, and data are evaluated to determine the next step in the disposal site management process. The conditions found after a defined period of disposal activity are compared with the long-term data set at a specific site (Germano et al. 1994). DAMOS monitoring surveys may also feature additional types of data collection activities, such as side-scan sonar, sediment coring, or grab sampling, as deemed appropriate to achieve specific survey objectives.

1.2 Introduction to the Portland Disposal Site

The Portland Disposal Site (PDS) is one of three regional dredged material disposal sites located in the waters of Maine. It covers a 1 nmi^2 (3.4 km^2) area of seafloor centered at 43° 34.105' N, 70° 01.969' W (NAD 83), approximately 7.1 nmi (13.2 km) east of Dyer Point, Cape Elizabeth, Maine (Figure 1-1). The topography at PDS is characterized by a rough, irregular bottom, a prominent northwest-southeast trending trough, and areas of soft sediment accumulation in the basins among bedrock outcrops (Figure 1-2). Water depths across the site range widely, from 37 to 71 m.

PDS is located in a depositional environment. The various bedrock ridges surrounding deep basins provide a measure of protection from wave energy and subsurface currents, and thus act to contain the deposited dredged material. Dredged material disposal operations have specifically targeted these natural basins to enhance containment of dredged material. Sediments deposited at PDS have originated from dredging projects in Portland Harbor, Fore River, and many of the smaller rivers and harbors within the Casco Bay region. Regulated and monitored disposal of dredged material has occurred at PDS since 1977; however, use of the 17.7 km^2 region surrounding PDS for disposal dates back to 1947 (SAIC 1998a).

The disposal site boundaries of PDS and other New England disposal sites have been established to provide a management objective for placement of dredged material on the seafloor. Barge operators are given specific coordinates (and often visible lighted buoys) within the disposal boundaries to navigate to and release their cargo of dredged material. In practice, it is expected that barge disposal will occur in a cluster around the designated disposal location and that some dredged material will be suspended in the water column during release. The Clean Water Act Section 404 (b)(1) provides guidelines for the discharge of dredged material and defines the “discharge point” as the point within the disposal site (the bottom surface area and any overlying volume of water) at which the dredged material is released. The Marine Protection, Research and Sanctuaries Act Section 102 defines the release zone as a locus of points 100 m around the barge from beginning to end of the discharge. Monitoring surveys are designed with the recognition that the site boundary is a target area for release at the water’s surface, and that during placement and descent some dredged material may extend across the boundary on the seafloor.

1.3 Historic Dredged Material Disposal Activity

PDS has received approximately 1.2 million m^3 of dredged material since 1982. Historically, the largest users of the site were the USACE Royal River and Portland

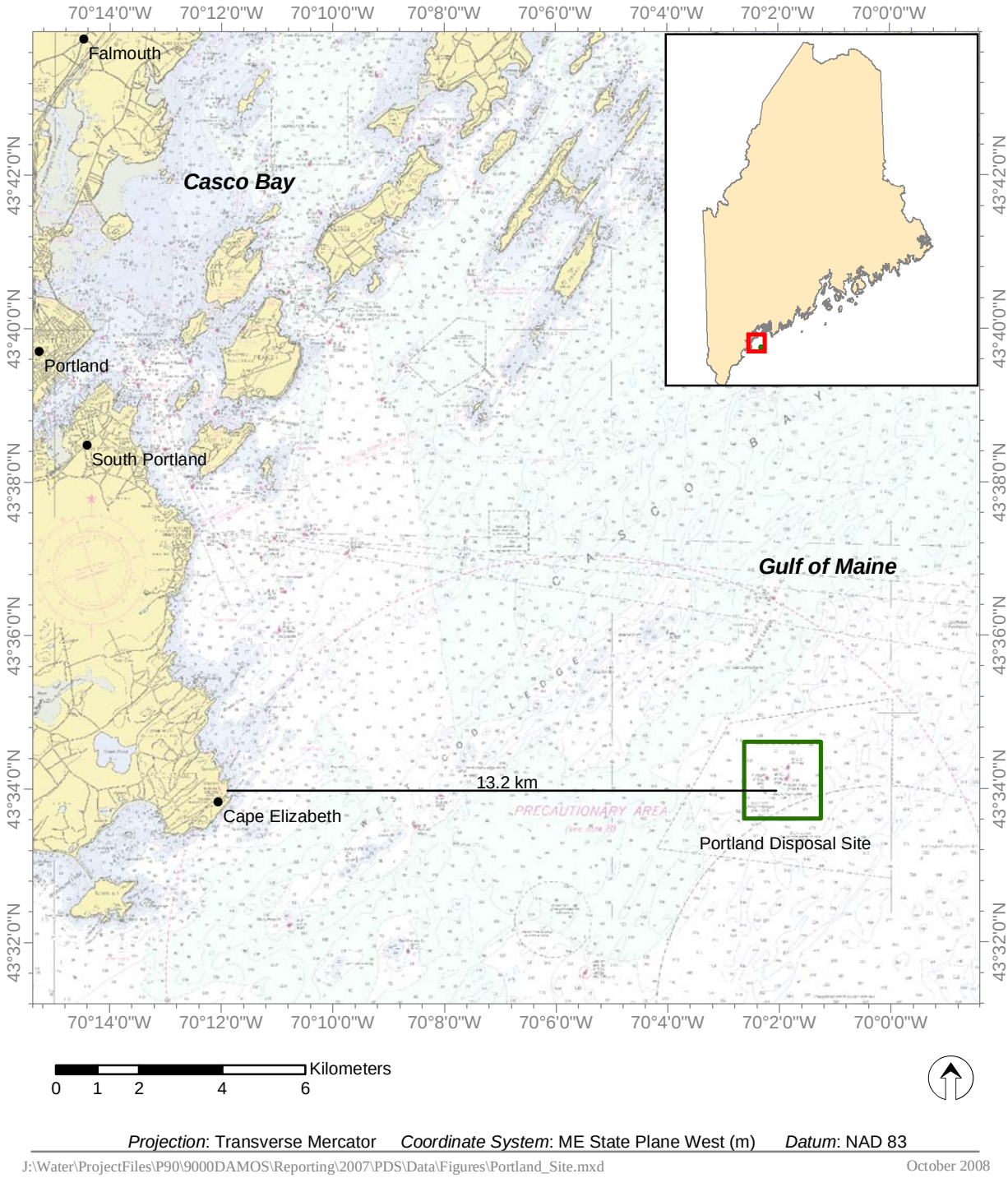

Figure 1-1. Location of the Portland Disposal Site

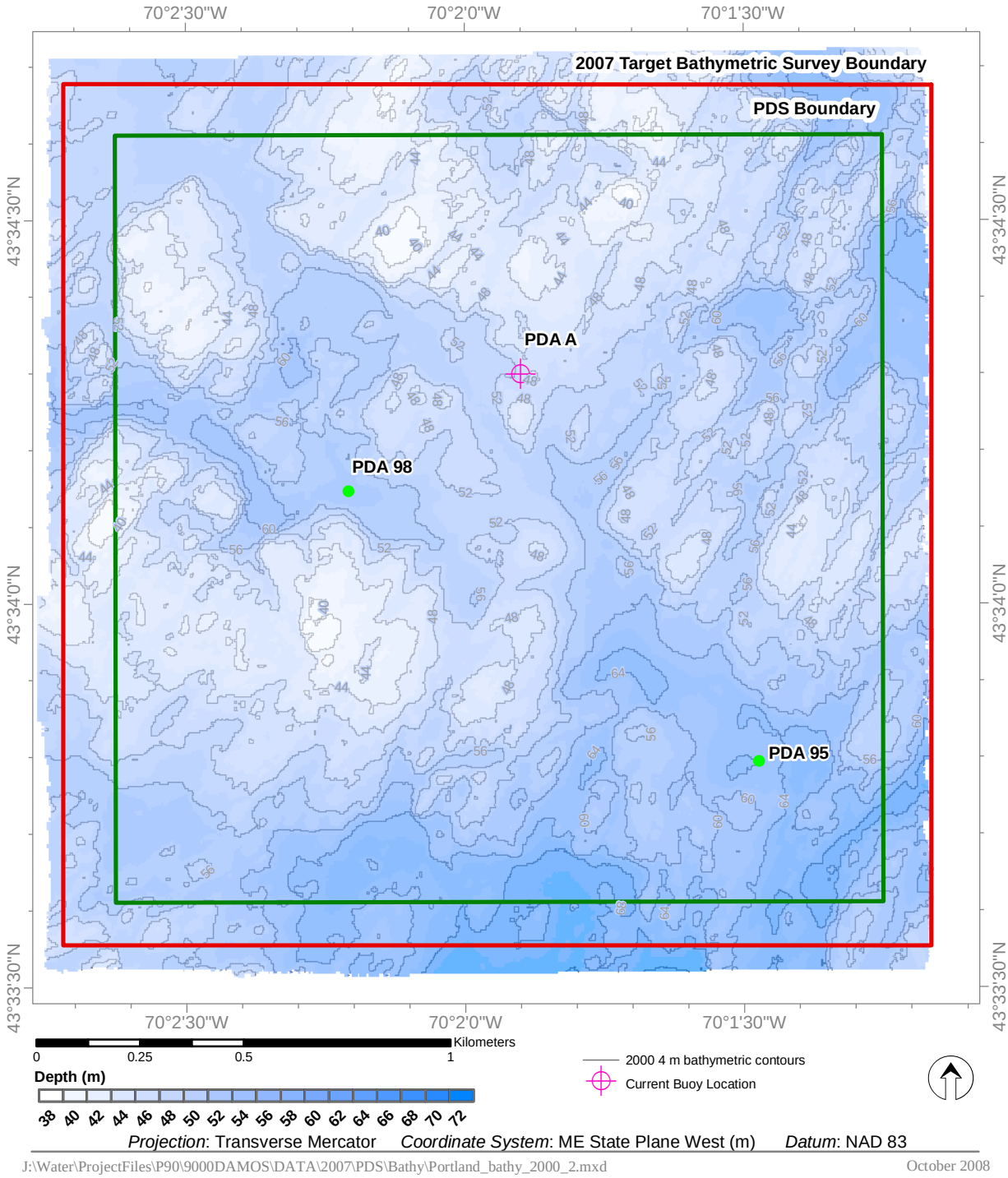

Figure 1-2. Bathymetric contour map of PDS, July 2000

Harbor federal navigation projects in 1996-1997 and 1998-1999, respectively. Material generally has been directed to the U.S. Coast Guard, Class-A; Special Purposes buoy (DG buoy), located in the north-central portion of the site (Figure 1-2). However, dredged material originating from several very large projects has been directed to other locations within the disposal site (SAIC 2002).

Three distinct disposal mounds have developed on the seafloor of PDS: PDA (Portland Disposal Area) A Mound, PDA 98 Mound, and PDA 95 Mound. The PDA A Mound, previously referred to as the DG Mound because it was formed by disposal at the DG buoy, has received material from numerous dredging projects over many years. The PDA 98 Mound was developed in 1998 and 1999 by the placement of sediment dredged from the federal channel and several marine terminals in the Fore River and Portland Harbor. Approximately 315,700 m^3 of material was directed to a natural seafloor containment basin in the west-central portion of the site to form the PDA 98 Mound. The PDA 95 Mound, formerly known as the Royal River Mound, is a moderate-sized disposal mound in the southeast corner of PDS formed from the placement of 61,700 m^3 of material. It was formed between 1995 and 1997 as part of a capping demonstration project in water depths of 64 m. Sediment dredged from the upper reaches of the Royal River in Yarmouth, Maine, which was determined to be suitable for unconfined open water disposal, was used as "pseudo unacceptably contaminated dredged material" (pseudo-UDM). Coarser grained sediment from the lower reaches of the same river was used as capping dredged material (CDM) (SAIC 1998a, 2003).

1.4 Previous PDS Monitoring Events

Monitoring at PDS has occurred periodically under the DAMOS Program since its inception in 1977 (Table 1-1). In addition to typical monitoring surveys employing bathymetry and sediment-profile imaging, investigations have included mussel bioaccumulation studies, oceanographic surveys, and monitoring of the capping demonstration project. A summary of monitoring events dating back to the Royal River capping demonstration project is provided below.

Substantial monitoring was conducted during and immediately following the Royal River capping demonstration project, from 1995 through 1997. Physical oceanographic monitoring studies were conducted in 1996 (SAIC 1998b) to evaluate physical processes at the disposal site that might affect long-term sediment stability for any capped disposal mounds built at the site. A moored instrument array was deployed at the site from February to May 1996 that monitored near-bottom currents, water temperature, and relative turbidity during winter storm events that could have induced bottom sediment resuspension. Near-bottom current speeds during the deployment period ranged from 0 to

Table 1-1.

Overview of Survey Activities at PDS

Date	Purpose of Survey	Bathymetry Area	SPI Stations	Additional Studies	DAMOS Report/ Contribution No.
1977-1978	Monitoring	Single-beam 1900 x 2100 m	--	Currents, mussel chemistry, sediment chemistry, grabs, fisheries	Annual Data Report, Supp. B
1979-1981	Monitoring	--	--	Mussel chemistry	43
Jan 1989	Monitoring	Single-beam 900 x 1100 m	PDA A – 43 REF – 39	--	78
July 1992	Capping demonstration (PDA A Area)	Single-beam 900 x 1100 m	PDA A – 42 REF – 39	Acoustic sediment density, grabs (chemistry)	108
1996	Oceanographic measurements	--	--	Tides, near-bottom currents, water temperature, turbidity, salinity	121
1995-1997	Capping demonstration (Royal River Project Area)	Single-beam 800 x 800 m (1995) Single-beam 1950 x 1000 m (1996)	PDA 95 – 33	Side-scan sonar, grabs, cores	123

Table 1-1. (continued)

Overview of Survey Activities at PDS

Date	Purpose of Survey	Bathymetry Area	SPI Stations	Additional Studies	DAMOS Report/ Contribution No.
1998-2000	Dredged material fate	Multi-beam 17.7 km^2 trapezoid (1998) Multi-beam 2100 x 2100 m (2000)	PDA 98 – 28	Side-scan sonar, ADCP, sediment traps	153
7/2000, 9/2000	Monitoring	Multi-beam 2100 x 2100 m	PDA 98 – 28 REF – 13	--	136
8/2001	Monitoring	--	PDA 98 – 28 PDA A – 25 PDA 95 – 13 REF - 13	--	140

approximately 20 cm/s, with the majority of variability occurring in association with the semi-diurnal tide; analysis of residual currents revealed that storms had almost no effect on near-bottom currents at PDS. Of the nine storms that were monitored during the deployment period, bottom sediments were resuspended during two storm events, each with maximum significant wave heights in excess of 3 m.

A bathymetric survey following the Royal River capping demonstration project revealed a discrete mound (PDA 95 Mound) on the seafloor within the Royal River Project Area (SAIC 1998a). Sediment-profile images, cores, and environmental tracers (combinations of biological and mineralogical parameters) were successfully used to differentiate the CDM, pseudo-UDM, and ambient material. Sediment-profile imaging proved the most useful tool in mapping the areal distribution of the CDM, while the cores were the most useful in measuring thickness at discrete locations. The use of environmental tracers was limited by the presence of historical dredged material and the overlapping tracer characteristics of sediment from several dredging reaches. Pseudo-UDM was covered by a minimum of 10 cm of CDM in all areas except at the extreme southern edge of the mound.

From 1998 to 2000, monitoring was conducted during the large-scale Portland Harbor dredging project, which resulted in more than 300,000 m^3 of dredged material placed at PDS. The purpose of the monitoring was to evaluate the behavior of dredged material placed at the PDA 98 Mound during the 1998 to 1999 dredging season (SAIC 2004). A follow-on modeling program was conducted to determine how well USACE Waterways Experiment Station (WES) Short Term Fate (STFATE) and Multiple Dump Fate (MDFATE) models predicted the results of disposal operations at PDS. Multibeam bathymetry, side-scan sonar, sediment cores, and sediment grabs were collected to obtain information on the physical characteristics of the dredged material, ambient water column, and ambient seafloor. Acoustic Doppler current profiling (ADCP) was used to study the hydrodynamics at PDS, and sediment traps were deployed in and around PDS to measure settling of dredged material. Bathymetry and SPI were used to delineate the dredged material footprint.

The summer 2000 survey, which included multibeam bathymetry and SPI, indicated the development of two disposal mounds at PDS in the areas of recent disposal activity (PDA 98 Mound and PDA A Mound) (SAIC 2002). A depth difference comparison between the 2000 bathymetry and the 1998 bathymetry revealed a deposit at PDA 98 with a maximum height of 2 m and a diameter of 600 m, while the PDA A Mound measured 2 m in height and 270 m in diameter compared to 1998 bathymetry. The majority of the new disposal material for both mounds accumulated in seafloor depressions adjacent to bedrock outcroppings. The SPI survey, which focused on the

PDA 98 Mound, indicated well oxygenated surface sediments and the presence of a well-developed Stage I benthic infaunal population. Stage III organisms were present at more than 50% of PDA 98 locations.

PDS was surveyed in 2001 to continue to track the benthic recolonization process at PDA 98, PDA A, and PDA 95 Mounds (SAIC 2003). Disposal did not occur at PDS between the 2000 and 2001 surveys. The SPI results at the PDA 98 and PDA A Mounds confirmed the continued development of Stage I to Stage III infaunal communities. Redox potential discontinuity (RPD) depths at PDA 98 ranged from 1.1 to 2.8 cm and were the shallowest of the three mounds surveyed, likely due to the larger amount of material placed at this location. The survey of the PDA 95 Mound, conducted four years post-disposal, found surface sediments characteristic of historic dredged material, with a grayer color relative to 1997 sediment-profile images, suggestive of a reduced organic load. An advanced successional stage assemblage was present at most stations sampled, with average apparent RPD depths ranging from 1.7 to 3.7 cm. All three sites displayed benthic communities similar to or more advanced than those found at the reference areas. However, the rocky substrate with patchy thin layers of soft sediment at two of the reference areas (SREF and EREF) may not be directly comparable to the thick layers of soft sediment of the disposal mounds.

1.5 Recent Dredged Material Disposal Activity

Since the most recent DAMOS survey in August 2001, approximately 369,000 m^3 of material has been deposited at PDS. The majority of this material originated from Southport Harbor and Casco Bay for the Portland Pipeline project (Table 1-2). This recent disposal activity was centered around the PDA A Mound at the DG buoy located at 43° 34.300' N, 70° 01.900' W (Figure 1-3).

A detailed record of barge disposal activity at PDS for the period from August 2001 to August 2007, including the origin of dredged material, the volume deposited, and the disposal location, is provided in Appendix A.

1.6 Survey Objectives

The 2007 PDS survey was designed to document the distribution of dredged material across a 2100 m x 2100 m area encompassing the entire PDS using multibeam bathymetry and to assess the benthic recolonization status of the area of recent disposal (PDA A), as well as historical mounds (PDA 95 and PDA 98), using SPI and plan view imaging.

Table 1-2.

Overview of Recent Disposal Activity at PDS (8/10/01 – 8/8/07)

Source Project	Estimated Scow Volume Disposed (m^3)
Northeast Petroleum	11,545
Portland Pipeline (Casco Bay)	207,293
Portland Pipeline (Southport Harbor)	110,937
Royal River Boatyard	4,843
Town of Cumberland	3,164
U.S. Coast Guard (Fore River)	18,349
U.S. Coast Guard (Newcastle, NH)	4,358
Brewer's So. Freeport Marina	1,529
Gulf Oil Limited Partnership	6,732
Total	368,750

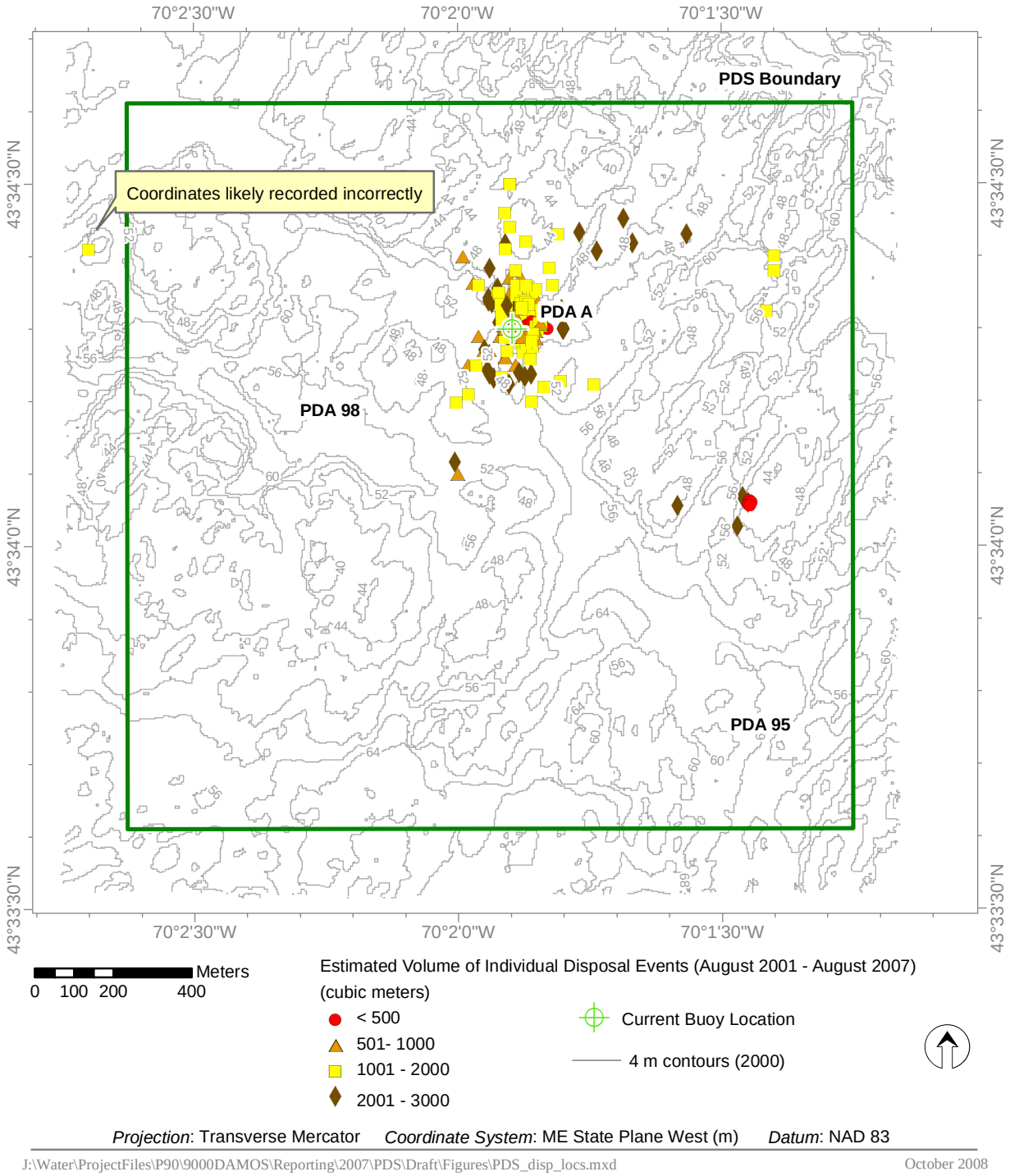

Figure 1-3. PDS with reported 2001-2007 dredged material disposal locations indicated

The design of the August 2007 survey allowed assessment of the following expectations:

- The placement of approximately 369,000 m^3 of dredged material at the DG buoy since August 2001 will result in the continued development of the PDA A Mound;
- The PDA A Mound is expected to have been augmented approximately 500 to 600 m in diameter with an added elevation of 2.5 to 4 m;
- The PDA A Mound will support early recolonization assemblages (Stage I and early Stage II);
- The historical mounds PDA 95 and PDA 98 will show minor consolidation; and
- As the PDA 95 and PDA 98 Mounds have not received dredged material in approximately 10 years and eight years, respectively, it is expected that the benthic community will be comprised of mature, equilibrium (Stage III) assemblages and will exhibit conditions comparable to those found at the reference areas.

2.0 METHODS

A team of investigators from ENSR, CR Environmental, and Germano and Associates performed the 2007 surveys at PDS. The multibeam bathymetric survey was conducted 8-10 August 2007. The sediment-profile and plan view imaging survey was conducted 18-22 August 2007. Field activities are summarized in Table 2-1, and an overview of the methods used to collect the survey data is provided below. A more detailed description of methodology and the related terminology can be found in ENSR (2004).

2.1 Navigation and On-Board Data Acquisition

Positional data, comprised of horizontal positioning (x- and y-dimensional data) and time (t-dimensional data), were collected using a Trimble AG-132 Differential Global Position System (DGPS) unit. This system received and processed satellite and land-based beacon data and provided real-time vessel position, typically to sub-meter accuracy. HYPACK® hydrographic survey software, developed by HYPACK, Inc., was used to acquire, integrate, and store all positional data from the DGPS as well as bathymetry and station data. The HYPACK® software also displayed real-time vessel position, bathymetry, and SPI stations over a background electronic chart of the study area, thus enabling survey scientists to review and evaluate survey data on a real-time basis.

2.2 Bathymetry

The 2007 multibeam bathymetric survey at PDS was conducted 8-10 August 2007 aboard the F/V *Shanna Rose*. The survey area covered a 2100 m X 2100 m square. A total of 26 survey lines, oriented in a north-south direction, were covered. The track lines were spaced 80 m apart to generate the necessary data coverage and overlap. Additional lines were run in an east-west direction to assess data quality (Figure 2-1).

The bathymetric data were collected using a Reson 8125 Ultra High Resolution Echo Sounder outfitted with a 0.5°, 455-kHz transducer. Sediment acoustic backscatter data, in the form of side-scan imagery, were also collected. A gyro compass was used to provide accurate measurement of heave, pitch and roll. The system was calibrated for local water mass speed of sound by performing conductivity-temperature-density (CTD) casts at frequent intervals throughout the day with a Seabird SBE-19 Seacat CTD profiler.

Water depths over the survey area were recorded in meters and referenced to mean lower low water (MLLW) based on local tidal data recorded at a project benchmark established in Portland Harbor using an In-Situ, Inc. Mini-Troll pressure transducer. Bathymetric data were recorded and stored within Hysweep®, a module of Hypack® used

Table 2-1.

August 2007 PDS Field Activities Summary

Survey Type	Date	Summary
Bathymetry	8-10 August 2008	Area: 2100 x 2100 m Lines: 26 Spacing: 80 m
Sediment-Profile and Plan View Imaging	18-22 August 2008	Stations: 65 PDA 95: 15 PDA 98: 16 PDA A: 15 EREF: 7 SREF: 7 SEREF: 5

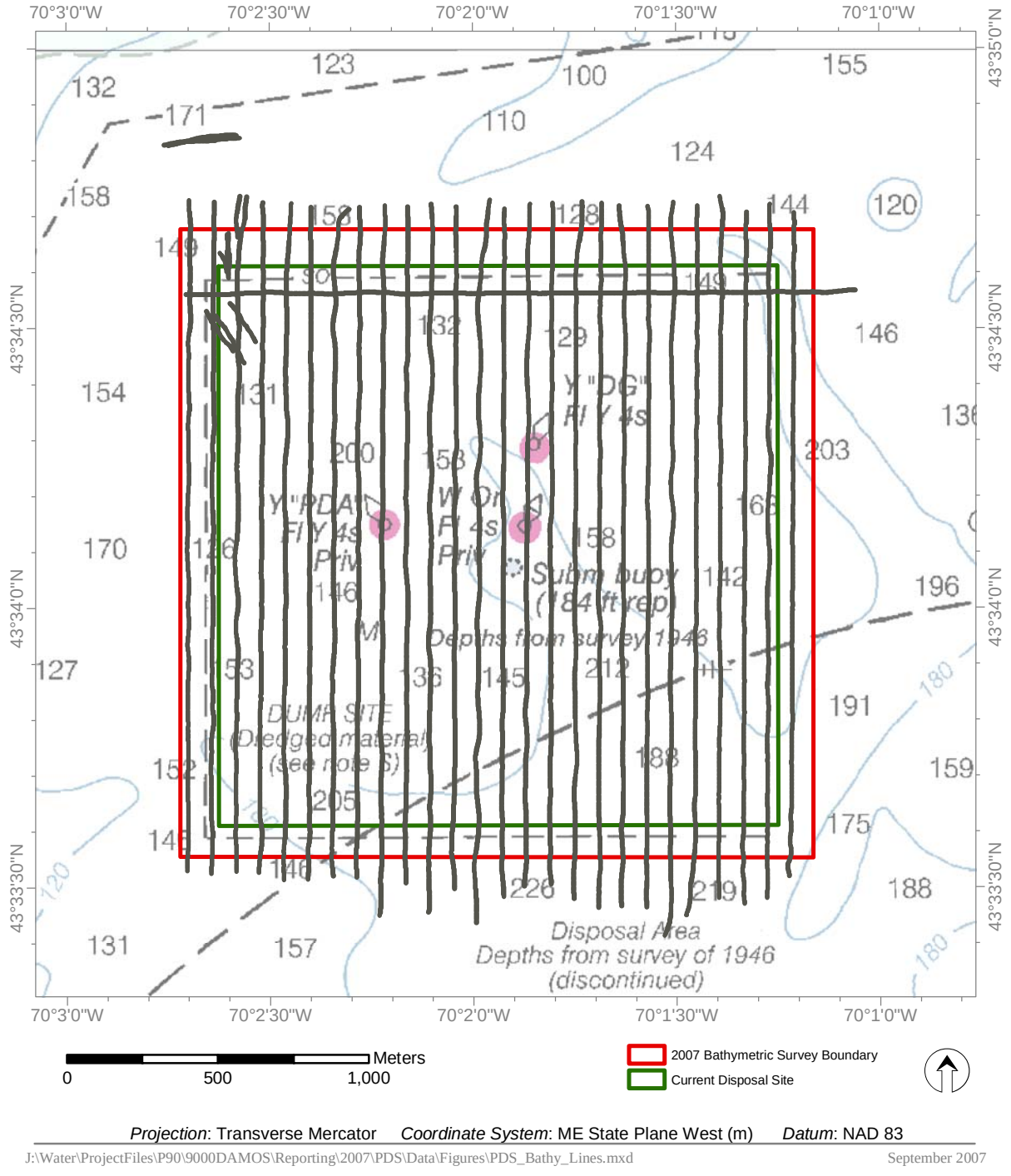

Figure 2-1. PDS with bathymetric survey boundary and survey lines indicated

to collect, display, and edit data from multibeam echosounder systems. Hysweep® managed data acquisition and storage of data from the echosounder and the navigation system. Hysweep® also recorded acoustic backscatter, depth, vessel heave, heading, position and time along each survey transect line.

2.2.1 Bathymetric Data Processing

The bathymetric data were processed using the HYPACK® software program and included corrections for tidal conditions, local speed of sound, and spurious data points. Tidal correction consisted of transforming the raw measurements of depth below the transducer to seafloor elevation measurements relative to MLLW using the locally collected tidal elevation data. Heave data supplied by the vessel's motion reference unit (MRU) was incorporated into the raw data to minimize the effects of vessel motion. The bathymetric data were also reviewed for spurious data points (clearly unrealistic measurements resulting from signal interference), and these points were removed. The final data set was averaged into 1.0-meter square bins. All soundings located within a given bin were averaged, and the average value was assigned to the coordinates at the center of the bin.

2.2.2 Bathymetric Data Analysis

Bathymetric data were analyzed to document the distribution of dredged material at PDS and evaluate changes in seafloor topography in comparison with previous surveys. The corrected bathymetric data were processed for display using a combination of the contouring and surface plotting software program, Surfer® 8.0 and the GIS-based software package ArcView® 9.2. The processed bathymetric data were converted into grids using Surfer® and bathymetric contour lines were generated and displayed using ArcView®.

Surfer® was also used to generate a depth-difference grid based on the July 2000 and the August 2007 bathymetric data sets. The depth difference grids were calculated by subtracting the 2000 interpolated depth estimates from the 2007 surveys depth estimates at each point thro-ughout the grid. The resulting depth differences were contoured and displayed using ArcView®.

2.3 Sediment-Profile and Plan View Imaging

2.3.1 Sediment-Profile Imaging

Sediment-profile imaging (SPI) was used to provide data on the physical characteristics of the seafloor as well as the status of the benthic biological community.

The technique involved deploying an underwater camera system to photograph a cross section of the sediment-water interface. Acquisition of high-resolution sediment-profile images was accomplished using a Nikon D100 digital single-lens reflex camera mounted inside an Ocean Imaging Model 3731 pressure housing system. The pressure housing sat atop a wedge-shaped prism with a front faceplate and a back mirror. The mirror was mounted at a 45° angle to reflect the profile of the sediment-water interface. As the prism penetrated the seafloor, a trigger activated a time-delay circuit that fired an internal strobe to obtain a cross-sectional image of the upper 15 to 20 cm of the sediment column (Figure 2-2). The camera remained on the seafloor for approximately 20 seconds to ensure that a successful image had been obtained.

Test exposures of the Kodak® Color Separation Guide (Publication No. Q-13) were made on deck at the beginning and end of each survey to verify that all internal electronic systems were working to design specifications and to provide a color standard against which final images could be checked for proper color balance. After deployment of the camera at each station, the frame counter was checked to ensure that the requisite number of replicates had been obtained. In addition, a prism penetration depth indicator on the camera frame was checked to verify that the optical prism had actually penetrated the bottom to a sufficient depth. If images were missed or the penetration depth was insufficient, the camera frame stop collars were adjusted and/or weights were added or removed, and additional replicate images were taken. Changes in prism weight amounts, the presence or absence of mud doors, and frame stop collar positions were recorded for each replicate image.

Each image was assigned a unique time stamp in the digital file attributes of the camera's data logger and cross-checked with the time stamp in the navigational system's computer data file. In addition, the field crew kept redundant written sample logs. Images were downloaded periodically to verify successful sample acquisition and/or to assess what type of sediment/depositional layer was present at a particular station. Digital image files were re-named with the appropriate station name immediately after downloading as a further quality assurance step.

Computer-aided analysis of the resulting images provided a set of standard measurements that enabled comparison among different locations and different surveys. The DAMOS Program has successfully used this technique for over 20 years to map the distribution of disposed dredged material and to monitor benthic recolonization at disposal sites. For a detailed discussion of SPI methodology, see ENSR (2004).

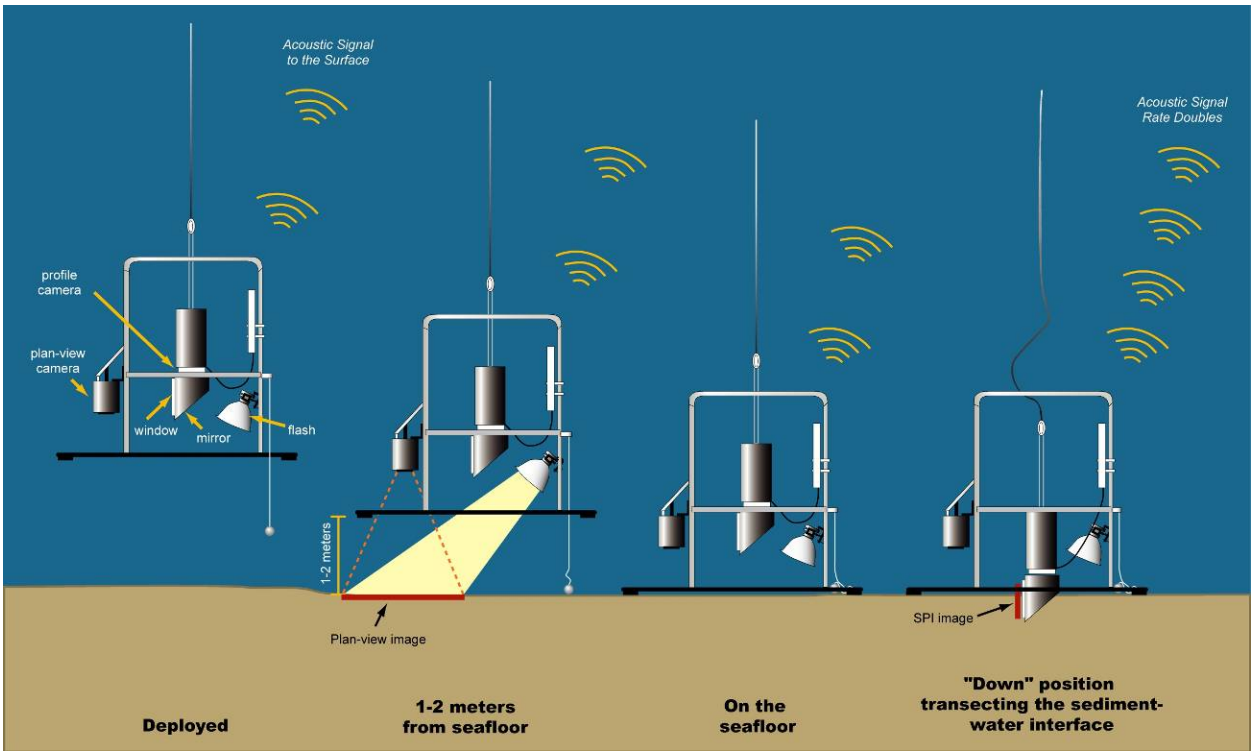

Figure 2-2. Operation of the combined Ocean Imaging Model 3731 sediment-profile and Model DSC-6000 plan view cameras

2.3.2 Plan View Imaging

Plan view underwater images were also collected at each station sampled with the sediment-profile camera. An Ocean Imaging Model DSC6000 plan view underwater camera (PUC) system with two Ocean Imaging Model 400-37 Deep Sea Scaling lasers was attached to the Model 3731 camera frame and used to collect plan view photographs of the seafloor surface (Figure 2-2). The PUC system consisted of a Nikon D-70 camera encased in a titanium housing, a 24 VDC autonomous power pack, a 500 W strobe, and a bounce trigger. A weight was attached to the bounce trigger with a stainless steel cable so that the weight hung below the camera frame. The scaling lasers projected 2 red dots that were separated by a constant distance (27 cm) regardless of the field of view of the PUC, which could be varied by increasing or decreasing the length of the trigger wire. For this survey, the trigger wire length was constant (1.5 meters), and the area of seafloor imaged was approximately 1.2 m^2. As the camera apparatus was lowered to the seafloor, the weight attached to the bounce trigger contacted the seafloor prior to the camera frame hitting the bottom and triggered the PUC. Details of the camera settings for each digital image are available in the associated parameters file embedded in each electronic image file; for this survey, the ISO-equivalent was set at 800. The additional camera settings used were as follows: shutter speed was 1/15, f10, white balance set to flash, color mode to Adobe RGB, sharpening to none, noise reduction off, and storage in compressed raw Nikon Electronic Format (NEF) files (approximately 5 MB each). Electronic files were converted to high-resolution jpeg (8-bit) format files (2000 x 3008 pixels) using Nikon Capture4® software (Version 4.4.2).

Prior to field operations, the internal clock in the digital PUC was synchronized with the GPS navigation system and the SPI camera. Each PUC image acquired was assigned a time stamp in the digital file, and redundant notations were made in the field and navigation logs. Throughout the survey, PUC images were downloaded at the same time as the sediment-profile images after collection and evaluated for successful image acquisition and image clarity.

2.3.3 SPI and PUC Data Collection

The sediment-profile and plan view imaging survey at PDS was initiated 18 August 2007 and completed 22 August 2007 aboard the F/V *Shanna Rose*. At each station, the vessel was positioned at the target coordinates, and the camera was deployed within a defined station tolerance of 10 m. In addition to the SPI camera, a plan view camera was affixed to the frame and deployed simultaneously. Three replicate SPI and PUC images were collected at each of the stations.

The 2007 sediment-profile and plan view imaging survey design included 60 stations: 45 stations located within the disposal site and 15 stations located within three reference areas. The three reference areas were located to the east (EREF), south (SREF) and southeast (SEREF) of PDS. The stations within PDS were divided among areas of recent disposal activity (PDA A) and two historical mounds (PDA 95 Mound and PDA 98 Mound), with 15 randomly chosen locations on each of the three mounds. However, 16 stations were actually sampled from the PDA 98 Mound, for a total of 46 stations from PDS. Several targets within the eastern and southern reference areas (EREF and SRERF) were found to be too hard to allow for adequate penetration of the SPI camera. New stations were selected based on available side-scan imagery and the boat's depth sounder. A total of 19 stations were sampled from the reference areas, five from SEREF and seven from both EREF and SREF (Table 2-2, Figures 2-3 and 2-4).

2.3.4 SPI and PUC Data Analysis

2.3.4.1 SPI Data Analysis

Computer-aided analysis of each SPI image was performed to provide measurement of the following standard set of parameters:

- *Sediment Type*—The sediment grain size major mode and range were estimated visually from the images using a grain size comparator at a similar scale. Results were reported using the phi scale. Conversion to other grain size scales is provided in Appendix B. The presence and thickness of disposed dredged material were also assessed by inspection of the images.

- *Penetration Depth*—The depth to which the camera penetrated into the seafloor was measured to provide an indication of the sediment density or bearing capacity. The penetration depth can range from a minimum of 0 cm (i.e., no penetration on hard substrates) to a maximum of 20 cm (full penetration on very soft substrates).

- *Surface Boundary Roughness*—Surface boundary roughness is a measure of the vertical relief of features at the sediment-water interface in the sediment-profile image. Surface boundary roughness was determined by measuring the vertical distance between the highest and lowest points of the sediment-water interface. The surface boundary roughness (sediment surface relief) measured over the width of sediment-profile images typically ranges from 0 to 4 cm, and may be related to physical structures (e.g., ripples, rip-up structures, mud clasts) or biogenic features (e.g., burrow openings, fecal mounds, foraging depressions). Biogenic roughness typically changes seasonally and is related to the interaction of bottom turbulence and bioturbational activities.

Table 2-2.

PDS Sediment-Profile and Plan View Image Target Sampling Locations

Station	Latitude (N)	Longitude (W)	Station	Latitude (N)	Longitude (W)
PDA95-01	43° 33.753'	70° 01.475'	PDA-A-03	43° 34.339'	70° 01.778'
PDA95-02	43° 33.830'	70° 01.454'	PDA-A-04	43° 34.342'	70° 01.855'
PDA95-03	43° 33.741'	70° 01.400'	PDA-A-05	43° 34.317'	70° 01.814'
PDA95-04	43° 33.852'	70° 01.488'	PDA-A-06	43° 34.265'	70° 01.967'
PDA95-05	43° 33.780'	70° 01.446'	PDA-A-07	43° 34.210'	70° 01.831'
PDA95-06	43° 33.768'	70° 01.520'	PDA-A-08	43° 34.313'	70° 01.929'
PDA95-07	43° 33.753'	70° 01.563'	PDA-A-09	43° 34.256'	70° 01.825'
PDA95-08	43° 33.841'	70° 01.511'	PDA-A-10	43° 34.240'	70° 01.921'
PDA95-09	43° 33.800'	70° 01.489'	PDA-A-11	43° 34.310'	70° 01.789'
PDA95-10	43° 33.719'	70° 01.481'	PDA-A-12	43° 34.266'	70° 01.805'
PDA95-11	43° 33.860'	70° 01.506'	PDA-A-13	43° 34.268'	70° 01.868'
PDA95-12	43° 33.778'	70° 01.408'	PDA-A-14	43° 34.286'	70° 01.906'
PDA95-13	43° 33.803'	70° 01.429'	PDA-A-15	43° 34.343'	70° 01.924'
PDA95-14	43° 33.824'	70° 01.577'	EREF-01	43° 34.415'	69° 59.768'
PDA95-15	43° 33.792'	70° 01.571'	EREF-03	43° 34.408'	69° 59.651'
PDA98-01	43° 34.120'	70° 02.174'	EREF-04	43° 34.507'	69° 59.693'
PDA98-02	43° 34.192'	70° 02.291'	EREF-05	43° 34.485'	69° 59.708'
PDA98-03	43° 34.138'	70° 02.264'	EREF-06	43° 34.457'	69° 59.743'
PDA98-04	43° 34.186'	70° 02.188'	EREF-07	43° 34.422'	69° 59.773'
PDA98-05	43° 34.202'	70° 02.153'	EREF-08	43° 34.393'	69° 59.653'
PDA98-06	43° 34.181'	70° 02.123'	SEREF-01	43° 32.825'	70° 00.163'
PDA98-07	43° 34.142'	70° 02.103'	SEREF-02	43° 32.773'	70° 00.216'
PDA98-08	43° 34.101'	70° 02.284'	SEREF-03	43° 32.833'	70° 00.220'
PDA98-09	43° 34.172'	70° 02.247'	SEREF-04	43° 32.825'	70° 00.145'
PDA98-10	43° 34.101'	70° 02.237'	SEREF-05	43° 32.793'	70° 00.266'
PDA98-11	43° 34.195'	70° 02.246'	SREF-01	43° 33.363'	70° 01.814'
PDA98-12	43° 34.112'	70° 02.131'	SREF-03	43° 33.400'	70° 01.692'
PDA98-13	43° 34.162'	70° 02.228'	SREF-04	43° 33.274'	70° 01.739'
PDA98-14	43° 34.128'	70° 02.317'	SREF-05	43° 33.412'	70° 01.732'
PDA98-15	43° 34.147'	70° 02.312'	SREF-06	43° 33.330'	70° 01.849'
PDA98-16	43° 34.139'	70° 02.225'	SREF-07	43° 33.439'	70° 01.710'
PDA-A-01	43° 34.303'	70° 01.888'	SREF-08	43° 33.441'	70° 01.568'
PDA-A-02	43° 34.285'	70° 01.959'			

Notes: Coordinate system NAD 83

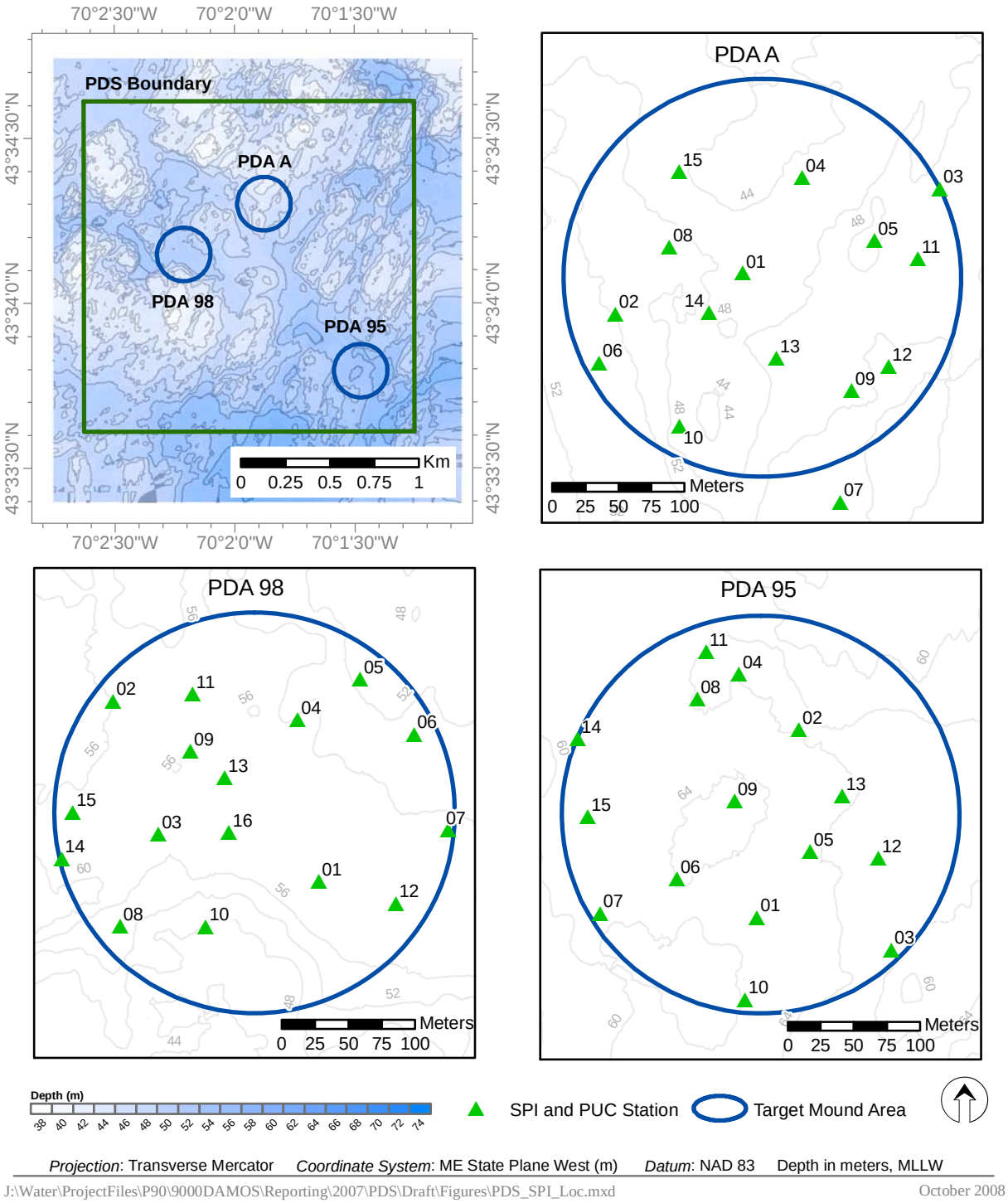

Figure 2-3. PDS with target sediment-profile and plan view image stations

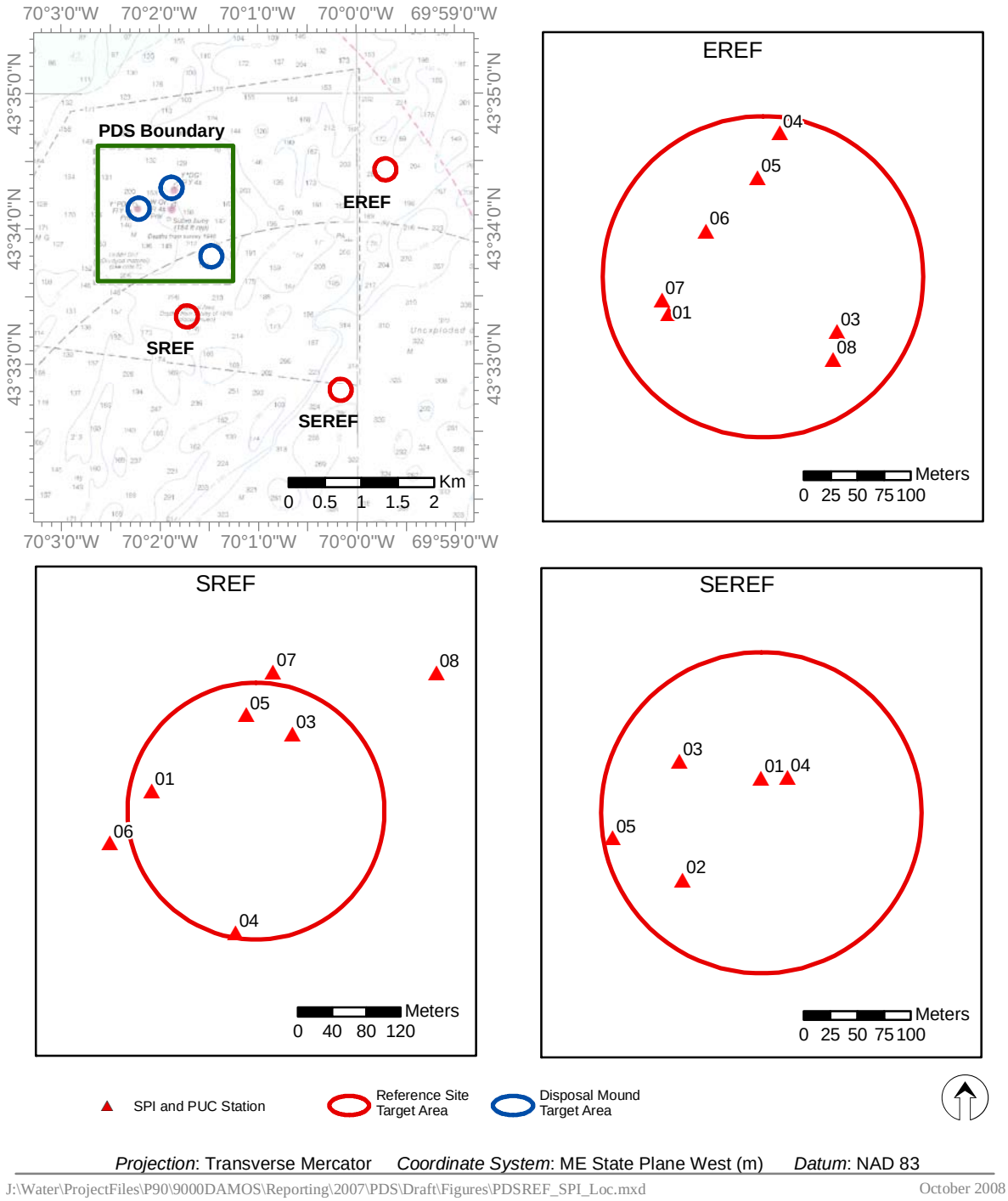

Figure 2-4. PDS reference areas with target sediment-profile and plan view image stations

- *Apparent RPD Depth*— RPD provides a measure of the integrated time history of the balance between near surface oxygen conditions and biological reworking of sediments. Sediment particles exposed to oxygenated waters oxidize and lighten in color to brown or light grey. As the particles are moved downwards by biological activity or buried, they are exposed to reduced oxygen concentrations in subsurface pore waters and their oxic coating slowly reduces, changing color to dark grey or black. When biological activity is high, the RPD depth increases; when it is low or absent, the RPD depth decreases. The RPD depth was measured by assessing color and reflectance boundaries within the images.

- *Infaunal Successional Stage*—Infaunal successional stage is a measure of the biological community inhabiting the seafloor. Current theory holds that organism-sediment interactions in fine-grained sediments follow a predictable sequence of development after a major disturbance (such as dredged material disposal), and this sequence has been divided subjectively into three stages (Rhoads and Germano 1982, 1986). Successional stage was assigned by assessing which types of species or organism-related activities were apparent in the images.

Additional components of the SPI analysis included calculation of means and ranges for the parameters listed above and mapping of station-averaged values.

2.3.4.2 PUC Image Data Analysis

Computer-aided analysis of each PUC image was performed to provide additional information about large-scale sedimentary features, density and patch size of surface fauna, density of infaunal burrowers, and occurrences and density of epifaunal foraging patterns on the seafloor of the disposal site and reference areas.

2.3.4.3 Statistical Methods

The objective of the SPI and plan view imaging survey was to assess the benthic recolonization status of the three disposal site mounds relative to reference conditions. The typical statistical approach to evaluate this type of objective is point-null hypothesis testing. This approach postulates the null hypothesis that there is no difference in benthic conditions between the mean values of the reference area and the mean values of the disposal mound; if the p-value is less than the accepted Type I error risk ($\alpha = 0.05$), it is concluded that the sites are different (e.g., Underwood 1990, 1997; Fairweather 1991). As such, p-values are treated as evidence for or against rejecting the null hypotheses.

As limitations have been identified with this approach (e.g., Carver 1978; Tukey 1991; McBride et al. 1993; Germano 1999; McBride 1999; Nelder 1999; Cole et al.

2001), equivalence tests (also known as interval hypothesis tests) have been employed to analyze SPI data. Statistical analysis of the 2007 PDS SPI data included equivalence tests to compare biological conditions at the PDS mounds with those at the reference stations.

Equivalence tests can examine either 1) the equivalence hypothesis, where the true difference between means is postulated to lie within a prescribed equivalence interval, or, 2) the inequivalence hypothesis, in which the true difference between means is postulated to lie beyond that interval. These two approaches provide a framework for demonstrating proof of hazard (equivalence tests), or proof of safety (inequivalence tests). It is the latter approach that is particularly appropriate for the evaluation of disposal mounds relative to nearby reference areas for the DAMOS Program. In this application of bioequivalence (interval) testing, the null hypothesis was chosen as one that presumes the difference between parameter values measured within a disposal site relative to reference areas is great, i.e., an inequivalence hypothesis (e.g., McBride 1999). This is recognized as a 'proof of safety' approach because rejection of this inequivalence null hypothesis requires sufficient proof that the difference is actually small. The null and alternative hypotheses to be tested were:

H_0: $d \leq -\delta$ or $d \geq \delta$ (presumes the difference is great)

H_A: $-\delta < d < \delta$ (requires proof that the difference is small)

Where:

d = the actual difference between reference mean and site mean for a particular parameter.

δ = the maximum difference expected for that parameter considering background information.

If the null hypothesis is rejected, then it can be concluded that the two means are equivalent to one another within $\pm\delta$ units. The size of δ should be determined from historical data and/or best professional judgment to identify a maximum difference that is within background variability/noise and is therefore not ecologically meaningful. To determine the expected difference (δ) between an undisturbed seafloor (i.e., reference area) and a recently-disturbed disposal site (i.e., disposal mound) for RPD and successional stage rank, both the mean and range of values in historical DAMOS SPI monitoring data were considered. Based on these historical data, it was determined that realistic δ for RPD and successional stage rank values would be 1 and 0.5 (on the 0-3 scale), respectively. These difference values were based on the typical spread of RPD

and successional stage rank values observed at the reference areas and were representative of a background range.

The test of this interval hypothesis was broken down into two one-sided tests (TOST) (McBride 1999 after Schuirmann 1987) which are based on Student's *t*-distribution. The statistics used to test the interval hypotheses shown here were based on the Central Limit Theorem (CLT) such that the mean of any random variable is normally distributed, and linear combinations of normal random variables are also normal. Hence, a linear function of means is also normally distributed. As a result, the t-distribution can be used to construct a confidence interval around any linear function of means.

In this sampling design, there are actually six distinct areas, three of which are categorized as reference locations, so the difference equation of interest is defined as the average of the 3 reference means minus each mound mean, or

$$[(\text{Mean}_{\text{ERef}} + \text{Mean}_{\text{SRef}} + \text{Mean}_{\text{SERef}})/3 - \text{Mean}_{\text{Mound}}]$$

The three reference areas collectively represent ambient conditions, and if appropriate, were pooled into a single reference group. However, if there are mean differences among these three areas, then pooling them into a single reference group would increase the variance beyond true background variability. Differences among the three reference areas were evaluated prior to comparison with the mound data to determine if pooling the reference areas was appropriate.

The difference equations, $\hat{d}$, for the comparisons of interest are:

$$\hat{d}_1 = \tfrac{1}{3}\,(\text{Mean}_{\text{ERef}} + \text{Mean}_{\text{SRef}} + \text{Mean}_{\text{SERef}}) - \text{Mean}_{\text{PDA 95}} \textbf{ or } \text{Mean}_{\text{Pooled Refs}} - \text{Mean}_{\text{PDA 95}}$$

$$\hat{d}_2 = \tfrac{1}{3}\,(\text{Mean}_{\text{ERef}} + \text{Mean}_{\text{SRef}} + \text{Mean}_{\text{SERef}}) - \text{Mean}_{\text{PDA 98}} \textbf{ or } \text{Mean}_{\text{Pooled Refs}} - \text{Mean}_{\text{PDA 98}}$$

$$\hat{d}_3 = \tfrac{1}{3}\,(\text{Mean}_{\text{ERef}} + \text{Mean}_{\text{SRef}} + \text{Mean}_{\text{SERef}}) - \text{Mean}_{\text{PDA A}} \textbf{ or } \text{Mean}_{\text{Pooled Refs}} - \text{Mean}_{\text{PDA A}}$$

The standard error of each difference was calculated from the fact that the variance of a sum is the sum of the variances for independent variables, or:

$$SE(\hat{d}) = \sqrt{\sum_j \left(S_j^2 c_j^2 / n_j\right)}$$

Where:

c_j = coefficients for the j means in the difference equation, $\hat{d}$ (i.e., for the difference equations shown above, the coefficients are 1/3, 1/3, 1/3, and –1 for areas EREF, SREF, SEREF, and each disposal mound, respectively; or they would be 1, -1 for Reference and Mound, respectively, if the three reference areas can be pooled).

S_j^2 = variance for the jth area. If equal variances were assumed, a single pooled variance estimate was substituted for each group, equal to the mean square error from an ANOVA.

n_j = number of replicates for the jth area (7, 7, 5, for areas EREF, SREF, and SEREF; and 15, 15, 16 for PDA A, PDA 95, PDA 98).

The inequivalence null hypothesis was rejected (and equivalence was concluded) if the confidence interval on the difference of means, $\hat{d}$, was fully contained within the interval $[-\delta , +\delta]$. Thus the decision rule is to reject H_0 if:

$$D_L = \hat{d} - t_{\alpha,\upsilon} se(\hat{d}) > -\delta \quad \text{and} \quad D_U = \hat{d} + t_{\alpha,\upsilon} se(\hat{d}) < \delta$$

Where:

$\hat{d}$ = observed difference in means between the reference and mound

$t_{\alpha,\upsilon}$ = upper 100α percentile of a Student's t-distribution with υ degrees of freedom

$se(\hat{d})$ = standard error of the difference.

υ = degrees of freedom for the standard error. If a pooled variance estimate was used, the degrees of freedom was equal to the sum of the sample sizes for all groups included in the $\hat{d}$ minus the number of groups; if separate variance estimates were used, degrees of freedom were calculated based on the Brown and Forsythe estimation (Zar 1996, p. 189).

Equality of the reference areas were graphically evaluated using boxplots and summary statistics. Validity of the normality and equal variance assumptions were tested using Shapiro-Wilk's test for normality on the area residuals ($\alpha=0.05$) and Levene's test for equality of variances among the four areas ($\alpha=0.05$). If normality was not rejected but equality of variances was rejected, then the variance for the difference equation was based on separate variances for each group. If systematic deviations from normality were identified, then the data were transformed to approximate normality, if possible. Otherwise, a non-parametric bootstrapped interval was used.

3.0 RESULTS

3.1 Bathymetry

3.1.1 Existing Bathymetry

The August 2007 bathymetric survey of PDS indicated a highly irregular bottom topography, with a prominent northwest-southeast trending trough (Figure 3-1). Water depths at the site ranged from 36.7 m to 72.7 m.

3.1.2 Comparison to Previous Bathymetric Survey

A depth difference map was generated comparing the August 2007 survey results to those of July 2000 (Figure 3-2). The 2000 multibeam bathymetric survey was conducted over the same area as the 2007 survey. Depth-difference results were plotted at 0.5 m contour intervals. The only significant change in bathymetry over this time period was an increase in the size of the PDA A Mound. This mound increased in height by approximately 4.5 m over an area approximately 400 m along its north-south axis by 250 along its east-west axis. There was no significant change in bathymetry at the PDA 95 or PDA 98 Mounds. The depth difference comparison revealed numerous small areas of apparent depth increases or decreases of up to 2 m. These changes in bathymetry are likely measurement and processing artifacts, which are common in areas of steeper slopes, rather than actual bathymetric differences between the two surveys.

3.2 Sediment-Profile Imaging

A summary of SPI results from the three disposal mounds (PDA A, PDA 95, and PDA 98) and the three reference areas (EREF, SREF, and SEREF) can be found in Tables 3-1 and 3-2, and the complete set of all SPI results can be found in Appendix B.

3.2.1 Reference Areas

3.2.1.1 Physical Sediment Characteristics

As described in previous monitoring surveys at PDS (SAIC 2002, 2003), the sediments at SEREF were notable for the lack of any rock outcrops on the sediment surface (Figure 3-3); all of the stations at SEREF had a sediment grain size major mode of >4 phi (silt-clay), while two of the seven stations sampled at both EREF and SREF were on hard rock outcrops with small patches of fine-grained sediment in between the

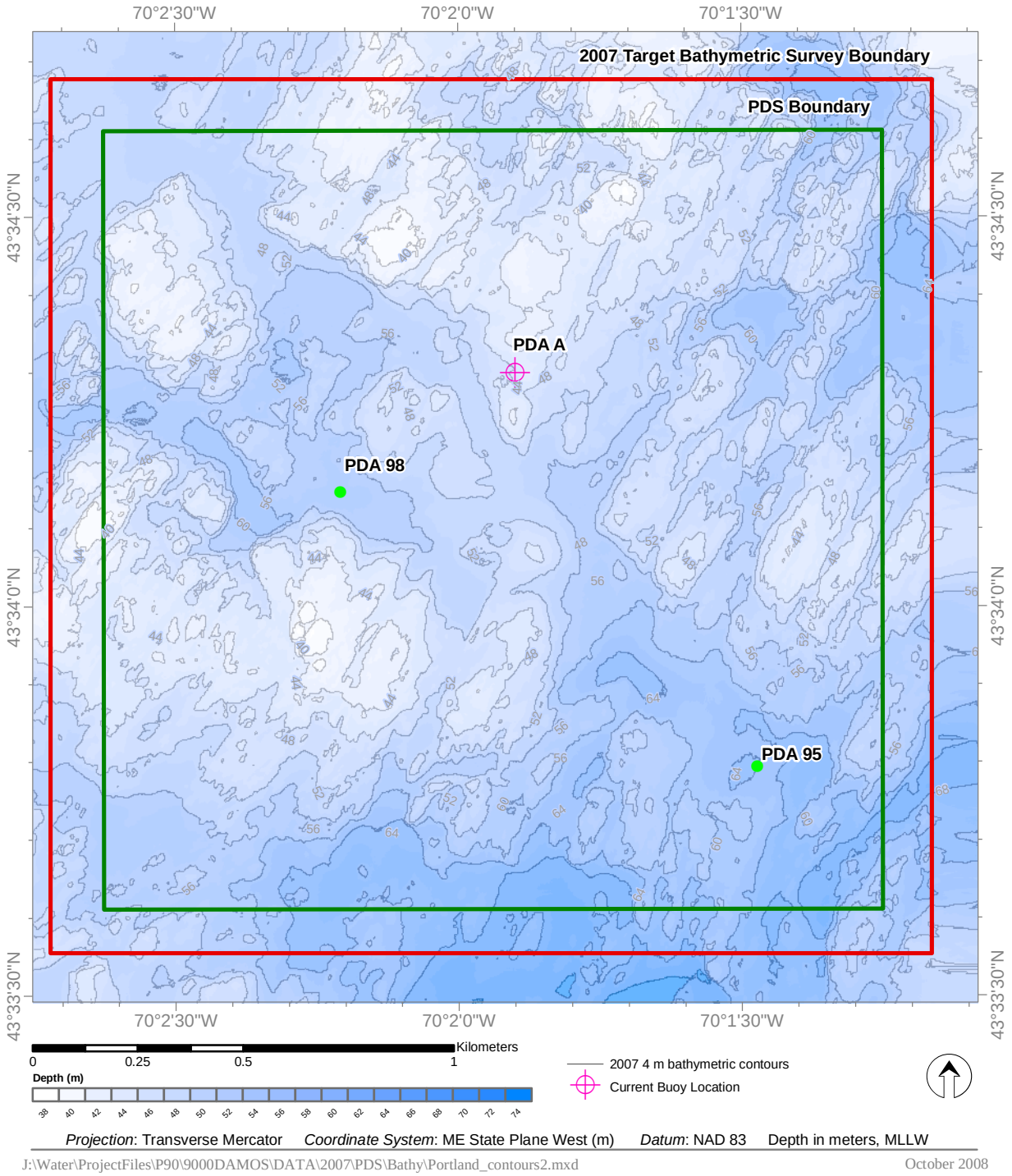

Figure 3-1. Bathymetric contour map of PDS survey area, August 2007 (4-m contour interval)

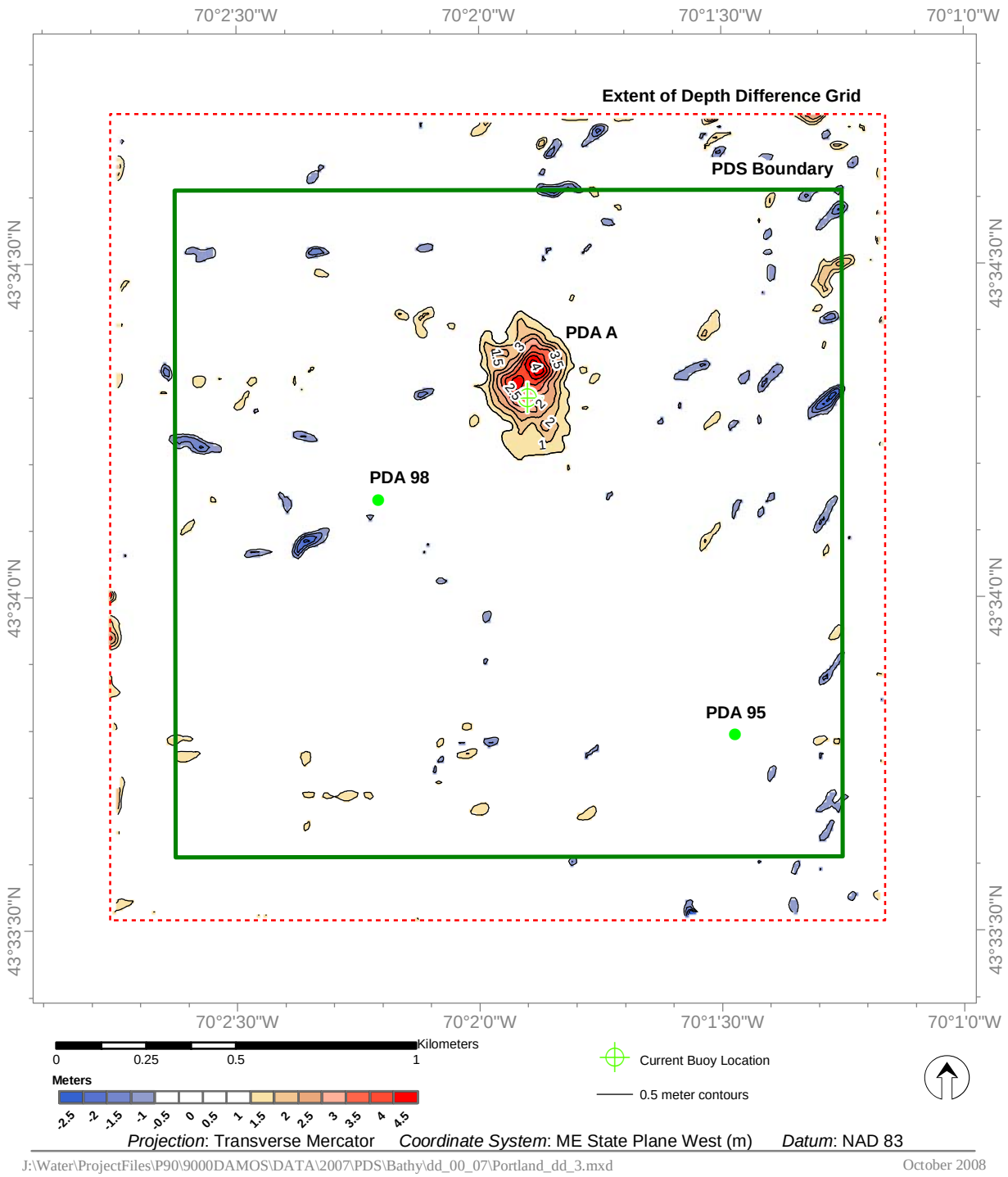

Figure 3-2. Depth difference contour map of PDS survey area, July 2000 vs. August 2007 survey results (0.5-m contour interval)

Table 3-1.

Summary of SPI Results for PDS Reference Stations, August 2007

Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean RPD Depth (cm)	Station Average DM Thickness (cm)	Station Void Average Depth (cm)	Highest Successional Stage Present
EREF-01	>4	10.8	0.7	2.8	0.0	1.5	I on III
EREF-03	>4	8.2	1.3	2.5	0.0	3.3	I on III
EREF-04	Rocky	0.0	0.0	Indeterminate	0.0	0.0	Indeterminate
EREF-05	Rocky	0.0	0.0	Indeterminate	0.0	0.0	Indeterminate
EREF-06	>4	9.4	1.0	3.0	0.0	0.0	I on III
EREF-07	>4	11.5	0.9	2.9	0.0	0.0	I on III
EREF-08	>4	10.4	1.2	2.6	0.0	4.1	I on III
SEREF-01	>4	18.4	1.3	4.5	0.0	7.5	I on III
SEREF-02	>4	17.3	1.6	4.2	0.0	8.2	I on III
SEREF-03	>4	17.1	0.5	4.3	0.0	8.7	I on III
SEREF-04	>4	14.4	1.7	4.0	0.0	3.3	I on III
SEREF-05	>4	14.5	1.0	2.9	0.0	5.0	I on III
SREF-01	>4	17.4	1.0	3.4	0.0	0.0	I on III
SREF-03	>4	8.9	1.2	2.6	0.0	2.5	I on III
SREF-04	Rocky	0.0	0.0	Indeterminate	0.0	0.0	Indeterminate
SREF-05	Rocky	1.9	0.4	1.8	0.0	0.0	I on III
SREF-06	>4	11.0	2.1	2.3	0.0	0.0	I on III
SREF-07	>4	15.5	0.7	3.1	0.0	5.4	I on III
SREF-08	>4	9.5	1.1	2.3	0.0	0.0	I on III
Average	NA	10.3	0.9	3.1	0.0	2.6	NA
Minimum	NA	0.0	0.0	1.8	0.0	0.0	NA
Maximum	NA	18.4	2.1	4.5	0.0	8.7	NA

NA = Not Applicable

Table 3-2.

Summary of SPI Results for PDS Stations, August 2007

Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean RPD Depth (cm)	Station Average DM Thickness (cm)	Station Void Average Depth (cm)	Highest Successional Stage Present
PDA-A-01	>4	4.1	2.6	1.6	>penetration	0.0	I-II
PDA-A-02	3 to 2/>4	10.3	2.1	2.6	>penetration	0.0	II
PDA-A-03	3 to 2	5.9	0.9	2.4	>penetration	0.0	I
PDA-A-04	3 to 2/>4	4.7	1.2	2.5	>penetration	0.0	I-II
PDA-A-05	2 to 1	6.3	2.9	2.6	>penetration	0.0	II
PDA-A-06	>4 to 3	6.1	1.1	1.4	>penetration	0.0	II-III
PDA-A-07	3 to 2/>4	11.8	3.6	1.4	>penetration	0.0	I-II
PDA-A-08	3 to 2	3.3	1.3	3.3	>penetration	0.0	II
PDA-A-09	3 to 2	3.8	0.7	3.1	>penetration	0.0	II
PDA-A-10	3 to 2	10.4	1.0	1.9	>penetration	0.0	I on III
PDA-A-11	3 to 2	8.2	2.0	2.1	>penetration	0.0	II
PDA-A-12	3 to 2	4.5	1.5	4.5	>penetration	0.0	II
PDA-A-13	2 to 1	5.8	3.0	Indeterminate	>penetration	0.0	II
PDA-A-14	Rocky	0.0	0.0	Indeterminate	Indeterminate	0.0	Indeterminate
PDA-A-15	3 to 2	6.1	1.5	2.7	>penetration	0.0	II-III
Average	NA	6.1	1.7	2.5	NA	0.0	NA
Minimum	NA	0.0	0.0	1.4	NA	0.0	NA
Maximum	NA	11.8	3.6	4.5	NA	0.0	NA

Table 3-2. (continued)

Summary of SPI Results for PDS Stations, August 2007

Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean RPD Depth (cm)	Station Average DM Thickness (cm)	Station Void Average Depth (cm)	Highest Successional Stage Present
PDA95-01	>4	9.5	0.7	1.8	>penetration	8.6	I on III
PDA95-02	>4	13.2	1.0	2.8	>penetration	9.6	I on III
PDA95-03	>4	8.8	2.4	2.1	>penetration	2.3	I on III
PDA95-04	>4	18.4	1.8	3.0	12.2	7.7	I on III
PDA95-05	>4	11.3	1.3	2.1	>penetration	7.7	I on III
PDA95-06	>4 to 3	10.6	0.7	2.7	>penetration	6.5	I on III
PDA95-07	>4	9.3	1.3	2.8	8.6	7.9	I on III
PDA95-08	>4	14.4	0.7	2.4	>penetration	7.3	I on III
PDA95-09	>4	10.4	1.1	2.5	>penetration	7.3	I on III
PDA95-10	>4	14.3	1.0	1.8	>penetration	3.2	I on III
PDA95-11	>4	18.4	1.1	2.4	11.9	7.5	I on III
PDA95-12	>4	12.4	0.7	2.9	>penetration	3.2	I on III
PDA95-13	>4	11.9	1.0	2.5	>penetration	6.0	I on III
PDA95-14	>4 to 3/>4	11.7	1.1	1.9	>penetration	4.9	I on III
PDA95-15	>4	13.2	1.4	2.5	>penetration	3.6	I on III
Average	NA	12.5	1.1	2.4	NA	6.2	NA
Minimum	NA	8.8	0.7	1.8	NA	2.3	NA
Maximum	NA	18.4	2.4	3.0	NA	9.6	NA

Table 3-2. (continued)

Summary of SPI Results for PDS Stations, August 2007

Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean RPD Depth (cm)	Station Average DM Thickness (cm)	Station Void Average Depth (cm)	Highest Successional Stage Present
PDA98-01	4-3/4	15.3	0.9	2.4	> penetration	6.9	I on III
PDA98-02	> 4	16.7	1.2	1.9	> penetration	7.6	I on III
PDA98-03	4-3/4	16.7	1.5	3.5	> penetration	9.6	I on III
PDA98-04	> 4	13.2	1.3	2.9	> penetration	3.9	I on III
PDA98-05	> 4	15.3	1.3	1.4	> penetration	4.9	I on III
PDA98-06	> 4	15.7	0.9	2.2	> penetration	8.3	I on III
PDA98-07	> 4	12.8	1.1	2.0	> penetration	4.7	I on III
PDA98-08	> 4	13.1	0.6	1.9	> penetration	6.5	I on III
PDA98-09	> 4	16.0	1.5	2.2	> penetration	6.3	I on III
PDA98-10	> 4	5.0	2.0	1.7	> penetration	4.5	I on III
PDA98-11	> 4	17.3	1.0	3.1	> penetration	7.8	I on III
PDA98-12	> 4	13.9	0.9	3.2	> penetration	7.0	I on III
PDA98-13	> 4	16.6	1.2	2.7	> penetration	6.9	I on III
PDA98-14	> 4	17.1	0.8	2.1	6.9	6.9	I on III
PDA98-15	> 4	16.0	1.6	2.9	9.1	9.8	I on III
PDA98-16	> 4	16.1	1.5	3.1	10.6	9.7	I on III
Average	NA	14.8	1.2	2.5	NA	7.0	NA
Minimum	NA	5.0	0.6	1.4	NA	3.9	NA
Maximum	NA	17.3	2.0	3.5	NA	9.8	NA

NA = Not Applicable

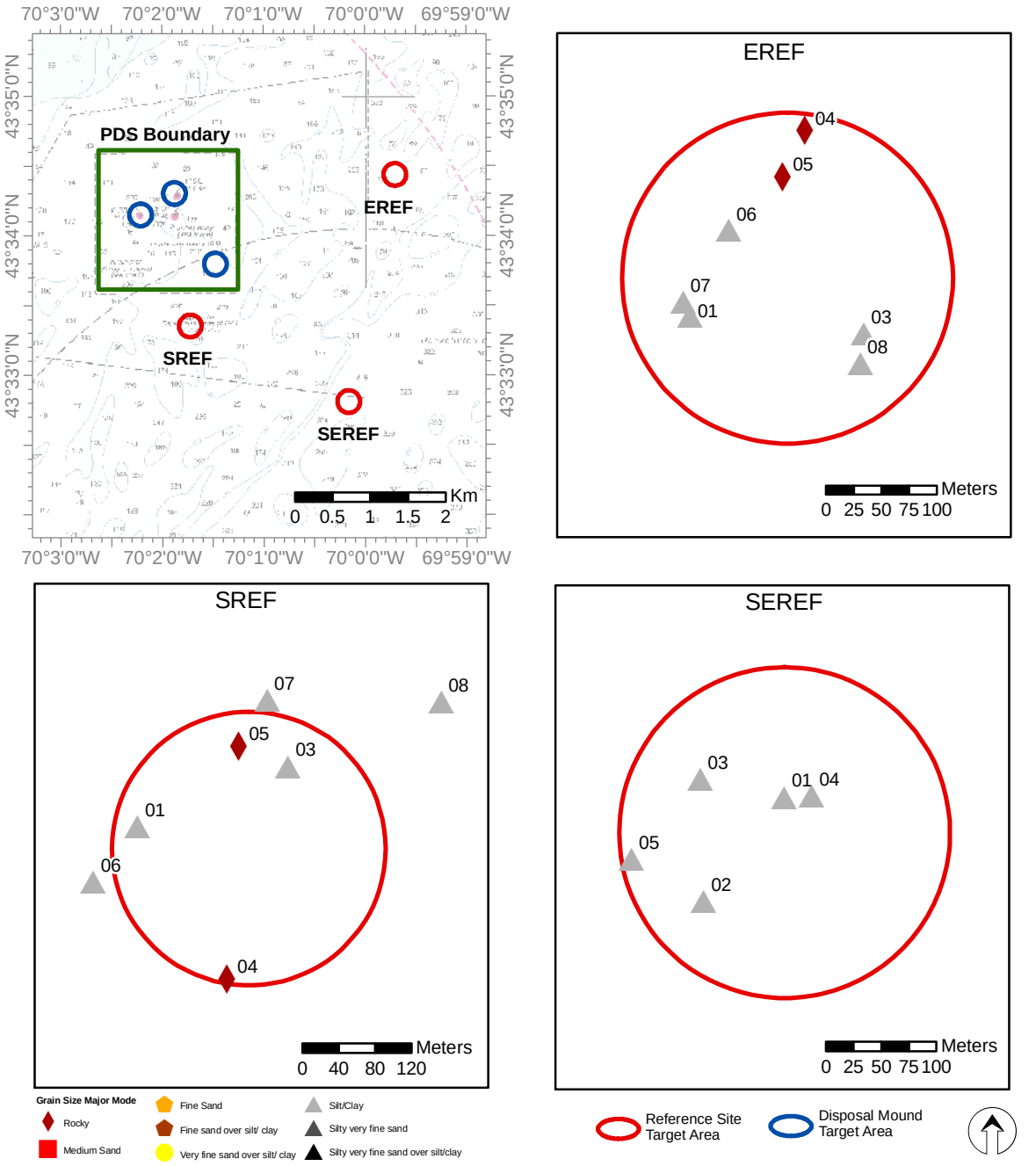

Figure 3-3. Distribution of sediment grain size major-mode (phi units) found at PDS reference areas

larger rocks (Figure 3-4). The remaining five stations at both EREF and SREF were also primarily silt-clay sediments (major mode > 4 phi).

Average camera prism penetration depth at the reference stations ranged from 0 to 18.4 cm (Figure 3-5), with an overall average reference station penetration of 10.3 cm (Table 3-1). With the alternating hard and soft bottom encountered in the reference areas, the stop collar settings and number of weights were not kept constant (Appendix B); however, at the 15 reference stations where fine-grained sediments were encountered, the sediments were well sorted and the muds fairly homogeneous (Figure 3-6).

Small-scale boundary roughness values at the reference stations ranged from 0 to 2.1 cm, with an overall average value of 0.9 cm for the ambient seafloor (Figure 3-7). With the exception of those stations located on the rocky outcrops, all of the small-scale surface roughness elements were biogenic in origin, caused by either infaunal fecal mounds, burrow openings, or feeding pits.

3.2.1.2 Biological Conditions and Benthic Recolonization

The average depth of the apparent RPD at the stations surveyed on the ambient seafloor ranged from 1.8 to 4.5 cm (Figure 3-8), with an overall reference average of 3.1 cm (Table 3-1). Evidence of mature infaunal assemblages was found at all the soft-bottomed stations (Figure 3-9); all of these muddy stations had well-bioturbated, homogeneous sedimentary fabric in the 10 cm below the sediment surface. Large, burrowing cerianthid anemones were also commonly found on the surface in all three reference areas (Figure 3-10).

3.2.2 PDA A Mound

3.2.2.1 Physical Sediment Characteristics

The sediment grain size of stations on the PDA A Mound ranged from rocky/cobble debris to silt-clay (Figure 3-11), reflecting the variability in source material from the recent disposal operations. While only one station (PDA-A-14) had a mixture of cobble and rocks on the surface that prevented prism penetration (Figure 3-12), the remaining 14 stations displayed the typical patterns of recently-disposed sediment ranging from consolidated clay clumps (Station PDA-A-01; Figure 3-13), to surface sand layers over mud (Figure 3-14), as well as uniform profiles of well-sorted fine or medium sand (Figure 3-15).

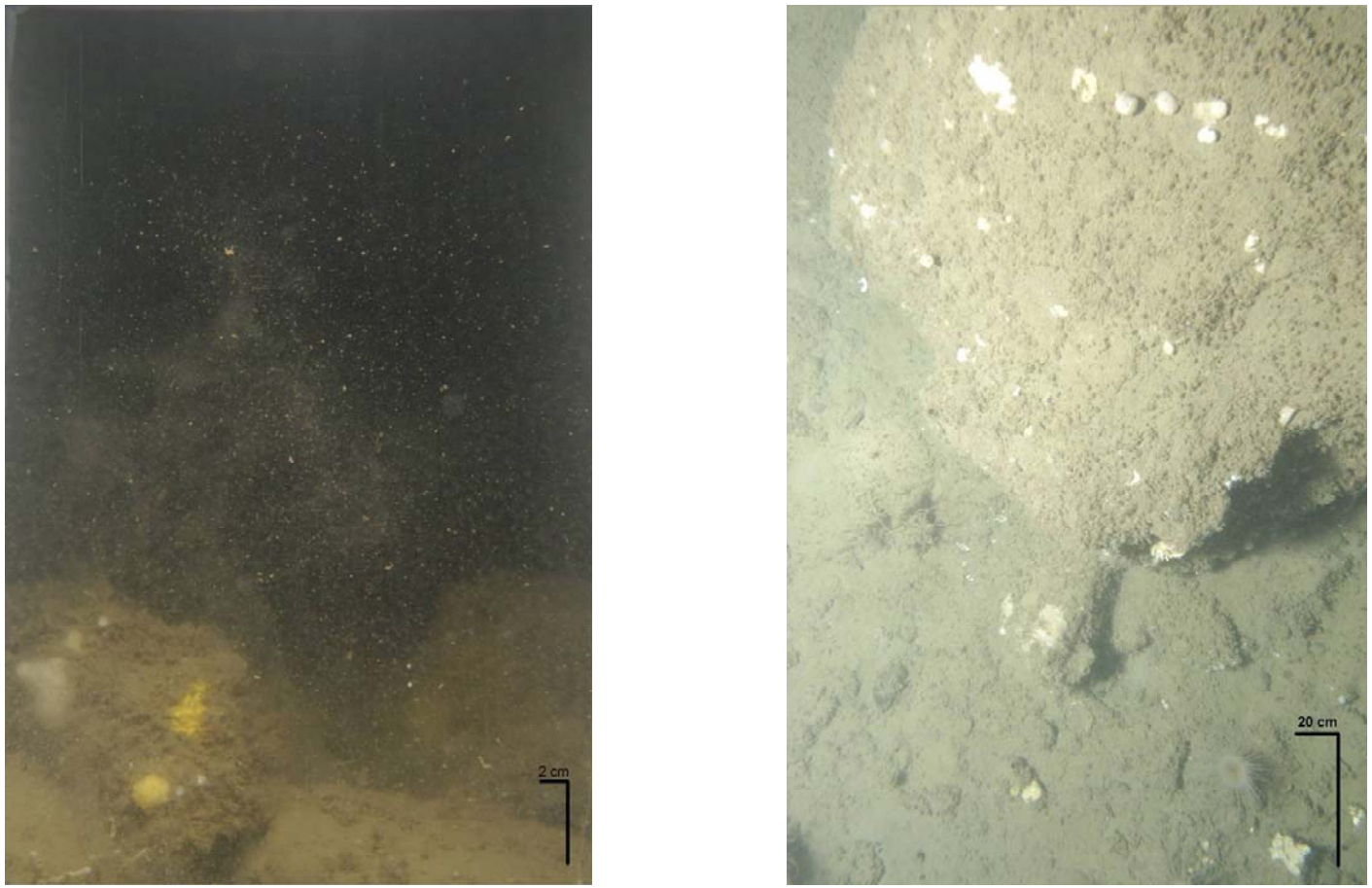

Figure 3-4. The hard rock outcrops shown in this profile (left) and plan view image (right) from Station EREF-05 were typical of those encountered at four of the 19 reference stations sampled.

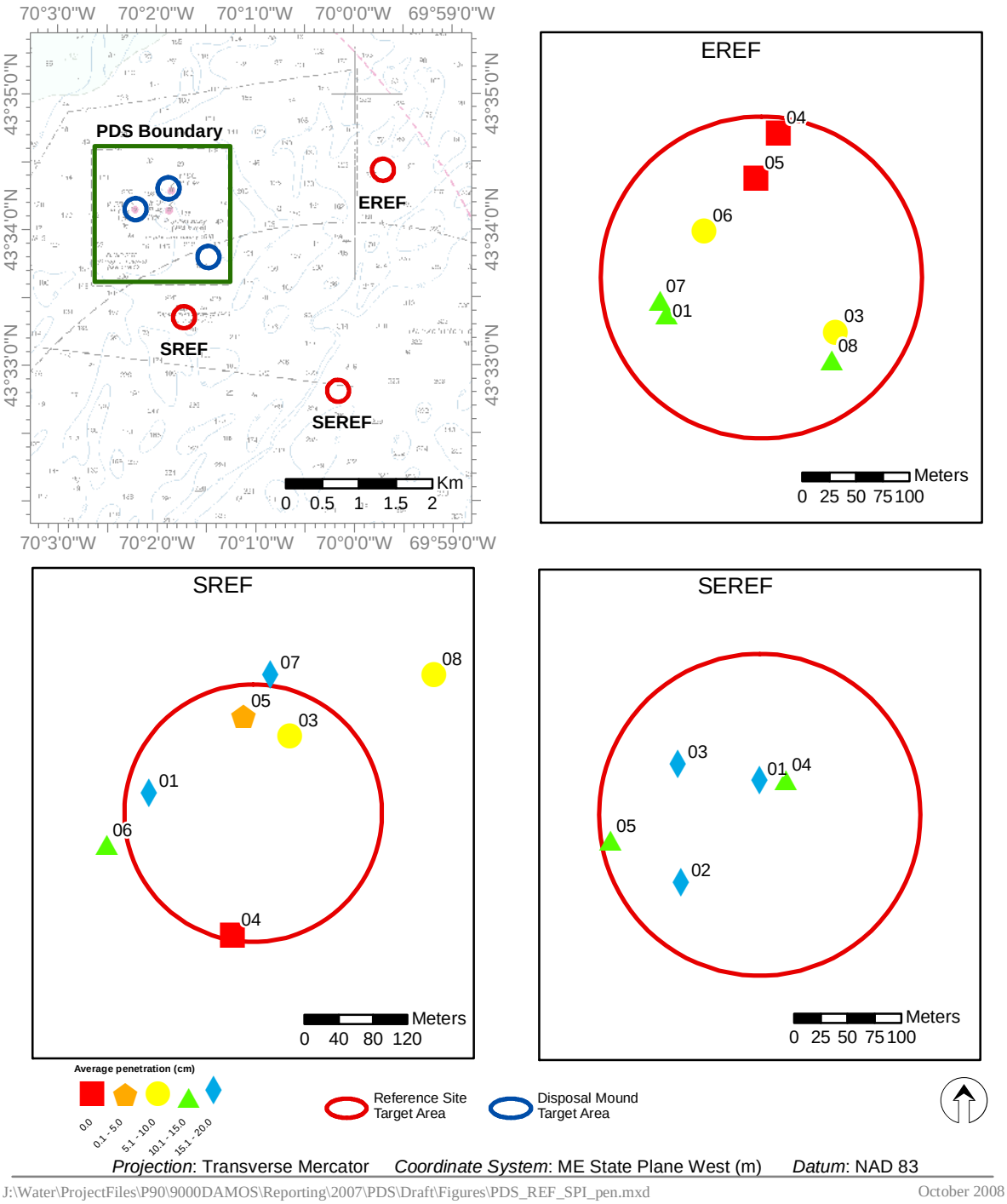

Figure 3-5. Spatial distribution of station-averaged camera prism penetration depth (cm) at PDS reference areas

Figure 3-6. This profile image from SEREF-03 shows the homogeneous silt-clay sediments that were typical of the reference areas.

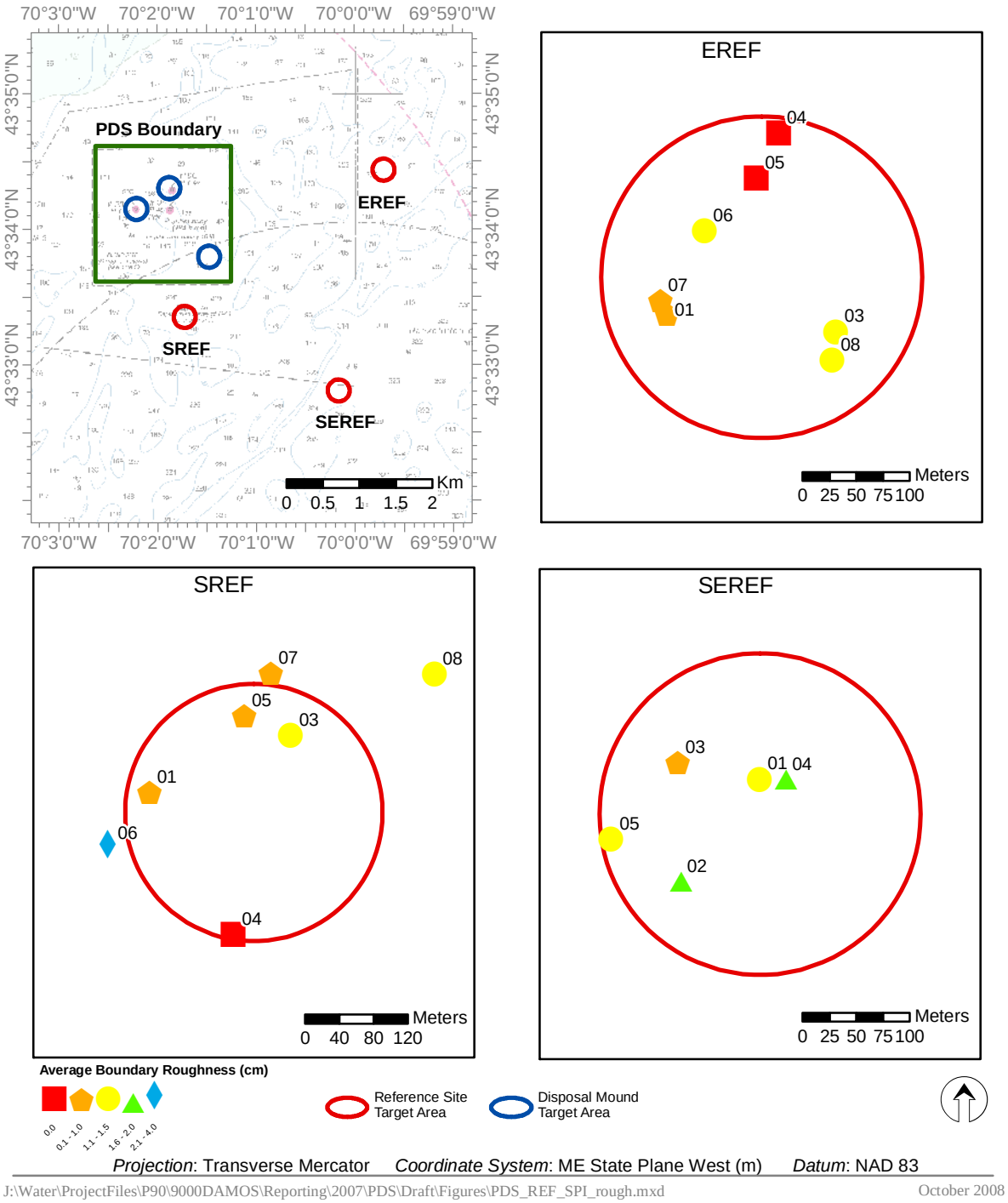

Figure 3-7. Spatial distribution of station-averaged boundary roughness (cm) at PDS reference areas

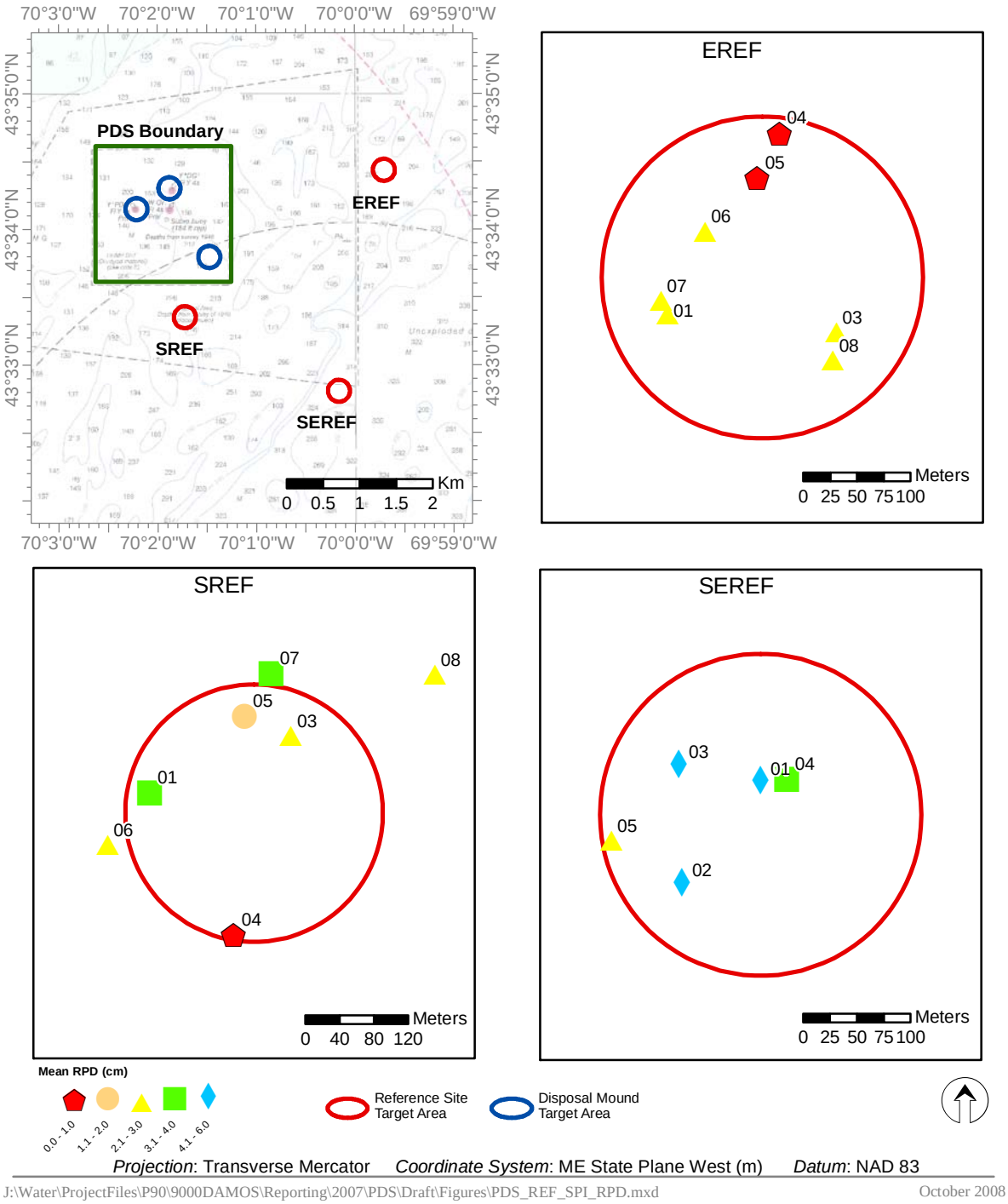

Figure 3-8. Spatial distribution of station-averaged apparent RPD depths (cm) at PDS reference areas

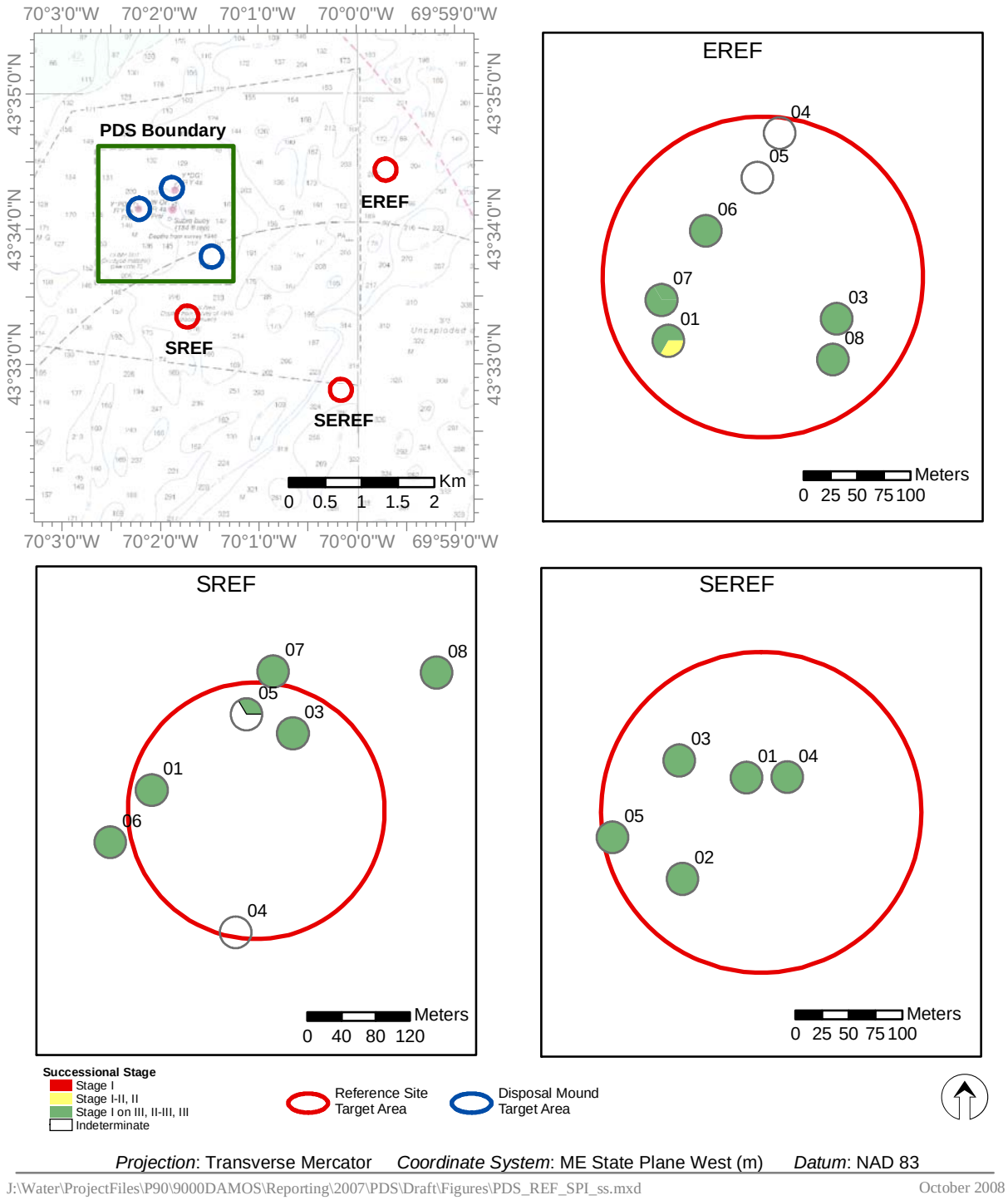

Figure 3-9. Distribution of infaunal successional stages found at PDS reference areas

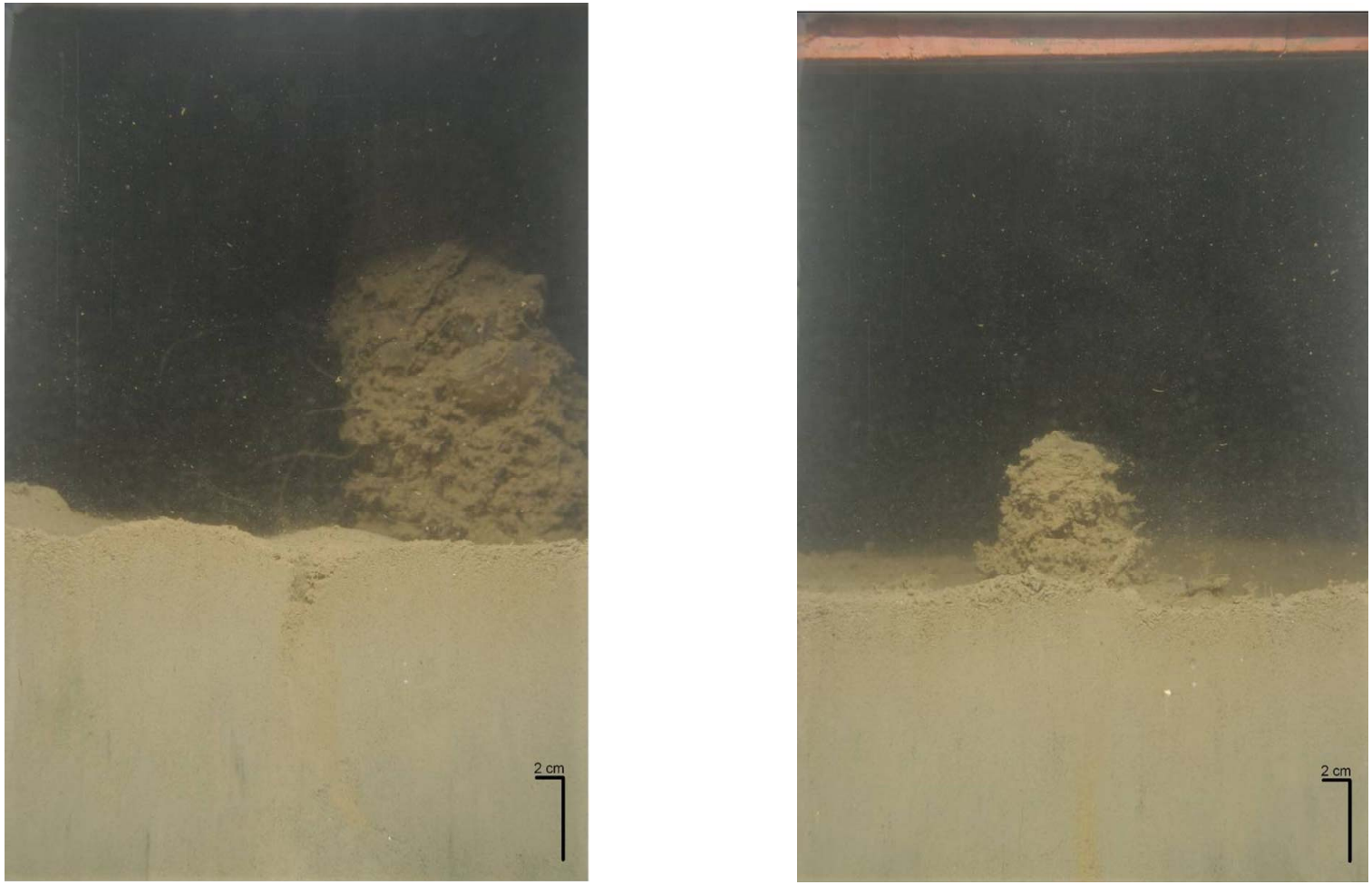

Figure 3-10. Tubes of cerianthid anemones can be seen in these profile images from Stations EREF-08 (left) and SREF-03 (right).

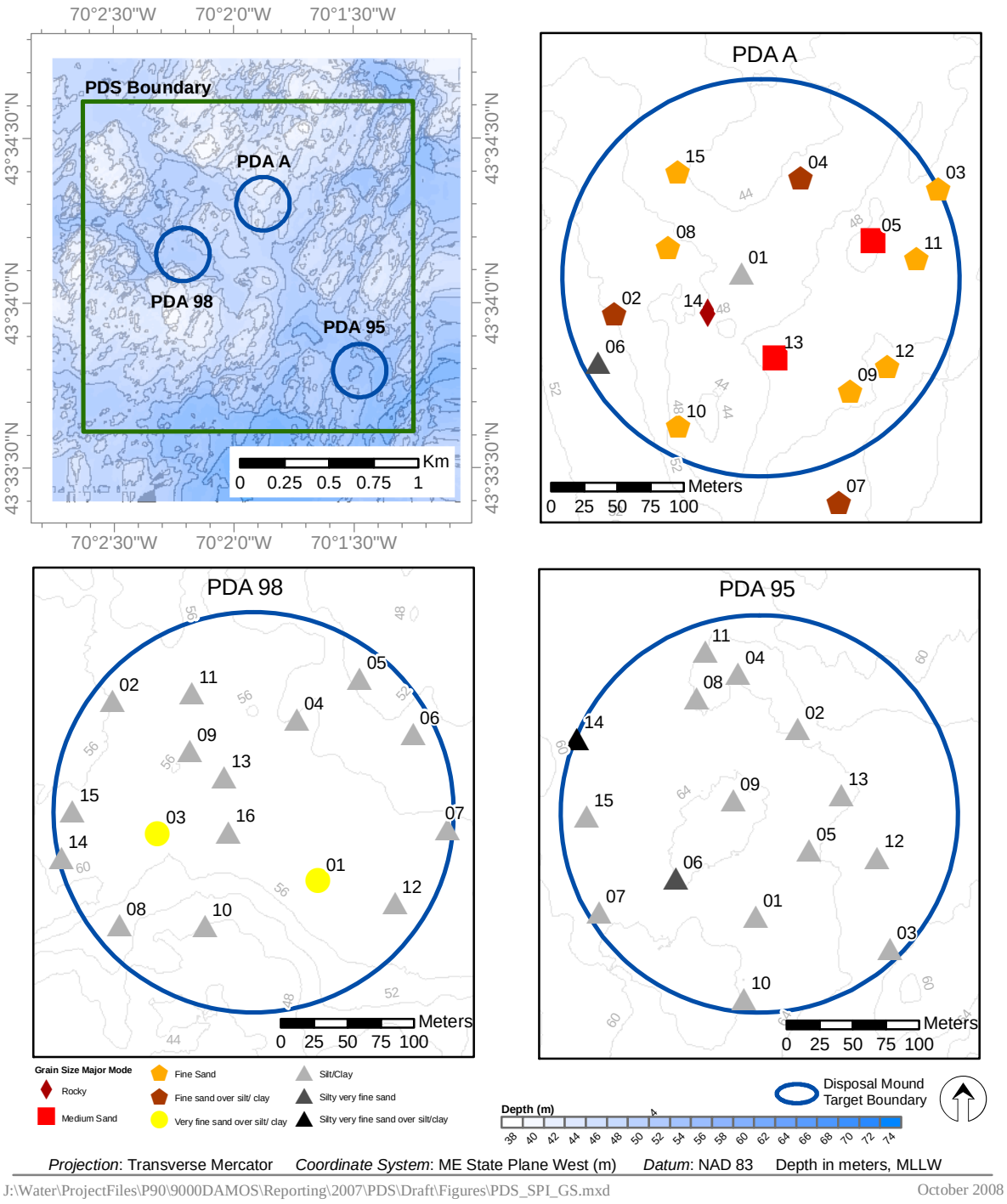

Figure 3-11. Distribution of sediment grain size major-mode (phi units) found at PDS

Figure 3-12. The sediment-profile image (left) and corresponding plan view image (right) from Station PDA-A–14 show rocks mixed in with the sand and silt deposited at the site; note the rock surfaces have already been colonized by a fouling community.

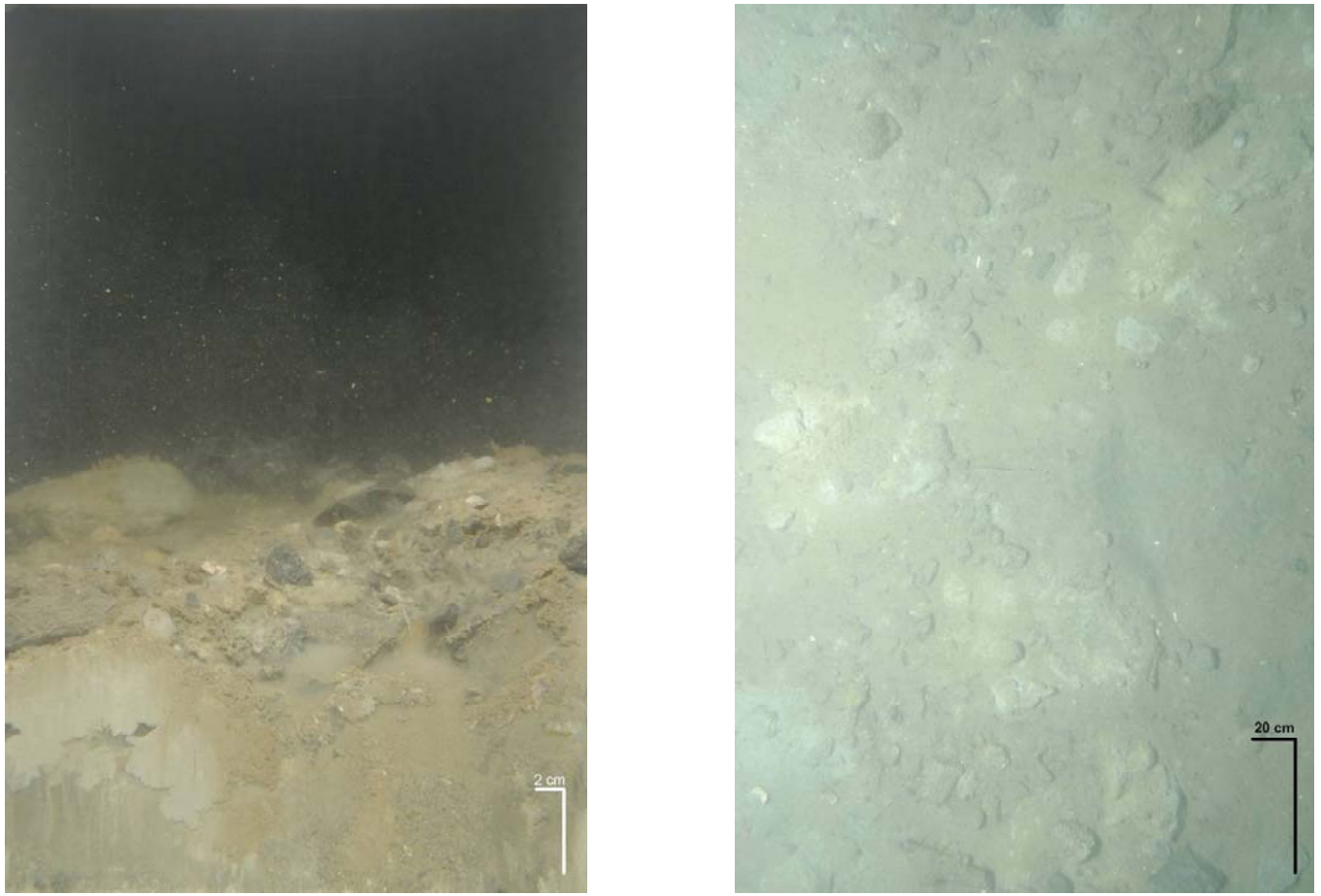

Figure 3-13. The consolidated clay clumps seen at the sediment surface in this profile (left) and plan view (right) image from Station PDA-A-01 are characteristic of recently disposed material dredged by a clamshell operation.

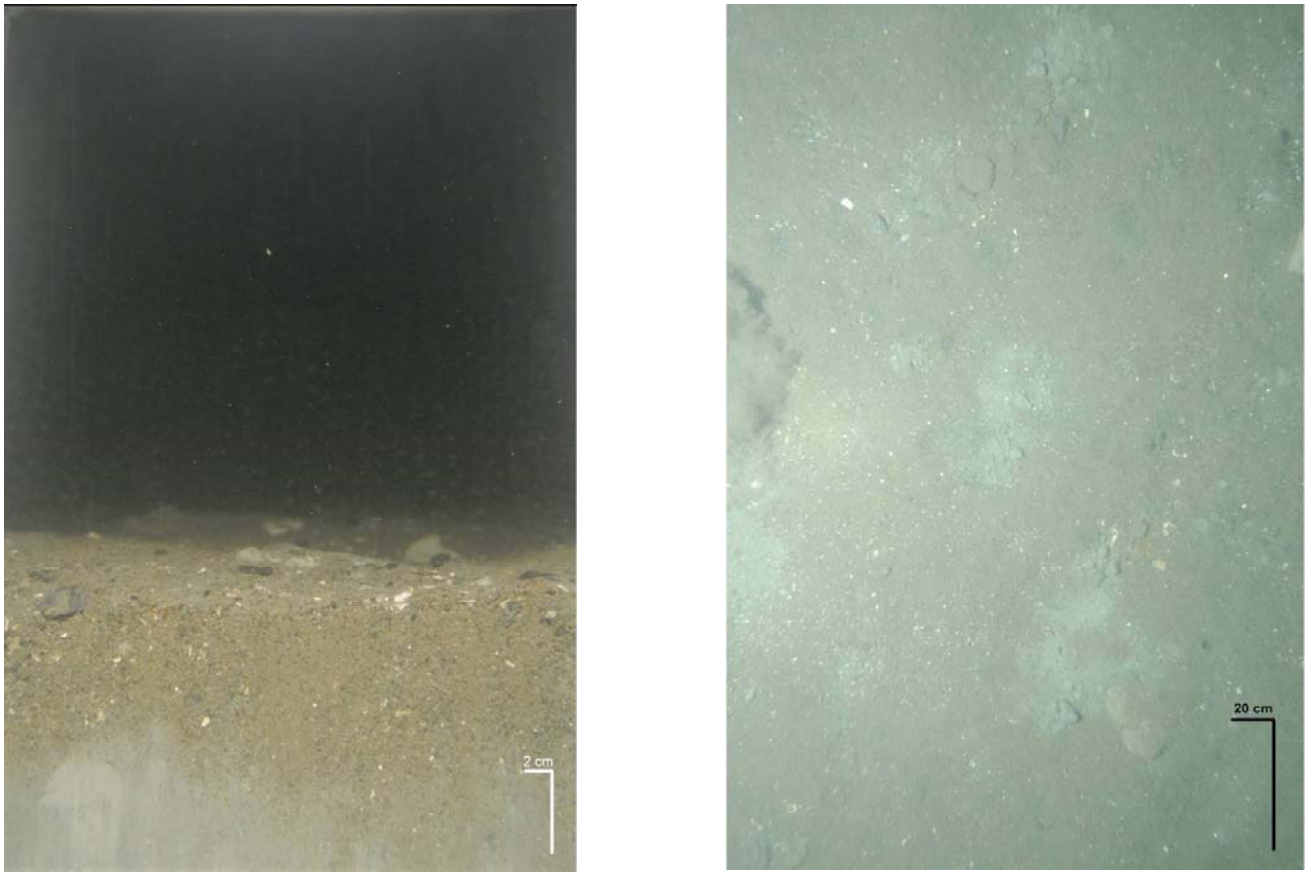

Figure 3-14. The surface layer of sand seen in this profile image from Station PDA-A-4 (left) is not continuous, as evidenced by the patches of mud seen on the sediment surface in the larger-scale corresponding plan view image (right).

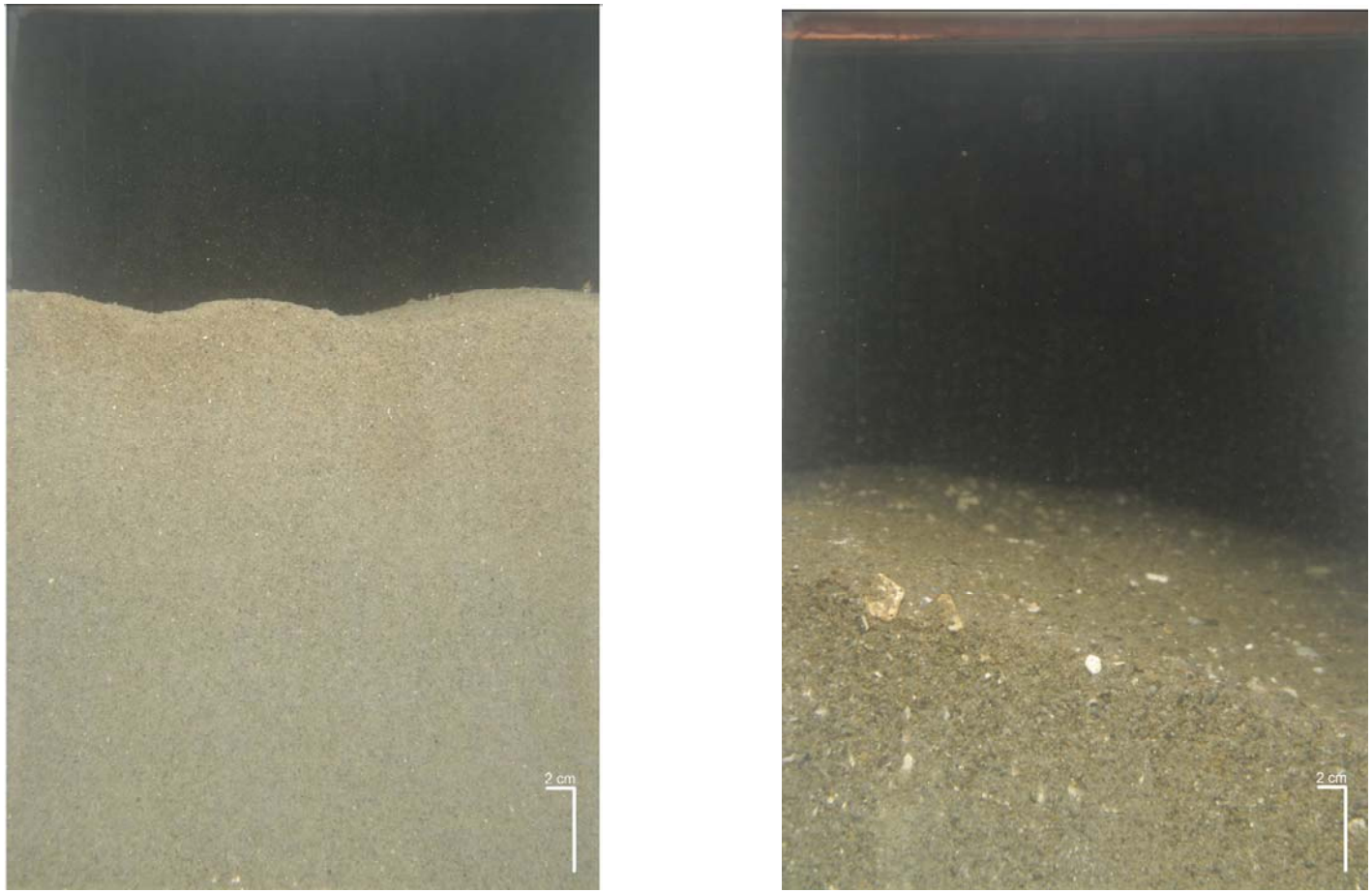

Figure 3-15. Profile images from Station PDA-A-10 (left) and PDA-A-13 (right) show homogeneous surface deposits of fine sand (left) and medium sand (right).

Camera prism penetration depth ranged from 0 to 11.8 cm (Figure 3-16); the stop collars and weights were only altered for two of the total of 45 replicate images collected on this mound (Appendix B), so the variation in camera prism penetration depth was a good indicator of relative sediment shear strength. Shear strength is the maximum stress a sediment will bear when it is twisted or otherwise deformed without stretching or compression. Although all the stations sampled on this mound showed dredged material thickness in excess of the prism penetration depth (Table 3-2), there was no evidence of organic enrichment, low oxygen concentrations in the overlying water, or presence of sub-surface methane gas in any of the images collected on the PDA A Mound.

Small-scale boundary roughness values ranged from 0 to 3.6 cm over the disposal mound, with an overall average of 1.7 cm (Table 3-2, Figure 3-17). The small-scale topographic roughness elements at the PDA A Mound were physical in origin (Appendix B), caused by surface ripples, clay clumps, or rocks/shells at the sediment surface (Figure 3-18).

3.2.2.2 Biological Conditions and Benthic Recolonization

The apparent RPD depths ranged from 1.4 to 4.5 cm over the PDA A Mound (Table 3-2, Figure 3-19), with an overall site average RPD depth of 2.5 cm (Table 3-2). Only one station (PDA-A-10) had clear evidence of Stage III infauna present (Figure 3-20) in one of the replicate images. The majority of stations showed benthic assemblages in the early stages of colonization (Stage I or II; Figure 3-20), and three individual replicate images from two different locations (Stations PDA-A-06 and PDA-A-15) showed early evidence of some deposit feeding activity (a late Stage II going to Stage III; Appendix B). Infaunal density and bioturbational activity was relatively low at this newly-formed mound, typical for a recent large-scale disturbance.

3.2.3 PDA 98 Mound

3.2.3.1 Physical Sediment Characteristics

The 16 locations sampled on this historical mound had fairly uniform sediment grain size major modes and ranges, with the majority of stations dominated by silt-clay sediment with minor fractions of fine to medium sand (Figure 3-11). Two of the locations (Stations PDA98-01 and PDA98-03) had thin surface layers of very fine sand overlying the silt-clay dredged material deposit, but the remaining stations were uniformly dominated by fine-grained muds showing the classic cross-sectional textural sedimentary fabric of an older dredged material deposit (Figure 3-21). There were a few locations (Stations PDA98-04 and PDA98-07) where evidence of consolidated clay clumps from the

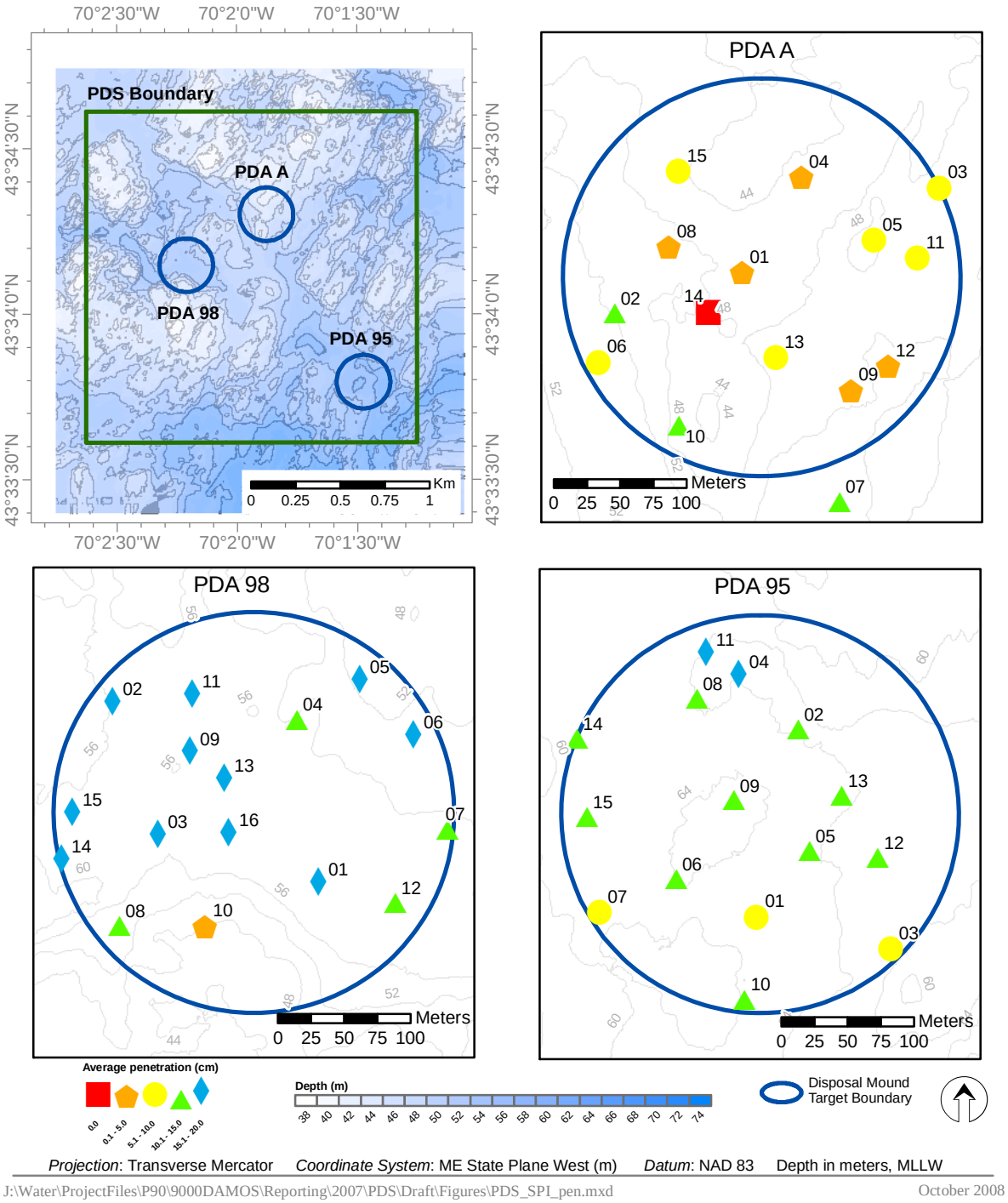

Figure 3-16. Spatial distribution of station-averaged camera prism penetration depth (cm) at PDS

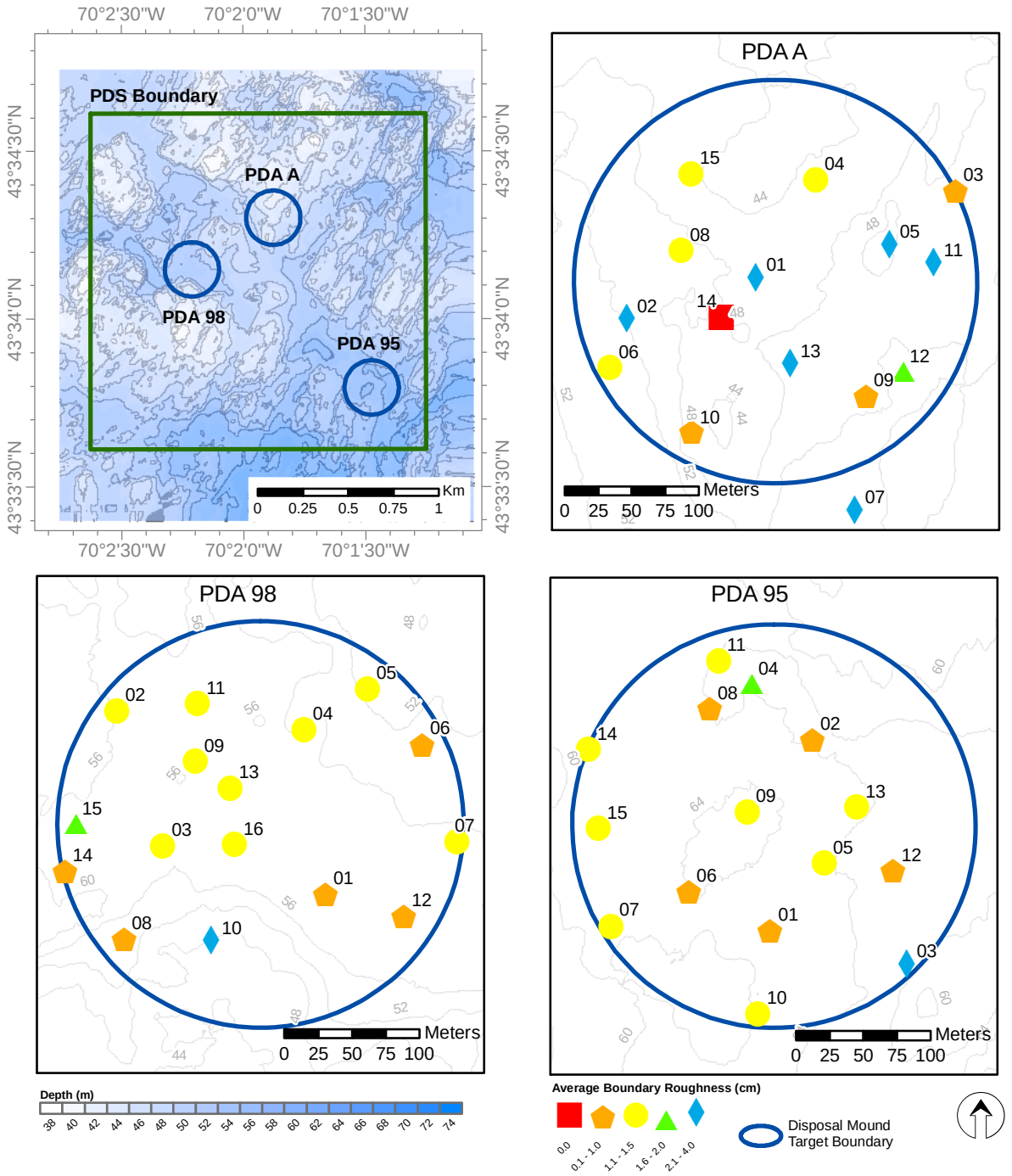

Figure 3-17. Spatial distribution of station-averaged boundary roughness (cm) at PDS

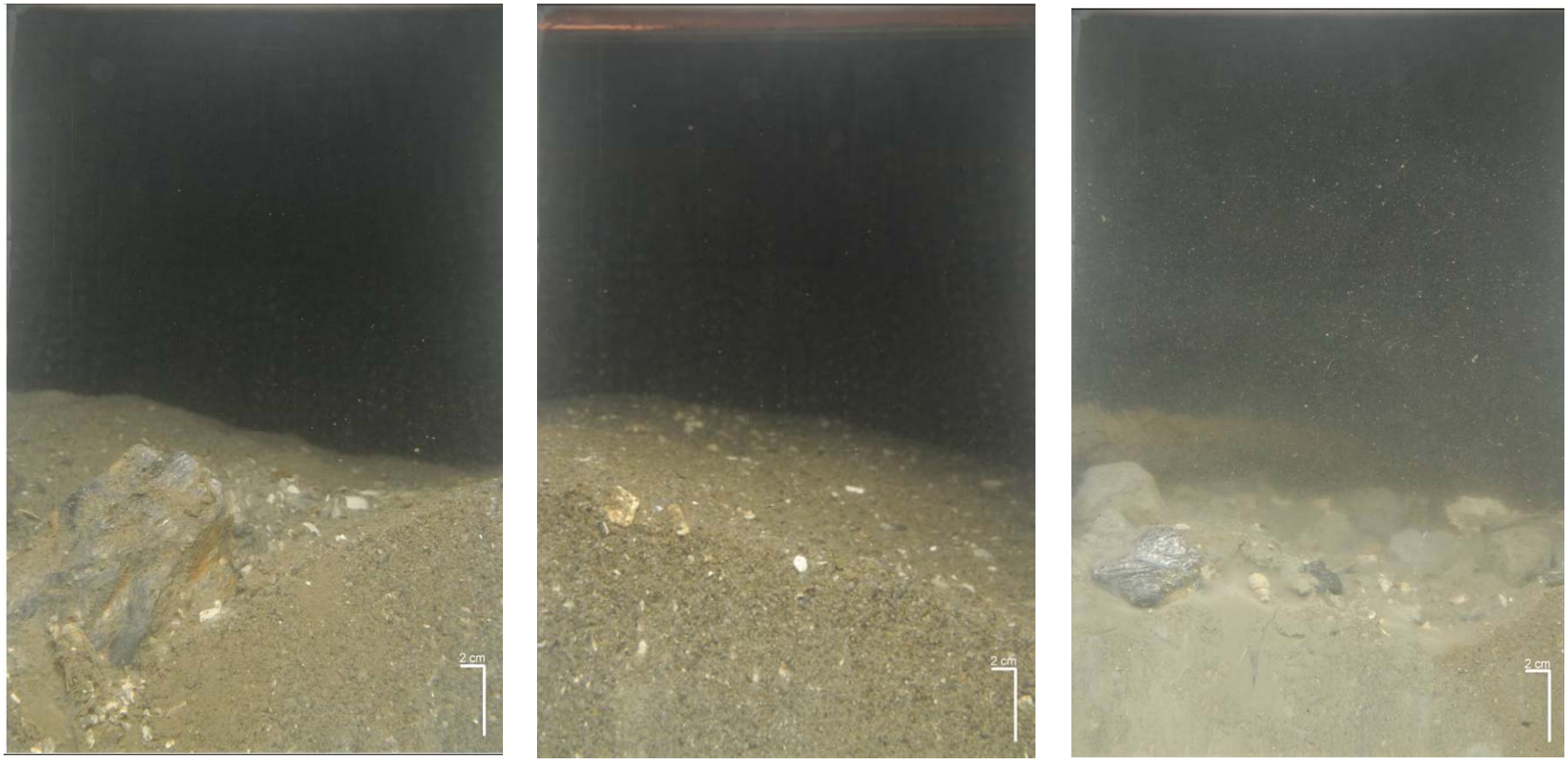

Figure 3-18. The small-scale surface boundary roughness elements seen in these example profile images from the PDA A Mound were all of physical origin, caused by the wide range in grain size (cobble or rocks projecting above the surface) or from surface ripples.

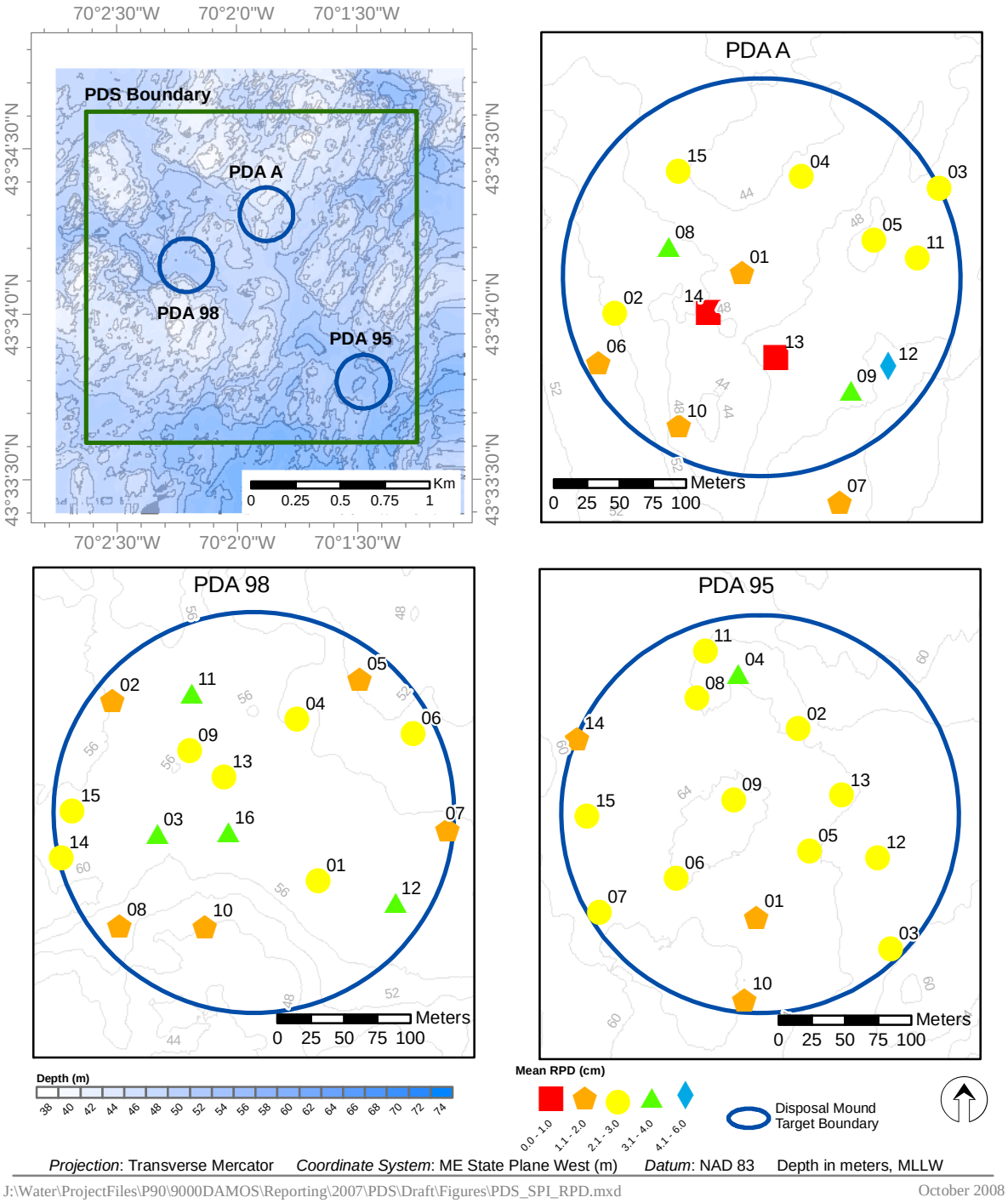

Figure 3-19. Spatial distribution of station-averaged apparent RPD depths (cm) at PDS

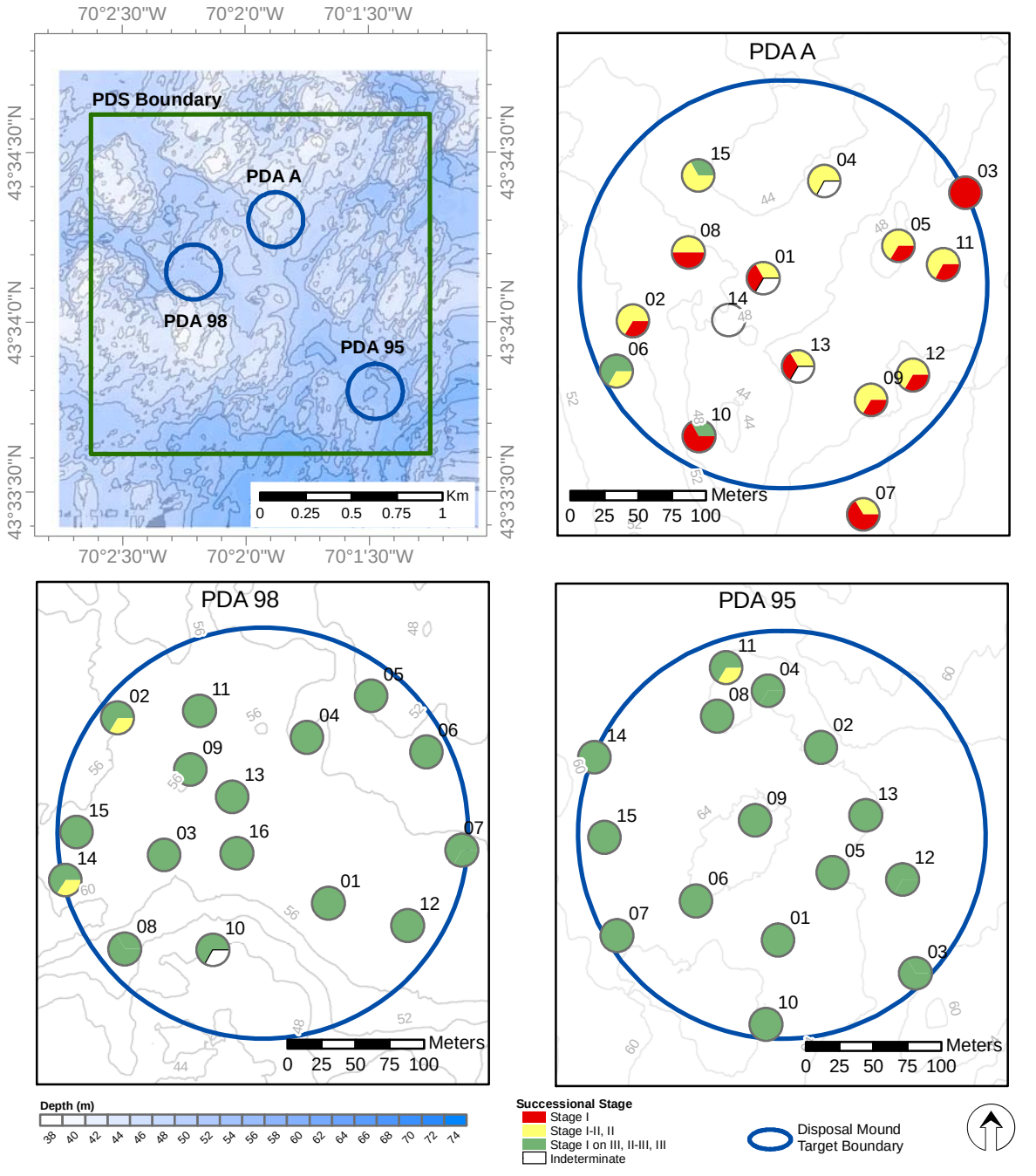

Figure 3-20. Distribution of infaunal successional stages found at PDS

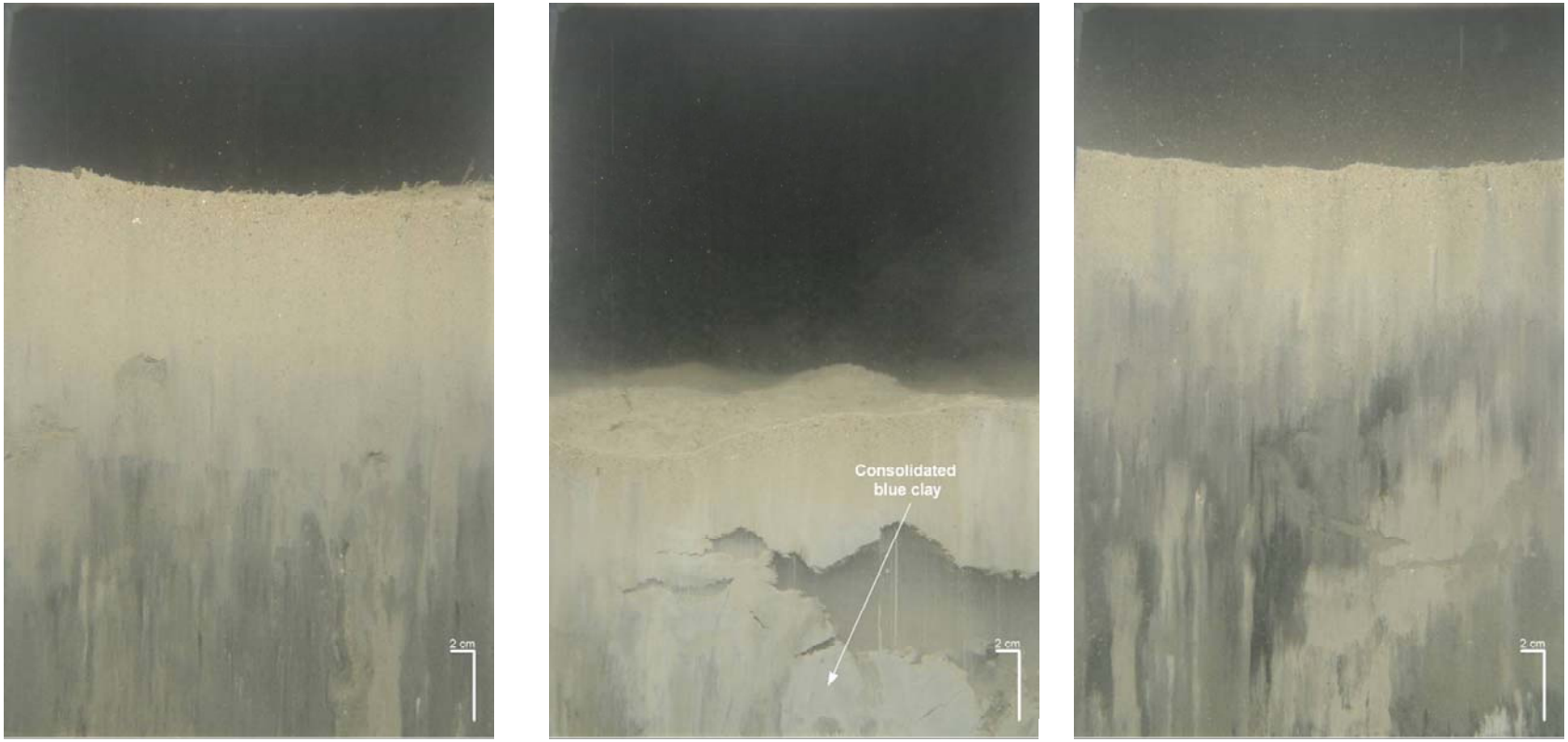

Figure 3-21. These representative sediment-profile images from the PDA 98 Mound show many of the features typically found on historical dredged material deposits. The image on the left, from Station 03, shows a fine sand layer approximately 2 cm thick at the sediment-water interface. The center image (Station 07) shows an inclusion of consolidated blue clay that is in the process of being bioturbated by burrowing infauna. The image on the right (Station 06) shows subsurface reduced patches of organically-enriched muds as well as depositional horizons that have been partially obscured from infaunal bioturbational activity.

disposal operation were still visible on the sediment surface, even though eight years have passed since the last disposal event (Figure 3-22).

Camera prism penetration ranged from 5.0 to 17.3 cm (Figure 3-16), with an overall mound average penetration depth of 14.8 cm; stop collar settings varied less than 1.5 cm among stations, and the number of weights was held constant except for one station (PDA98-16, where three weights per carriage were used instead of one; Appendix B). The sediments on this mound had relatively low shear strength compared to those on the other two mounds sampled (Table 3-2); the highest prism penetration values were obtained from this mound with the lowest amount of weights and lowest stop collar settings as compared with the other two mounds sampled (Appendix B). As with the PDA A Mound, there was no evidence of organic enrichment, low oxygen concentrations in the overlying water, or presence of sub-surface methane gas in any of the images collected. Dredged material was found at all stations, with dredged material thickness exceeding camera penetration depth at most stations.

Small-scale boundary roughness ranged from 0.6 to 2.0 cm over this disposal mound, with an overall mound average of 1.2 cm (Table 3-2, Figure 3-17). The majority of the surface roughness elements were of biogenic origin and due to the presence of burrow openings, feeding pits, or fecal mounds at the sediment-water interface.

3.2.3.2 Biological Conditions and Benthic Recolonization

The depth of the apparent RPD measured at the stations surveyed on the PDA 98 Mound ranged from 1.4 to 3.5 cm (Figure 3-19), with an overall mound average of 2.5 cm (Table 3-2). Evidence of Stage III fauna was found at every location sampled, with the average depth of subsurface feeding voids ranging from 3.9 to 9.8 cm below the sediment surface (Table 3-2). In the eight years since the last disposal event, the site was completely recolonized by a mature, equilibrium, deposit-feeding community and has subsurface sediments that have been extensively bioturbated (Figure 3-23).

3.2.4 PDA 95 Mound

3.2.4.1 Physical Sediment Characteristics

Sediment grain size major mode and range at PDA 95 were similar to those found at the PDA 98 Mound; all but two stations had a sediment grain size major mode of >4 phi (silt-clay) (Figure 3-11). The two stations that were not predominantly muds were PDA95-06 and PDA95-14 (Figure 3-24). No evidence of consolidated clay clumps was seen at the sediment surface in any of the replicate images (SPI or PUC), unlike the other

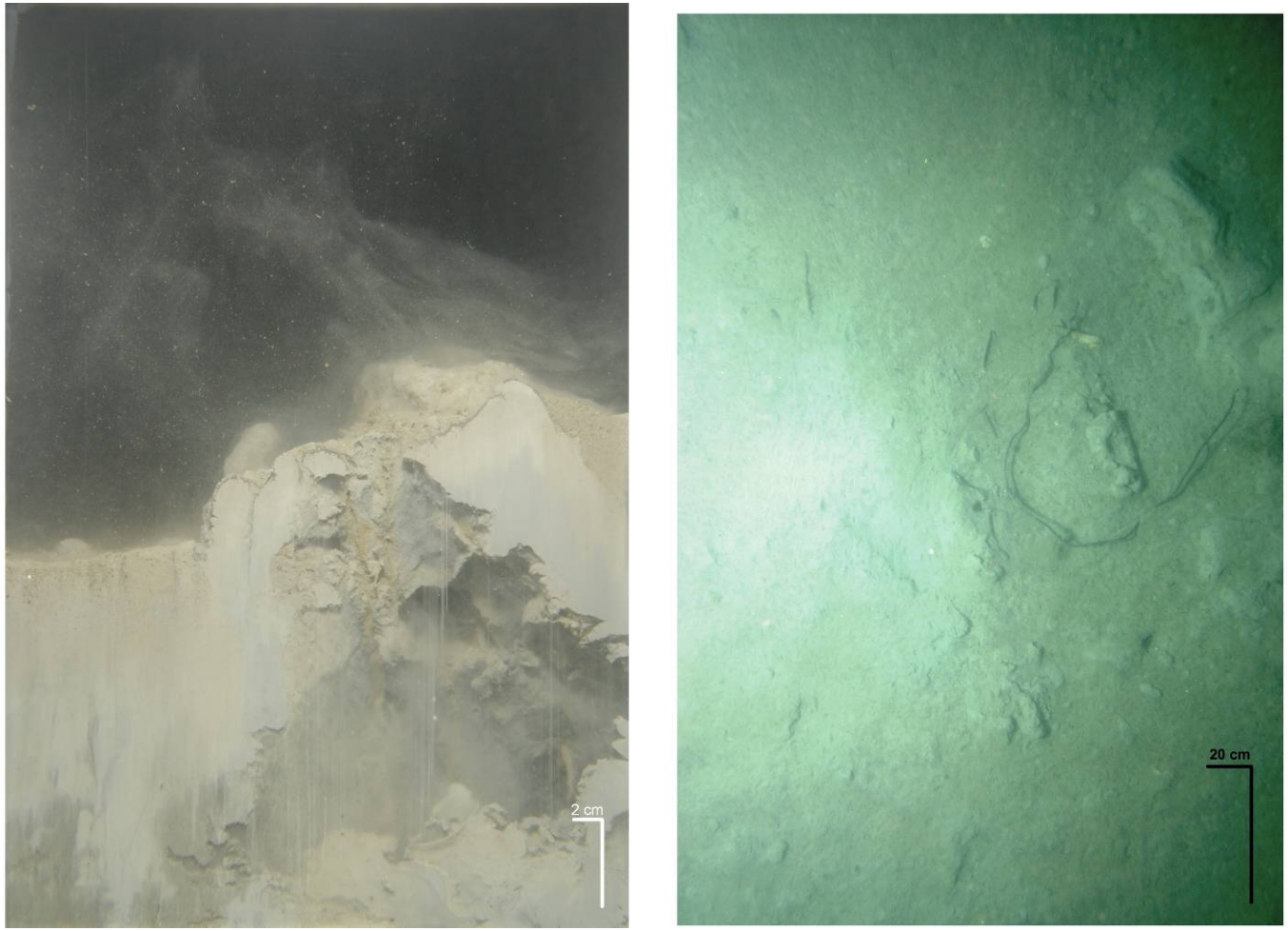

Figure 3-22. Evidence of consolidated clay clumps from the clamshell operation can still be seen at the sediment surface at PDA98-07 as shown in the profile (left) and plan view (right) image from this location.

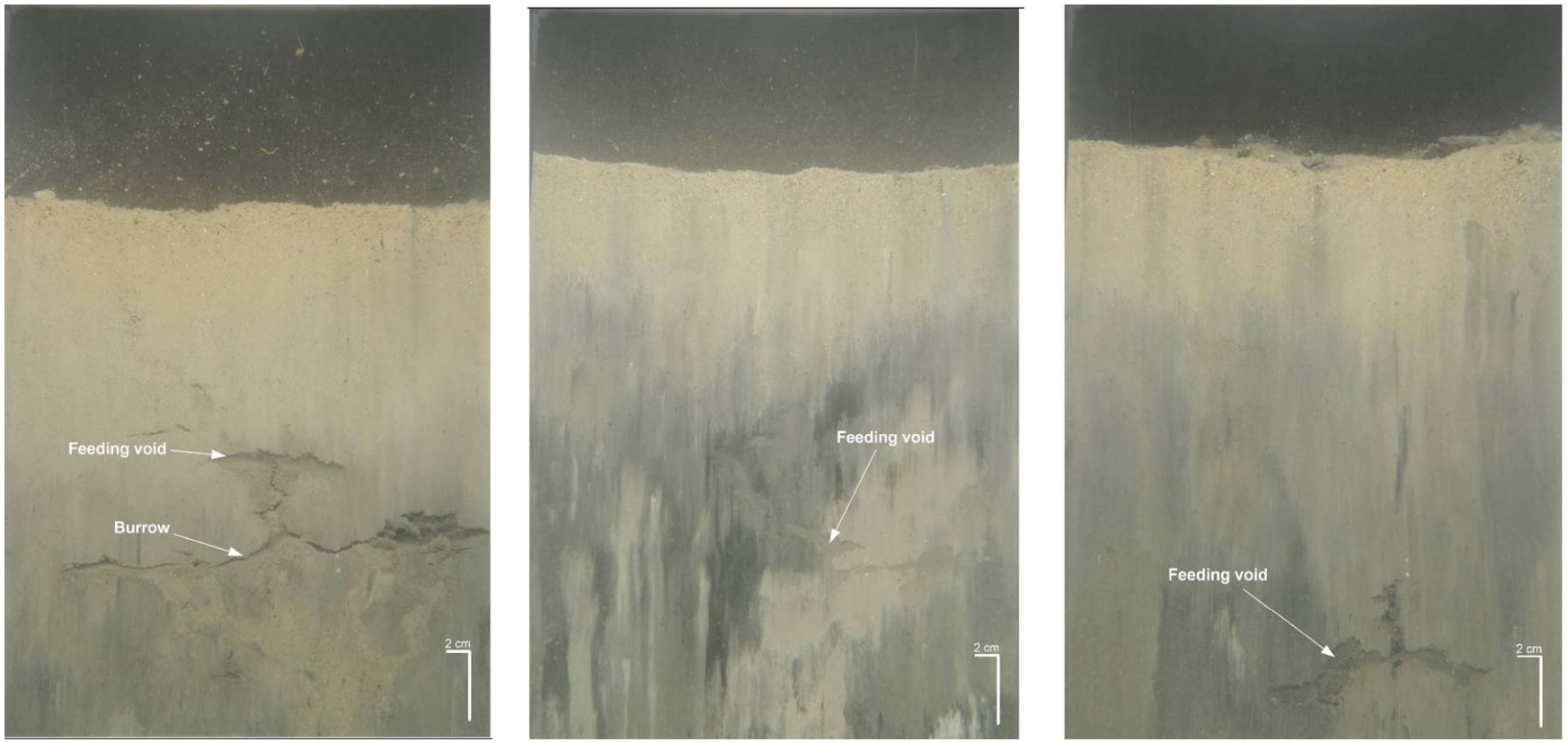

Figure 3-23. These representative sediment-profile images from the PDA 98 Mound show the degree to which the subsurface sediments have been reworked by infaunal burrowing and deposit feeding activities (voids and burrows highlighted by arrows on the images) (left, Station 01; center, Station 06; right, Station 11).

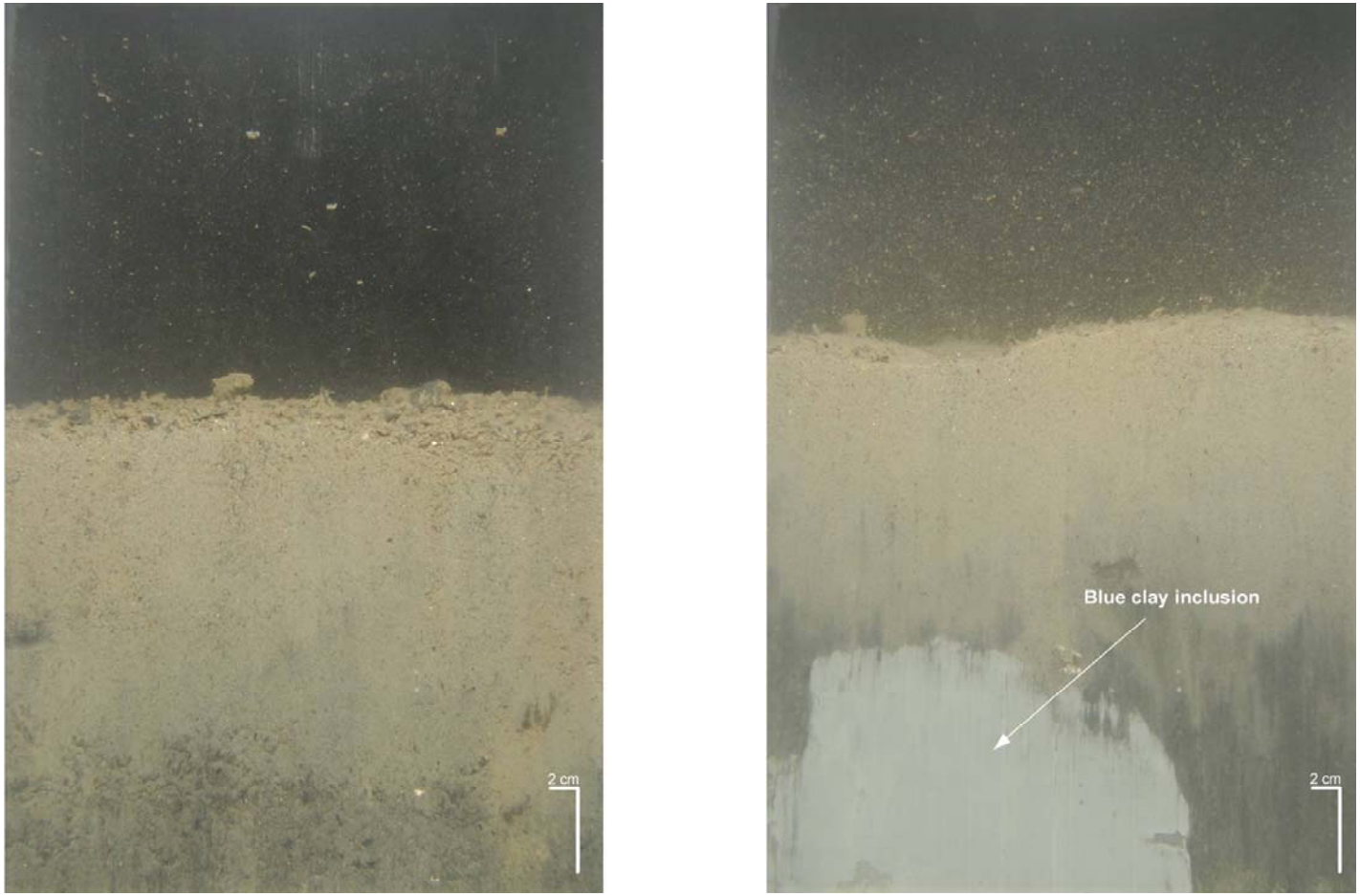

Figure 3-24. These representative profile images are the only two locations on the PDA 95 Mound that were not dominated by fine-grained sediments. Station 06 (left) shows poorly-sorted silty fine sand with some larger granules at the sediment surface. Station 14 (right) has a layer of silty very fine sand overlying reduced muddy sediments with a blue clay inclusion.

two mounds. Even though more than a decade has passed since disposal operations ceased, evidence of the dredged material signature was still present in the cross-sectional profiles (Figure 3-25). Dredged material was identified at all stations and was thicker than camera penetration depth at 12 of the 15 stations.

Camera prism penetration depth ranged from 8.8 to 18.4 cm, with an overall mound average penetration depth of 12.5 cm (Figure 3-16). The stop collars and weight settings were changed at different stations on this mound; while many of the settings were similar to the settings used at the PDA 98 Mound (stop collar settings generally varied by less than 1.5 cm, and either one or two weights were used in each carriage), all the weights were used and the stop collars were at maximum height for the images collected at PDA95-06. On a relative scale among the three disposal mounds, the sediment shear strength on this mound was intermediate compared to PDA A (highest) and PDA 98 (lowest).

Small-scale boundary roughness values ranged from 0.7 to 2.4 cm, with an overall mound average value of 1.1 cm. As with the other historical mound surveyed, the majority of the surface roughness elements were of biogenic origin and due to the presence of burrow openings, feeding pits, or fecal mounds at the sediment-water interface (Figure 3-26).

3.2.4.2 Biological Conditions and Benthic Recolonization

The average depth of the apparent RPD at the stations surveyed on the PDA 95 Mound ranged from 1.8 to 3.0 cm (Figure 3-19), with an overall mound average of 2.4 cm (Table 3-2). As with the other historical mound surveyed, evidence of Stage III fauna was found at every location sampled, with the average depth of subsurface feeding voids ranging from 2.3 to 9.6 cm below the sediment surface (Table 3-2). Evidence of larger-bodied burrowing infauna was more common on this mound than the other mounds surveyed (Figure 3-27), and the mound was completely recolonized with a mature equilibrium infaunal community.

3.2.5 Statistical Results of SPI Data Analysis

The dataset consists of three distinct reference areas (EREF, SREF, SEREF) with five to seven stations at each reference area, and 15 to 16 stations at each of the three disposal mounds (PDA 95, PDA 98, PDA A). The three replicate observations from each station were combined to get one value per station: the average of replicates was used for the station RPD, and the maximum among replicates was used as the successional stage rank for the station. Successional stage ranks have possible values

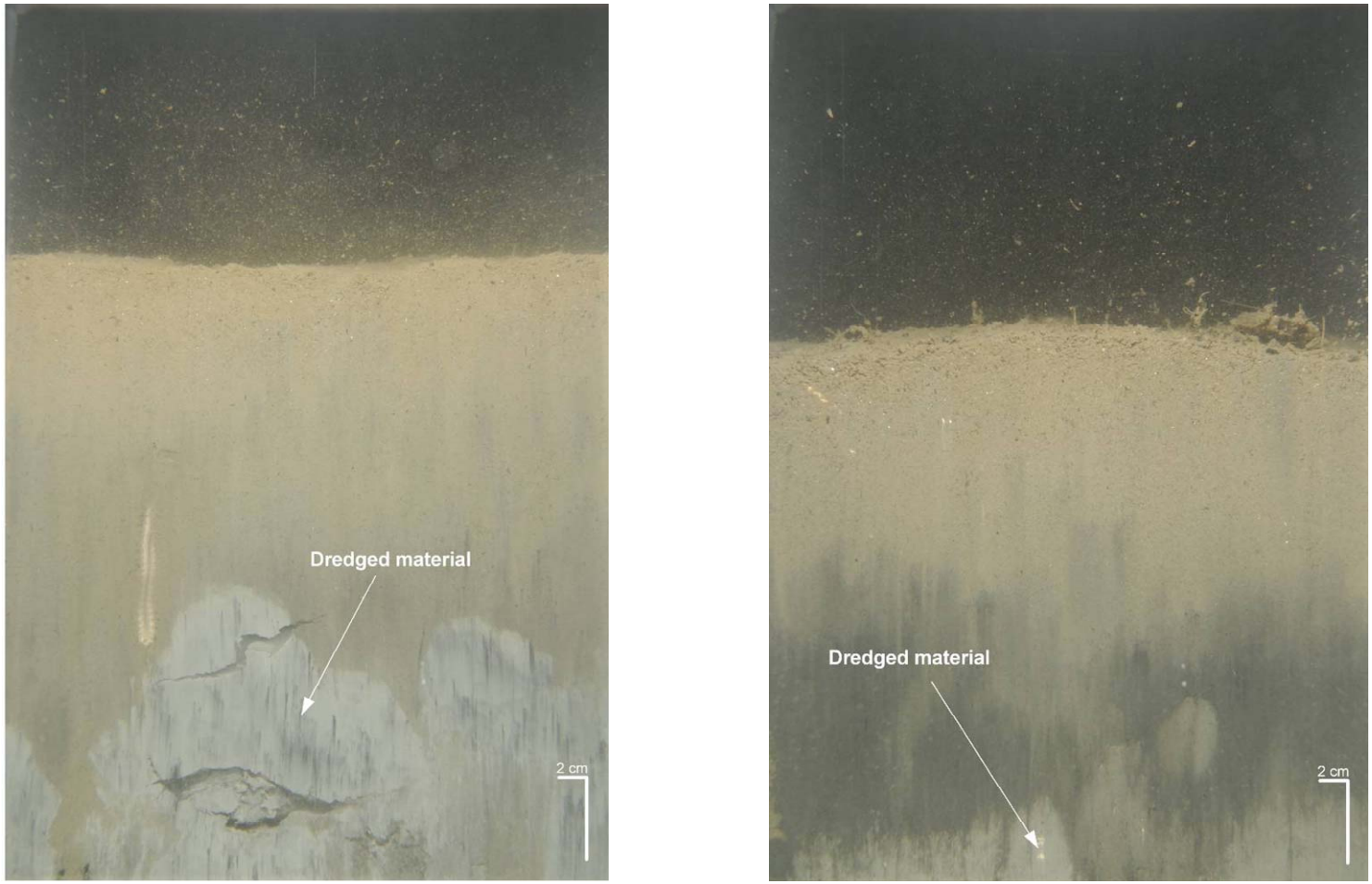

Figure 3-25. Evidence of dredged material can still be seen in these profile images from Stations PDA95-08 (left) and PDA95-15 (right) despite the extensive recolonization and subsurface reworking by benthic infauna.

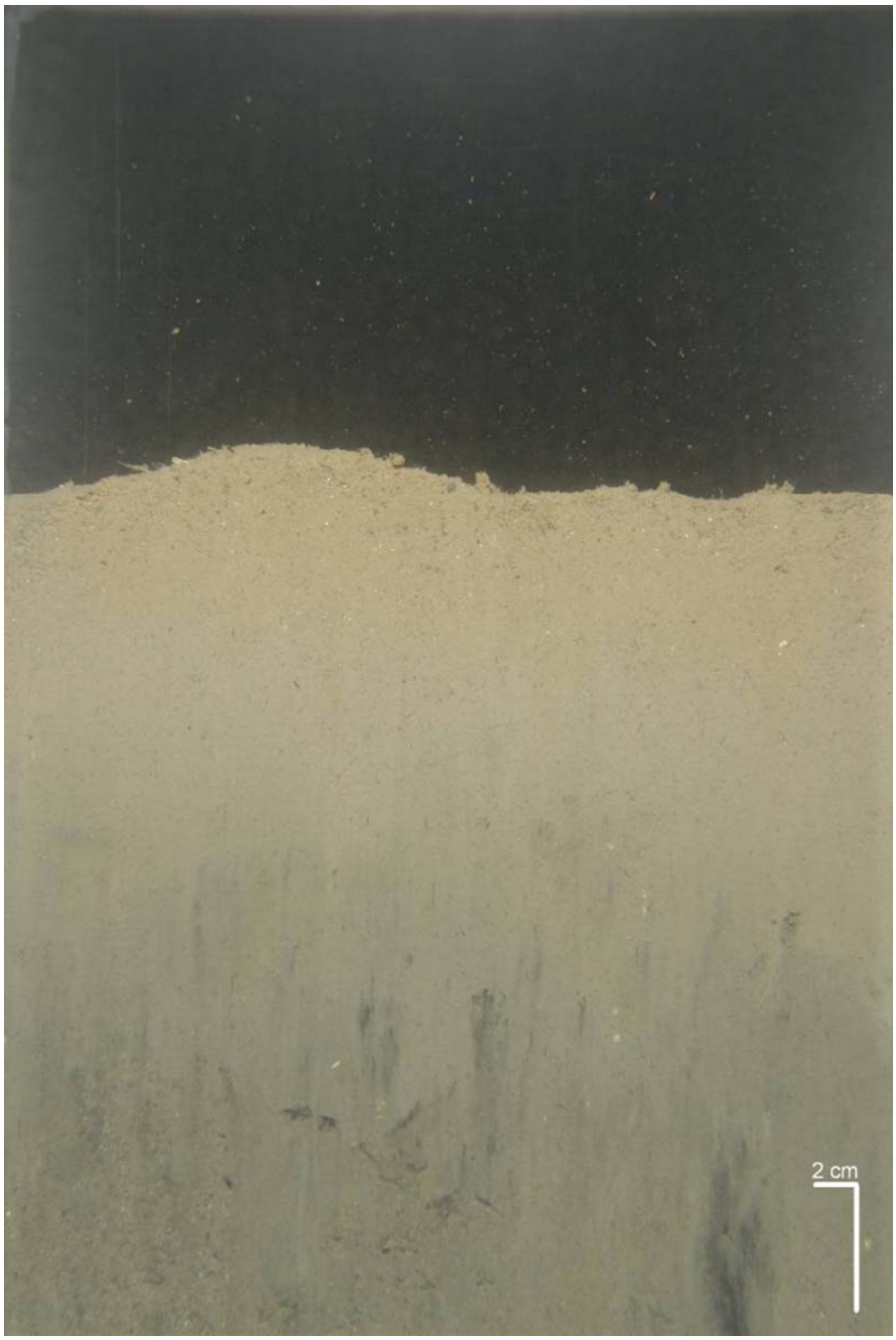

Figure 3-26. The biogenic mound at the sediment surface in this profile image from PDA95-02 is representative of the type of features contributing to the surface boundary roughness values measured at disposal Mound PDA 95.

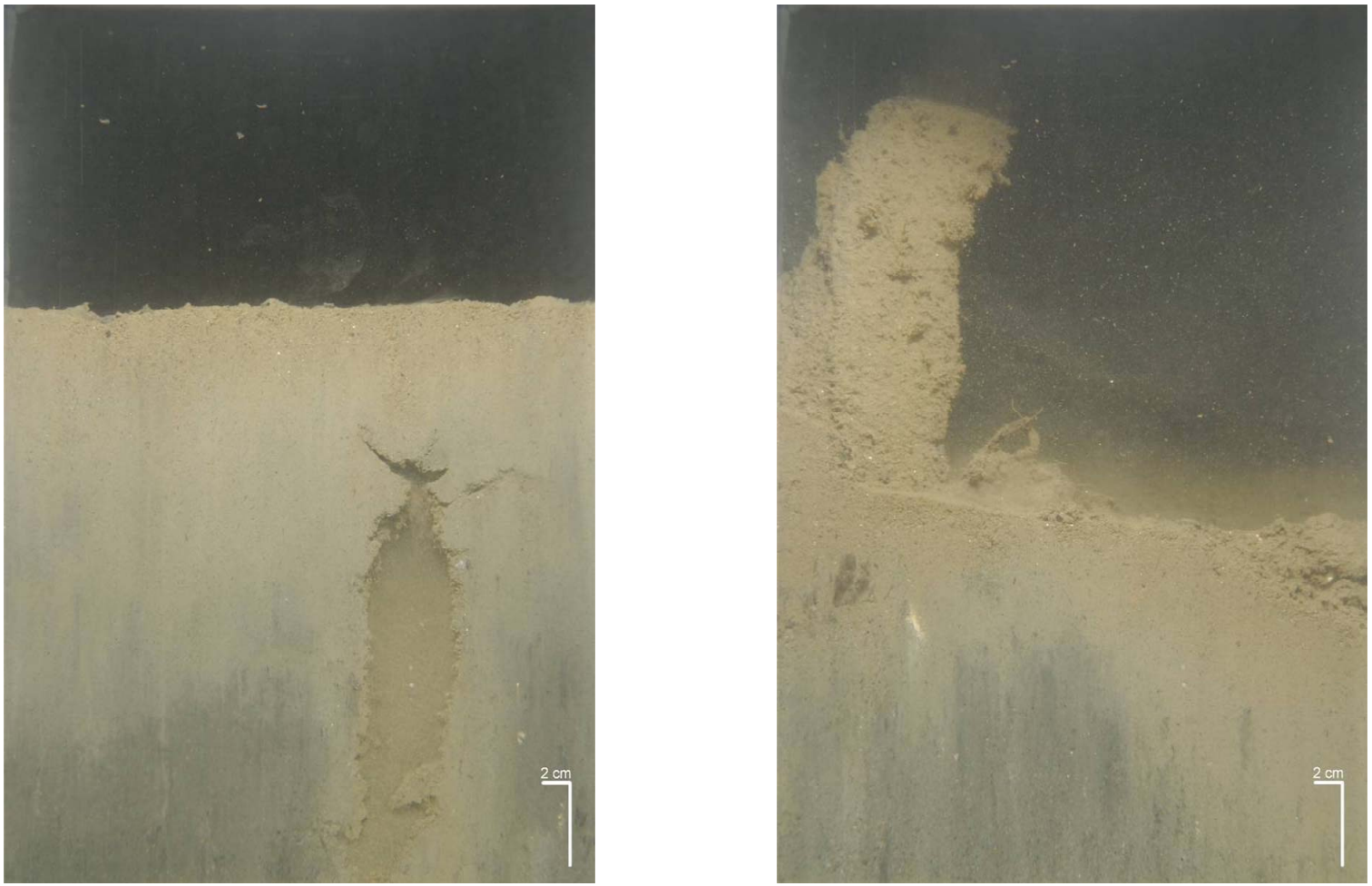

Figure 3-27. These profile images from Station PDA95-12 (left) and PDA95-03 (right) show evidence of larger sized infauna present at this older mound.

between 0 (no fauna present) and 3 (Stage III); half ranks are also possible for the "in-between" stages (e.g., Stage I-II has value 1.5). A summary of the mean RPD and successional stage rank values for the station means are shown in Table 3-3 and Figure 3-28.

3.2.5.1 Mean RPD Variable

The three reference areas showed some differences in mean RPD values (Table 3-3, Figure 3-28) with SEREF having a higher mean than the other two. The maximum difference in mean RPD values among reference locations was 1.4 cm (4.0 cm – 2.6 cm), more than twice the standard deviations within reference areas (range of 0.23 to 0.64). Pooling stations across reference areas with different means will increase the estimate of residual variability beyond what is probably the true within-group variance. Consequently, the reference areas were treated separately in the following analysis.

Results of the Shapiro-Wilk's test indicates the RPD area residuals (i.e., each observation minus the area mean) were normal ($p=0.21$). There was a single influential data point from PDA A Mound (PDA-A-12; mean RPD=4.46 cm); by excluding this data point, the distribution was much more symmetric (Shapiro-Wilk's $p=0.73$). The result of including this station is to increase the variance and reduce the power of the test. Because there is no reason to exclude this station, it must be considered a valid data point, and must be used in the analysis. However, results were calculated both with and without this station to identify its level of influence. The assumption of equal variances was not rejected by Levene's test ($p=0.18$ all data; $p=0.13$ excluding PDA-A-12) so a pooled variance estimate was used to compute the variance for the difference equation (Table 3-4).

The specified δ values of ±1 were outside of the 95% lower and upper confidence bounds for the shaded comparisons (Table 3-4). The differences in apparent mean RPD depth between Mounds PDA 98 and PDA A and Reference were significantly smaller than 1 cm. Therefore, RPD depths at these mounds were not different from the reference areas within the pre-determined definition of what is "ecologically meaningful" for apparent mean RPD depths. By excluding the influential value for PDA A, the difference in means increased from 0.63 to 0.79, resulting in a non-significant result.

3.2.5.2 Successional Stage Rank Variable

The successional stage rank values were all 3 (Stage III, or equivalent) at every station outside of PDA A (Table 3-3, Figure 3-28). Thus, the PDA 95 and PDA 98 Mounds were identical to Reference for this parameter. A confidence interval on the

Table 3-3.

Summary of Station Means by Sampling Location

Area	N	Mean RPD (cm) Mean	Mean RPD (cm) Standard Deviation	Successional Stage Rank Mean	Successional Stage Rank Standard Deviation
Reference Locations					
EREF	7	2.7	0.23	3.0	0
SREF	7	2.6	0.58	3.0	0
SEREF	5	4.0	0.64	3.0	0
Mean:		3.1			
Disposal Mounds					
PDA 95	15	2.4	0.41	3.0	0
PDA 98	16	2.5	0.63	3.0	0
PDA A	15	2.5	0.84	2.0	0.5

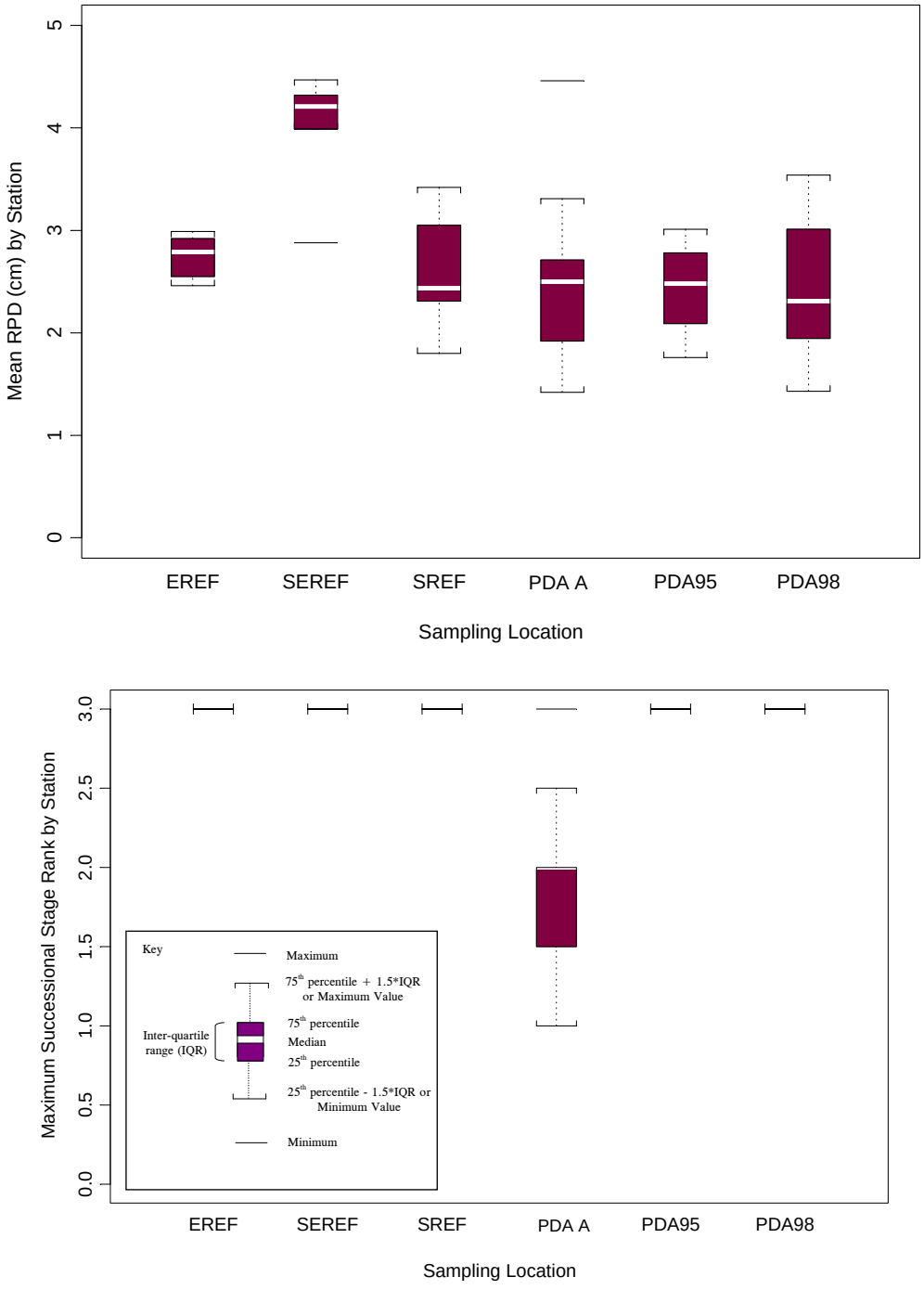

Figure 3-28. Boxplots showing distribution of station mean RPD and successional stage rank values for 2007 PDS survey

Table 3-4.

Summary Statistics and Results of Bioequivalence Testing for RPD Values

Difference Equation	Observed Difference ($\hat{d}$)	SE($\hat{d}$)	Degrees of Freedom for SE($\hat{d}$)	95% Lower Confidence Bound	95% Upper Confidence Bound
All Data					
REF – PDA 95	0.69	0.212	54	0.33	1.04
REF – PDA 98	0.64	0.209	54	0.29	0.99
REF – PDA-A	0.63	0.212	54	0.27	0.98
Excludes Influential Datapoint					
REF – PDA 95	0.69	0.190	53	0.37	1.00
REF – PDA 98	0.64	0.187	53	0.33	0.95
REF – PDA-A	0.79	0.194	53	0.47	1.12

Note: Shading indicates that the two groups were “statistically equivalent”.

difference between the reference area mean (value=3) and the mean of the PDA A data was constructed. The PDA A data were approximately normally distributed (Shapiro-Wilk's p=0.17), so a parametric confidence interval was used.

The observed difference from Reference (3) for PDA A was 1.04, which is statistically greater than 0.5 (Table 3-5). Thus, the infaunal community on the PDA A mound was not equivalent, within the pre-determined definition of "ecologically meaningful", to that found in the Reference areas.

3.3 Plan View Imaging

Because the turbidity in the water column was quite low at the time of the survey, the plan view images taken in conjunction with the sediment-profile images provided extremely valuable additional information about large-scale sedimentary features (bedforms), density/patch size of surface fauna, density of infaunal burrowers, and occurrence and density of epifaunal foraging patterns both on the disposal mounds and reference areas. Detailed comments and results of the plan view image analysis can be found in Appendix C.

3.3.1 Physical Sediment Characteristics

The sediment surface on the most recent disposal mound (PDA A) was notably different from the surface at the other two mounds or the reference area. Irregular topography from consolidated clay clumps or rocks was quite common, and high variability in sediment size within the same field of view (approximately 1.2 m^2; see Appendix C) was also not unusual, with sand, clay, and rocks visible on the sediment surface in the same image (Figure 3-29). Wood debris was also seen on the surface at a number of stations on this newly formed mound (Figure 3-30).

Occasional evidence of wood debris was also found at the older PDA 95 and PDA 98 Mounds (Figure 3-31), as well as some evidence of residual consolidated clay clumps that had not been completely fragmented (Figure 3-32). However the surface at most of the fine-grained stations on the two older mounds resembled the sediments seen at the reference areas: uniform silt-clay surfaces with biogenic topography caused by infaunal activities (Figure 3-33).

Table 3-5.

Summary Statistics and Results of Bioequivalence Testing for Successional Stage Rank Values

Difference Equation	Observed Difference ($\hat{d}$)	SE($\hat{d}$)	Degrees of Freedom for SE($\hat{d}$)	95% Lower Confidence Bound	95% Upper Confidence Bound
REF – PDA 95	0	0	n/a	0	0
REF – PDA 98	0	0	n/a	0	0
REF – PDA A	1.04	0.133	13	0.80	1.27

Note: Shading indicates that the two groups were "statistically equivalent".

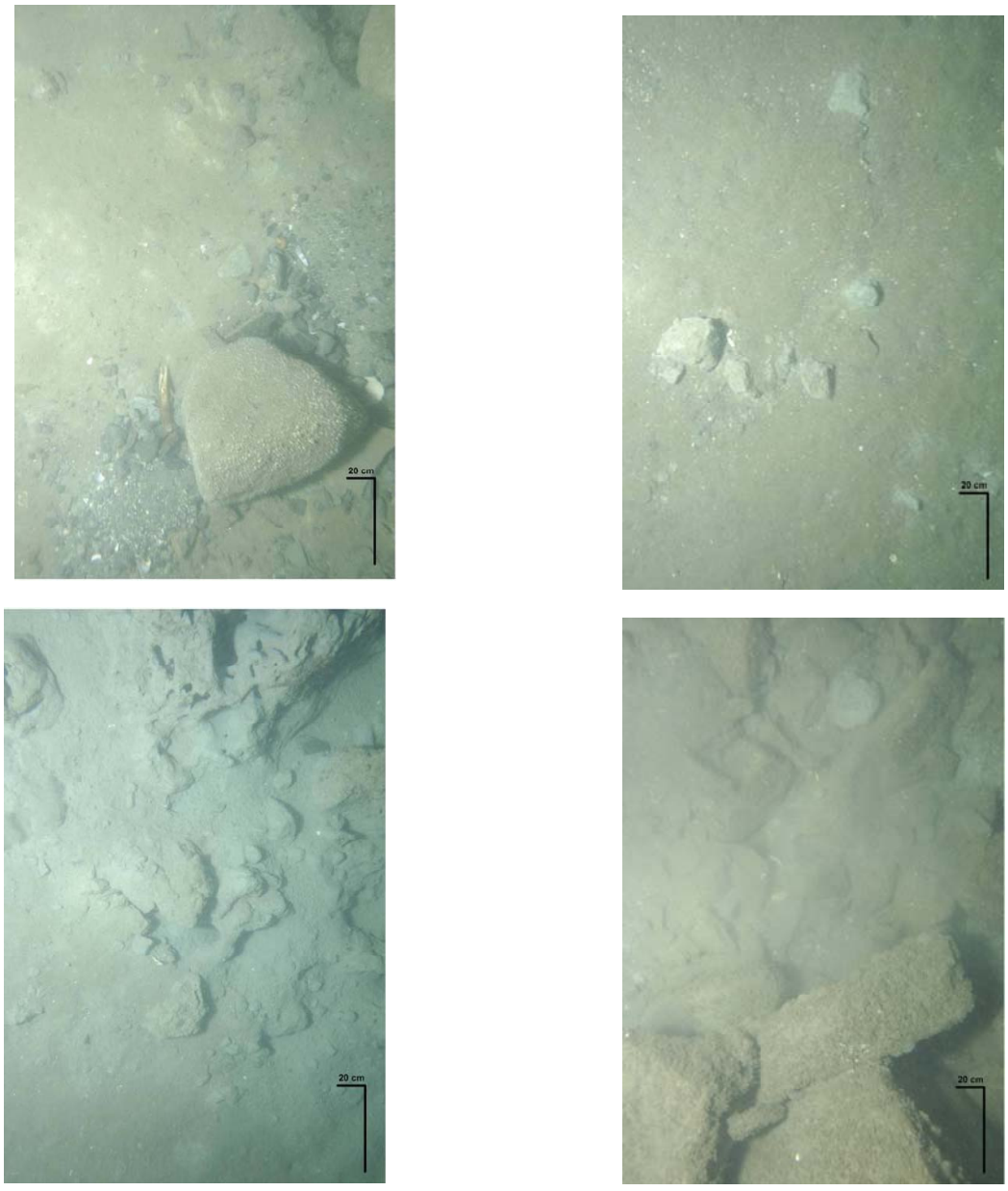

Figure 3-29. Plan view images from the PDA A Mound show wide variability in sediment type and topography found on this newly-formed disposal mound. Rocks, cobble, sand, shell hash and clay can be seen on the surface at Station 01 (upper left). Isolated clay clumps are visible on the sandy surface at Station 15 (upper right). A large collection of consolidated clay clumps are visible in an image from Station 07 (lower left). Both large rocks as well as consolidated clay clumps can be seen in an image from Station 14 (lower right).

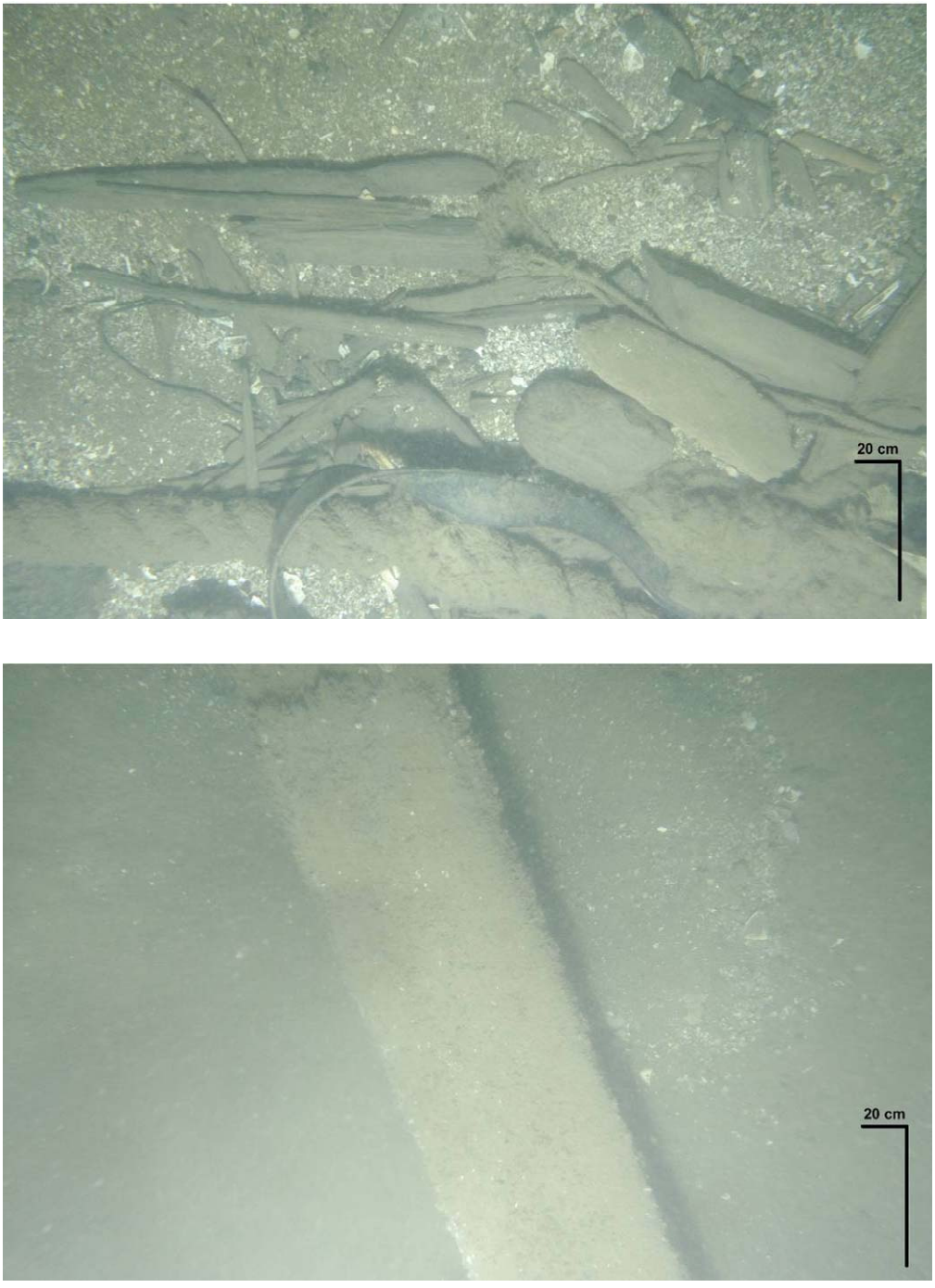

Figure 3-30. Examples of some of the wood debris found on the sediment surface at the newly formed PDA A mound can be seen in these two plan view images from Station 13 (top) and Station 07 (bottom).

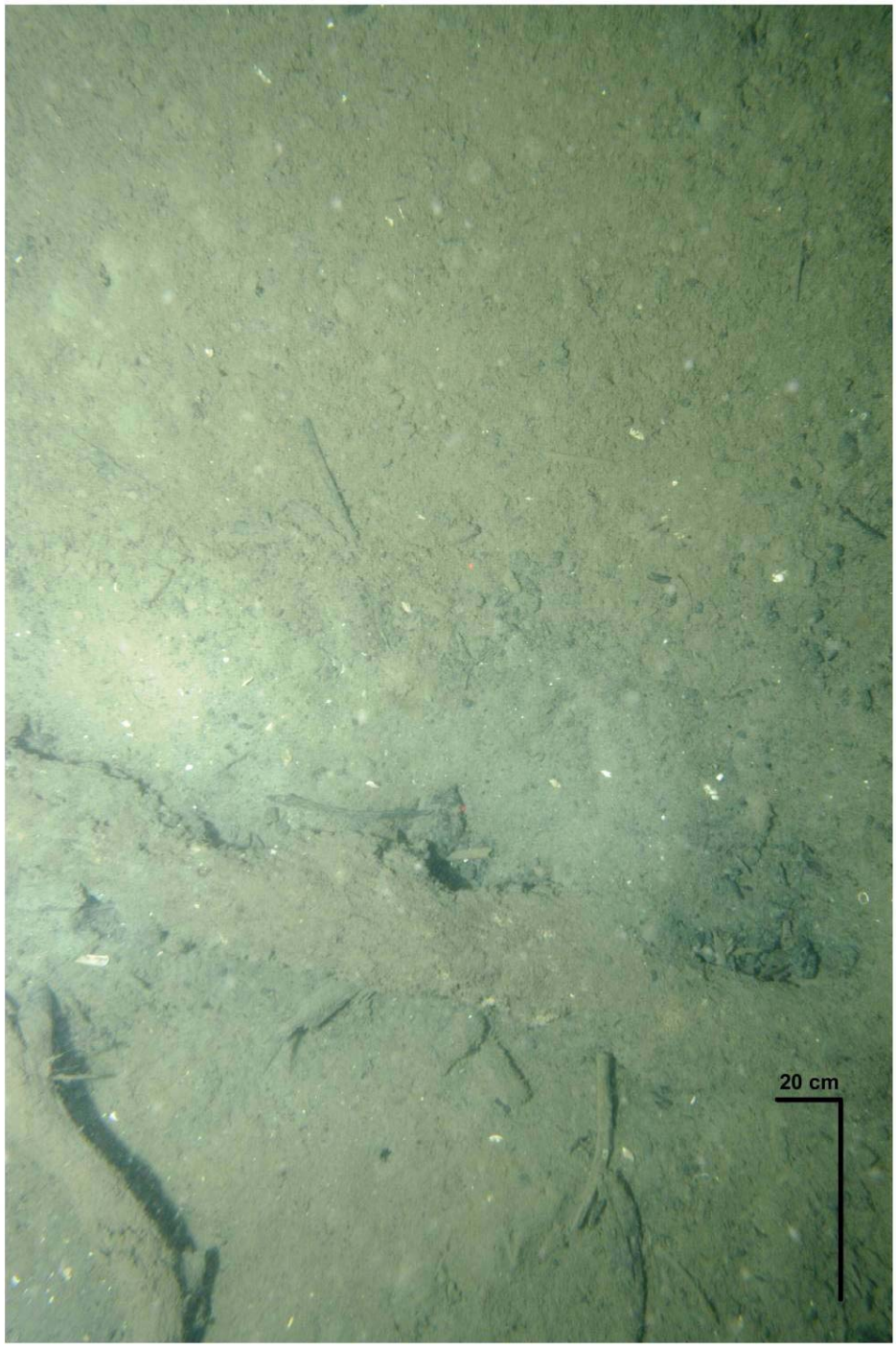

Figure 3-31. The wood debris seen at the surface from Station PDA95-06 is mantled with detritus and undergoing decomposition, as evidenced by the smaller wood fragments on the sediment surface surrounding the larger piece of wood in the image.

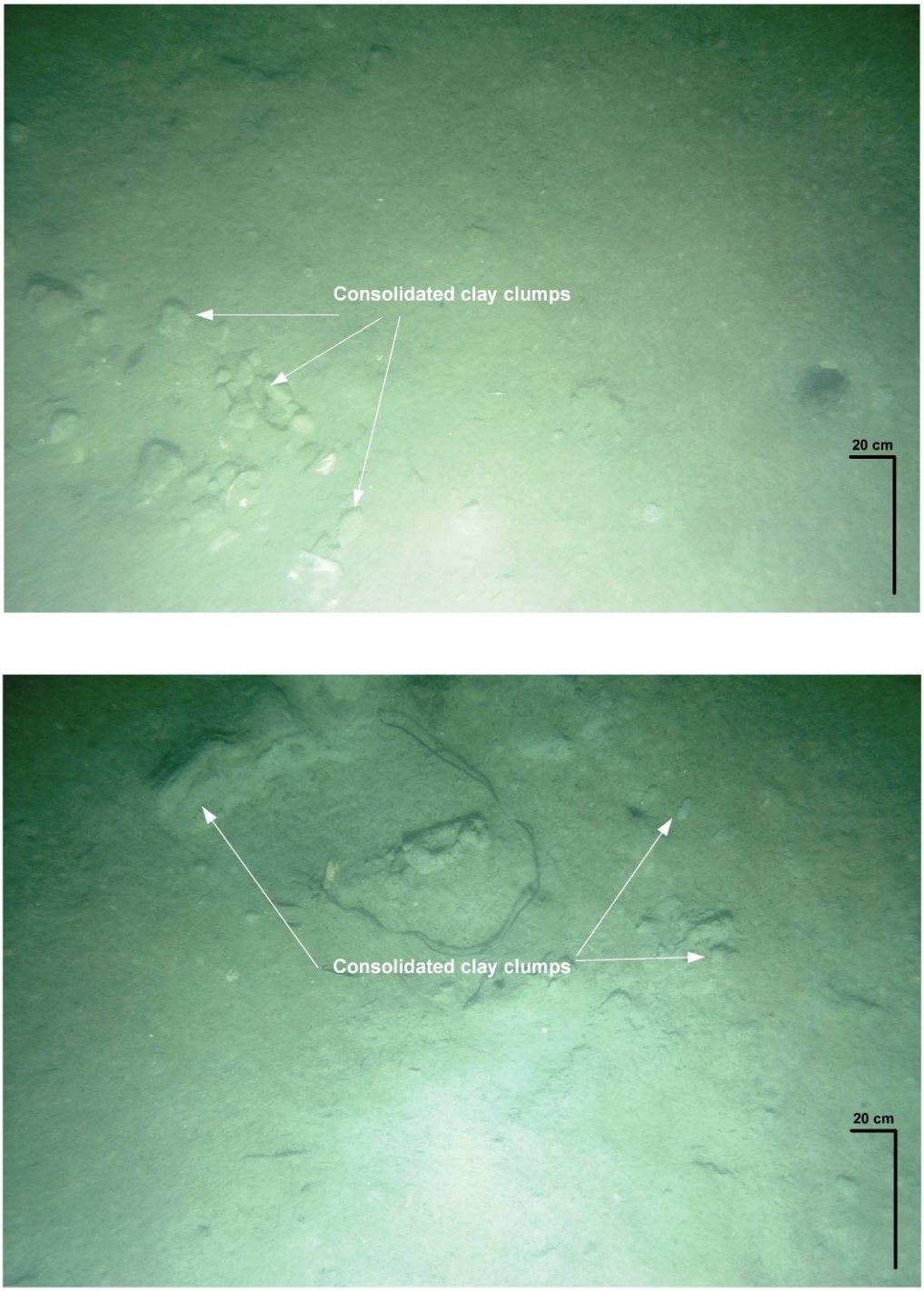

Figure 3-32. Some residual consolidated clay clumps are still evident at the sediment surface at a few locations on the PDA 98 Mound as shown in these images from Stations 04 (top) and 07 (bottom).

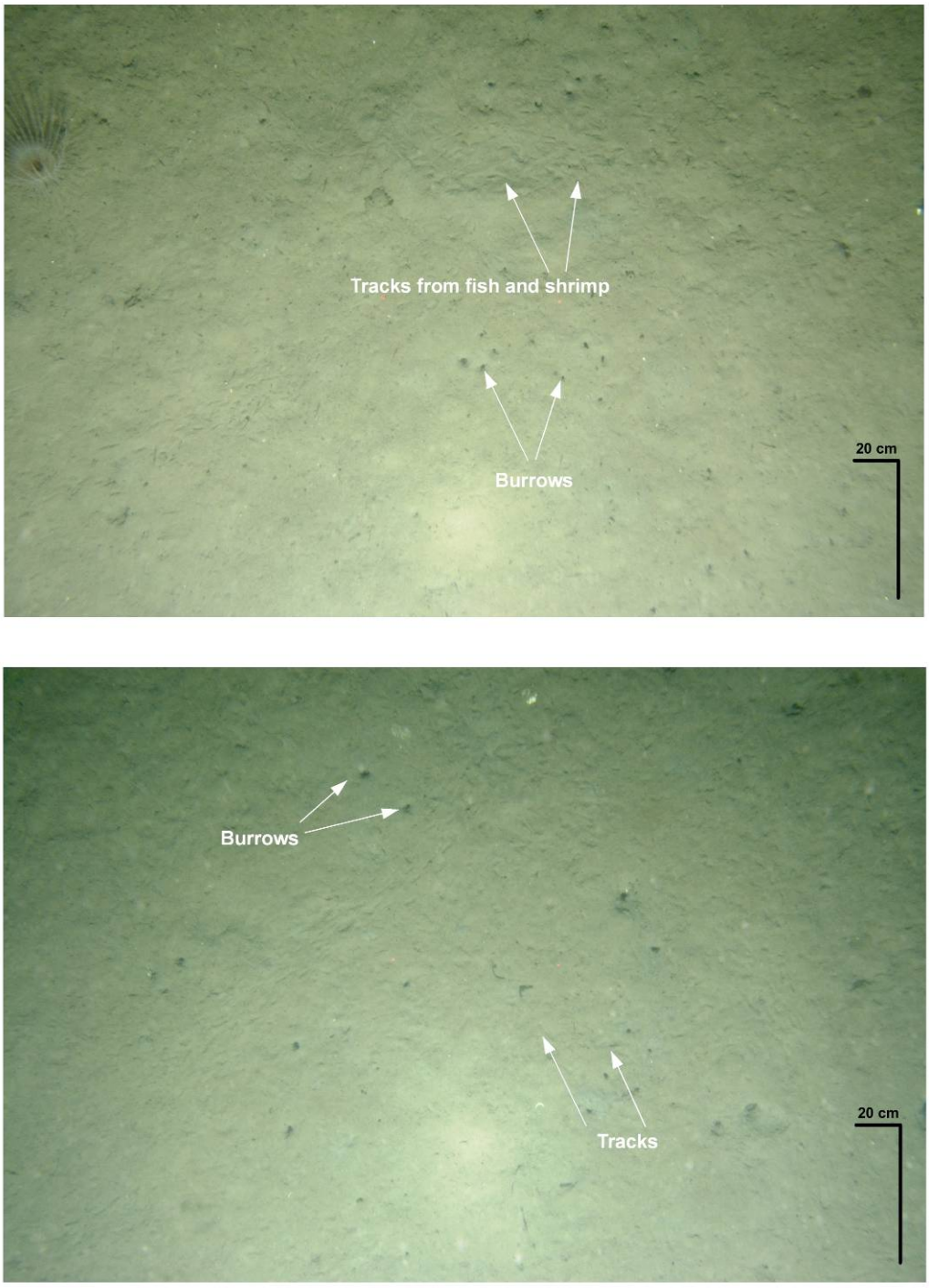

Figure 3-33. Tracks from foraging shrimp and fish as well as burrow openings were common features over most surfaces at the fine-grained stations on both the older mounds and in the reference areas, as illustrated in these images from SREF-03 (top) and PDA95-09 (bottom).

3.3.2 Biological Conditions

While occasional crabs, shrimp, and fish could be seen in the plan view images (Figure 3-34; Appendix C), their foraging tracks were evident on the surface at the majority of the images (e.g., Figure 3-33). The presence of Stage III infauna on both the older disposal mounds and at the reference station was confirmed by the numerous burrow openings and fecal mounds seen in the plan view images, with high densities of these infaunal burrows on the disposal mounds comparable to those found in the reference area (Figure 3-35). The plan view images also provide a good estimate of the relative densities of the burrowing cerianthid anemone (Figure 3-36), which were typically found at a density of one per square meter.

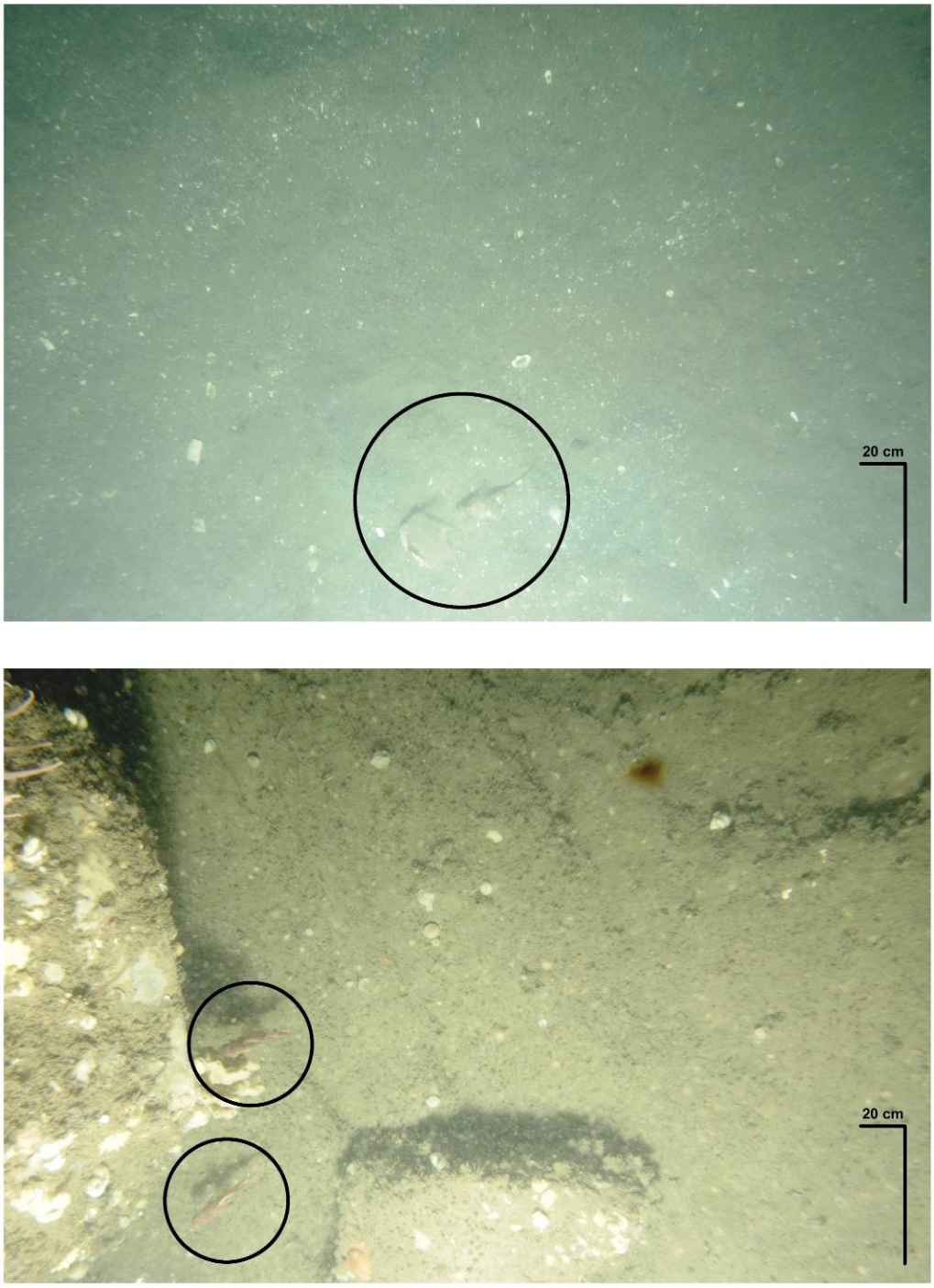

Figure 3-34. A crab and sculpin can be seen on the sediment surface in this image from PDA-A-12 (top), while two fish are visible in the left half of this image from Station EREF-05.

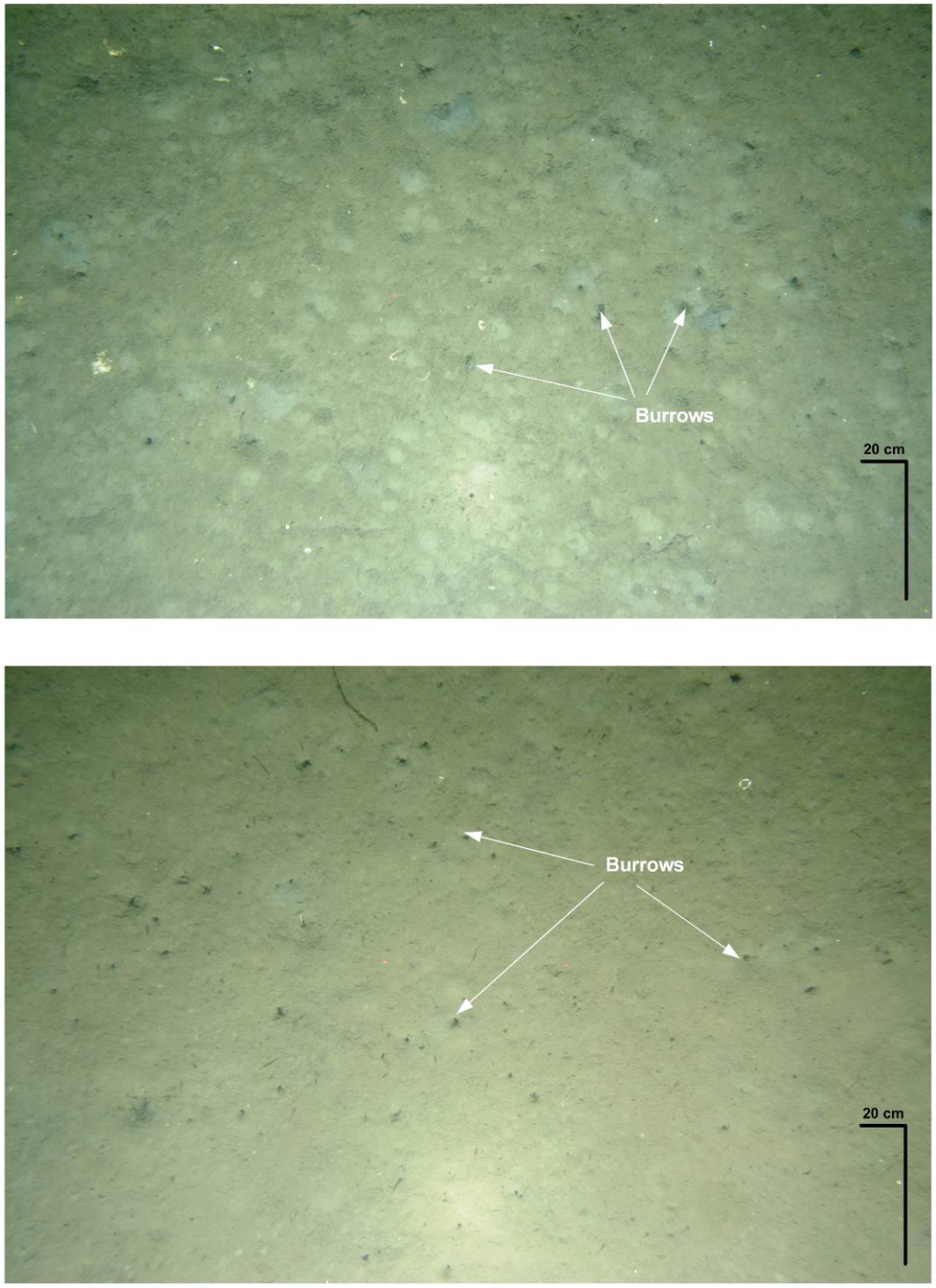

Figure 3-35. Note the high densities of infaunal burrows seen on the sediment surface at both the older disposal mounds (Station PDA95-01, top) and the reference areas (Station SREF-08, bottom).

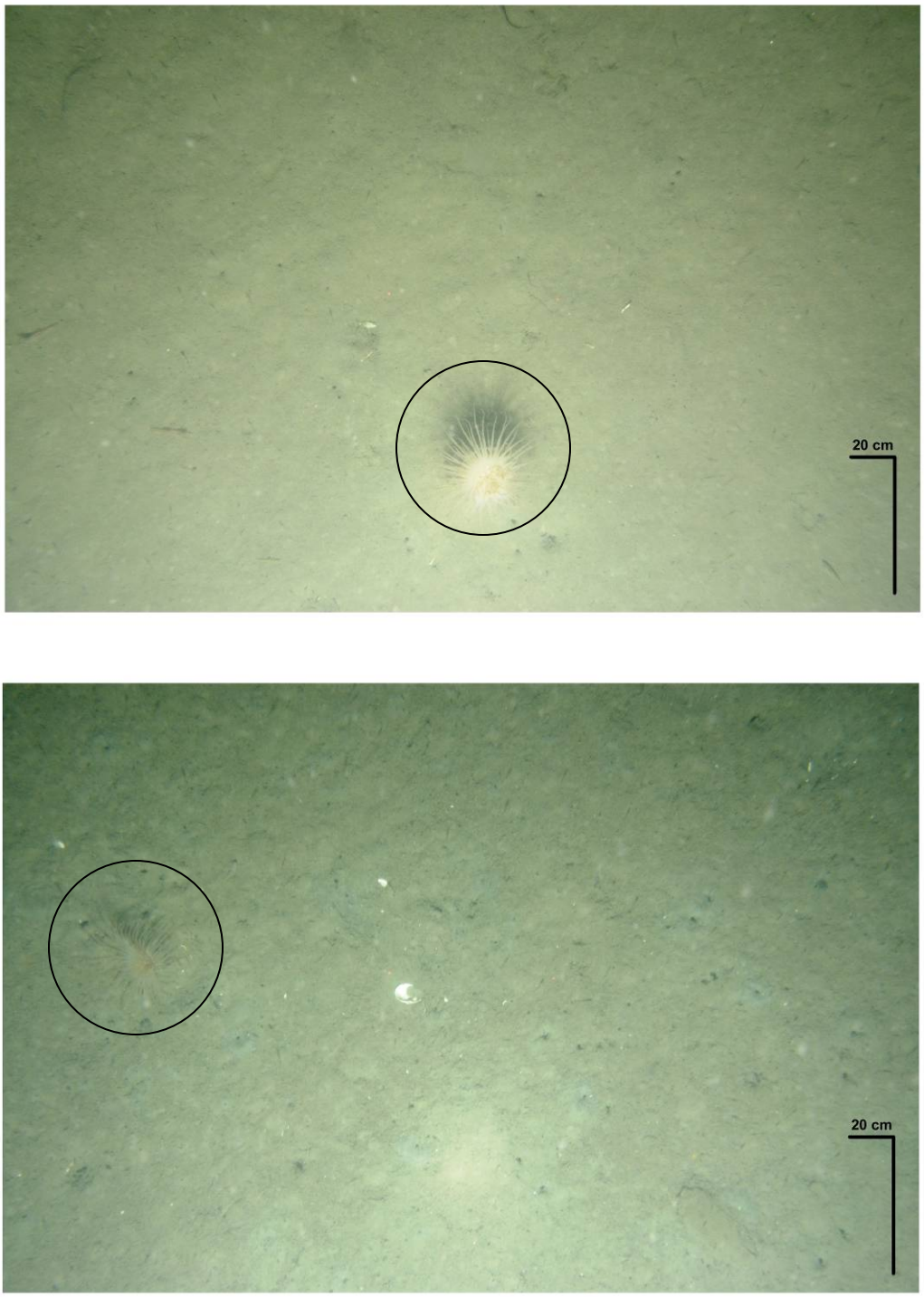

Figure 3-36. Cerianthid anemones were typically seen at a density of $1/m^2$, as shown in these images from Stations EREF-08 (top) and PDA95-07 (bottom).

4.0 DISCUSSION

The objectives of the 2007 PDS survey were to document the distribution of dredged material at the disposal site and to assess the recolonization status and benthic habitat characteristics of representative areas on the three disposal mounds and at the reference areas. These objectives were accomplished using bathymetric, SPI, and PUC survey techniques.

4.1 Dredged Material Distribution

The August 2007 bathymetric and SPI surveys at PDS were intended to assess the seafloor topography of the disposal site and to evaluate the distribution of dredged material at the recent disposal location and two historic mounds. Between August 2001 and August 2007, approximately 369,000 m^3 of dredged material was directed to the PDA A Mound (Table 1-2). Changes in bathymetry detected between the 2000 and 2007 surveys showed that the thickest accumulations of dredged material occurred in the immediate vicinity of the site marker buoy (Figure 3-2), coincident with the recorded disposal locations (Figure 1-3). The bathymetric changes revealed a mound with a maximum height of approximately 4.5 m and dimensions of approximately 250 by 400 m. These measured dimensions are very similar to the predicted dimensions of 2.5 to 4 m height and 500 to 600 m diameter. The measured mound was only slightly higher and narrower than anticipated.

The historic mounds PDA 95 and PDA 98 did not show evidence of consolidation. It was anticipated that the mounds would demonstrate a slight decrease in height due to natural consolidation over the eight years since the last bathymetric survey at PDS, particularly because the 2000 bathymetric survey occurred only several years following disposal at PDA 95 and immediately following the last disposal at PDA 98, with little time for initial consolidation.

4.2 Biological Conditions and Benthic Recolonization

The results of the SPI and PUC survey confirmed the initial expectations and the trends noted in the last monitoring survey at PDS (SAIC 2003). Recolonization at the older mounds (PDA 95 and PDA 98) has continued as expected, with mature, Stage III communities found throughout both of these older mounds. Even though the mean apparent RPD depth was lower at the PDA 95 Mound than that measured on the ambient seafloor, the biological infaunal community was functionally equivalent. High densities of infaunal burrowers and deposit feeders were evident in the plan view images from these two older mounds, and both mounds are considered to be fully recovered with habitat conditions similar to those found at the reference stations.

Interestingly, consolidated clay clumps were still visible at some of the stations on the PDA 98 Mound. While these clumps were clearly not as angular and "fresh" as those seen on the surface at the PDA A stations, it was anticipated that normal weathering and biological re-working would have eliminated most traces of them on the sediment surface after such a considerable length of time had elapsed since disposal (eight years). Although the physical traces of the former disposal events were not totally eliminated from the sediment surface at the PDA 98 Mound (Figure 3-33), they apparently were not impeding the benthic community recovery process.

The PDA A Mound displayed the classic pattern of early recolonization described for newly disturbed areas or recently formed disposal mounds (Rhoads and Germano 1982, 1986; Rhoads et al., 1978). Little to no evidence of deep burrowing or bioturbational activity was detected in any of the profile images from this site, and successional stages were confined to initial opportunistic assemblages (Stage I) or shallow-dwelling deposit feeders (Stage II). No evidence of organic enrichment or subsurface methane was found at any of the stations on any of the three mounds, so there is little reason to suspect that recolonization on the PDA A Mound would not follow the same progression as that documented on the PDA 95 and PDA 98 Mounds.

The highly variable surface topography at the PDA A Mound was typical for a recently-formed mound, with mixed consolidated clay clumps, sand, rocks, and debris. Over time, these surface irregularities are expected to smooth out from normal fine-grained depositional patterns in the topographic lows as well as animals breaking up the consolidated clay clumps from their burrowing and foraging activities. While future monitoring surveys at the site should include the PDA A Mound to document the completion of the recolonization sequence, frequent monitoring of either the PDA 95 or PDA 98 Mounds is not determined to be necessary.

5.0 CONCLUSIONS

The August 2007 survey provided a means to assess changes in seafloor topography and the benthic recolonization status of two historic mounds and one recently formed mound within PDS following placement of nearly 369,000 m^3 of sediment between 2001 and 2007.

The 2007 survey was designed to assess the following expectations:

- The placement of approximately 369,000 m^3 of dredged material at the PDA A buoy since August 2001 will result in the continued development of the PDA A Mound;
- The PDA A Mound is expected to measure approximately 500 to 600 m in diameter with an elevation of 2.5 to 4 m;
- Historical mounds will show minor consolidation;
- As the PDA 95 and PDA 98 Mounds have not received dredged material in approximately eight and 10 years, respectively, it is expected that the benthic community will be comprised of mature, equilibrium (Stage III) assemblages and will have conditions comparable to those found at the reference areas; and
- The PDA A Mound will display early recolonization assemblages (Stage I and early Stage II).

The PDA A Mound increased in height by approximately 4.5 m since the 2001 survey. The new mound was only slightly higher and narrower than predicted. Consolidation of PDA 95 and PDA 98 Mounds was not observed. No other significant changes in bathymetry were noted.

Recolonization at the older mounds (PDA 95 and PDA 98) has continued as expected, with mature, Stage III communities equivalent to reference locations. The PDA A Mound was in an early phase of recolonization, with successional stages confined to initial opportunistic assemblages (Stage I) or shallow-dwelling deposit feeders (Stage II). No evidence of organic enrichment or subsurface methane was found at this mound, so it is expected that recolonization of the PDA A Mound will follow the same progression as that documented on the PDA 95 and PDA 98 Mounds.

Based on the findings of the 2007 PDS survey, the following recommendations are proposed:

R1) Periodic SPI surveys should be conducted over the PDA A Mound to confirm that a normal pattern of benthic recolonization is occurring; and

R2) Unless future dredged material is directed to the PDA 95 and PDA 98 Mounds, there is no need to regularly monitor these areas of advanced recolonization.

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INDEX

INDEX

Appendix A

Disposal Barge Log Summary for PDS
August 2001 to August 2007

Project Name: FORE RIVER
Permittee: NORTHEAST PETROLEUM
Permit Number: 199803453

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
12/5/2001	750	573	43.57233	-70.03117	80	ENE
12/7/2001	750	573	43.5719	-70.03067	40	E
12/11/2001	1,000	765	43.573	-70.0315	100	E
12/13/2001	750	573	43.57117	-70.03233	80	SW
12/16/2001	750	573	43.5715	-70.032	80	W
12/17/2001	750	573	43.57273	-70.03284	80	E
12/19/2001	750	573	43.57084	-70.0315	100	W
12/21/2001	750	573	43.57117	-70.0325	80	W
12/27/2001	750	573	43.5725	-70.0315	80	NE
1/3/2002	750	573	43.57217	-70.03183	80	NE
1/9/2002	750	573	43.57283	-70.03169	80	NE
1/11/2002	750	573	43.57217	-70.03067	70	NE
1/15/2002	750	573	43.57084	-70.033	80	W
1/24/2002	600	459	43.57267	-70.03133	80	SE
2/25/2002	750	573	43.57283	-70.03133	100	E
3/1/2002	750	573	43.57267	-70.03117	100	NE
3/3/2002	750	573	43.57233	-70.03083	80	E
3/8/2002	750	573	43.5715	-70.03267	80	W
3/13/2002	750	573	43.57233	-70.0315	80	E
3/18/2002	750	573	43.571	-70.03183	90	W
Total Dredged Material Volume	15,100	11,545				

Project Name: CASCO BAY - PORTLAND, ME
Permittee: PORTLAND PIPELINE
Permit Number: 200002974

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
11/30/2002	3,000	2,294	43.5717	-70.03	90	
11/30/2002	3,178	2,430	43.57217	-70.03172	25	N
11/30/2002	3,000	2,294	43.57388	-70.02948	70	
12/1/2002	3,000	2,294	43.57385	-70.0261	77	
12/1/2002	3,000	2,294	43.57167	-70.03	50	N
12/1/2002	3,000	2,294	43.57345	-70.02893	83	
12/2/2002	3,600	2,753	43.5717	-70.04992	50	S
12/2/2002	3,400	2,600	43.57167	-70.03	50	W
12/2/2002	3,500	2,676	43.57364	-70.0278	68	
12/2/2002	3,620	2,768	43.57167	-70.03	50	N
12/2/2002	3,900	2,982	43.57187	-70.03115	100	NE
12/3/2002	3,700	2,829	43.57167	-70.03167	5	N
12/3/2002	3,500	2,676	43.57193	-70.03105	100	N
12/3/2002	3,700	2,829	43.57167	-70.03136	50	N
12/3/2002	3,150	2,408	43.57163	-70.03142	40	S
12/3/2002	3,200	2,447	43.57183	-70.03117	50	N

Project Name: CASCO BAY - PORTLAND, ME
Permittee: PORTLAND PIPELINE
Permit Number: 200002974

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
12/4/2002	3,100	2,370	43.57212	-70.03005	150	N
12/4/2002	3,000	2,294	43.57167	-70.03	25	W
12/4/2002	3,100	2,370	43.57217	-70.03105	180	N
12/4/2002	3,050	2,332	43.57175	-70.03101	25	N
12/4/2002	3,700	2,829	43.57198	-70.03091	175	NE
12/5/2002	3,800	2,905	43.57167	-70.03	50	N
12/5/2002	3,100	2,370	43.57187	-70.03125	75	NW
12/5/2002	3,800	2,905	43.572	-70.03115	100	N
12/5/2002	3,800	2,905	43.57183	-70.03098	85	NE
12/5/2002	3,250	2,485	43.57362	-70.03183	50	N
12/6/2002	2,800	2,141	43.57421	-70.02808	50	N
12/6/2002	3,000	2,294	43.57162	-70.03115	65	S
12/6/2002	2,800	2,141	43.57173	-70.0317	25	N
12/6/2002	3,150	2,408	43.57187	-70.031	75	NNE
12/7/2002	3,255	2,489	43.57195	-70.03136	50	N
12/7/2002	3,000	2,294	43.57175	-70.03115	100	N
12/8/2002	3,052	2,334	43.572	-70.031	100	NNW
12/8/2002	3,000	2,294	43.57218	-70.03162	50	N
12/8/2002	2,900	2,217	43.57183	-70.03115	60	N
12/8/2002	3,000	2,294	43.57208	-70.03135	25	N
12/8/2002	3,125	2,389	43.57163	-70.031	65	SSE
12/9/2002	3,125	2,389	43.57307	-70.03233	75	N
12/9/2002	3,100	2,370	43.57183	-70.03115	40	N
12/9/2002	3,000	2,294	43.57262	-70.03207	25	N
12/9/2002	3,150	2,408	43.57187	-70.03132	85	NNW
12/10/2002	3,000	2,294	43.57175	-70.03082	100	E
12/10/2002	2,500	1,912	43.57183	-70.03115	40	N
12/10/2002	3,100	2,370	43.57198	-70.03115	100	N
12/10/2002	2,500	1,912	43.57187	-70.03115	90	N
12/11/2002	3,500	2,676	43.57183	-70.03115	45	N
12/11/2002	3,100	2,370	43.57165	-70.03115	40	S
12/11/2002	2,748	2,101	43.57187	-70.03132	75	NNW
12/11/2002	2,685	2,053	43.57188	-70.03115	50	N
12/11/2002	3,000	2,294	43.57183	-70.03136	100	NW
12/11/2002	3,000	2,294	43.57187	-70.03115	75	N
12/13/2002	3,500	2,676	43.5715	-70.03115	100	S
12/13/2002	3,500	2,676	43.57175	-70.03115	10	S
12/13/2002	3,500	2,676	43.5718	-70.03125	25	NW
12/13/2002	3,500	2,676	43.57192	-70.03098	100	NNE
12/14/2002	3,600	2,753	43.57192	-70.03098	100	NNE
12/15/2002	3,600	2,753	43.57182	-70.03205	25	N
12/15/2002	3,600	2,753	43.57163	-70.03155	50	N
12/15/2002	2,800	2,141	43.57183	-70.0316	50	N
12/15/2002	2,800	2,141	43.5718	-70.03162	50	N
12/16/2002	3,000	2,294	43.57238	-70.03235	25	N

Project Name: CASCO BAY - PORTLAND, ME
Permittee: PORTLAND PIPELINE
Permit Number: 200002974

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
12/16/2002	3,200	2,447	43.57067	-70.0314	25	S
12/16/2002	2,200	1,682	43.57045	-70.03008	75	S
12/17/2002	2,800	2,141	43.56861	-70.03342	100	S
12/17/2002	2,700	2,064	43.57057	-70.03122	25	S
12/17/2002	2,600	1,988	43.57033	-70.0306	50	S
12/18/2002	2,784	2,129	43.57143	-70.03172	25	N
12/18/2002	2,800	2,141	43.5704	-70.03172	20	S
12/18/2002	2,700	2,064	43.57053	-70.0322	20	S
12/18/2002	2,500	1,912	43.57185	-70.03194	25	N
12/18/2002	2,800	2,141	43.57072	-70.0324	25	S
12/19/2002	2,200	1,682	43.5727	-70.04818	50	N
12/19/2002	2,500	1,912	43.57055	-70.03194	15	S
12/19/2002	3,125	2,389	43.57062	-70.03101	25	S
12/19/2002	3,240	2,477	43.57063	-70.03233	50	S
12/20/2002	2,894	2,213	43.57227	-70.03225	50	N
12/20/2002	2,810	2,149	43.5712	-70.0325	25	S
12/20/2002	2,500	1,912	43.57307	-70.03043	100	N
12/21/2002	2,400	1,835	43.57245	-70.03208	25	N
12/22/2002	2,500	1,912	43.57217	-70.0319	25	N
12/22/2002	2,500	1,912	43.57208	-70.02358	50	N
12/22/2002	2,700	2,064	43.57228	-70.03191	50	N
12/22/2002	2,884	2,205	43.57232	-70.03235	25	N
12/23/2002	2,468	1,887	43.57203	-70.03194	75	N
12/23/2002	2,600	1,988	43.57147	-70.03185	50	N
12/23/2002	2,600	1,988	43.57224	-70.03198	50	N
12/23/2002	3,786	2,895	43.57222	-70.03178	50	N
12/24/2002	2,600	1,988	43.57117	-70.03115	100	S
12/24/2002	2,600	1,988	43.57082	-70.03275	25	S
Total Dredged Material Volume	271,129	207,305				

Project Name: ROYAL RIVER
Permittee: ROYAL RIVER BOATYARD
Permit Number: 200201020

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
4/10/2003	532	407	43.571833	-70.031	100	E
4/14/2003	750	573	43.571783	-70.03125	100	W
4/17/2003	750	573	43.5725	-70.031667	50	W
4/19/2003	750	573	43.571667	-70.030833	25	E
4/22/2003	750	573	43.571667	-70.031833	100	W
4/24/2003	642	491	43.571667	-70.031167	100	S
4/26/2003	750	573	43.571667	-70.031667	50	W
4/29/2003	660	505	43.5715	-70.031	50	S
4/30/2003	750	573	43.5715	-70.031	100	S
Total Dredged Material Volume	6,334	4,843				

Project Name: CASCO BAY
Permittee: TOWN OF CUMBERLAND
Permit Number: 200201272

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
1/18/2004	550	421	43.5715	-70.031167	50	W
1/19/2004	550	421	43.571667	-70.0305	100	E
1/21/2004	554	424	43.57165	-70.031117	25	S
1/22/2004	564	431	43.4051	-70.030167	100	S
1/22/2004	517	395	43.57165	-70.031167	25	E
1/25/2004	564	431	43.57165	-70.031167	100	S
1/26/2004	380	291	43.5715	-70.031167	100	S
1/27/2004	460	352	43.571667	-70.031167	50	S
Total Dredged Material Volume	4,139	3,165				

Project Name: SOUTHPORT HARBOR
Permittee: PORTLAND PIPELINE CORP
Permit Number: 200300787

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
1/27/2005	2,200	1,682	43.5704	-70.029033	591	S
1/29/2005	1,900	1,453	43.572483	-70.031033	270	N
2/1/2005	1,800	1,376	43.572633	-70.0311	309	N
2/5/2005	1,900	1,453	43.5725	-70.032017	213	N
2/6/2005	2,250	1,720	43.572217	-70.031783	96	N
2/6/2005	1,900	1,453	43.57215	-70.031333	93	N
2/8/2005	2,200	1,682	43.572167	-70.0313	94	N
2/8/2005	1,975	1,510	43.572233	-70.031233	99	N

Project Name: SOUTHPORT HARBOR
Permittee: PORTLAND PIPELINE CORP
Permit Number: 200300787

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
2/9/2005	2,150	1,644	43.572017	-70.0309	90	N
2/10/2005	2,050	1,567	43.572517	-70.030967	219	N
2/13/2005	2,300	1,759	43.572567	-70.030867	129	N
2/13/2005	1,900	1,453	43.57245	-70.031467	126	N
2/14/2005	2,350	1,797	43.572683	-70.031467	144	N
2/16/2005	1,900	1,453	43.5723	-70.031233	87	N
2/18/2005	2,200	1,682	43.57225	-70.031333	96	N
2/19/2005	1,850	1,415	43.5721	-70.03095	128	N
2/20/2005	2,400	1,835	43.572017	-70.0311	97	N
2/21/2005	1,800	1,376	43.571167	-70.031783	200	SW
2/24/2005	2,300	1,759	43.571333	-70.031333	69	S
2/25/2005	1,980	1,514	43.5715	-70.031283	87	S
2/27/2005	2,300	1,759	43.571133	-70.031267	30	S
2/28/2005	1,200	918	43.57195	-70.03115	84	N
3/3/2005	2,350	1,797	43.571417	-70.031083	122	S
3/4/2005	1,920	1,468	43.571983	-70.031217	85	N
3/5/2005	1,800	1,376	43.572267	-70.031183	42	N
3/6/2005	1,500	1,147	43.572233	-70.031083	24	N
3/8/2005	1,600	1,223	43.571267	-70.030967	38	S
3/10/2005	2,000	1,529	43.571867	-70.031167		
3/11/2005	2,300	1,759	43.571817	-70.031167		
3/13/2005	2,800	2,141	43.5716	-70.031217		
3/14/2005	2,100	1,606	43.57195	-70.031067		
3/15/2005	2,000	1,529	43.571517	-70.031233		
3/15/2005	2,700	2,064	43.571633	-70.031033		
3/16/2005	1,600	1,223	43.571817	-70.031117		
3/17/2005	1,650	1,262	43.57165	-70.031033		
3/18/2005	2,100	1,606	43.5718	-70.031083		
3/18/2005	2,400	1,835	43.5716	-70.031067		
3/20/2005	2,400	1,835	43.570967	-70.031033		
3/20/2005	1,600	1,223	43.571783	-70.031133		
3/21/2005	1,500	1,147	43.57165	-70.031117		
3/22/2005	2,600	1,988	43.571683	-70.031133		
3/22/2005	2,400	1,835	43.571783	-70.031167		
3/23/2005	2,000	1,529	43.571733	-70.031067		
3/24/2005	1,600	1,223	43.571767	-70.031067		
3/26/2005	2,300	1,759	43.5717	-70.031133		
3/26/2005	2,400	1,835	43.571817	-70.03105		
3/26/2005	2,000	1,529	43.571717	-70.03105		
3/30/2005	1,800	1,376	43.571683	-70.03105		
4/1/2005	2,250	1,720	43.571783	-70.031183		
4/2/2005	2,000	1,529	43.571833	-70.031167		
4/2/2005	2,000	1,529	43.57175	-70.031233		
4/4/2005	2,300	1,759	43.571683	-70.0308		
4/4/2005	1,800	1,376	43.571733	-70.030867		
4/6/2005	2,700	2,064	43.571683	-70.030967		

Project Name: SOUTHPORT HARBOR
Permittee: PORTLAND PIPELINE CORP
Permit Number: 200300787

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
4/6/2005	2,000	1,529	43.571667	-70.031167		
4/7/2005	1,800	1,376	43.5715	-70.031167		
4/7/2005	1,800	1,376	43.571833	-70.031333		
4/8/2005	1,700	1,300	43.571333	-70.031167		
4/9/2005	1,900	1,453	43.5718	-70.030767		
4/10/2005	1,000	765	43.571433	-70.030867		
4/11/2005	1,000	765	43.571617	-70.030867		
4/11/2005	1,300	994	43.571617	-70.031233		
4/13/2005	1,600	1,223	43.57155	-70.03095		
4/14/2005	1,200	918	43.571783	-70.030717		
4/15/2005	1,600	1,223	43.571383	-70.031		
4/16/2005	1,200	918	43.571483	-70.031283		
4/16/2005	800	612	43.571733	-70.0312		
2/4/2006	3,500	2,676	43.567617	-70.0264		
2/8/2006	3,500	2,676	43.567667	-70.024167		
2/15/2006	3,000	2,294	43.567133	-70.0245		
2/28/2006	3,200	2,447	43.567817	-70.024333		
3/2/2006	600	459	43.5677	-70.024133		
3/5/2006	200	153	43.567717	-70.024117		
3/7/2006	200	153	43.567633	-70.02415		
3/16/2006	525	401	43.567683	-70.02405		
3/24/2006	200	153	43.5676	-70.0241		
Total Dredged Material Volume	145,100	110,943				

Project Name: FORE RIVER/COAST GUARD STATION
Permittee: US COAST GUARD
Permit Number: NAE20042399

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
3/2/2005	1,100	841	44.239833	-70.190167	75	N
3/3/2005	1,350	1,032	43.573667	-70.031167	75	NE
3/5/2005	1,350	1,032	43.5735	-70.031833	150	N
3/5/2005	1,350	1,032	43.5735	-70.045	300	N
3/7/2005	1,350	1,032	43.573333	-70.023333	150	N
3/9/2005	1,350	1,032	43.573	-70.023333	60	N
3/9/2005	1,350	1,032	43.573833	-70.030167	150	N
3/14/2005	1,350	1,032	43.573	-70.0315	150	N
3/15/2005	1,300	994	43.573333	-70.033167	300	N
3/15/2005	1,350	1,032	43.575	-70.031667	150	N
3/16/2005	1,350	1,032	43.572667	-70.031167	50	N
3/17/2005	1,350	1,032	43.572667	-70.032667	150	N
3/18/2005	1,350	1,032	43.572667	-70.030333	225	N
3/19/2005	1,350	1,032	43.57	-70.031	150	N
3/21/2005	1,350	1,032	43.570167	-70.033	150	N
3/23/2005	1,350	1,032	43.575	-70.031667		
3/26/2005	1,350	1,032	43.574333	-70.031833		
3/30/2005	1,350	1,032	43.574	-70.031667		
Total Dredged Material Volume	24,000	18,350				

Project Name: HARRASEEKET RIVER
Permittee: BREWER'S SO. FREEPORT MARINA
Permit Number: NAE20042856

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
3/5/2005	750	573	43.568333	-70.033333		
3/22/2005	600	459		-70.033167		
3/26/2005	650	497	43.585667	-70.034667		
Total Dredged Material Volume	2,000	1,529				

Project Name: CG STATION/NEWCASTLE NH
Permittee: US COAST GUARD
Permit Number: NAE20044039

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
12/11/2006	1,450	1,109	43.569983	-70.033383		
12/16/2006	1,500	1,147	43.57175	-70.030683		
12/18/2006	1,550	1,185	43.571767	-70.031033		
12/20/2006	1,200	918	43.571933	-70.031483		
Total Dredged Material Volume	5,700	3,250				

Project Name: FORE RIVER/PORTLAND HARBOR
Permittee: GULF OIL LIMITED PARTNERSHIP
Permit Number: NAE20044298

Disposal Date	Volume (yd^3)	Volume (m^3)	Disposal Latitude (degrees)	Disposal Longitude (degrees)	Approximate Distance from Buoy (ft)	Approximate Direction from Buoy
1/17/2007	500	382	43.57175	-70.031139		
1/23/2007	500	382	43.57175	-70.031139		
3/1/2007	225	172	43.57175	-70.031139		
3/6/2007	300	229	43.57175	-70.031139		
3/9/2007	375	287	43.57175	-70.031139		
3/11/2007	375	287	43.57175	-70.031139		
3/15/2007	225	172	43.57175	-70.031139		
3/15/2007	400	306	43.57175	-70.031139		
3/19/2007	380	291	43.57175	-70.031139		
3/20/2007	400	306	43.57175	-70.031139		
3/21/2007	275	210	43.57175	-70.031139		
3/24/2007	350	268	43.57175	-70.031139		
3/26/2007	300	229	43.57175	-70.031139		
3/27/2007	250	191	43.57175	-70.031139		
3/28/2007	200	153	43.57175	-70.031139		
3/30/2007	400	306	43.57175	-70.031139		
3/31/2007	400	306	43.57175	-70.031139		
4/6/2007	400	306	43.57175	-70.031139		
4/11/2007	1100	841	43.57175	-70.031139		
4/12/2007	450	344	43.57175	-70.031139		
4/21/2007	500	382				
4/24/2007	500	382	43.57175	-70.031139		
Total Dredged Material Volume	8,805	6,350				

Appendix B

Sediment-Profile Image Results for PDS
August 2007 Survey

Appendix B-1
Grain Size Scale for Sediments

Phi (Φ) size	Size range (mm)	Size class (Wentworth class)
< -1	> 2	Gravel
0 to –1	1 to 2	Very coarse sand
1 to 0	0.5 to 1	Coarse sand
2 to 1	0.25 to 0.5	Medium sand
3 to 2	0.125 to 0.25	Fine sand
4 to 3	0.0625 to 0.125	Very fine sand
> 4	< 0.0625	Silt/clay

Appendix B-2
Sediment-Profile Image Results for Reference Stations at PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
EREF01 A	8/20/2007	16:40:51	153.38	10.61	10.41	10.86	14	2	14.46	0.45	B	>4	2	>4	>4 - 2	37.29	2.58	0		N	NP	N	1	1.42	1.44	1.43	Stage 1 on 3	Soft, homogenous ambient tan mud>pen; uniform tan color w/ very weak rpd contrast (low organics); large+small surf tubes+Podocerid amp stalks; 1 shallow small void
EREF01 B	8/20/2007	16:42:10	149.77	10.36	10.03	10.7	14	2	14.46	0.67	B	>4	2	>4	>4 - 2	45.36	3.14	0		N	NP	N	1	2.96	3.1	3.03	Stage 1 on 3	Soft homogenous ambient tan mud>pen; minor very fine sand fraction; shell or smooth rock in farfield; lrg+small surf tubes+1 small shallow void-like opening@right.
EREF01 C	8/20/2007	16:43:39	166.79	11.53	11.08	11.91	14	2	14.46	0.83	B	>4	2	>4	>4 - 2	38.3	2.65	0		N	NP	N	0			0.00	Stage 2	Soft homogenous ambient tan mud>pen; low rpd contrast=low organic content; dense surf tubes+1 or 2 very small worm-like orgs@depth
EREF03 A	8/20/2007	17:13:25	116.58	8.06	7.57	8.58	14	3	14.46	1.01	B	>4	2	>4	>4 - 2	29.96	2.07	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low rpd contrast; dense surf tubes+biogenic mounds; planview trigger wire visible, transected burrow at lower left edge of image
EREF03 B	8/20/2007	17:15:15	132.75	9.19	8.93	9.36	14	3	14.44	0.43	B	>4	2	>4	>4 - 2	40.15	2.78	0		N	NP	N	1	2.69	2.83	2.76	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low rpd contrast; dense stg 1 surf tubes+1 v. small shallow void@right
EREF03 C	8/20/2007	17:16:21	105.73	7.31	6.05	8.4	14	3	14.46	2.35	P	>4	2	>4	>4 - 2	36.64	2.53	0		N	NP	N	1	7.17	7.3	7.24	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low/weak rpd conrtrast=low organics; increased br=camera sled disturbance. 1 small void@depth+1 subsurface poly+stg 1 surf tubes
EREF04 A	8/20/2007	15:54:49	0	0.00	0	0	13	1	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=probably large rocks
EREF04 B	8/20/2007	15:56:06	0	0.00	0	0	13	1	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=ambient rocks
EREF04 C	8/20/2007	15:57:02	0	0.00	0	0	13	1	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=ambient rocks
EREF05 A	8/20/2007	16:30:08	0	0.00	0	0	14	2	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=ambient rock in farfield
EREF05 B	8/20/2007	16:31:37	0	0.00	0	0	14	2	14.46	0	ind	-7	-8	>4	>4 - -8	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=ambient rocks encrusted with epifaunal growth (e.g., hydroids+sponges) clearly visible
EREF05 C	8/20/2007	16:32:32	0	0.00	0	0	14	2	14.46	0	ind	ind	<-1	ind	ind - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=water shot=assume hardbottom consisting of ambient rocks
EREF06 A	8/20/2007	16:51:00	121.69	8.42	7.88	8.82	14	2	14.46	0.94	B	>4	2	>4	>4 - 2	46.34	3.20	3	O	N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; weak rpd contrast=low organic content; 1 stg 3 worm-like org in lower right corner+abundant stg 1 surf tubes; planview wire in farfield
EREF06 B	8/20/2007	16:51:56	145.03	10.03	9.18	10.77	14	2	14.46	1.59	B	>4	1	>4	>4 - 1	44.8	3.10	1	O	N	NP	N	0			0.00	Stage 1 on 3	Soft ambient tan mud w/ some very fine sand>pen; low rpd contrast; at least 1 deep oxidized burrow/tube w/ associated organism; numerous surf tubes
EREF06 C	8/20/2007	16:53:01	142.01	9.82	9.4	9.96	14	2	14.46	0.56	B	>4	2	>4	>4 - 2	38.44	2.66	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low rpd contrast; abundant surf tubes+1 or 2 visible subsurface worm-like orgs
EREF07 A	8/20/2007	17:02:24	153.29	10.60	10.21	11.17	14	3	14.46	0.96	B	>4	2	>4	>4 - 2	33.68	2.33	1	O	N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low rpd contrast=low organics; numerous surf tubes+1 or 2 small subsurface worm-like orgs

Appendix B-2
Sediment-Profile Image Results for Reference Stations at PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
EREF07 B	8/20/2007	17:03:17	184.78	12.78	12.47	13.54	14	3	14.46	1.07	B	>4	2	>4	>4 - 2	50.44	3.49	2	O	N	NP	N	0			0.00	Stage 2 -> 3	Soft homogenous ambient tan mud>pen; very low rpd contrast; a few stg 1 surf tubes+little evidence of stg 3 subsurface activity
EREF07 C	8/20/2007	17:04:16	161.37	11.18	10.7	11.37	14	3	14.44	0.67	B	>4	2	>4	>4 - 2	42.63	2.95	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; low rpd contrast; abundant surf tubes+1 larger-bodied subsurface poly=stg 3; small patched of red sed@depth
EREF08 A	8/20/2007	17:41:55	120.69	8.35	6.83	8.89	14	4	14.46	2.06	B	>4	2	>4	>4 - 2	27.1	1.87	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous ambient tan mud>pen; weak rpd contrast; burrow opening w/ oxidized halo@depth+stg 3 worms@left=Stg 3; epifauna-encrusted Cerianthid tube in farfield
EREF08 B	8/20/2007	17:43:05	145.48	10.06	9.76	10.59	14	4	14.46	0.83	B	>4	2	>4	>4 - 2	43.1	2.98	0		N	NP	N	1	2.29	2.33	2.31	Stage 1 on 3	Soft homogenous ambient tan mud>pen; slightly sandy@depth; 1 small indistinct void+subsurface worm-like org @far left=stg 3; dense surf tubes
EREF08 C	8/20/2007	17:44:24	183.36	12.68	12.16	12.94	14	4	14.46	0.78	B	>4	2	>4	>4 - 2	40.51	2.80	0		N	NP	N	1	8.4	11.76	10.08	Stage 1 on 3	Soft homogenous ambient tan mud>pen; very low rpd contrast; burrow/void complex in lwr left corner; abundant surf tubes
SEREF01 A	8/21/2007	16:27:41	300.19	20.80	20.35	20.98	14	1	14.43	0.63	B	>4	2	>4	>4 - 2	72.07	4.99	0		N	NP	N	1	5.52	5.68	5.60	Stage 1 on 3	Partial overpenetration; very soft homogenous ambient tan mud>pen; low rpd contrast; 1 feeding void+surf tube visible in upper left corner
SEREF01 B	8/21/2007	16:28:33	267.37	18.50	18.19	19.2	14	1	14.45	1.01	B	>4	2	>4	>4 - 2	73.44	5.08	8	O	N	NP	N	1	8.55	8.7	8.63	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; low rpd contrast; wiper clasts; prominent subsurface void; several surface tubes.
SEREF01 C	8/21/2007	16:29:25	229.53	15.88	14.47	16.81	14	1	14.45	2.34	B	>4	2	>4	>4 - 2	48.03	3.32	0		N	NP	N	2	5.33	11.06	8.20	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; low rpd contrast; wiper clasts; most likely surface sed disturbance was caused by camera frame; 1 prominent void+1 void/burrow complex
SEREF02 A	8/21/2007	16:46:48	248.82	17.22	16.78	17.67	14	1	14.45	0.89	B	>4	2	>4	>4 - 2	52.83	3.66	0		N	NP	N	2	4.73	9.09	6.91	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; low rpd contrast; x-section of large stg 3 polychaete+two voids+surf tubes=classic stg 1 on 3
SEREF02 B	8/21/2007	16:47:50	273.67	18.94	17.73	20.37	14	1	14.45	2.64	P	>4	2	>4	>4 - 2	65.54	4.54	1	O	N	NP	N	4	10.2	17.68	13.94	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; low rpd contrast; faint horizon of darker/reduced sed@depth; several voids+surf tubes+subsurface worm-like orgs
SEREF02 C	8/21/2007	16:48:58	228.81	15.83	15.36	16.66	14	1	14.45	1.3	P	>4	2	>4	>4 - 2	64	4.43	0		N	NP	N	2	2.09	5.32	3.71	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; low rpd contrast; 1 small shallow void and 1 partial void@far right edge; wiper clasts; vertical oxy tubes/burrows
SEREF03 A	8/21/2007	8:10:06	253.89	17.59	17.54	17.93	14	4	14.43	0.39	B	>4	2	>4	>4 - 2	62.4	4.32	0		N	NP	N	1	12.39	12.74	12.57	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; very clay-like@depth; 1 prominent void+a few surf tubes; low rpd contrast=sed has very homogenous color+texture
SEREF03 B	8/21/2007	8:11:02	240.44	16.63	16.51	17.06	14	4	14.46	0.55	B	>4	2	>4	>4 - 2	59.95	4.15	2	R	N	NP	N	1	13.23	13.53	13.38	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; partial/indistinct void lwr right+subsurface worm-like org upper right+a few surf tubes; wiper clasts

Appendix B-2
Sediment-Profile Image Results for Reference Stations at PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
SEREF03 C	8/21/2007	8:12:02	246.55	17.05	16.86	17.27	14	4	14.46	0.41	B	>4	2	>4	>4 - 2	65.08	4.50	6	R	N	NP	N	0			0.00	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; no clear voids but partial/indistinct; 1 subsurface organism; wiper clasts
SEREF04 A	8/21/2007	16:35:39	205.34	14.21	13.86	14.5	14	1	14.45	0.64	B	>4	2	>4	>4 - 2	75.59	5.23	0		N	NP	N	0			0.00	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; no clear voids but 1 or 2 partial/indistinct; 1 subsurface worm-like org; abundant surf tubes
SEREF04 B	8/21/2007	16:36:43	209.58	14.49	14.22	15.31	14	1	14.46	1.09	B	>4	2	>4	>4 - 2	43.4	3.00	3	R	N	NP	N	1	5.67	5.76	5.72	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; 1 thin subsurface void/burrow; numerous short surf tubes; low rpd contrast
SEREF04 C	8/21/2007	16:37:53	207.86	14.37	12.87	16.3	14	1	14.46	3.43	P	>4	2	>4	>4 - 2	53.97	3.73	3	O	N	NP	N	1	3.99	4.06	4.03	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; 1 shallow distinct void+abundant small and large surf tubes; faint reduced banding@depth
SEREF05 B	8/21/2007	8:21:56	175.77	12.16	11.78	12.63	14	2	14.46	0.85	B	>4	2	>4	>4 - 2	19.65	1.36	0		N	NP	N	0			0.00	Stage 1 on 3	Very soft homogenous ambient light grey clay>pen; surface veneer of brownish silty mud over cohesive clay; transected edge of oxygenated void at mid left edge of image
SEREF05 C	8/21/2007	16:51:43	224.24	15.51	15.25	15.76	14	1	14.46	0.51	B	>4	2	>4	>4 - 2	45.73	3.16	0		N	NP	N	1	4.59	4.77	4.68	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; weak rpd contrast=low organics; 1 prominent void+1 subsurface poly+surf tubes+surface reworking
SEREF05 D	8/21/2007	16:52:33	226.97	15.70	14.78	16.5	14	1	14.46	1.72	B	>4	2	>4	>4 - 2	59.66	4.13	0		N	NP	N	2	8.04	12.74	10.39	Stage 1 on 3	Very soft homogenous ambient tan mud>pen; clayey@depth; weak rpd contrast; at least 2 voids+lrg and small surf tubes
SREF01 A	8/22/2007	9:10:48	262.39	18.15	17.71	18.75	15	3	14.46	1.04	B	>4	2	>4	>4 - 2	60.41	4.18	0		N	NP	N	0			0.00	Stage 1 on 3	Very soft silty homogenous ambient mud>pen; darker@depth than SEREF sed; multiple surf tubes+several vertical oxy tubes/burrow+1 subsurface worm-like org
SREF01 D	8/22/2007	10:33:06	251.37	17.38	17.05	17.8	14	1	14.46	0.75	B	>4	2	>4	>4 - 2	51.3	3.55	0		N	NP	N	0			0.00	Stage 1 on 3	Very soft silty homogenous ambient mud>pen; moderate rpd contrast; a few surf tubes and start of oxygenated burrow at bottom center
SREF01 E	8/22/2007	10:34:01	241.4	16.69	15.29	16.43	14	1	14.46	1.14	B	>4	2	>4	>4 - 2	36.57	2.53	0		N	NP	N	0			0.00	Stage 1 on 3	Very soft silty homogenous ambient mud>pen; moderate rpd contrast; vertical oxy tube/burrow
SREF03 A	8/22/2007	9:02:53	123.06	8.49	7.79	9.52	15	3	14.49	1.73	B	>4	0	>4	>4 - 0	36.71	2.53	0		N	NP	N	1	7.22	7.55	7.39	Stage 1 on 3	Moderately firm tan silty ambient mud w/ significant very fine sand>pen; sandy-silty over clayey@depth; 1 prominent void+1 subsurface poly; rippled surface
SREF03 B	8/22/2007	9:03:53	103.88	7.19	6.7	7.68	15	3	14.44	0.98	B	>4	2	>4	>4 - 2	35.67	2.47	0		N	NP	N	0			0.00	Stage 1 on 3	Moderately firm tan ambient silty clay>pen; Cerianthid tube in farfield; classic fecal mound w/ pellets; heavy biological reworking of sed surf; oxy tube/burrow@depth
SREF03 C	8/22/2007	9:04:54	159.77	11.05	10.57	11.42	15	3	14.46	0.85	B	>4	-1	>4	>4 - -1	38.29	2.65	0		N	NP	N	0			0.00	Stage 1 on 3	Layered ambient sed=upper 2-3 cm is muddy silt w/ fine to medium sand over homogenous silt-clay@depth; abundant surf tubes+at least 2 subsurface worm-like orgs
SREF04 A	8/22/2007	9:20:50	0	0.00	0	0	14	3	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration; planview confirms hardbottom consisting of detritus-mantled ambient rocks

Appendix B-2
Sediment-Profile Image Results for Reference Stations at PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
SREF04 B	8/22/2007	9:21:49	0	0.00	0	0	14	3	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration; planview confirms hardbottom consisting of detritus-mantled ambient rocks
SREF04 C	8/22/2007	9:22:45	0	0.00	0	0	14	3	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration; planview confirms hardbottom consisting of detritus-mantled ambient rocks
SREF05 B	8/22/2007	8:34:52	81.08	5.61	5	6.09	14	1	14.46	1.09	B	>4	2	>4	>4 - 2	26.03	1.80	0		N	NP	N	0			0.00	Stage 1 on 3	Moderately firm light-colored silty firm ambient clay>pen; planview trigger wire visible; many surf tubes on biologically active sed surf+1 stg 3 poly@depth
SREF05 C	8/22/2007	8:35:57	0	0.00	0	0	14	1	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=encrusted rock in farfield=ambient rocks
SREF05 F	8/22/2007	8:56:19	0	0.00	0	0	15	3	14.46	0	ind	ind	<-1	>4	>4 - <-1	ind	ind	ind		N	NP	N	ind			0.00	Ind	No penetration=hardbottom=encrusted rock in farfield=ambient rocks
SREF06 A	8/22/2007	9:41:50	156.68	10.84	10.55	11.33	14	3	14.46	0.78	B	>4	2	>4	>4 - 2	35.41	2.45	0		N	NP	N	0			0.00	Stage 1 on 3	Moderately soft homogenous tan ambient silt-clay>pen; abundant surf tubes+reworking of sed surf+2 subsurface polys+vertical oxy burrow@left
SREF06 B	8/22/2007	9:42:55	143.37	9.93	8.31	11.78	14	3	14.44	3.47	B	>4	2	>4	>4 - 2	28.98	2.01	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous tan silty ambient mud>pen; fecal pellet mound@left+very active bio reworking of sed surf with transected edge of oxygenated burrows at depth
SREF06 C	8/22/2007	9:44:07	176.74	12.24	11.06	13.03	14	3	14.44	1.97	B	>4	2	>4	>4 - 2	35.87	2.48	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous tan silty mud>pen; dm-like black+grey clay streaks@depth; bio reworking of sed surf+2 very small/thin worm-like orgs@depth
SREF07 A	8/22/2007	10:10:42	208.29	14.42	14.13	14.66	14	3	14.44	0.53	B	>4	2	>4	>4 - 2	42.56	2.95	0		N	NP	N	1	1.86	2.04	1.95	Stage 1 on 3	Soft homogenous tan ambient mud>pen; very weak rpd contrast; a few small reduced patches@depth; 1 void+several subsurface worms+surf tubes
SREF07 D	8/22/2007	10:53:32	228.51	15.82	15.45	16.12	14	3	14.44	0.67	B	>4	2	>4	>4 - 2	47.36	3.28	10	O	N	NP	N	5	3.92	12.36	8.14	Stage 1 on 3	Soft homogenous tan ambient mud>pen; weak rpd contrast; multiple shallow+deep voids+several subsurface worms+bio reworking of sed surf; mud clasts and smearing of rpd=artifact
SREF07 E	8/22/2007	10:54:23	235.18	16.26	15.89	16.72	14	3	14.46	0.83	B	>4	2	>4	>4 - 2	42.15	2.91	1	R	N	NP	N	5	1.93	10.23	6.08	Stage 1 on 3	Soft homogenous tan ambient mud>pen; low rpd contrast; multiple voids+surf tubes; mud clasts=wiper artifacts
SREF08 A	8/22/2007	10:20:45	147.64	10.21	9.92	10.61	14	3	14.46	0.69	B	>4	2	>4	>4 - 2	33.7	2.33	0		N	NP	N	0			0.00	Stage 1 on 3	Soft homogenous tan ambient mud>pen; low rpd contrast; several small/thin worms@depth+abundant surf tubes+feeding pits
SREF08 B	8/22/2007	10:21:38	115.75	8.00	7.08	8.69	14	3	14.46	1.61	P	>4	2	>4	>4 - 2	34.56	2.39	0		N	NP	N	0			0.00	Stage 1 on 3	Moderately firm homogenous tan ambient slightly sandy mud>pen; several worm-like orgs@depth+surface activity; disturbance of sed surf from camera base (confirmed in plan view)
SREF08 C	8/22/2007	10:22:33	147.3	10.19	9.72	10.81	14	3	14.46	1.09	B	>4	2	>4	>4 - 2	32.53	2.25	0		N	NP	N	0			0.00	Stage 1 on 3	Moderately soft homogenous tan ambient slightly sandy mud>pen; weak rpd contrast; abundant surf tubes+1 or 2 small polys@depth; biogenic mounds

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA A Mound																												
PDA-A-01 A	8/22/2007	13:15:23	86.49	5.98	4.21	8.04	15	5	14.46	3.83	P	>4	-6	>4	>4 - -6	23.32	1.61	0		N	>pen	N	0			0.00	Stage 1 -> 2	DM>pen=poorly sorted mix of light tan clay, sand and pebbles; surface worm tubes+1 thin subsurface red worm
PDA-A-01 B	8/22/2007	13:16:31	90.48	6.24	4.39	8.49	15	5	14.51	4.1	P	>4	-5	>4	>4 - -5	ind	ind	0		N	>pen	N	0			0.00	Stage 1	DM>pen=mostly light tan consolidted clay w/ rocks@surf; high tubidity@swi but a few stg 1 tubes visible
PDA-A-01 C	8/22/2007	13:17:24	0	0.00	0	0	15	5	14.46	0	ind	ind	-5	>4	>4 - -5	ind	ind	0		N	>pen	N	0			0.00	Ind	No pen; rocks@swi likely=likely DM
PDA-A-02 A	8/22/2007	13:26:21	169.71	11.74	10.84	12.13	15	5	14.46	1.29	P	4 to 3	-1	>4	>4 - -1	33.94	2.35	0		N	>pen	N	0			0.00	Stage 2	DM>pen=mostly fine to very fine tan sand w/ shell frags and patches of grey clay@depth; Stg 1 surf tubes with shallow burrows
PDA-A-02 B	8/22/2007	13:27:21	196.85	13.61	12.72	14.93	15	5	14.46	2.21	P	3 to 2/>4	-1	>4	>4 - -1	44.44	3.07	0		N	>pen	N	0			0.00	Stage 2	DM>pen= brown sand w/ shell hash over consolidated grey clay; numerous stg 1 tubes + at least 2 Ampeliscid tubes
PDA-A-02 C	8/22/2007	13:28:16	82.13	5.68	4.28	7.21	15	5	14.46	2.93	P	3 to 2	-1	>4	>4 - -1	32.35	2.24	0		N	>pen	N	0			0.00	Stage 1	DM>pen=light tan poorly sorted fine sand w/ shell hash+pebbles+grey clay; Stage 1 surface tubes; grey clay streaks
PDA-A-03 A	8/22/2007	12:54:09	94.67	6.55	6.09	7.03	15	5	14.46	0.94	P	4 to 3/>4	-1	>4	>4 - -1	32.58	2.25	0		N	>pen	N	0			0.00	Stage 1	DM>pen=consolidated grey clay chunks mixed with muddy tan fine sand in interstitial spaces; shell hash; lower left is stress fraction and not biological; Stg 1 surf tubes
PDA-A-03 B	8/22/2007	12:55:14	71.25	4.93	4.57	5.35	15	5	14.44	0.78	P	3 to 2	-1	>4	>4 - -1	Ind	2.92	0		N	>pen	N	0			0.00	Stage 1	DM>pen=muddy light brown fine to very fine sand w/ shell hash; clay streaks=artifact from previous replicate; apparent RPD linear measurment (right half obscured by clay clast streak)
PDA-A-03 C	8/22/2007	12:56:16	88.01	6.09	5.53	6.54	15	5	14.46	1.01	P	3 to 2	-1	>4	>4 - -1	ind	2.07	0		N	>pen	N	0			0.00	Stage 1	DM>pen=slightly muddy light brown fine sand w/ some shell hash; moderately well-sorted.
PDA-A-04 A	8/22/2007	12:59:56	95.74	6.62	6.16	7.1	15	5	14.46	0.94	P	3 to 2/>4	-4	>4	>4 - -4	45.51	3.15	0		N	>pen	N	0			0.00	Stage 1 -> 2	DM>pen=layering of fine to medium brown sand w/ shell hash+pebbles over consolidated light grey clay; rpd measured as sand layer
PDA-A-04 B	8/22/2007	13:00:53	108.77	7.52	6.25	8.93	15	5	14.46	2.68	P	3 to 2/>4	-4	>4	>4 - -4	ind	1.86	1	O	N	>pen	N	0			0.00	Stage 1 -> 2	DM>pen=poorly sorted mix of fine to medium sand w/ shell hash+pebbles+clay clasts over grey consolidated clay.
PDA-A-04 C	8/22/2007	13:01:51	0	0.00	0	0	15	5	14.46	0	ind	ind	ind	ind	ind	ind	ind			N	Ind	N	ind			0.00	Ind	No pen; rocks@swi??? strange shape in farfield
PDA-A-05 A	8/22/2007	12:50:04	68.06	4.71	2.06	7.73	15	5	14.46	5.67	P	2 to 1	-6	>4	>4 - -6	ind	3.37	0		N	>pen	N	0			0.00	Stage 1	DM>pen=mostly fine to medium slightly muddy brown-grey sand w/ shell hash; 1 large rock; very early recolonization=fresh DM?
PDA-A-05 B	8/22/2007	12:50:53	94.94	6.57	5.69	7.41	15	5	14.46	1.72	P	2 to 1	-1	>4	>4 - -1	33.3	2.30	0		N	>pen	N	0			0.00	Stage 1 -> 2	DM>pen=fine to medium brown-grey sand w/ shell hash+small grey clay streaks/clasts; subtle rpd contrast (brown over grey)
PDA-A-05 C	8/22/2007	12:51:48	108.47	7.50	6.92	8.31	15	5	14.46	1.39	P	3 to 2	-1	>4	>4 - -1	29.2	2.02	0		N	>pen	N	0			0.00	Stage 2	DM>pen=fine to medium brown-grey sand w/ shell hash>pen; subtle rpd contrast (brown over darker grey)

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA-A-06 A	8/22/2007	13:30:44	87.1	6.02	5.69	6.25	15	5	14.46	0.56	P	>4 to 3	-1	>4	>4 - -1	16.35	1.13	0		N	>pen	N	0			0.00	Stage 2 -> 3	DM>pen=muddy very fine sand w/ some shell hash and grey clay patches; a few small polychaetes@depth+1 larger=bodied worm bottom center
PDA-A-06 B	8/22/2007	13:31:37	102.07	7.06	5.87	8.11	15	5	14.46	2.24	P	>4 to 3	-1	>4	>4 - -1	26.12	1.81	1	O	N	>pen	N	0			0.00	Stage 2	DM>pen=muddy fine to very fine sand/sandy brown mud; shell hash+ gray clay clasts that are artifacts from prism blade
PDA-A-06 C	8/22/2007	13:32:29	75.62	5.23	4.82	5.26	15	5	14.46	0.44	P	>4 to 3	-1	>4	>4 - -1	19.01	1.31	0		N	>pen	N	0			0.00	Stage 2 -> 3	DM>pen=muddy very fine brown/grey sand w/ some shell hash; several small+thin worm-like orgs in subsurface; subtle rpd contrast
PDA-A-07 D	8/22/2007	12:20:13	108.76	7.52	2.06	10.03	15	5	14.46	7.97	P	>4	2	>4	>4 - 2	10.62	0.73	1	O	N	>pen	N	0			0.00	Stage 1	DM>pen=streaky black/grey consolidated clay w/ surface veneer of brown sandy mud=rpd; stress fractures@depth not voids; fresh/recent DM
PDA-A-07 E	8/22/2007	12:21:13	170.99	11.83	11.15	12.27	15	5	14.46	1.12	P	3 to 2/>4	-1	>4	>4 - -1	13.38	0.93	0		N	>pen	N	0			0.00	Stage 1	DM>pen=layering of brown fine sand over grey cohesive clay; some clay shavings from camera bolade from previous replicate
PDA-A-07 F	8/22/2007	12:22:16	230.44	15.94	15.38	16.97	15	5	14.46	1.59	P	3 to 2	0	>4	>4 - 0	38.4	2.66	0		N	>pen	N	0			0.00	Stage 1 -> 2	DM>pen=mostly brown/muddy fine sand w/ patches of cohesive grey clay@depth; smearing artifact from previous rep.
PDA-A-08 B	8/22/2007	13:11:08	41.72	2.89	2.36	3.32	15	5	14.46	0.96	P	3 to 2	-2	>4	>4 - -2	41.72	2.89	0		N	>pen	N	0			0.00	Stage 1	DM>pen=brownish/grey slightly muddy fine to very fine sand w/ shell hash; minimal pen with aRPD > pen
PDA-A-08 C	8/22/2007	13:12:11	53.97	3.73	2.91	4.59	15	5	14.46	1.68	B	3 to 2	-2	>4	>4 - -2	53.97	3.73	0		N	>pen	N	0			0.00	Stage 2	DM>pen=brownish/grey muddy fine to very fine sand w/ shell hash; minimal pen with aRPD >pen
PDA-A-09 D	8/22/2007	12:27:39	54.7	3.79	3.47	4.19	15	5	14.44	0.72	P	3 to 2	-1	>4	>4 - -1	54.7	3.79	0		N	>pen	N	0			0.00	Stage 2	DM>pen=brown/tan fine to very fine sand w/ shell hash; aRPD > pen, fecal mound in background of deposit-feeder
PDA-A-09 E	8/22/2007	12:28:35	47.08	3.26	2.85	3.72	15	5	14.46	0.87	P	3 to 2	-2	>4	>4 - -2	47.08	3.26	0		N	>pen	N	0			0.00	Stage 1	DM>pen=brown/tan/grey fine to very fine sand w/ shell hash; Stage 1 tubes; low pen in firm sand with aRPD > pen
PDA-A-09 F	8/22/2007	12:30:24	61.57	4.26	4.08	4.48	15	5	14.44	0.4	P	3 to 2	<-1	>4	>4 - <-1	32.35	2.24	0		N	>pen	N	0			0.00	Stage 2	DM>pen=brown/grey fine to very fine sand w/ shell hash; low pen in firm sand; brown sand near surface measured as rpd over grey sand
PDA-A-10 A	8/22/2007	13:35:50	205.41	14.21	13.7	14.64	15	5	14.46	0.94	P	3 to 2	0	>4	>4 - 0	30.23	2.09	0		N	>pen	N	0			0.00	Stage 1	DM>pen=tan/grey very homogenous fine to very fine sand; lack of shell hash; subtle rpd contrast
PDA-A-10 B	8/22/2007	13:36:42	87.43	6.05	5.62	6.56	15	5	14.46	0.94	P	3 to 2	-1	>4	>4 - -1	22.32	1.54	0		N	>pen	N	0			0.00	Stage 1	DM>pen=tan/grey fine to very fine sand w/ minor shell hash; mostly homogenous sand; brown over grey; subtle rpd contrast
PDA-A-10 C	8/22/2007	13:37:34	160.34	11.07	10.5	11.53	15	5	14.48	1.03	P	3 to 2	0	>4	>4 - 0	30.57	2.11	0		N	>pen	N	0			0.00	Stage 1 on 3	DM>pen=tan/grey homogenous fine to very fine sand w/ minor shell hash; very subtle rpd contrast; oxygenated burrow at depth & portion of worm just above

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA-A-11 A	8/22/2007	12:45:16	132.05	9.13	7.57	10.23	15	5	14.46	2.66	P	3 to 2	-2	>4	>4 - -2	32.71	2.26	1	O	N	>pen	N	0			0.00	Stage 2	DM>pen=tan/grey fine to medium sand w/ significant shell hash; large cohesive clay clast on sed surf in farfield. Shallow burrows bisected
PDA-A-11 B	8/22/2007	12:46:06	100.08	6.92	6.5	7.61	15	5	14.46	1.11	P	3 to 2	-2	>4	>4 - -2	28.33	1.96	0		N	>pen	N	0			0.00	Stage 2	Fairly fresh DM>pen=brown/tan muddy fine sand w/ shell hash; subtle rpd contrast; shallow sub-surface worms and bivalves evident
PDA-A-11 C	8/22/2007	12:47:14	121.71	8.42	7.19	9.49	15	5	14.46	2.3	P	>4	<-1	>4	>4 - <-1	ind	ind	0		N	>pen	N	0			0.00	Stage 1	DM>pen=brown mostly muddy-clayey DM w/ minor fine sand and some shell hash; interstitial spaces are physical not biological
PDA-A-12 C	8/22/2007	11:40:24	45.39	3.14	2.06	4.15	14	2	14.46	2.09	P	3 to 2	-1	>4	>4 - -1	45.39	3.14	0		N	>pen	N	0			0.00	Stage 1	DM>pen=brown-grey slightly muddy firm fine sand w/ shell hash; low pen with aRPD > pen
PDA-A-12 D	8/22/2007	12:39:23	89.38	6.18	5.82	6.79	15	5	14.46	0.97	P	3 to 2	-1	>4	>4 - -1	89.38	6.18	0		N	>pen	N	0			0.00	Stage 2	DM>pen=brown slightly muddy fine sand w/ shell hash; aRPD > pen
PDA-A-12 F	8/22/2007	12:41:17	58.66	4.06	3.34	4.84	15	5	14.46	1.5	P	3 to 2	-1	>4	>4 - -1	58.66	4.06	0		N	>pen	N	0			0.00	Stage 2	DM>pen=brown-grey slightly muddy fine sand w/ shell hash; low pen=firm sand; aRPD > pen, shallow worms & bivalves at depth
PDA-A-13 B	8/22/2007	11:44:38	84.52	5.85	3.52	7.68	14	2	14.46	4.16	P	2 to 1	<-1	>4	>4 - <-1	ind	ind	0		N	>pen	N	0			0.00	Ind	DM>pen=darkish grey-brown medium sand w/ shell hash; moderate penetration in firm sand; no rpd contrast
PDA-A-13 E	8/22/2007	11:45:33	109.04	7.55	6.32	8.91	15	5	14.44	2.59	P	2 to 1	0	>4	>4 - 0	ind	ind	0		N	>pen	N	0			0.00	Stage 2	DM>pen=darkish brown-grey slightly muddy medium sand; aRPD > pen, only a few pieces of shell hash
PDA-A-13 F	8/22/2007	12:33:57	55.63	3.85	2.87	5	15	5	14.46	2.13	P	2 to 1	<-1	2	2 - <-1	ind	ind	0		N	>pen	N	0			0.00	Stage 1	DM>pen=brown firm medium sand w/ significant shell hash; no clear rpd delineation, aRPD >pen.
PDA-A-14 B	8/22/2007	13:21:46	0	0.00	0	0	15	5	14.46	0	ind	-8	-8	ind	ind - -8	ind	ind	0		N	???	N	ind			0.00	Ind	No pen; rock in farfield; DM??
PDA-A-15 A	8/22/2007	13:04:36	125.47	8.68	8.17	9.05	15	5	14.46	0.88	P	3 to 2	-1	>4	>4 - -1	33.62	2.33	0		N	>pen	N	0			0.00	Stage 2	DM>pen=tan-over-grey medium to fine sand w/ shell hash; slightly muddy w/ grey clay streaks; subtle rpd contrast; shallow burrows and worms visible
PDA-A-15 B	8/22/2007	13:05:26	77.04	5.33	4.75	6.16	15	5	14.46	1.41	P	3 to 2	-3	>4	>4 - -3	44.77	3.10	0		N	>pen	N	0			0.00	Stage 2 -> 3	DM>pen=tan-grey medium to fine sand w/ shell hash+a few grey mud clasts; subtle aRPD contrast
PDA-A-15 C	8/22/2007	13:06:23	61.75	4.27	3.09	5.18	15	5	14.46	2.09	P	-5/>4-3	-5	>4	>4 - -5	ind	ind	>10	O	N	>pen	N	0			0.00	Stage 2	DM>pen=chaotic poorly sorted mix of pebbles+cohesive grey clay clasts@surface over muddy fine sand@depth; no rpd contrast.
PDA 95 Mound																												
PDA95-01 A	8/21/2007	9:00:48	115.3	7.98	7.7	8.35	14	2	14.44	0.65	B	>4	1	>4	>4 - 1	30.3	2.10	0		N	>pen	N	1	7.56	7.75	7.66	Stage 1 on 3	Old/weathered DM>pen; dm is brown mud w/ very slight amount of very fine sand; floccy/reworked surface; small polychaetes+feeding voids lower right corner
PDA95-01 B	8/21/2007	9:01:48	125.91	8.71	8.49	9.07	14	2	14.46	0.58	B	>4	2	>4	>4 - 2	21.46	1.48	0		N	>pen	N	2	7.52	8.62	8.07	Stage 1 on 3	Old/weathered DM>pen; sed is brown silt-clay w/ weak rpd contrast; active sed surf=lots of tubes+reworking.

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA95-01 C	8/21/2007	9:03:32	168.18	11.65	11.08	12	14	2	14.44	0.92	B	>4	2	>4	>4 - 2	24.31	1.68	0		N	>pen	N	5	9.18	10.95	10.07	Stage 1 on 3	Old/weathered DM>pen; softer mud over mud/clay mixed with sand=multiple DM layers; feeding voids@depth; active sed surface=dense tubes.
PDA95-02 A	8/21/2007	9:41:05	204.13	14.10	13.61	14.51	13.5	1	14.48	0.9	B	>4	2	>4	>4 - 2	39.4	2.72	0		N	>pen	N	2	9.5	10.04	9.77	Stage 1 on 3	Old/weathered DM>pen (old DM layers?); mud over sandy mud; clay streaks and sand@depth=DM evidence; 2 voids+subsurface worm@right
PDA95-02 B	8/21/2007	9:42:02	201.39	13.91	13.59	14.55	13.5	1	14.48	0.96	B	>4	2	>4	>4 - 2	43.79	3.02	0		N	>pen	N	4	6.92	11.98	9.45	Stage 1 on 3	Old/weathered DM>pen (old DM layers?); mud over sandy mud; clay streaks and sand@depth=DM evidence; Stg 1 surf tubes+several indistinct voids
PDA95-02 C	8/21/2007	9:42:57	165.59	11.45	10.72	11.87	13.5	1	14.46	1.15	B	>4	2	>4	>4 - 2	37.38	2.59	0		N	>pen	N	3	9.38	9.96	9.67	Stage 1 on 3	Old/weathered muddy DM>pen; homogenous silt-clay; dense Stage 1 tubes@swi+subsurface poly+voids.
PDA95-03 A	8/21/2007	10:24:12	119.79	8.28	7.61	8.78	13.5	1	14.46	1.17	P	>4	2	>4	>4 - 2	34.33	2.37	0		N	>pen	N	1	6.94	6.94	6.94	Stage 1 on 3	Old/weather muddy DM>pen (based on other 2 reps). ; biologically active surface=lots of tubes+reworking; 1 large-bodied poly@depth+bisected burrow lower right corner
PDA95-03 B	8/21/2007	10:25:03	128.63	8.90	6.18	11.55	13.5	1	14.46	5.37	P	>4	2	>4	>4 - 2	29.6	2.05	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered muddy DM>pen; sandy@depth; large encrusted piece of wood @ sed surf; large polychaete tubes at surface
PDA95-03 C	8/21/2007	10:26:04	135.08	9.34	9.02	9.67	13.5	1	14.46	0.65	B	>4	2	>4	>4 - 2	29.07	2.01	0		N	>pen	N	0			0.00	Stage 2 -> 3	Old/weathered muddy DM>pen. ; dense surf tubes; worm lower right corner
PDA95-04 A	8/21/2007	9:32:50	275.93	19.12	18.85	19.58	13.5	1	14.43	0.73	B	>4	2	>4	>4 - 2	46.92	3.25	0		N	14.05	N	3	3.31	11.9	7.61	Stage 1 on 3	Old/weathered soft muddy DM; likely DM>pen=multiple layers; several feeding voids+Stg 1 tubes.
PDA95-04 B	8/21/2007	9:33:53	242.45	16.78	15.74	18.72	13.5	1	14.45	2.98	P	>4	2	>4	>4 - 2	32.6	2.26	0		N	12.34	N	2	7.63	9.13	8.38	Stage 3	Old/weathered soft muddy DM surface layer over ambient or another dm lyr; rpd estimated due to smearing; partial voids; slightly sandy horizon near surface
PDA95-04 C	8/21/2007	9:34:55	277.28	19.19	18.46	20.14	13.5	1	14.45	1.68	B	>4	2	>4	>4 - 2	50.99	3.53	0		N	10.28	N	2	4.43	9.7	7.07	Stage 1 on 3	Old/weathered soft muddy DM surface layer over ambient or another dm layer; weark rpd contrast; partial subsurface voids
PDA95-05 A	8/21/2007	9:51:11	218.62	15.12	14.66	15.67	13.5	1	14.46	1.01	B	>4	2	>4	>4 - 2	29.17	2.02	0		N	>pen	N	1	9.25	9.27	9.26	Stage 1 on 3	Old/weathered soft muddy DM>pen. ; vertical burrow near swi on upper right; steaky grey/black clay@depth
PDA95-05 B	8/21/2007	9:52:09	104.52	7.24	5.73	7.88	13.5	1	14.44	2.15	B	>4	1	>4	>4 - 1	31.65	2.19	0		N	>pen	N	1	4.73	7.01	5.87	Stage 1 on 3	Old/weathered muddy DM>pen. ; burrow/void@depth; Stage 1 surf tubes
PDA95-05 C	8/21/2007	9:53:09	166.94	11.54	11.28	11.91	13.5	1	14.47	0.63	B	>4	2	>4	>4 - 2	29.69	2.05	0		N	>pen	N	3	4.48	11.26	7.87	Stage 1 on 3	Old/weathered muddy DM w/ cohesive grey clay>pen; several voids+surface Stg 1 worm tubes
PDA95-06 D	8/21/2007	17:17:50	202.05	13.97	13.75	14.42	15	4	14.46	0.67	B	>4	2	>4	>4 - 2	43.28	2.99	0		N	>pen	N	4	4.17	12.32	8.25	Stage 1 on 3	Old/weathered muddy DM>pen; floccy/highly reworked sed surface; multiple subsurface voids+large-bodied worm

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA95-06 E	8/21/2007	17:18:45	161.83	11.21	10.86	11.4	15	4	14.44	0.54	B	>4 to 3	0	>4	>4 - 0	46.45	3.22	0		N	>pen	N	1	5.11	5.29	5.20	Stage 1 on 3	Old/weathered DM>pen; sed is muddy fine sand/sandy mud; dense surface tubes+reworking; 1 void@left; appears to be wood fibers/particles in sed fabric
PDA95-06 F	8/21/2007	17:19:39	97.26	6.73	6.45	7.19	15	4	14.46	0.74	B	>4 to 3	0	>4	>4 - 0	28.02	1.94	0		N	>pen	N	1	5.96	6.05	6.01	Stage 1 on 3	Old/weathered muddy Dm>pen; muddy w/ fine sand+small gravel-sized particles; partial/indistinct void; Stage 1 surf tubes
PDA95-07 A	8/21/2007	10:42:59	144.22	9.97	9.31	10.61	13.5	1	14.46	1.3	B	>4	2	>4	>4 - 2	38.92	2.69	1	O	N	>pen	N	1	8.02	8.73	8.38	Stage 1 on 3	Old/weathered muddy dm>pen; grey clay patches@depth; large void; several prominent surf tubes.
PDA95-07 B	8/21/2007	10:43:52	124.41	8.62	7.17	9.07	13.5	1	14.44	1.9	B	>4	2	>4	>4 - 2	45.68	3.16	0		N	>pen	N	1	6.16	6.59	6.38	Stage 1 on 3	Old/weathered muddy dm>pen; a few small grey clay patches@depth; indistinct void; prominent surf tubes.
PDA95-07 C	8/21/2007	10:44:41	134.61	9.31	8.76	9.43	13.5	1	14.46	0.67	B	>4	2	>4	>4 - 2	37.59	2.60	0		N	8.58	N	1	8.71	8.98	8.85	Stage 1 on 3	Old/weatherd muddy dm layer over ambient or more dm; dense Stage 1 surf tubes+actively reworked surface.
PDA95-08 A	8/21/2007	9:27:48	219.11	15.15	14.98	15.43	13.5	1	14.46	0.45	B	>4	2	>4	>4 - 2	33.15	2.29	0		N	>pen	N	1	4.59	4.71	4.65	Stage 1 on 3	Old/weathered dm>pen; soft silty brown mud over cohesive grey clay layer; one small indistinct void above polychaete; stress fractures in clay; large subsurface Nepthys against faceplate
PDA95-08 B	8/21/2007	9:28:41	220.32	15.24	14.82	15.65	13.5	1	14.46	0.83	B	>4	2	>4	>4 - 2	35.02	2.42	0		N	>pen	N	2	8.45	14.93	11.69	Stage 1 on 3	Old/weathered soft muddy dm>pen; surbsurface voids+1 distinct polychaete; a few surf worm tubes.
PDA95-08 C	8/21/2007	9:29:41	185.74	12.85	12.51	13.19	13.5	1	14.46	0.68	B	>4	2	>4	>4 - 2	34.47	2.38	>20	O	N	>pen	N	1	5.18	6.03	5.61	Stage 1 on 3	Old/weathered soft muddy dm>pen; patch of cohesive grey clay@depth; 1 prominent void; grey clay clasts@swi=camera artifact
PDA95-09 A	8/21/2007	10:30:34	154.13	10.66	10.05	11.4	13.5	1	14.46	1.35	B	>4	2	>4	>4 - 2	35.34	2.44	0		N	>pen	N	2	5.6	6.52	6.06	Stage 1 on 3	Old/weathered soft muddy dm>pen; dm layering; stg 1 surf tubes+2 distinct subsurface voids (one w/ organism).
PDA95-09 B	8/21/2007	10:31:35	156.95	10.87	10.37	11.4	13.5	1	14.44	1.03	B	>4	2	>4	>4 - 2	39.95	2.77	0		N	>pen	N	1	5.82	6.7	6.26	Stage 1 on 3	Old/weathered soft muddy dm>pen; some layering; 1 partial subsurface void/burrow+red worm@left.
PDA95-09 C	8/21/2007	10:32:44	139.23	9.63	9.25	10.23	13.5	1	14.46	0.98	B	>4	2	>4	>4 - 2	32.12	2.22	0		N	>pen	N	1	9.29	9.72	9.51	Stage 1 on 3	Old/weathered soft muddy dm>pen; distinct feeding void+subsurface worms+stg 1 surf tubes+biogenic mound.
PDA95-10 A	8/21/2007	8:52:41	221.84	15.34	14.89	15.78	14	2	14.46	0.89	B	>4	2	>4	>4 - 2	26.57	1.84	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; old layering; at least 2 subsurface worms with edge of burrows transected +stg 1 surf tubes.
PDA95-10 B	8/21/2007	8:53:33	181.46	12.55	12.27	13.3	14	2	14.46	1.03	B	>4	2	>4	>4 - 2	17.8	1.23	1	R	N	>pen	N	3	7.23	12.2	9.72	Stage 1 on 3	Old/weathered soft muddy dm>pen; multiple subsurface voids/burrows+stg 1 surf tubes. Mud clast artifact from camera sled
PDA95-10 C	8/21/2007	8:54:26	217.46	15.04	14.39	15.54	14	2	14.46	1.15	B	>4	2	>4	>4 - 2	33.16	2.29	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; very weathered=looks like ambient; 1 obvious surf tube+subsurface worm-like org@right; very weak rpd contrast

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA95-11 A	8/21/2007	9:16:42	262	18.09	17.58	18.82	14	2	14.48	1.24	B	>4	2	>4	>4 - 2	25.24	1.74	0		N	12.07	N	0			0.00	Stage 2	Old/weathered very soft muddy dm>pen; surface layer over ambient or another dm layer; 1 shallow biogenic textural re-working
PDA95-11 B	8/21/2007	9:17:39	257.01	17.77	17.49	18.19	14	2	14.46	0.7	B	>4	2	>4	>4 - 2	36.13	2.50	0		N	11.7	N	1	5.54	6.35	5.95	Stage 1 on 3	Old/weathered very soft muddy dm w/ grey clay chunks>pen; surface layer measured over a subsurface dm lyr; 1 indistinct void+small surf tubes
PDA95-11 C	8/21/2007	9:18:48	278.4	19.23	18.84	20.06	14	2	14.48	1.22	B	>4	2	>4	>4 - 2	44.68	3.09	0		N	12.06	N	2	13.91	18.87	16.39	Stage 1 on 3	Old/weathered very soft muddy dm over dm>pen; a few small clay streaks+reduced patch@depth; 2 subsurface voids.
PDA95-12 A	8/21/2007	9:56:58	141.56	9.79	9.37	10.36	13.5	1	14.46	0.99	B	>4	2	>4	>4 - 2	41.11	2.84	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; looks like ambient but w/ some grey clay streaks; vertical oxy burrow on right
PDA95-12 B	8/21/2007	9:57:55	203.39	14.07	13.79	14.31	13.5	1	14.46	0.52	B	>4	2	>4	>4 - 2	36.4	2.52	3	R	N	>pen	N	0			0.00	Stage 3	Very weathered old soft muddy dm or ambient mud>pen; large verutical oxidized burrow opening; small mudclasts are artifacts from camera sled
PDA95-12 C	8/21/2007	9:58:48	190.58	13.18	13.05	13.52	13.5	1	14.46	0.47	B	>4	2	>4	>4 - 2	47.32	3.27	0		N	>pen	N	2	7.01	11.89	9.45	Stage 1 on 3	Very weathered old soft muddy dm with evidence of multiple layering; 2 voids+subsurface worm+surf tubes+active surf reworking; vertical oxy tube/burrow.
PDA95-13 A	8/21/2007	9:46:14	141.3	9.77	9.2	10.32	13.5	1	14.46	1.12	B	>4	1	>4	>4 - 1	40.95	2.83	0		N	>pen	N	1	7.59	7.59	7.59	Stage 1 on 3	Very weathered old soft muddy dm >pen; very active sed surf+1 subsurface worm-like org; clay streaks+patch of sandy sed in right corner suggest dm
PDA95-13 B	8/21/2007	9:47:11	198.01	13.69	13.28	14.01	13.5	1	14.46	0.73	B	>4	2	>4	>4 - 2	42.1	2.91	0		N	>pen	N	0			0.00	Stage 1 on 3	Very weathered old soft muddy dm>pen; slightly sandy texture@depth+reduced patches=dm evidence; 1 subsurface worm-like org+possible burrowing anemone on left.
PDA95-13 C	8/21/2007	9:48:09	176.41	12.20	11.62	12.81	13.5	1	14.46	1.19	B	>4	2	>4	>4 - 2	26.94	1.86	0		N	>pen	N	3	9.54	11.24	10.39	Stage 1 on 3	Old/weathered soft muddy dm>pen; several subsurface voids+Podocerid amphipod stalks@swi; biogenic mounds of slightly reduced sed@swi
PDA95-14 A	8/21/2007	10:52:03	190.83	13.22	12.65	13.84	13.5	1	14.44	1.19	B	>4 to 3/>4	2	>4	>4 - 2	19.79	1.37	0		N	>pen	N	1	5.76	5.85	5.81	Stage 1 on 3	Old./weathered dm>pen; layering of slightly sandy mud over large patch of grey cohesive clay; active sed surface+1 indistinct subsurface void.
PDA95-14 B	8/21/2007	10:52:53	181.32	12.56	12.18	12.92	13.5	1	14.44	0.74	B	>4 to 3/>4	1	>4	>4 - 1	34.25	2.37	0		N	>pen	N	3	7.1	10.52	8.81	Stage 1 on 3	Old dm>pen; layering of soft mud over slightly sandy mud; rpd estimated due to clay smearing; active sed surf; Podocerid stalk
PDA95-14 C	8/21/2007	10:53:51	132.99	9.20	8.71	9.96	13.5	1	14.46	1.25	B	>4	2	>4	>4 - 2	26.59	1.84	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered muddy dm>pen; white clay is artifact from previous reps; active sed surface. ; oxidized vertical burrow/tube below swi@right

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA95-15 A	8/21/2007	10:47:51	190.82	13.20	12.6	13.52	13.5	1	14.46	0.92	B	>4	2	>4	>4 - 2	37.08	2.56	0		N	>pen	N	0			0.00	Stage 1 on 3	Old weathered soft muddy dm>pen; dm layering=cohesive clay horizon@depth; dense surf tubes+lots of surf activity; large oxygenated burrow at left edge of image
PDA95-15 B	8/21/2007	10:48:44	191.61	13.27	11.98	14.37	13.5	1	14.44	2.39	B	>4	2	>4	>4 - 2	30.76	2.13	0		N	>pen	N	1	10.49	10.84	10.67	Stage 1 on 3	Old/weathered soft muddy dm>pen; horizon of black/reduced sed@depth; biologically active surface+1 subsurface worm-like org+indistinct void+vertical oxy burrows/tubes
PDA95-15 C	8/21/2007	10:49:38	191.6	13.25	12.83	13.82	13.5	1	14.46	0.99	B	>4	2	>4	>4 - 2	40.11	2.77	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; slightly sandy; many larger tubes@swi+prominent vertical oxidized burrow.
PDA 98 Mound																												
PDA98-01 A	8/21/2007	11:07:39	233.84	16.19	15.69	16.45	13.5	1	14.44	0.76	B	4-3/4	0	>4	>4 - 0	33.25	2.30	0		N	>pen	N	2	3.54	3.7	3.62	Stage 1 on 3	Silty very fine sand layer over silt over more silty sand;old/weathered dm>pen; dm is mostly mud w/ patches of sandy mud; reduced patches@depth; 2 small feeding voids on right+stg 1 surf tubes
PDA98-01 B	8/21/2007	11:08:44	225.66	15.61	15.18	15.89	13.5	1	14.46	0.71	B	>4	2	>4	>4 - 2	39.67	2.74	0		N	>pen	N	7	3.12	13.86	8.49	Stage 1 on 3	Old/weathered muddy dm>pen looks like ambient); deep rpd w/ weak contrast; extensive burrow/void complex@depth; Stg 1 surf tubes
PDA98-01 C	8/21/2007	11:09:48	203.61	14.08	13.46	14.57	13.5	1	14.46	1.11	B	4-3/4	1	>4	>4 - 1	31.75	2.20	0		N	>pen	N	1	8.4	8.49	8.45	Stage 1 on 3	Old/weathered muddy, slightly sandy dm>pen (looks like ambient); weak rpd contrast; 1 small partial void@center; a few Stage 1 surf tubes
PDA98-02 A	8/21/2007	15:33:12	238.1	16.47	15.96	16.83	14	1	14.46	0.87	B	>4	2	>4	>4 - 2	39.03	2.70	0		N	>pen	N	4	3.7	10.48	7.09	Stage 1 on 3	Old/weathered soft muddy dm>pen; patches of consolidated grey clay@depth; several prominent voids+stg 1 surf tubes
PDA98-02 B	8/21/2007	15:34:18	251.69	17.41	17.1	17.8	14	1	14.46	0.7	B	>4	2	>4	>4 - 2	36.6	2.53	1	R	N	>pen	N	1	11.33	11.37	11.35	Stage 1 on 3	Old/weathered soft muddy dm>pen; lightly reduced w/ clay streaks@depth; mud clast@surf=camera artifact; 1 partial/tenuous void+1 small worm-like org@left; weak rpd contrast
PDA98-02 C	8/21/2007	15:35:15	234.14	16.21	15.13	17.28	14	1	14.44	2.15	P	>4	2	>4	>4 - 2	7.96	0.55	0		N	>pen	N	3	2.71	5.69	4.20	Stage 2	old/weathered soft homogenous muddy dm>pen; relatively reduced dm w/ v. shallow rpd; several small feeding voids+a few Stg 1 surf tubes
PDA98-03 A	8/21/2007	17:41:53	232.64	16.09	15.63	16.81	13.5	1	14.46	1.18	B	4-3/4	2	>4	>4 - 2	68.19	4.72	0		N	>pen	N	3	5.09	7.44	6.27	Stage 1 on 3	Old/weathered soft homogenous muddy dm>pen; deep rpd w/ weak contrast; several subsurface voids+dense Stg 1 surf tubes
PDA98-03 B	8/21/2007	17:42:42	272.54	18.85	18.41	20.01	13.5	1	14.46	1.6	B	>4	2	>4	>4 - 2	40.65	2.81	0		N	>pen	N	2	14.28	15.81	15.05	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; thick band of reduced sed@depth; weak rpd contrast; deep subsurface voids; a few stg 1 surf tubes

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA98-03 C	8/21/2007	17:43:35	220.2	15.23	14.75	16.36	13.5	1	14.46	1.61	B	4-3/4	2	>4	>4 - 2	44.73	3.09	0		N	>pen	N	2	6.88	8.31	7.60	Stage 1 on 3	Old/weathered soft muddy dm>pen (looks like ambient); weak rpd contrast; 2 partial/indistinct voids: prominent vertical oxy tube/burrow structure=sig. deeper rpd
PDA98-04 A	8/21/2007	15:10:26	120.7	8.35	7.77	9.07	14	1	14.46	1.3	P	>4	1	>4	>4 - 1	29.49	2.04	1	O	N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered muddy-clayey dm>pen; a few reduced patches@depth; Podocerid stick amps@left; indistinct void@depth; old DM clay clast@swi
PDA98-04 B	8/21/2007	15:11:31	220.19	15.23	14.84	16.57	14	1	14.46	1.73	B	>4	2	>4	>4 - 2	42.23	2.92	0		N	>pen	N	3	7.4	15.78	11.59	Stage 1 on 3	Old/weathered muddy-clayey dm>pen; relatively reduced@depth w/ white clay patches; deep rpd; multiple subsurface voids+worm-like orgs
PDA98-04 C	8/21/2007	15:12:36	231.94	16.04	15.42	16.41	14	1	14.46	0.99	B	>4	1	>4	>4 - 1	53.41	3.69	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered muddy-clayey dm>pen; reduced@depth; deep rpd w/ smearing artifacts; several worm-like orgs@depth
PDA98-05 A	8/21/2007	15:04:40	218.2	15.09	14.42	16.1	14	1	14.46	1.68	P	>4	1	>4	>4 - 1	8.19	0.57	0		N	>pen	N	2	5.51	8.38	6.95	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; reduced sed near surface w/ thin rpd; prominent subsurface voids+stg 1 surf tubes
PDA98-05 B	8/21/2007	15:05:33	218.56	15.11	14.71	15.58	14	1	14.46	0.87	B	>4	2	>4	>4 - 2	34.61	2.39	0		N	>pen	N	0			0.00	Stage 1 on 3	Multiple layers(??) of old/weathered soft muddy dm>pen; large burrow apppears to be drag-down artifact of camera penetration; several subsurface worms@left; Stg 1 surf tubes; well-colonized old dm
PDA98-05 C	8/21/2007	15:06:30	225.38	15.59	15.24	16.59	14	1	14.46	1.35	B	>4	2	>4	>4 - 2	19.35	1.34	0		N	>pen	N	4	6.2	9.47	7.84	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; moderately reduced horizons@depth; multiple voids+a few stg 1 surf tubes
PDA98-06 A	8/21/2007	15:00:01	209.9	14.52	14.24	15.4	14	1	14.46	1.16	B	>4	2	>4	>4 - 2	22.86	1.58	0		N	>pen	N	4	4.24	11.06	7.65	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; horizons of reduced sed+cohesive grey clay@depth; multiple voids+Stg 1 surf tubes
PDA98-06 B	8/21/2007	15:01:03	244.37	16.90	16.68	17.39	14	1	14.46	0.71	B	>4	2	>4	>4 - 2	36.29	2.51	0		N	>pen	N	3	7.87	11.62	9.75	Stage 1 on 3	Old/weathered muddy-clayey dm>pen; layering; reduced patches+clay patches@depth; feeding voids/burrow; a few Stg 1 surf tubes
PDA98-06 C	8/21/2007	15:02:07	225.02	15.56	15.07	15.85	14	1	14.46	0.78	B	>4	2	>4	>4 - 2	34.17	2.36	1	O	N	>pen	N	2	4.08	10.93	7.51	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; reduced patches+clay streaks; indistinct voids+vertical burrow+a few stg 1 surf tubes.
PDA98-07 D	8/21/2007	14:51:21	217.63	15.05	14.51	15.6	14	1	14.46	1.09	B	>4	2	>4	>4 - 2	30.71	2.12	0		N	>pen	N	2	7.62	10.24	8.93	Stage 1 on 3	Old/weathered mottled cohesive grey clay dm>pen; surface veneer of muddy silt over grey clay; indistinct voids+subsurface worms.
PDA98-07 E	8/21/2007	14:52:25	162.51	11.24	10.81	11.67	14	1	14.46	0.86	B	>4	2	>4	>4 - 2	41.43	2.87	0		N	>pen	N	4	3.21	7.03	5.12	Stage 3	Multiple layers of old/weathered clayey-muddy dm>pen; light grey clay over reduced mud; muddy silt in upper 2-3 cm; vertical burrow+several indistinct voids

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA98-07 F	8/21/2007	14:53:20	174.75	12.09	11.58	12.92	14	1	14.46	1.34	B	>4	2	>4	>4 - 2	12.83	0.89	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered dm consisting of mottled cohesive grey clay>pen; upper 1-2 cm is brown muddy silt; stg 1 surf tubes+subsurface worm-like org at far right edge of image
PDA98-08 A	8/21/2007	17:35:54	204.23	14.12	13.77	14.46	13.5	1	14.46	0.69	B	>4	2	>4	>4 - 2	39.24	2.71	0		N	>pen	N	2	6.14	7.35	6.75	Stage 1 on 3	Surface layer of old/weathered soft muddy dm over more dm or ambient; deep rpd w/ weak contrast; 2 subsurface voids+numerous surf tubes+Podocerid amphipods at far left
PDA98-08 B	8/21/2007	17:36:57	194.77	13.47	13.16	13.72	13.5	1	14.46	0.56	B	>4	2	>4	>4 - 2	23.67	1.64	0		N	>pen	N	2	4.3	11.55	7.93	Stage 2 -> 3	Old/weathered mostly soft muddy dm w/ some clay>pen; smearing artifacts along rpd; 2 indistinct voids; stg 1 surf tubes+Podocerid amphipod stalks in farfield
PDA98-08 C	8/21/2007	17:37:54	167.1	11.56	11.33	11.96	13.5	1	14.46	0.63	B	>4	-4	>4	>4 - -4	20.96	1.45	0		N	>pen	N	3	3.81	5.78	4.80	Stage 1 on 3	Old/weathered mostly muddy soft dm w/ a few small rocks+pebbles>pen; dense surf tubes+Podocerid stalks+indistinct subsurface voids; upper 1-2 cm slightly sandy
PDA98-09 A	8/21/2007	15:22:55	227.94	15.76	14.08	17.24	14	1	14.46	3.16	P	>4	2	>4	>4 - 2	17.93	1.24	0		N	>pen	N	1	9.7	10.84	10.27	Stage 1 on 3	Old/weathered soft muddy dm with streaky grey clay+reduced patches>pen; 1 clear void/burrow+several indistinct; Stg 1 surf tubes
PDA98-09 B	8/21/2007	15:23:59	258.94	17.91	17.73	18.31	14	1	14.46	0.58	B	>4	1	>4	>4 - 1	24.77	1.71	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm w/ clay streaks>pen; slightly sandy in upper 2-4 cm; multiple dm layers. Oxygenated burrow edge at depth
PDA98-09 C	8/21/2007	15:25:01	208.01	14.37	14.17	14.86	14	1	14.48	0.69	B	>4	2	>4	>4 - 2	53.07	3.67	0		N	>pen	N	4	5.09	11.96	8.53	Stage 1 on 3	Old/weathered soft muddy dm w/ grey clay patches>pen; several subsurface voids/burrows; deep rpd w/ moderate contrast; stg 1 surf tubes; Podocerid stalk@left
PDA98-10 A	8/21/2007	17:27:56	140.26	9.71	8.27	10.95	13.5	1	14.44	2.68	P	>4	-5	>4	>4 - -5	30.21	2.09	0		N	>pen	N	4	7.61	10.48	9.05	Stage 1 on 3	Old/weathered soft muddy-clayey dm>pen; s few encrusted rocks@sed surf; Stg 1 surf tubes+multiple subsurface voids
PDA98-10 B	8/21/2007	17:28:42	6.09	0.42	0	1.53	13.5	1	14.46	1.53	B	>4	1	>4	>4 - 1	ind	ind	0		N	ind	N	ind			0.00	Ind	No/low penetration; sed surf appears silty; possible old dm; appears to be large moon snail (Lunatia) partially buried at swi.
PDA98-10 C	8/21/2007	17:29:59	70.4	4.87	3.85	5.71	13.5	1	14.46	1.86	B	>4	2	>4	>4 - 2	17.53	1.21	3	O	N	>pen	N	1	4.21	4.64	4.43	Stage 1 on 3	Old/weathered dm comprised of cohesive mottled grey/black clay>pen; 2 vertical oxy burrows+1 indistinct void; surf worm tubes+Podocerid amp stalks in farfield
PDA98-11 A	8/21/2007	15:27:35	251.77	17.44	17.15	17.71	14	1	14.44	0.56	B	>4	2	>4	>4 - 2	47.39	3.28	0		N	>pen	N	0			0.00	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; reduced@depth; 1 larger-bodied worm-like org@depth+Stg 1 surf tubes; weak rpd contrast
PDA98-11 B	8/21/2007	15:28:45	253.23	17.51	16.77	18.31	14	1	14.46	1.54	B	>4	0	>4	>4 - 0	47.48	3.28	1	R	N	>pen	N	3	7.16	11.92	9.54	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; reduced@depth; 1 distinct void+several partial voids; stg 1 surf tubes

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA98-11 C	8/21/2007	15:29:50	246.74	17.06	16.61	17.54	14	1	14.46	0.93	B	>4	1	>4	>4 - 1	40.04	2.77	3	R	N	>pen	N		12.39	15.59	13.99	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; reduced mud clasts=artifacts; 1 prominent void/burrow complex; a few stg 1 surf tubes
PDA98-12 A	8/21/2007	11:02:57	204.96	14.17	13.75	14.62	13.5	1	14.46	0.87	B	>4	1	>4	>4 - 1	59.01	4.08	0		N	>pen	N	1	8.43	8.61	8.52	Stage 1 on 3	Old/weathered soft muddy dm>pen; layers?; 1 feeding void+a few stg 1 surf tubes; deep rpd w/ moderate contrast
PDA98-12 B	8/21/2007	11:03:59	210.8	14.58	14.4	15.18	13.5	1	14.46	0.78	B	>4	2	>4	>4 - 2	41.61	2.88	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; patches of consolidated clay@depth; Podocerid stalk amp@swi+several worm-like orgs @ depth in sed
PDA98-12 C	8/21/2007	11:04:58	186.59	12.89	12.6	13.55	13.5	1	14.48	0.95	P	>4	1	>4	>4 - 1	39.69	2.74	10	O	N	>pen	N	2	12.05	12.72	12.39	Stage 1 on 3	Old/weathered soft muddy dm>pen; rough surface due to cohesive clay clasts; band of reduced sed@depth; subsurface voids
PDA98-13 A	8/21/2007	15:18:17	252.52	17.44	17.33	17.98	14	1	14.48	0.65	B	>4	2	>4	>4 - 2	49.06	3.39	0		N	>pen	N	7	1.71	17.54	9.63	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; multiple subsurface voids/burrows+sed surf is biologically active+1 subsurface worm@bottom of image
PDA98-13 B	8/21/2007	15:19:17	230.81	15.98	14.77	16.95	14	1	14.44	2.18	B	>4	1	>4	>4 - 1	29.87	2.07	0		N	>pen	N	0			0.00	Stage 1 on 3	Old/weathered soft muddy dm>pen; worm @ depth as well as portion of oxidized burrow
PDA98-13 C	8/21/2007	15:20:17	235.68	16.30	16.1	16.81	14	1	14.46	0.71	B	>4	2	>4	>4 - 2	40.15	2.78	0		N	>pen	N	4	7.23	15.14	11.19	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; multiple prominent voids/burrows@depth; a few Stg 1 surf tubes; low/moderate rpd contrast
PDA98-14 A	8/21/2007	15:43:34	236.55	16.36	16.05	17.28	14	1	14.46	1.23	B	>4	2	>4	>4 - 2	29.94	2.07	0		N	7.1	N	0			0.00	Stage 2	Surface layer of old/very weathered muddy dm over ambient; homogenous soft muddy texture; a few stg 1 surf tubes+subsurface worms
PDA98-14 B	8/21/2007	15:44:54	251.03	17.36	16.9	17.51	14	1	14.46	0.61	B	>4	2	>4	>4 - 2	28.02	1.94	2	R	N	6.36	N	3	6.65	16.52	11.59	Stage 1 on 3	Surface layer of old/very weathered muddy dm over ambient ; several feeding voids+scattered Stg 1 surf tubes; mud clasts=wiper artifacts
PDA98-14 C	8/21/2007	15:45:54	253.12	17.50	17.26	17.95	14	1	14.46	0.69	B	>4	2	>4	>4 - 2	31.84	2.20	0		N	7.1	N	2	6.2	12.12	9.16	Stage 1 on 3	Surface layer of old/very weathered muddy dm over ambient; several feeding voids+scattered Stg 1 surf tubes.
PDA98-15 A	8/21/2007	15:38:48	230.45	15.94	15.78	16.5	14	1	14.46	0.72	B	>4	2	>4	>4 - 2	34.35	2.38	0		N	9.07	N	1	6.45	6.61	6.53	Stage 1 on 3	Surface layer of old/very weathered muddy dm over ambient; 1 partial feeding void@right+scattered Stg 1 surf tubes; homogenous texture
PDA98-15 B	8/21/2007	15:39:46	215.36	14.89	12.69	16.3	14	1	14.46	3.61	P	>4	2	>4	>4 - 2	31.47	2.18	0		N	>pen	N	3	4.39	10.28	7.34	Stage 1 on 3	Multiple layers of old/weathered muddy dm>pen; slight smearing of rpd=artifact; several small voids+a few stg 1 surf tubes
PDA98-15 C	8/21/2007	15:40:45	246.6	17.05	16.95	17.51	14	1	14.46	0.56	B	>4	2	>4	>4 - 2	60.23	4.17	0		N	>pen	N	3	14.98	16.28	15.63	Stage 1 on 3	Multiple layers of old/weathered muddy dm>pen; faint reduced patches/horizon@depth=dm evidence; several voids lwr right corner+1 subsurface worm+many stg 1 surf tubes

Appendix B-3
Sediment-Profile Image Results for PDS

Station	Date	Time	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Stop Collar Setting (in)	# of Lead Weights per Carriage	Calibration Constant	Boundary Roughness (cm)	Boundary Roughness Type (B-Biological, P-Physical, ind-Indeterminate)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Grain Size Range	RPD Area (sq.cm)	Mean RPD (cm) (ind-Indeterminate)	Mud Clast Number	Mud Clast State (O-Oxidized, R-Reduced, B-Both)	Methane (N-No)	DM Thickness (cm) (NP-Not Present)	Low DO?	Feeding Void #	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage (ind-Indeterminate)	Comment
PDA98-16 A	8/22/2007	11:09:52	225.26	15.58	15.02	16.59	14	3	14.46	1.57	P	>4	2	>4	>4 - 2	42.18	2.92	0		N	10.64	N	3	6.94	9.16	8.05	Stage 1 on 3	Surface layer of old/weathered soft muddy dm over ambient; several voids, subsurface worms+a few stg 1 surf tubes
PDA98-16 B	8/22/2007	11:10:47	209.29	14.47	13.41	15.4	14	3	14.46	1.99	P	>4	0	>4	>4 - 0	35.08	2.43	4	O & R	N	>pen	N	1	12.56	12.69	12.63	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; distinct horizon of reduced sed@depth=bottom of upper lyr; 1 void; mud clasts=wiper artifacts
PDA98-16 C	8/22/2007	11:11:43	263.62	18.23	17.56	18.51	14	3	14.46	0.95	B	>4	1	>4	>4 - 1	58.68	4.06	3	R	N	>pen	N	2	4.8	11.9	8.35	Stage 1 on 3	Multiple layers of old/weathered soft muddy dm>pen; 2 small indistinct voids; reduced mud clasts@swi=wiper artifacts

Appendix C

Plan-View Image Results for PDS
August 2007 Survey

Appendix C-1
Plan-View Image Results for Reference Stations at PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
EREF01	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft ambient low-relief brown silty mud; burrows, tracks/gouges, shrimp, larger recumbent tubes
EREF01	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis; sed surf in upper left corner looks disturbed=lots of mud clasts=camera disturbance?
EREF01	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
EREF03	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft ambient low-relief brown silty mud; burrows, tracks/gouges, numerous shrimp
EREF03	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Image slightly fuzzy due to turbidity; Soft ambient low-relief brown silty mud w/ burrows and several Cerianthids and Cerianthid tubes
EREF03	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
EREF04	A	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambeint hardbottom=mud-draped rocks of various sizes (boulders to granules); crab under rock; various attached epifauna
EREF04	B	1.2	Rock/ledge sloping into mud	N	N	Y	N	Y	N	N	Ambient hardbottom=flat rock ledge? Significant small-scale relief from numerous tubes; 1 open anemone; seastar upper left
EREF04	C	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambeint hardbottom=mud-draped rocks of various sizes (boulders to granules); orange fish at edge of sediment plume; attached epifauna
EREF05	A	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambient hardbottom=mud-draped/epifauna encrusted rocks of various sizes; visible epifauna=sponges, tunicates, anemones
EREF05	B	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambient hardbottom=mud-draped/epifauna encrusted rocks of various sizes; 1 orange fish; epifauna=sponges/tunicates, anemone
EREF05	C	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambient hardbottom=mud-draped/epifauna encrusted rocks of various sizes; 2 orange fish; abundant/diverse epifauna: sponges/tunicates, anemones;bryozoans
EREF06	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Low-relief ambient silty brown mud; Several Cerianthids/Cerian. tubes; numerous shrimp
EREF06	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
EREF06	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
EREF07	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief soft brown mud; numerous shrimp+small tracks/biogenic gouges on sed surf; burrows
EREF07	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis

Appendix C-1
Plan-View Image Results for Reference Stations at PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
EREF07	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
EREF08	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief brown soft mud; 1 Cerianthid; numerous shrimp; small burrow openings; faint tracks/gouges
EREF08	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief brown soft mud; 1 Cerianthid, numerous shrimp, tracks/gouges/pits, burrow openings
EREF08	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SEREF03	A	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SEREF03	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SEREF03	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SEREF05	A	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SEREF05	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF01	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Ambient soft brown silty mud; small burrows+sseveral larger distinct burrows; distinct tracks
SREF01	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF01	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF01	D	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient soft brown silty mud; numerous large+small burrows; 1 visible shrimp; distinct tracks; feeding pits/gouges
SREF01	E	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF03	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Ambient soft low-relief brown silty mud; 1 open Cerianthid; numerous burrow openings; distinct tracks
SREF03	B	1.2	Silt-clay	Ind	Y	Y	Y	Ind	Ind	Ind	High turbidity=partial image; 2 visible Cerianthids on soft bottom; burrow openings+tracks
SREF03	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF04	A	1.2	Mixed rocks	N	N	Y	N	Y	N	N	Ambient hardbottom=mud-draped, epifauna-encrusted rocks; 1 visible orange fish; sponges, hydroids/bryozoans, coralline algae

Appendix C-1
Plan-View Image Results for Reference Stations at PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
SREF04	B	1.2	Rocky ledge	N	N	Y	N	Y	N	N	Ambient hardbottom=low-relief= possible flat ledge surface. Encrusting epifauna=anemones, seastar, sponges/tunicates, hydroids
SREF04	C	1.2	Rocky ledge	N	N	Y	N	Y	N	N	Ambient hardbottom=low-relief= possible flat ledge surface. Encrusting epifauna=seastar, sponges/tunicates, hydroids
SREF05	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient soft brown silty low-relief mud; burrow openings; several shrimp+1 fish visible; tracks
SREF05	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF05	C	1.2	Silt-clay with mixed rocks	N	Y	Y	Y	Y	N	N	Ambient soft brown silty low-relief mud; rocks@left edge of image; numerous shrimp+burrows
SREF05	D	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient soft brown silty low-relief mud; 1 visible shrimp; burrows+faint tracks
SREF05	E	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF05	F	1.2	Silt-clay	N	Y	Y	N	Y	N	N	Ambient low-relief soft silty mud; dense tubes, at least 2 visible shrimp, burrow openings
SREF06	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief soft silty mud; dense tubes, 1 visible shrimp+at least 1 fish; numerous burrows+tracks
SREF06	B	1.2	Silt-clay	N	Y	Y	Y	Y	Y	N	Ambent soft low-relief silty mud; dense tubes; 2 visible shrimp; many tracks+burrows; larger depressions at top of image (possible old foraging pits)
SREF06	C	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief soft silty mud; numerous large+small burrows; tracks; 2 fish=fish head far right edge+fish tail lower edge; fecal mound
SREF07	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief soft silty mud; abundant burrows; several shrimp+fish; tracks
SREF07	B	1.2	Rocky ledge	N	N	Y	N	Y	N	N	Ambient hard-bottom=rocky ledge w/ encrusting epifauna=anemones, sponges, hydroids/bryozoans, fish in farfield
SREF07	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
SREF08	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Ambient low-relief soft silty mud; dense burrow openings; tubes; faint tracks
SREF08	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Ambient low-relief soft silty mud; burrow openings; 1 visible shrimp; camera base disturbance
SREF08	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity/water shot=image cannot be analyzed

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA A Mound											
PDA-A-01	A	1.1	Mixed (rocks, gravel, silt, grey clay)	No	No	No	No	Yes	No	No	DM=mix of large and small rocks/gravel over firm grey-clay substrate; drape of brown silt, shell fragments, exhumed razor clam shells
PDA-A-01	B	1.1	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA-A-01	C	1.1	Mixed (rocks/gravel,silt, clay, shell hash)	No	No	No	Yes	Yes	No	No	DM=loose gravel+small rocks over grey cohesive clay; draped w/ brown silt; a few epifauna covered rocks
PDA-A-03	A	1.2	Mixed (rocks/gravel,silt, clay, shell hash)	No	No	No	No	Y	Y	N	DM=loose gravel+small rocks+clay clasts+shell frags over grey cohesive clay; draped w/ brown silt; a few epifauna covered rocks
PDA-A-03	B	1.2	Shell frags w/ brown silt	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=limited visibility=shell frags visible in lower portion=assume weathered DM
PDA-A-03	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA-A-04	A	1.2	Mixed (brown sandy silt+shell hash, grey clay)	N	Y	N	N	N	Y	N	DM=brown sandy silt+shell hash+some gravel+grey clay clasts over cohesive grey clay
PDA-A-04	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA-A-05	A	1.2	Mixed (rocks/gravel,silt, clay, shell hash)	No	No	Y	No	Y	Y	N	DM=loose gravel+small rocks+clay clasts+shell frags over grey cohesive clay; draped w/ brown silt; a few epifauna covered rocks
PDA-A-05	B	1.2	Mixed (rocks/gravel,silt, clay, shell hash)	No	Y	Y	No	N	Y	N	DM=loose gravel+small rocks+clay clasts+shell frags over grey cohesive clay; draped w/ brown silt; 1 small burrow opening
PDA-A-05	C	1.2	Mixed (silt, shell hash, gravel, clay clasts)	N	N	N	N	N	Y	N	DM=brown silt w/ abundant shell frags+shell hash+a few pieces gravel+cohesive clay clast; clay clast not colonized by epifauna=recent disposal
PDA-A-07	A	1.2	Brown silt w/ shell hash	N	Y	N	Y	N	N	N	Brown silt mixed w/ some shell hash; relatively little surface relief
PDA-A-07	B	1.2	Brown silt w/ shell hash	N	Y	N	Y	N	N	N	Brown silt mixed w/ some shell hash; relatively little surface relief;image somewhat fuzzy
PDA-A-07	C	1.2	Brown silt w/ abundant shell hash	N	N	N	N	Y	N	Y (wood)	Large piece of wood debris over brown silt w/shell frags+shell hash; assume DM
PDA-A-07	D	1.2	Cohesive grey clay	N	Y	N	Y	Y	Y	N	Hummocks+chunks of cohesive grey clay DM; some brown epifaunal growth; burrow openings in clay clumps
PDA-A-07	E	1.2	Brown silt w/ cohesive clay chunks	N	N	N	N	N	Y	N	Half of image obscured by turbidity cloud; brown silt w/ chunks of cohesive clay+shell hash=DM

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA-A-07	F	1.2	Brown silt w/ cohesive clay clast	N	Y	N	N	N	Y	N	DM=brown silt w/ some scattered shell hash+1 large cohesive grey clay clump; a few small burrow openings
PDA-A-08	A	1.2	Mixed (large rocks, grey clay, silt, gravel, rocks)	N	N	N	N	Y	Y	N	DM=assorted mix of large epifauna-encrusted rocks, grey clay+clay chunks, shell hash, gravel, rocks, brown silt
PDA-A-08	AA	1.2	Brown silt, shell hash, clay clasts	N	Y	Y	N	N	Y	N	DM=chunks+clasts of grey cohesive clay over brown silt w/ abundant shell hash; irregular dimpled surface
PDA-A-08	B	1.2	Mixed (brown silt, shell frags, rocks, grey clay clasts)	N	Y	Y	N	Y	Y	N	DM=mix of brown silt, grey clay+clay clasts, rocks, pebbles, shell frags+shell hash; 1 larger rock w/ epifauna
PDA-A-08	C	1.2	Brown silt, grey clay clasts, rocks, shell hash	N	Y	Y	N	Y	Y	N	DM=mostly brown silt w/ shell hash, several cohesive clay clasts, 1 rock w/ epifauna; very small burrow openings
PDA-A-09	A	1.2	Silt, clay, shell frags+hash	N	Y	N	N	Y	N	N	DM=mostly brown silt w. abundant shell frags+shell hash; a few epifauna-covered rocks; 1 burrow opening surrounded by excavated grey clay
PDA-A-09	B	1.2	Silt, shell hash	N	Y	N	N	N	N	N	Somewhat fuzzy image; assume DM=mostly low-relief brown silt w/ shell frags; small burrow openings
PDA-A-09	C	1.2	Silt, shell frags+shell hash	N	Y	N	N	N	N	N	DM=brown silt w/ shell frags+shell hash; somewhat dimpled surface; scattered very small burrow openings
PDA-A-09	D	1.2	Silt, shell	N	Y	N	N	N	N	N	DM=brown silt w/ abundant shell frags+shell hash; small burrow openings
PDA-A-09	E	1.2	Silt, shell	N	Y	Y	N	N	N	N	DM=brown silt w/ abundant shell frags+shell hash; small burrow openings
PDA-A-09	F	1.2	Silt, shell	N	Y	Y	N	N	N	N	DM=brown silt w/ abundant shell frags+shell hash; small burrow openings
PDA-A-11	A	1.2	Silt, shell hash, cohesive clay	N	N	N	Y	Y	Y	Y (wood)	DM=mix of brown silt w/ shell hash, cohesive grey clay clumps+large tree branch/trunk; limited epifaunal growth on wood
PDA-A-11	B	1.2	Silt, shell hash, grey clay	N	Y	Y	N	N	Y	N	DM=mix of brown silt w/ shell hash; patches of grey clay (due to bioturbation); clay clasts; 2 tubes associated w/ grey clay clast
PDA-A-11	C	1.2	Silt+shell hash	N	Y	Y	Ind	Ind	Ind	N	Image somewhat fuzzy; assume DM=brown silt w/ abundant shell hash+debris
PDA-A-12	A	1.2	Silt+shell hash	N	Y	N	N	Y	N	N	DM=low relief brown silt w/ abundant shell hash; crab+fish visible; small burrow openings
PDA-A-12	B	1.2	Silt+shell hash	N	Y	N	N	N	N	N	DM=low relief brown silt w/ abundant shell hash; small burrow openings
PDA-A-12	D	1.2	Silt+shell hash	N	Y	N	N	N	N	N	DM=low relief brown silt w/ abundant shell hash; small burrow openings

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA-A-13	A	1.2	Silty sand +shell hash	N	N	N	N	Y	N	Y	DM=silt w/ very abundant shell hash; abundant large debris=wood chunks, leather belt, rope
PDA-A-13	B	1.2	Silty sand +shell hash	N	N	N	N	Y	N	Y	DM=silt w/ abundant shell hash; debris@edge of image=epifauna-encrusted rope and some wood in lower left corner
PDA-A-13	E	1.2	Silty sand +shell hash	N	Y	Y	N	N	Y	N	DM=brown silt w/ abundant shell hash; a few grey mud patches/clasts
PDA-A-14	A	1.2	Mix (rocks, gravel, shell hash, silt)	N	N	N	N	Y	N	N	DM=rocks encrusted with epifauna over poorly sorted mix of brown silt w/ gravel+shell frags+hash
PDA-A-14	B	1.2	Mix (rocks, gravel, shell, clay)	N	N	N	N	Y	Y	N	DM=hardbottom=mostly angular rocks encrusted w/ epifauna over brown/grey silt; grey cohesive clay clasts
PDA-A-15	A	1.2	Silt and cohesive clay	N	Y	N	N	N	Y	N	DM=low-relief brown silt w/ shell hash interpersed w/ moderate-relief chunks of cohesive grey clay; a few small burrow openings
PDA-A-15	B	1.2	Silt, shell hash, cohesive clay	Ind	Ind	Ind	Ind	Ind	Y	Y (rope)	Fuzzy image except for lower left corner=brown silt w/ shell hash and a few grey cohesive clay clasts=DM? 1 piece of rope debris
PDA-A-15	C	1.2	Silt, gravel, clay	Y	N	N	N	N	Y	Y (rope)	DM=brown silt w/ abundant shell hash, rocks/gravel, grey cohesive clay clasts; rope could be from lobster trawl line
PDA 95 Mound											
PDA95-01	A	1.2	Silt-clay	N	>50	>100	Y	Y	N	N	Low-relief brown silt-clay w/ patches of loose excavated grey clay; many burrow openings; 1 shrimp=mobile epifauna; old DM
PDA95-01	B	1.2	Silt-clay	N	>50	>100	Y	N	N	N	Low-relief brown silt-clay w/ many burrow openings/biogenic mounds/fecal pellets; dimpled surface=high biogenic reworking; old DM
PDA95-01	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-02	A	1.2	Silt-clay	N	>50	>100	Y	Y	N	N	Soft brown mud; many burrow openings+tubes; Cerianthid at edge of image+one visible shrimp; old DM
PDA95-02	B	1.2	Silt-clay	N	>50	>100	Y	N	N	N	Soft brown mud; many burrow openings+tubes
PDA95-02	C	1.2	Silt-clay	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-03	A	1.2	Silt-clay	N	>50	>100	Y	Y	N	N	Soft brown silty mud; many burrow openings+tubes; excavated grey sed patches; faint tracks; old DM
PDA95-03	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-03	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA95-04	A	1.2	Silt-clay	N	> 50	> 100	Y	N	N	N	Soft brown mud; large+small burrow openings and many small tubes; faint tracks or feeding pits; weathered DM
PDA95-04	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-04	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-05	A	1.2	Silt-clay	N	> 25	> 100	Y	N	N	N	Soft brown silty mud; many burrow openings; assume many small tubes; many small gouges=feeding pits or tracks; old DM
PDA95-05	B	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft brown silty mud w/ a few burrow openings; one-half of image obscured by turbidity; old DM
PDA95-05	C	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Image fuzzy - looks like soft brown silty mud w/ a few burrow openings+faint tracks; old DM
PDA95-06	A	1.2	Silt-clay	N	Y	Y	Y	N	N	Y (wood)	Soft brown low-relief mud w/ a few shell frags; many tubes of different sizes+scattered burrow openings; old DM
PDA95-06	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-06	C	1.2	Silt-clay	N	Y	Y	Y	Y	N	Y (wood)	Brown silty mud w/ scattered shell frags; scattered wood debris=small pieces+bark; numerous burrow openings; old DM
PDA95-07	A	1.2	Silt-clay	N	> 50	Y	Y	N	N	N	Low-relief brown silty mud; 1 Cerianthid; numerous small burrow openings; actively re-worked surface; old DM
PDA95-07	B	1.2	Silt-clay	N	> 50	> 100	Y	N	N	N	Low-relief brown silty mud; 2 Cerianthids/tubes; numerous small burrow openings; old DM
PDA95-07	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-08	A	1.2	Silt-clay	N	Y	Ind	Y	N	N	N	Slightly fuzzy image; soft brown low-relief silty mud w/ many burrow openings; 1 Cerianthid@edge of image; old DM
PDA95-08	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-08	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-09	A	1.2	Silt-clay	N	> 50	Y	Y	N	N	N	Soft low-relief brown silty mud; many small burrow openings; many tracks and small feeding pits from shrimp; old DM
PDA95-09	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-09	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA95-10	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft brown silty low-relief mud; numerous large+small burrow openings+feeding pits+faint tracks; old DM
PDA95-10	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-10	C	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft brown silty low-relief mud; a few shell frags+numerous large+small burrow openings+feeding pits+faint tracks; old DM
PDA95-11	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft brown silty low-relief mud; a few burrow openings+feeding pits+faint tracks; 1 small fish; old DM
PDA95-11	B	1.2	Silt-clay	N	Y	Ind	Ind	N	N	N	Water turbid so seafloor features difficult to discern, but looks like silty low-relief brown mud w/ a few biogenic pits
PDA95-11	C	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft brown low-relief silty mud; large+small burrow openings; 2 shrimp@swi; faint tracks; old DM?
PDA95-12	A	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft low-relief brown silty mud; numerous burrow openings; 2 shrimp+1 Cerianthid visible; faint tracks/feeding pits; old DM
PDA95-12	B	1.2	Silt-clay	N	Y	Y	Ind	N	N	N	Image partially obscured by turbidity; low relief soft brown mud w/ burrow openings+tracks
PDA95-12	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-13	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft low-relief brown silty mud; long thin banded fish (pipefish) in upper left corner; numerous burrow openings; reworked surface
PDA95-13	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft low-relief brown silty mud; shrimp on left edge of image=mobile epifauna; tracks+numerous burrow openings; old DM
PDA95-13	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA95-14	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Soft low-relief brown silty mud; burrow openings+tracks+small worm tubes
PDA95-14	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft brown-grey low-relief silty mud; burrow openings+many tracks/feeding pits; 1 small shrimp@swi
PDA95-14	C	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Partially obscured by turbidity; soft brown low-relief mud; burrow openings+tracks
PDA95-15	B	1.2	Silt-clay	N	Y	Y	Y	Y	N	N	Soft brown low-relief silty mud; 1 large+numerous small burrow openings; 1 shrimp@swi; tracks/feeding pits
PDA95-15	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA98 Mound											
PDA98-01	A	1.1	Ind	N	Y	Ind	Ind	Ind	Ind	N	Fuzzy image because of high turbidity; appears to be soft low-relief brown silty mud w/ tubes+burrows; old DM
PDA98-01	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-01	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-04	A	1.2	Silt-clay	N	Y	Ind	Ind	Ind	Y	Y	Image somewhat cloudy; brown silty mud w/ many chunks of cohesive grey clay; 1 prominent burrow
PDA98-04	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-04	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-05	A	1.2	Silt-clay	N	Y	Y	N	Y	N	Y	Somewhat cloudy image; soft brown low-relief silty mud w/ burrow openings+a few shell frags; gastropod on surface
PDA98-05	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-05	C	1.2	Silt-clay	N	Y	Ind	N	N	N	Y (wood)	Somewhat fuzzy image; low-relief brown silty mud w/ burrow openings; some wood fragments
PDA98-06	A	1.2	Silt-clay	N	Y	Ind	Ind	N	N	Ind	Somewhat fuzzy image; soft brown low-relief silty mud w/ scattered burrow openings; one bivalve shell.
PDA98-06	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-06	C	1.2	Silt-clay	N	Y	Ind	Ind	Ind	Ind	Ind	Fuzzy image; low-relief brown silty mud w/ burrow openings+tracks@far left
PDA98-06	D	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-07	D	1.2	Silt-clay	N	Y	Y	Y	N	Y	Y	brown silty mud w/ roughness caused by weathered cohesive grey clay chunks; wire or rope debris; scattered burrow openings; faint tracks; old DM
PDA98-07	E	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-07	F	1.2	Silt-clay	N	Y	Y	Y	N	Y	N	brown silty mud overlying grey cohesive clay; numerous small clay clasts; 1 prominent large burrow opening+many tracks/feeding pits; old DM
PDA98-09	A	1.2	Silt-clay	N	Y	Y	Y	N	Y	N	brown silty mud overlying grey cohesive clay: gouge w/ cohesive clay clasts+shell debris in lwr right corner; small burrow openings; tracks; old DM

Appendix C-2
Plan-View Image Results for PDS

Station	Rep	Field of View Imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
PDA98-09	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-09	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-12	A	1.2	Silt-clay	N	Y	Ind	Ind	Ind	Ind	N	Fuzzy image; guesstimate brown silty mud; small burrow openings; old DM
PDA98-12	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-12	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-13	A	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Fuzzy image; brown silty low-relief mud; small burrow openings; extensive tracks/feeding pits
PDA98-13	B	1.2	Silt-clay	N	Y	Y	Y	N	N	N	Fuzzy image; brown low-relief silty mud; small burrow openings+tracks; old DM
PDA98-16	A	1.2	Silt-clay	N	Y	Y	Y	N	Y	N	somewhat fuzzy image; brown silt over grey cohesive clay; burrow openings+tracks.
PDA98-16	B	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis
PDA98-16	C	1.2	Ind	Ind	Ind	Ind	Ind	Ind	Ind	Ind	High turbidity=image too cloudy for accurate analysis