HYDRODYNAMICS AND SEDIMENT DYNAMICS SURVEYS REPORT REVISION 2

REMEDIAL DESIGN SERVICES
SWAN ISLAND BASIN PROJECT AREA
CERCLA DOCKET NO. 10-2021-001

PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

Contract Number: DT2002

Prepared for:
Swan Island Basin Remedial Design Group

Prepared by:

HGL

11107 Sunset Hills Road, Suite 400
Reston, Virginia 20190

With assistance from:

PACIFIC groundwater GROUP MOTT MACDONALD BRIDGEWATER GROUP

December 2024

This page was intentionally left blank.

Hydrodynamics and Sediment Dynamics Surveys Report
Revision 2

Remedial Design Services
Swan Island Basin Project Area
CERCLA Docket No. 10-2021-001

Portland Harbor Superfund Site
Portland, Multnomah County, Oregon

Contract Number: DT2002

Prepared for:

Swan Island Basin Remedial Design Group

Prepared by:

HydroGeoLogic, Inc.
11107 Sunset Hills Road, Suite 400
Reston, Virginia 20190

With assistance from:

Mott MacDonald
Pacific Groundwater Group
Bridgewater Group Inc.

December 2024

This page was intentionally left blank

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1-1
1.1 OBJECTIVES AND SCOPE 1-1
1.2 PROJECT AREA 1-2
1.3 DOCUMENT ORGANIZATION 1-2

2.0 SURVEY ACTIVITIES 2-1
2.1 SEDFLUME 2-1
2.2 ACOUSTIC DOPPLER CURRENT PROFILER 2-2
2.2.1 Bottom-Mounted Acoustic Doppler Current Profiler 2-2
2.2.2 Vessel-Mounted Acoustic Doppler Current Profiler 2-2
2.3 SUSPENDED SEDIMENTS 2-3
2.4 WAVES 2-4

3.0 SURVEY RESULTS SUMMARY 3-1
3.1 SEDFLUME 3-1
3.2 ACOUSTIC DOPPLER CURRENT PROFILER 3-1
3.2.1 Bottom-Mounted Acoustic Doppler Current Profiler 3-2
3.2.2 Vessel-Mounted Acoustic Doppler Current Profiler 3-2
3.3 SUSPENDED SEDIMENTS 3-3
3.4 WAVES 3-4

4.0 CONCLUSIONS 4-1
4.1 SEDFLUME 4-1
4.2 ACOUSTIC DOPPLER CURRENT PROFILER 4-1
4.3 SUSPENDED SEDIMENTS 4-2
4.4 WAVES 4-2

5.0 REFERENCES 5-1

LIST OF TABLES

Table 2-1 Survey Equipment Summary

LIST OF FIGURES

Figure 2-1 River Conditions at Morrison Street Bridge (USGS 14211720) and ADCP/Wave Gage Deployment Periods
Figure 2-2 SEDflume Sampling Locations
Figure 2-3 Deployment Locations of ADCPs and Wave Gages, and Transects Surveyed by Vessel-Mounted ADCPs
Figure 2-4 Deployment Locations of CTD Turbidity Sensors and CTD Profiles (Casts)
Figure 2-5 Turbidity to TSS Preparation
Figure 2-6 CTD Turbidity to TSS Correlation

Figure 3-1 SEDflume Median Grain Size (Surface Layer)
Figure 3-2 SEDflume Dry Bulk Density (Surface Layer)
Figure 3-3a SEDflume Critical Shear Stress for Erosion (Surface Layer)
Figure 3-3b SEDflume Critical Shear Stress for Erosion (Layer 2)
Figure 3-4 Measured Current Speed and Velocity Components at ADCP1, 3 ft and 9 ft Above Riverbed
Figure 3-5 Measured Current Speed and Velocity Components at ADCP2, 3 ft and 9 ft Above Riverbed
Figure 3-6 Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in the Willamette River, Rising Tide Conditions
Figure 3-7 Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in the Willamette River, Falling Tide Conditions
Figure 3-8 Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in Swan Island Basin, Falling Tide Conditions
Figure 3-9 River Conditions and TSS Concentrations in Swan Island Basin
Figure 3-10 Closeup of TSS Concentrations in Willamette River and Swan Island Basin
Figure 3-11 Vertical Profiles of TSS Concentrations Measured During CTD Casts
Figure 3-12 Measured Wave Gage Depth: Deployment 1 and Deployment 2
Figure 3-13 High-Pass Filtered Water Level Fluctuations at Wave Gages: Deployment 1 and Deployment 2
Figure 3-14 Calculated Wave Statistics, Deployment 1
Figure 3-15 Calculated Wave Statistics, Deployment 2
Figure 3-16 Vessel Wake Event Identified in Swan Island Basin at Station 3
Figure 3-17 Largest Vessel Wake Observed in Swan Island Basin at Station 3
Figure 3-18 Deep-Draft Vessel Drawdown Event Identified in Willamette River at Station 1

LIST OF ATTACHMENTS

Attachment A Daily Field Reports
Attachment B SEDflume Sampling Summary

LIST OF ACRONYMS AND ABBREVIATIONS

cm	centimeter
ft	foot/feet
ft/s	feet per second
mg/L	milligrams per liter
mL	milliliter
ADCP	acoustic doppler current profiler
AIS	Automatic Information System
BODR	Basis of Design Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CTD	Conductivity, Temperature, and Depth
EPA	U.S. Environmental Protection Agency
eTrac	eTrac Inc.
HGL	HydroGeoLogic, Inc.
Integral	Integral Consulting, Inc.
PDI	Pre-Design Investigation
RD	Remedial Design
RM	River Mile
SIB	Swan Island Basin
TSS	total suspended solids
USGS	U.S. Geological Survey

This page was intentionally left blank.

HYDRODYNAMICS AND SEDIMENT DYNAMICS SURVEYS REPORT
SWAN ISLAND BASIN PROJECT AREA
PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

1.0 INTRODUCTION

This report summarizes hydrodynamics and sediment dynamics surveys conducted in the Swan Island Basin (SIB) Project Area of the Portland Harbor Superfund Site in Portland, Multnomah County, Oregon. Mott MacDonald, eTrac Inc. (eTrac), Delphis Solutions, and Integral Consulting, Inc. (Integral) performed the work in response to a request from HydroGeoLogic, Inc. (HGL) and on behalf of the SIB Remedial Design (RD) Group. The scope of work was proposed in the March 2022 Pre-Design Investigation (PDI) Work Plan, which the U.S. Environmental Protection Agency (EPA) conditionally approved on April 5, 2022. The scope of the surveys remained consistent with that detailed in the final PDI Work Plan that EPA fully approved in May 2022 (HGL, 2022a).

1.1 OBJECTIVES AND SCOPE

This hydrodynamics and sediment dynamics data collection program was conducted to support the evaluation of sediment movements (recontamination potential, cap stability). Hydrodynamics and sediment dynamics data collection and PDI studies are necessary to evaluate sources and pathways, including sediment resuspension as well as transport and deposition of contaminants of concern in sediments. The same studies will be applied during the RD to support evaluation of sediment resuspension and scour, recontamination potential, sediment cap stability, riverbank stability, and other aspects of overall RD. The primary goal of this phase of data collection was to obtain measurements of currents, suspended sediments, and general wave statistics within the SIB Project Area. The data collection program included the following activities:

- Obtained SEDflume near-surface sediment cores to provide surface sediment erodibility, grain size, and bulk density information;
- Obtained Acoustic Doppler Current Profiler (ADCP) measurements by bottom-mounted and vessel-mounted sensors to evaluate water velocities in the SIB and Willamette River;
- Obtained turbidity measurements using Conductivity, Temperature, and Depth (CTD) sensors, which were later converted to total suspended solids (TSS) concentrations following laboratory calibration, to demonstrate levels of suspended sediment present in SIB; and
- Obtained free surface elevation measurements using pile-mounted pressure gages to facilitate analysis of wind-waves and vessel wakes.

These surveys will inform the conceptual site model, facilitate development of hydrodynamic and sediment transport models, validate the hydrodynamic model, and evaluate site conditions for use in RD. Numerical models will be used for many purposes on the project, including evaluating exchange between SIB and the Willamette River, recontamination analysis, and cap stability analysis.

1.2 PROJECT AREA

The SIB Project Area is between approximately River Mile (RM) 8.1 and RM 9.2 on the northeast side of the Willamette River. The hydrodynamics and sediment dynamics surveys area encompassed SIB and a portion of the main Willamette River channel. To collect the necessary data to support the objectives of the surveys, the survey area begins in the Willamette River Channel at approximately RM 7.8 and extends up the Willamette River Channel to RM 8.8 and within the SIB to approximately RM 9.2.

1.3 DOCUMENT ORGANIZATION

This summary documents the field activities conducted at SIB and the adjacent Willamette River channel during the hydrodynamics and sediment dynamics surveys. The report is organized into the following sections:

- Section 1 presents an introduction, including the objectives and scope of the hydrodynamics and sediment dynamics surveys;
- Section 2 describes survey activities completed;
- Section 3 summarizes the data collected;
- Section 4 presents conclusions of the surveys; and
- Section 5 presents the references cited in this report.

2.0 SURVEY ACTIVITIES

This section provides details regarding survey activities mentioned in Section 1.1, including SEDflume sampling and analysis, ADCP measurements, CTD sensor measurements, and free surface elevation measurements. Survey activities were conducted over approximately 3 months, from February 21 to May 24, 2022. The surveys were conducted in a manner that satisfies the data quality objectives established in the Uniform Federal Policy-Quality Assurance Project Plan for SIB (HGL, 2022b). Hydrodynamic and sediment dynamics measurements were completed in accordance with industry best practices and with standard industry accuracy tolerances that are suitable for reliable use.

Deployment locations of fixed and mobile survey equipment, such as bottom-mounted and vessel-mounted ADCPs, near-bottom CTD turbidity sensors and CTD profiles (casts), water samplers, and wave gages, are presented in this section along with the specifications and setup details of the survey equipment. Figure 2-1 illustrates river conditions (gage height and discharge) at U.S. Geological Survey (USGS) gage 14211720, located approximately 5 miles upstream of the SIB Project Area at the Morrison Street Bridge, during a 1-year period between July 2021 and June 2022. Both low and high discharges were observed during the surveys, with a peak river discharge of approximately 90,000 cubic feet (ft) per second. Flows reaching approximately 90,000 cfs do not represent extreme flows and are typically exceeded annually. Equipment specifications and deployment durations for all survey activities are presented in Table 2-1. Daily field reports for survey activities are included in Attachment A.

2.1 SEDFLUME

Integral performed a SEDflume sampling and laboratory study to determine sediment characteristics and develop erodibility parameters. Sediment samples were collected throughout SIB, as well as in the Willamette River channel near the SIB entrance. Samples were collected at 30 locations over a 3-day period from February 21 to February 23, 2022. SEDflume sample locations are shown in Figure 2-2. A 3.94 by 5.9 inch (10 by 15 centimeter [cm])[1] rectangular plastic core barrel was used to obtain a sediment sample by inserting the core into the hydraulic apparatus. The objective was to collect a core that is undisturbed throughout and is of sufficient length to process multiple test intervals.

The device and core barrel were lowered via pulley system onto the sediment bed. Once the apparatus was on the sediment bed, a hydraulic pressure system was applied to the core barrel to penetrate the sediment. The check valve was closed and bed material was retained during retrieval. Once the sample was collected, the apparatus was lifted to the surface of the water and safely returned to the boat where the sample was measured for recovery. The collected material and core barrel were removed from the apparatus. Core barrels were then securely transported to Integral's SEDflume laboratory in Santa Cruz, California, for further sample processing (see Section 3.1). Additional information regarding the SEDflume sampling techniques is provided in Attachment B, SEDflume Sampling Summary.

[1] Units have been converted from metric system to imperial system throughout the document for consistency. However, metric units are also included where appropriate to correspond with PDI Work Plan components.

2.2 ACOUSTIC DOPPLER CURRENT PROFILER

eTrac performed ADCP measurements using two stationary bottom-mounted ADCPs in SIB and a vessel-mounted ADCP along transects in SIB and the Willamette River. Figure 2-3 shows the locations of the bottom-mounted ADCPs (ADCP1 and ADCP2) and the transects surveyed by the vessel-mounted ADCP. The ADCPs measured current speed and direction in a prescribed number of bins vertically through the water column. ADCPs use a series of acoustic transducers that emit consistent rapid pulses and receive backscattered pulses from different directions, ricocheted off particles suspended in moving water. Deployments for both bottom-mounted and vessel-mounted ADCPs are described below.

2.2.1 Bottom-Mounted Acoustic Doppler Current Profiler

Bottom-mounted ADCPs were deployed for two periods of approximately 30 days each. Deployment 1 began on February 21, 2022. A service trip was made on March 24, 2022, to download data, refresh the batteries, and initiate Deployment 2. Final recovery of the ADCPs occurred on April 21, 2022. The bottom-most bin sampled by the ADCPs was at a height of approximately 1.35 m above the bed. The average water column depth interval (bin size) sampled by the ADCPs was 0.25 m. The ADCP sampling frequency was once every 10 minutes, providing six velocity measurements per hour.

As shown in Figure 2-1, river discharge was higher during Deployment 1 than during Deployment 2. ADCP2 recovered the full 60 days of data, whereas ADCP1 recovered only approximately 40 days. The reduced data collection period was reported in Field Change Request #6 dated May 20, 2022 (HGL, 2022c), which EPA approved on May 31, 2022. Bottom-mounted ADCPs were factory-calibrated prior to deployment.

2.2.2 Vessel-Mounted Acoustic Doppler Current Profiler

Vessel-mounted ADCP transect measurements were performed during initiation of bottom-mounted ADCP Deployment 1, over several days from February 19 to February 22, 2022. Raw ADCP data collected with the vessel-mounted unit provided current velocities in 1.64-ft (0.5-meter) vertical bins, from 4.6 ft below the sensor to the riverbed, at a varying horizontal resolution.

The vessel-mounted ADCP transect surveys were conducted during the low-flow conditions occurring at the onset of bottom-mounted ADCP Deployment 1. The vessel-mounted ADCP transect data supplemented the bottom-mounted data by providing spatial coverage while bottom-mounted instruments were being deployed. As such, they were not intended to capture high-flow events. Vessel-mounted ADCP transect data provided a snapshot in time during low flows, and verified the low current speeds measured at the bottom-mounted stations. Since the bottom-mounted stations captured temporal variability of currents, only the bottom-mounted stations will be used for hydrodynamic model validation. Vessel-mounted ADCPs were factory-calibrated prior to deployment.

2.3 SUSPENDED SEDIMENTS

Delphis Solutions conducted turbidity measurements, which were used to estimate TSS concentrations, at two bottom-mounted stations and at vertical profiles taken during bottom-mounted sensor deployment and recovery. CTD sensors were mounted on each of the two bottom-mounted ADCP platforms provided by eTrac and are shown as CTD1 and CTD2 on Figure 2-4. Deployment schedules for these two near-bottom turbidity sensors coincided with Deployment 1 and Deployment 2 of the bottom-mounted ADCPs discussed in Section 2.2.1. The CTDs recorded near-bottom turbidity levels continuously for approximately 2 months. Bottom-mounted CTD sensors collected data at a fixed location approximately 20 inches above the riverbed. Sampling frequency for the bottom-mounted CTD sensors was six samples per hour (one measurement every 10 minutes).

Delphis Solutions also collected real-time CTD vertical profiles (casts) during deployment of the vessel-mounted ADCP transects to measure vertical turbidity profiles at different times and locations, including at the bottom-mounted sensor locations. Casts were primarily collected following the initial deployment on February 21, 2022. Additional casts were recorded prior to instrument recovery on March 24, 2022. Fifteen CTD profiles were collected at the locations shown in Figure 2-4, each for over an approximately 2-minute duration. CTD profile data were collected at 1-hertz frequency and included depth, turbidity, conductivity/salinity, temperature, and pH. The sensor was lowered slowly down through the water column from the support vessel to collect multiple data points through each vertical profile. CTD sampling over the side of the vessel (casts) collected measurements at 1 Hz frequency (once per second) as the instrument was lowered down into the water to the bottom, and back up from the bottom to the surface, resulting in sufficient samples to display vertical variation of turbidity.

To provide an additional quality check on CTD measurements, water grab samples were collected approximately 3 ft above the riverbed at ADCP and CTD cast locations during sensor deployment periods. An initial field measurement of each sample was performed using a handheld turbidimeter prior to samples being placed on ice for laboratory delivery. The water samples were delivered to ALS Environmental in Everett, Washington, within appropriate holding times. Laboratory analysis of water samples followed EPA-180.1 methodology for turbidity. TSS analysis followed the SM2540D (National Environmental Methods Index Standard Method 2540 D) methodology due to low sediment concentrations, which prevented use of EPA Method 160.2 and ASTM D 3977-97 as originally planned in the PDI Work Plan (HGL, 2023). The change in laboratory methodology for developing a correlation between turbidity and TSS was reported in Field Change Request #15 dated March 15, 2023 (HGL, 2022d), which EPA approved on March 15, 2023.

The bottom-mounted CTDs were calibrated against prepared concentrations of sediment per volume of water to correlate recorded turbidity levels throughout the deployment with TSS. Small sediment traps were attached to the frame of the bottom mount to collect ambient sediment in the water column to use as the source suspension when dried out. Insufficient sediment was captured in the water samples during the two deployments to provide adequate sediment for preparing sample concentrations. Therefore, sediment was collected from the sediment trap and oven- dried. Once dried, the sediment was carefully measured using a Mettler balance (#42 at ALS Environmental [calibration date: 7/13/21]), then poured into the respective 500 milliliter (mL) Nalgene bottles and labeled as to the concentration. Using a 500-mL graduated cylinder, 500-mL of deionized water was placed into each Nalgene bottle and the bottle capped and shaken vigorously at the lab. Sediment concentrations of 10.9-milligrams per liter (mg/L), 27.8-mg/L, 63.6-mg/L, 106.7-mg/L, and 223.7 mg/L were prepared (Figure 2-5).

Based on turbidity measured in these prepared samples, the linear regression equation shown in Figure 2-6 was developed to convert turbidity measured by the CTDs to TSS. This equation was used to develop TSS values for turbidity data measured by both the bottom-mounted CTDs and the CTD casts. For reference, the correlation plot also includes the turbidity-to-TSS correlation obtained from the water samples, which generally follow the same trend as the reconstituted water samples but only cover a very small range of turbidity. Figure 2-6 also shows water sample collection information, field turbidity measurements, and laboratory measurements, as well as a photograph of a typical water sample. Turbidity measurements and correlation to TSS will be used only to calibrate and validate a sediment transport model; therefore, the turbidity data and estimated TSS will not be scaled or used in any direct calculations of sediment loading to the project site.

2.4 WAVES

Delphis Solutions deployed four independent logging, non-directional wave gages to record free surface elevations/gage depths for evaluation of wave conditions. Wave gage locations were modified due to accessibility issues, prior to deployment. Field Change Request #2 dated January 31, 2022 (HGL, 2022d), was submitted for moving Gage 2 from the U.S. Coast Guard dock to the Marine Consortium, Inc. dock, and Field Change Request #3 dated February 14, 2022 (HGL, 2022e) was submitted for moving Gage 1 from Berth 313 to Berth 315. Final locations of the wave gages are shown in Figure 2-3. The wave gages were installed for two separate deployments. The first deployment started on March 24, 2022. A service trip was made on April 21, 2022, to download data from the instruments, refresh the batteries, and initiate the second deployment. The wave gages were recovered on May 24, 2022. Gages were deployed in the same locations for both deployments. As shown in Figure 2-1, river discharge was lower during the first deployment of the wave gages than during the second deployment. Wave gages were factory-calibrated prior to deployment.

Each wave gage was installed within an aluminum tube for additional protection and a rigid mounting platform then secured to a chain at an estimated elevation of approximately 3 ft North American Vertical Datum of 1988, based on depths provided at each deployment location. The chain was then suspended from a pile or whaler of opportunity at each location with the 30-pound anchor resting on the bottom and the chain drawn taut to dampen any vertical motion in the system. Each gage recorded free surface elevation data in 10-minute bursts, which included 4,096 samples per burst (sampling rate of 8 hertz), and an 88-second time gap between successive bursts that was assigned for data storage. The gages measured wave periods between 0.5 and 512 seconds, which was sufficient to measure relevant water surface fluctuations including wind-waves, vessel-generated Kelvin wakes (transverse and divergent surface wakes), and vessel-generated long period waves (pressure fields).

3.0 SURVEY RESULTS SUMMARY

This section provides a summary of the findings from the four different types of hydrodynamics and sediment dynamics surveys.

3.1 SEDFLUME

Integral performed laboratory analysis of 30 SEDflume cores distributed throughout SIB to determine sediment erodibility properties. Each core was analyzed in four to five vertical segments that were several cm thick to further assess variation in properties over depth. Sediment grain-size distributions were determined using laser diffraction analysis (International Organization for Standardization Standard 13-320). Figure 3-1 shows the spatial distribution of surface layer median grain size. Laboratory analysis shows that sediment within SIB is primarily silt, with varying clay and fine sand content. Sand content increases with proximity to the higher-energy environment of the Willamette River. Samples showed a mostly uniform grain-size distribution over depth. Figure 3-2 shows the spatial distribution of surface layer dry bulk density. Analysis indicates that most samples range in dry bulk density between 0.2 and 0.3 grams per cubic cm, consistent with weakly consolidated mud. Samples collected from the Willamette River channel tended to be slightly denser than samples from within the SIB interior. In addition, dry bulk density generally increased with depth due to consolidation with bottom layer values (located approximately 5.9 inches, or 15 cm, below the surface) on the order of 0.5 grams per cubic cm, consistent with partially consolidated mud. Dry bulk densities in the sub-surface depth intervals are shown in Attachment B, Appendix B, Figures B1 to B30.

Sediment erosive properties were derived from experimental measurements, as detailed in Attachment B. Figure 3-3a shows the spatial distribution of *surface* layer critical shear stress for erosion, defined as the bed shear stress required to initiate erosion. Most surface layer critical shear stress for erosion values are between 0.15 to 0.3 Pascals, or 0.003 to 0.006 pounds per square ft, consistent with loosely consolidated mud at the lower bound, and partly consolidated mud at the upper bound. Critical shear stress for erosion tends to increase with proximity to the Willamette River channel, which is logical given its higher energy and larger grain sizes. Samples located toward the upper portion of the site away from the mouth of SIB were the most erodible, while samples located near the ship berths at the end of Swan Island (more energetic area), were the least erodible. Critical shear stress for erosion also tends to increase with depth (Figure 3-3b), with typical values of approximately 0.6 Pascals (0.013 pounds per square ft) in the second vertical segment, immediately below the surface segment. Critical shear stresses below the surface layer are provided in Attachment B, Appendix B, Figures B1 to B30. Regression analysis of SEDflume data was further used to calibrate power-law formula parameters to describe site-specific erosion as a function of bed shear stress, as detailed in Attachment B. Maximum bed shear stresses are being calculated using a 3D hydrodynamic and sediment transport model for a wide range of flows including 100-year flows, and the modeling results will be reported in the Basis of Design Report.

3.2 ACOUSTIC DOPPLER CURRENT PROFILER

As discussed in Section 2.2, eTrac collected water velocity measurements using bottom-mounted and vessel-mounted ADCPs. Measured raw ADCP data were analyzed and processed using manufacturer processing tools (Teledyne RDI) to generate time histories of horizontal and vertical velocity components at each vertical bin.

3.2.1 Bottom-Mounted Acoustic Doppler Current Profiler

Raw data collected by the bottom-mounted ADCPs were saved in Workhorse Binary Output format, which was processed using the Teledyne RDI WinADCP software package. The software uses trigonometric relationships to convert the raw data of current speed and direction in "ADCP" coordinates to "Earth" coordinates (north-south, east-west, and up-down). ADCP1 was functionally deployed during Deployment 1 from February 21, to April 1, 2022 (38 days of data collected). ADCP2 collected data for the entire 2-month duration.

Bottom-mounted ADCP measurements indicated low water velocities in SIB. The combination of extremely low turbidity, described in Section 3.3 (low back-scatter), and extremely low water velocities, resulted in moderate levels of noise that required further processing and filtering of the raw data. However, the measurements clearly demonstrated that velocities at both ADCP1 and ADCP2 are small, even during the river flow conditions observed on March 3, 2022 (approximately 90,000 cubic ft per second). Figures 3-4 and 3-5 show measured current speed and individual velocity components (north-south, east-west, and up-down) at vertical bins located 3 ft and 9 ft above the riverbed for ADCP1 and ADCP2, respectively. Current speeds below 0.10 ft per second (ft/s) were observed for the entire deployment period at both ADCP locations. SIB currents show minimal influence from river conditions (discharge, water level, fluctuating tides). Differences observed between the two ADCP stations are generally within 0.1 feet per second or less, which is considered a minimum detectable current speed considering the low turbidity in SIB that resulted in low backscatter and inter-beam correlation with the ADCPs. These velocities are all significantly below the threshold for sediment resuspension and transport, not being used in any direct calculations for any analysis; therefore, no further analysis of current speed differences between the two stations has been performed."

3.2.2 Vessel-Mounted Acoustic Doppler Current Profiler

Raw data in binary format was post-processed using the Teledyne RDI WinRiverII software. This software uses vessel navigation data and trigonometric relationships to convert raw ADCP soundings to real-world coordinates and velocities. As noted in Section 3.2.1, very low water turbidity and extremely low velocities in the SIB interior caused noise in the raw velocity data. Noise was higher for vessel-mounted ADCP measurements than for bottom-mounted instruments due to vessel movements. Additional filtering was performed by analyzing the return signal correlation between the ADCP's four beams, which is a measure of return signal quality. Raw data were then filtered by removing data that did not meet a minimum average beam correlation threshold.

Figures 3-6 and 3-7 show depth-averaged velocity transects taken within the Willamette River channel during periods of rising and falling tide, respectively. Currents measured during the rising tide period (Figure 3-6) were generally 0.5 ft/s or less with most transects showing currents moving downstream or mixed directions, with lower current speeds than during the falling tide conditions. USGS gage 14211720 (Morrison Street Bridge) data indicated a brief measured flow reversal occurred during this rising time period. The highest overall current speeds, with velocities upwards of 1 ft/s and directed downstream, were measured during the falling tide period (Figure 3-7).

Figure 3-8 shows depth-averaged velocity transects sampled within SIB. Current speeds in SIB are low, generally 0.1 ft/s or less, with significant directional variation. Figure 3-8 shows some vectors with non-negligible velocities; however, these seemingly higher values contain excessive noise and occur most frequently in shallow water or near dock structures. No distinct velocity trends were identified in the vertical velocity profiles. Transects within SIB measured after 19:00 UTC on February 22, 2022, were taken during a period of negligible current speed and very low turbidity based on observations during the surveys, resulting in high levels of noise; hence, those measurements are not shown due to relatively low beam correlation caused by noise in the ADCP signal resulting from a combination of vessel movements, very low current speeds, and low backscatter (turbidity). Discharges were not measured within the ADCP transects. Discharge at Morrison St. USGS Station will be used to support model development, validation, and application to RD.

Although some of the vessel-mounted ADCP measurements (particularly in the SIB interior) contained noise due to extremely clear water as observed in water samples and very low velocities as observed in the field, measurements indicate extremely low-to-negligible velocities following further processing, and as documented in the bottom-mounted ADCP measurements.

3.3 SUSPENDED SEDIMENTS

Figure 3-9 shows time histories of TSS concentrations at the two near-bottom CTD sensors deployed within SIB, as well as at USGS gage 14211720 (Morrison Street Bridge). TSS values shown here represent estimates made based on measured turbidity. Both bottom-mounted CTD sensors recorded an approximate 2-week period of elevated turbidity, occurring during a high-discharge event in early March 2022. During this high flow period, a peak TSS concentration of roughly 140 mg/L was predicted at USGS gage 14211720, upstream in the Willamette River. Approximately 1.5 days later, near-bottom TSS predictions in SIB increased to a peak sustained concentration of roughly 80 mg/L. These measured turbidity data and estimated TSS values will be used to support numerical model validation. TSS concentrations in SIB, as well as at the USGS gage, were generally less than 10 mg/L during low-flow periods. Several short-duration periods of elevated TSS concentrations were predicted at the near-bottom sensors in SIB. No significant trends were observed between the influence of rainfall events or minor changes in measured velocities and the measured turbidity values at both stations. During the peak measured turbidity in SIB (approximately 80 mg/L at both stations), the majority of the lagoon appears to have similarly high turbidity, the vast majority of which was introduced by elevated TSS in the Willamette River. Observations show wide-scale elevated TSS in the SIB, as observed at both CTDs (which correlate well as observed in Figure 3-10); no other forcing exists (e.g., vessel traffic, stormwater discharges) which is capable of causing the elevated trend.

Figure 3-10 presents a closeup view of measured TSS concentrations for the deployment periods. TSS concentrations were consistent between the two gages, which were located more than 2,100 ft apart, with CTD1 located roughly halfway into the SIB interior. Figure 3-11 shows vertical TSS concentration profiles computed from turbidity measured during each of the CTD casts. "TSS concentration values during low flows were typically in a similar range (10 to 15 mg/L) as those measured in the Willamette River at Morison St. Station during low flows. While some CTD casts showed increased surface turbidity, data generally showed a vertically uniform profile, with concentrations typically at or around 10 mg/L. Figure 3-11 also shows point measurements from the bottom-mounted CTDs at approximately the same time as the CTD casts were taken. The bottom-mounted CTD measurements are within the range of TSS variability observed in the casts. Causes of the elevated surface turbidity measurements are unknown. These elevated values have not been evaluated further because the turbidity measurements are not being used for direct calculations and are only used as part of model calibration.

Cast 13 was the only cast with elevated TSS at depth; this cast was taken near City of Portland Outfall M-1. Elevated turbidity at CTD cast 13 at depth indicates likely influence of the M-1 Outfall. CTD casts 5 and 15 did not observe elevated turbidity at depth which was observed at CTD cast 13 nearest the M-1 Outfall, which may indicate that solids discharging from the M-1 Outfall at the time of sampling were depositing in close proximity to the outfall. While elevated turbidity at cast 13 has not been correlated to outfall sediment load, the turbidity measurements are not being used for direct calculations and are only used as part of model calibration.

Elevated TSS in the Willamette River results in the elevated TSS delivered to SIB, which was observed in measurements. Overall, the turbidity in SIB is low, except for limited time periods during elevated river discharge. Independent laboratory and field analysis of water grab samples, all of which were taken during low flow periods, corroborated the CTD measurements, and indicated low turbidity values.

3.4 WAVES

Measured free surface elevation data were collected and processed to derive wave statistics and to quantify the influence of wind-waves and vessel wakes. Delphis Solutions performed preliminary processing of the burst data and provided raw gage depths (water column heights above the instruments) at all stations. Figure 3-12 shows time histories of measured gage depths at the four stations for Deployment 1 and Deployment 2.

Raw gage depths were processed to derive wave statistics using a high-pass filter. This filter removed fluctuations due to tides and changes in Willamette River discharge. Figure 3-13 filtered water level fluctuations at the four stations for Deployment 1 and Deployment 2, which includes both wind-waves and vessel wakes. Data indicates that wave troughs and crests vary only in the range between -0.2 ft and 0.2 ft, with occasional peaks occurring outside of this range. Stations 1 and 2 located on the Willamette River and the SIB entrance, respectively, recorded higher wave heights than Stations 3 and 4 in the SIB interior due to greater wind-wave activity and vessel traffic.

Filtered water levels were then used to derive general wave statistics using zero-crossing analysis, which is a technique that documents the number of times that the water surface elevation crosses the zero-elevation line and records wave crest and trough elevations. This technique is commonly used to determine the frequency, or the number of oscillations per unit time, of ocean waves and vessel wakes. Wave parameters derived included significant wave height, significant wave period, mean zero-crossing wave period, mean zero-crossing wave height, and maximum wave height.

Figures 3-14 and 3-15 show the timeline of significant wave height, maximum wave height, and mean zero-crossing wave period at the four stations during Deployment 1 and Deployment 2, respectively. Figures 3-14 and 3-15 show analysis of all water surface movements, which includes a combination of both wind-waves and vessel wakes, although the statistical contribution of vessel wakes to the significant wave heights is negligible. The data indicates that the SIB interior has a calm wave climate and that the main Willamette River is more energetic. Measured significant wave heights were below 0.1 ft inside SIB, and 0.25 ft in the Willamette River. Maximum wave heights at all stations were below 0.3 ft in SIB and 1.0 ft in the Willamette River. The calm conditions inside SIB were confirmed by observations made in the field by Delphis Solutions during gage deployment and recovery.

The free surface elevation data were also used to investigate the presence of vessel-generated surface wakes and long-period pressure field effects (i.e., drawdown) generated by deep-draft vessels. The heights and periods of vessel-generated surface (Kelvin) wakes are anticipated to be similar to those for measured wind-waves, according to Kelvin wake theory for vessels moving slowly in deep water. To identify wave activity from passing vessels, vessel locations and speeds in the SIB and Willamette River were documented using Automatic Information System (AIS) data. The data were supplied by Astra Paging, Inc., which included reports of general vessel particulars (e.g., length and beam), vessel position, and speed. The data were available at 30-second intervals.

Since vessel-generated surface (Kelvin) wake properties in the area are similar to those of wind-waves, identification of vessel wakes in the free surface elevation record requires time-frequency analysis using a spectrogram approach. Spectrograms are used to analyze the frequency content of the wakes generated by a vessel’s movement through the water using free surface elevations recorded at a station. The spectrogram displays the frequencies present in a water level signal over time. This analysis successfully identified passing vessel events in the data.

Figure 3-16 shows a summary of one of the observed vessel wake events recorded at Station 3, including the raw data (a), high-pass filtered data (b), and spectrogram (c). The spectrogram clearly shows a typical surface wake signature. Figure 3-16 also includes the vessel speed and passing distance (d) derived from AIS data. The vessel moved along the SIB centerline, towards the interior of the SIB, and passed approximately 400 ft from Station 3 while moving at approximately 12 knots. Stations 2 and 4 also recorded this passing event. The analysis demonstrated that vessel wakes are present in the wave data from the four stations; however, within SIB, vessel wakes are small and have characteristics similar to small wind-waves.

Figure 3-17 shows the largest vessel wake train observed at Station 3, and the heights and periods of the individual waves within the wake train. Heights and periods range from 0.05 to 0.33 ft, and 2.4 to 4.1 seconds, respectively. The heights and periods of the individual waves are within the range of heights and periods observed in the wind-waves. During the data collection period, winds were relatively mild with peak wind speeds up to 26 miles per hour during Deployment 1, and 19 miles per hour during Deployment 2. For reference, the PHSS Remedial Investigation/Feasibility Study (EPA, 2016) reports 100-year wind speeds in Portland Harbor to be approximately 69 miles per hour. No extreme winds were observed during the data collection period.

The AIS data and high-pass filtered free surface elevation data were also scrutinized to evaluate the potential presence of vessel displacement effects (long-period pressure field waves) generated by larger vessels. Figure 3-18 shows an example observed pressure field (drawdown) effect generated by a large cargo vessel transiting upstream in the Willamette River past Station 1. Results show raw data (a), low-pass filtered water level (b), and the ship's passing speed and distance from Station 1 (c). Figure 3-17 also shows the vessel's transit route. The vessel passed by Station 1 at approximately 650 ft, while moving upstream at approximately 13 knots. A maximum drawdown of roughly 0.3 ft was measured when the vessel was closest to Station 1. Data indicates that the vessel-generated displacement effects (long-period pressure fields) result in small water level oscillations and fluctuate very slowly. Measurements in the SIB interior (Stations 3 and 4) indicated no significant drawdown effects generated by larger vessels, which is anticipated due to low vessel speeds and limited deep-draft traffic. Analysis performed to identify wake events indicated minimal presence of wakes and given that their characteristics are very similar to wind-waves, vessel wakes will not control any analysis or design. As such, no further analysis was performed.

4.0 CONCLUSIONS

The data presented in this report are sufficient to fulfill the applicable data needs as envisioned and documented in the PDI Work Plan (HGL, 2022a) in supporting the development of the RD and the completion of the source control sufficiency assessment. The purpose of hydrodynamics and sediment dynamics surveys was to generate data necessary to facilitate analysis of recontamination potential and to demonstrate stability/persistence of the remedy under both river hydrodynamics and anthropogenic hydrodynamic effects. Field data collected will be used to either directly characterize the site or as input to, or for validation of, numerical modeling tools.

SEDflume sampling results show relatively consistent fine sediments with relatively consistent erodibility properties and slightly higher sand content in samples closer to the main river. Current velocities measured inside the SIB are less than 0.1 ft/sec during all phases of the tidal cycle and during varying river discharges. River hydrodynamic conditions (current velocities and water level fluctuations) are not likely to control either resuspension and scour of native sediments, or cap erosion protection design, for most of the SIB Project Area. TSS concentrations in the SIB were low during low-discharge periods and increased in a uniform manner in SIB as river discharges increased, indicating that material entering SIB is well-mixed, fine sediment. Wave activity within SIB is minimal; wind-waves during extreme wind events are likely to be the controlling wave condition for RD. The following section contains conclusions regarding the four survey activities discussed in this report.

4.1 SEDFLUME

Sediment properties vary both horizontally and vertically within the project area. The SEDflume results presented in this report characterize sediment property variability adequately to fulfill the applicable data needs as envisioned and documented in the PDI Work Plan (HGL, 2022a). Samples in the SIB generally consisted of predominantly silt, with small amounts of clay and fine sand with sand content increasing with proximity to the Willamette River. Data shows bed surface layer properties consistent with a loosely consolidated mud mixture and underlayers with properties consistent with a partially consolidated mud mixture. The data will be used to support refinement of the conceptual site model, PDI engineering studies including hydrodynamic and sediment transport modeling, and to develop the Basis of Design Report (BODR).

4.2 ACOUSTIC DOPPLER CURRENT PROFILER

ADCP current velocity data support the elements of the conceptual site model that describe the hydrodynamics of the SIB as quiescent within the interior lagoon with a transition to relatively higher velocities within the Willamette River. Both observations and measurements indicate current velocities generally below 0.1 ft/s in the SIB interior during both low and high river discharges. Vessel-mounted ADCP data collected within the Willamette River showed downstream directed currents with magnitudes upwards of 1 ft/s during falling tide conditions and weaker currents with mixed directionality during rising tide conditions.

The ADCP data showed current speeds throughout the entire deployment duration (including lower and higher river flows) well below the threshold for resuspension and transport of sediment. Since the RD will not be based on currents measured during low-flow condition, but rather extreme events simulated with numerical models, the data have not been further evaluated. ADCP measurements will be used to support refinement of the conceptual site model, and support validation of numerical models to be used during PDI engineering studies, recontamination evaluations, and development of the BODR.

4.3 SUSPENDED SEDIMENTS

TSS concentration measurements showed a background of only roughly 10 mg/L throughout most of the sensor deployment (low flow periods), but with a period of elevated TSS concentration reaching 75 to 80 mg/L inside SIB during a high-discharge event. The similarity in TSS concentrations between the two stations (located 2,100 ft apart) indicate that sediments in the water column entering SIB are well-mixed fine material. The similarity noted between stations in the SIB here refers to an approximate visual comparison. Figure 3-10 demonstrates the strong correlation between TSS at each of the two stations, further demonstrating that the sediment introduced into SIB from the river is well mixed and relatively uniform in nature, confirming the presence of fine sediments with low settling velocities. No further correlation was performed since the measurements are not being used in direct calculations and only for numerical model calibration. Sediment transport model calibration and validation efforts and use of the correlated TSS will be described in the Recontamination Potential Technical Memorandum to be included in the Final Sufficiency Assessment Report. Total suspended solids estimates will support refinement of the conceptual site model, sediment transport model validation as part of recontamination potential evaluation, PDI engineering studies, and completion of the BODR. The bottom-mounted TSS time series estimates will be used for model calibration and validation.

4.4 WAVES

Maximum wave heights associated with wind-waves and vessel wakes were less than approximately 0.3 ft inside SIB and approximately 1.0 ft in the Willamette River. The free surface measurements indicate that wakes and wind-waves are small during typical conditions and unlikely to cause significant erosion or sediment transport. Displacement effects are not likely to affect shorelines; however, velocities under the hulls of moving deep-draft vessels (not measured during this program), in addition to vessel wakes, will be considered for cap stability during PDI engineering studies. Vessel-induced hydrodynamics will be predicted using numerical models. Maximum pressure field drawdown of approximately 0.3 ft was observed during a deep-draft passing vessel event in the Willamette River; however, measurements in the SIB interior did not show any significant drawdown effects due to low vessel speeds and limited deep-draft traffic. This data will be used to support refinement of the conceptual site model, support PDI engineering studies, and provide input to the BODR.

5.0 REFERENCES

HydroGeoLogic, Inc. (HGL), 2022a. *Pre-Design Investigation Work Plan, Revision 3, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2022b. *Uniform Federal Policy-Quality Assurance Project Plan, Revision 3, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2022c. *Field Change Request #6, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2022d. *Field Change Request #2, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. January.

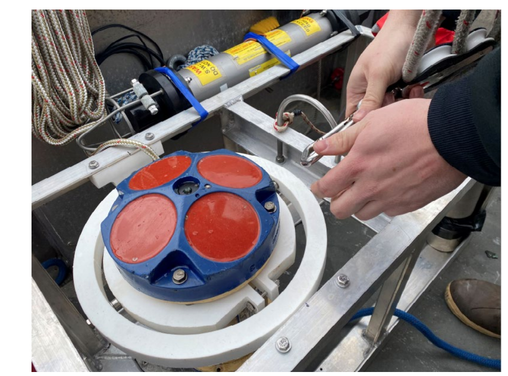
HGL, 2022e. *Field Change Request #3, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. February.

HGL, 2023. *Field Change Request #15, CERCLA Docket No. 10-2021-001*. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. February.

U. S. Environmental Protection Agency (EPA), 2016. *Portland Harbor RI/FS, Final Remedial Investigation Report, Portland Oregon*. United States Environmental Protection Agency Region 10, Seattle, Washington. February 8.

TABLES

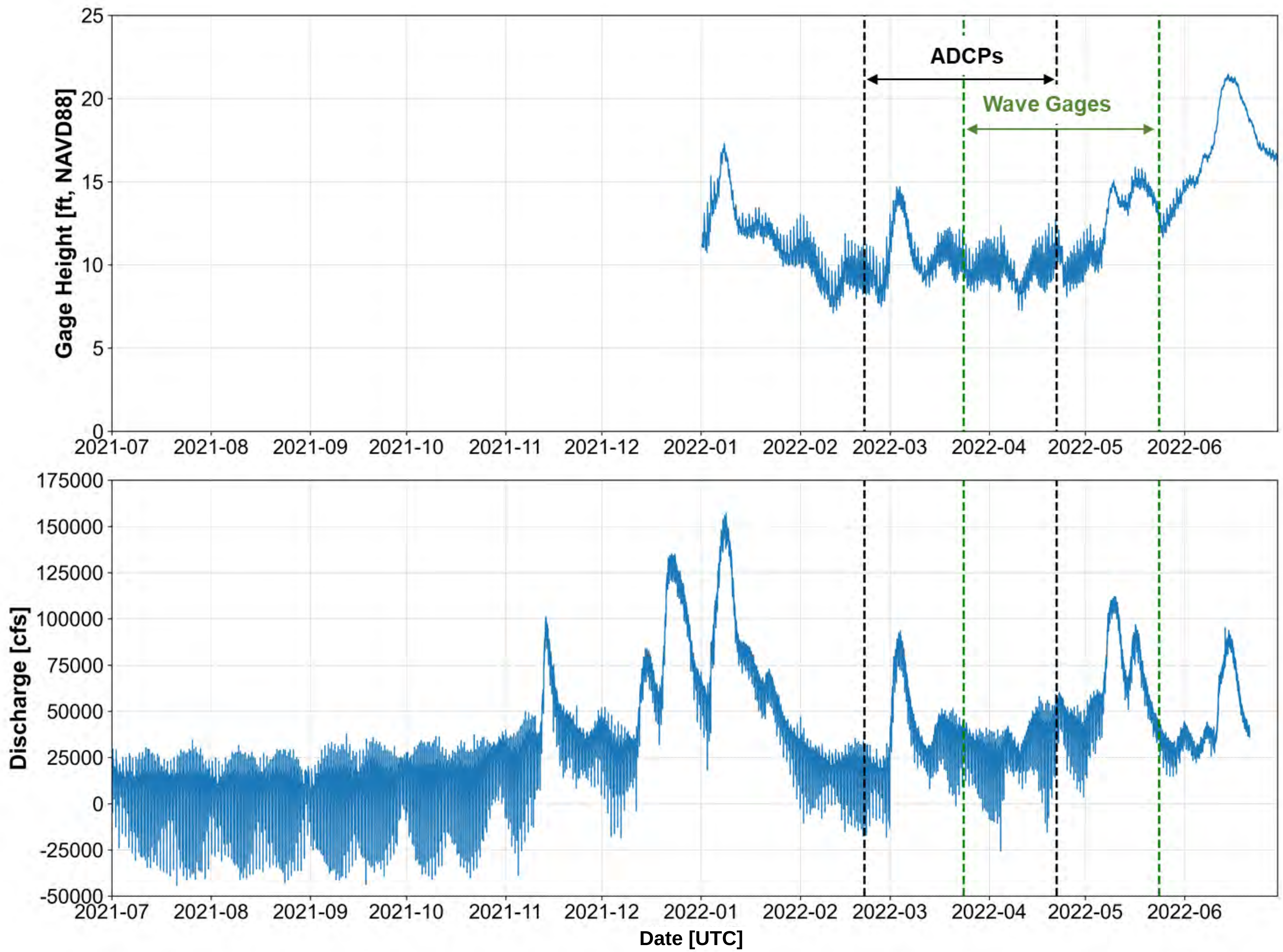
Table 2-1
Survey Equipment Summary
Hydrodynamics and Sediment Dynamics Surveys Report, Swan Island Basin Project Area,
Portland, Oregon

Survey (Duration)	Equipment	Calibration	Image
Bottom-mounted ADCPs (Deployment 1: 2/21-3/24/2022 Deployment 2: 3/24-4/21/2022)	• Model: Teledyne RDI Workhorse Sentinel ADCP1 • Frequency: 600 kHz (ADCP1) and 1200kHz (ADCP2) • Beam Angle: 20º • Orientation: Up-looking • Beam Pattern: Convex Additional equipment specifications can be found at: http://www.teledynemarine.com/Lists/Downloads/sentinel_datasheet_lr.pdf	Factory calibrated	
Vessel-mounted ADCP (2/19-2/22/2022)	• Model: Teledyne RDI Workhorse Rio Grande ADCP • Frequency: 600 kHz • Beam Angle: 20º • Orientation: Down-looking • Beam Pattern: Convex Additional equipment specifications can be found at: https://www.comm-tec.com/prods/mfgs/RDI/brochures/rio_grande_ds_lr.pdf		
Turbidity Sensors – Bottom Mounted (Deployment 1: 2/21-3/24/2022 Deployment 2: 3/24-4/21/2022)	YSI EXO-2[3] CTD sondes equipped with turbidity sensors. Additional equipment specifications can be found at: https:\\YSI EXO2 Multiparameter Water Quality Sonde | ysi.com	Calibrated against prepared concentrations of sediment per volume of water to correlate recorded turbidity levels throughout the deployment.	
Turbidity Sensors – Profiles (Casts) (2/21/-2/22 and 2/24/2022)	Hydrolab H20[4] water quality CTD sonde equipped with a turbidity sensor. Additional equipment specifications can be found at: http://web.mit.edu/1.75/www/FieldTrips/Series_4a_Manual.pdf	2-point calibration against standards: 0.1 NTU (DI water) and 50-NTU standard) CTD standards are QC checked using the handheld turbidimeter with traceable calibration standards.	
Wave Gages (Deployment 1: 3/24- 4/21/2022 Deployment 2: 4/21- 5/24/2022)	• Model: RBR Solo35 wave gage • Sampling Rate: 8 Hz • Samples per ensemble: 4096 • Mode: Wave Burst • Ensemble interval: 10 minutes Additional equipment specifications can be found at: https://rbr-global.com/products/compact-loggers/rbrsolo-d	Factory calibrated	

Notes:
° = Degree
Hz = hertz
kHz = kilohertz
NTU = nephelometric turbidity unit
ADCP = Acoustic Doppler Current Profiler
CTD = conductivity, temperature, depth
DI = deionized
QC = quality control

FIGURES

This page was intentionally left blank.



Black and Green Dashed Lines Show Deployment Extents for ADCPs and Wave Gages Respectively

ADCP - Acoustic Doppler Current Profiler
cfs - cubic feet per second
ft - feet
NAVD88 - North American Vertical Datum of 1988
(5.28' NAVD88 = 0' Columbia River Datum (CRD))
USGS - U.S. Geological Survey
UTC - Coordinated Universal Time

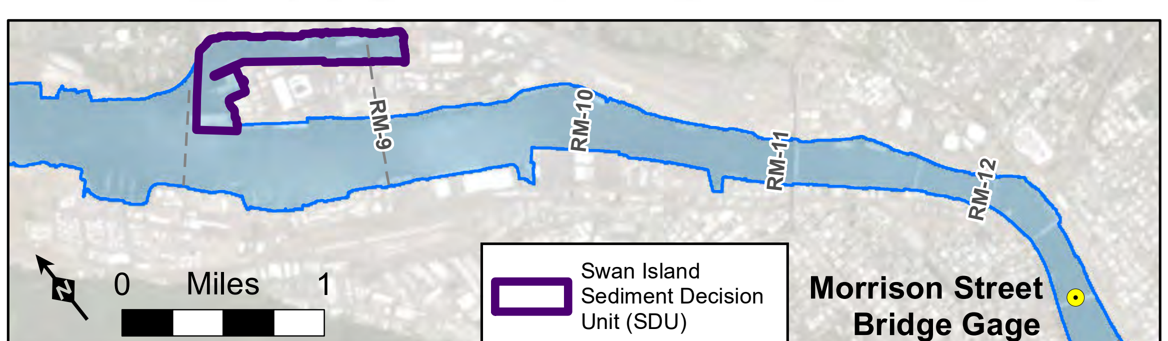


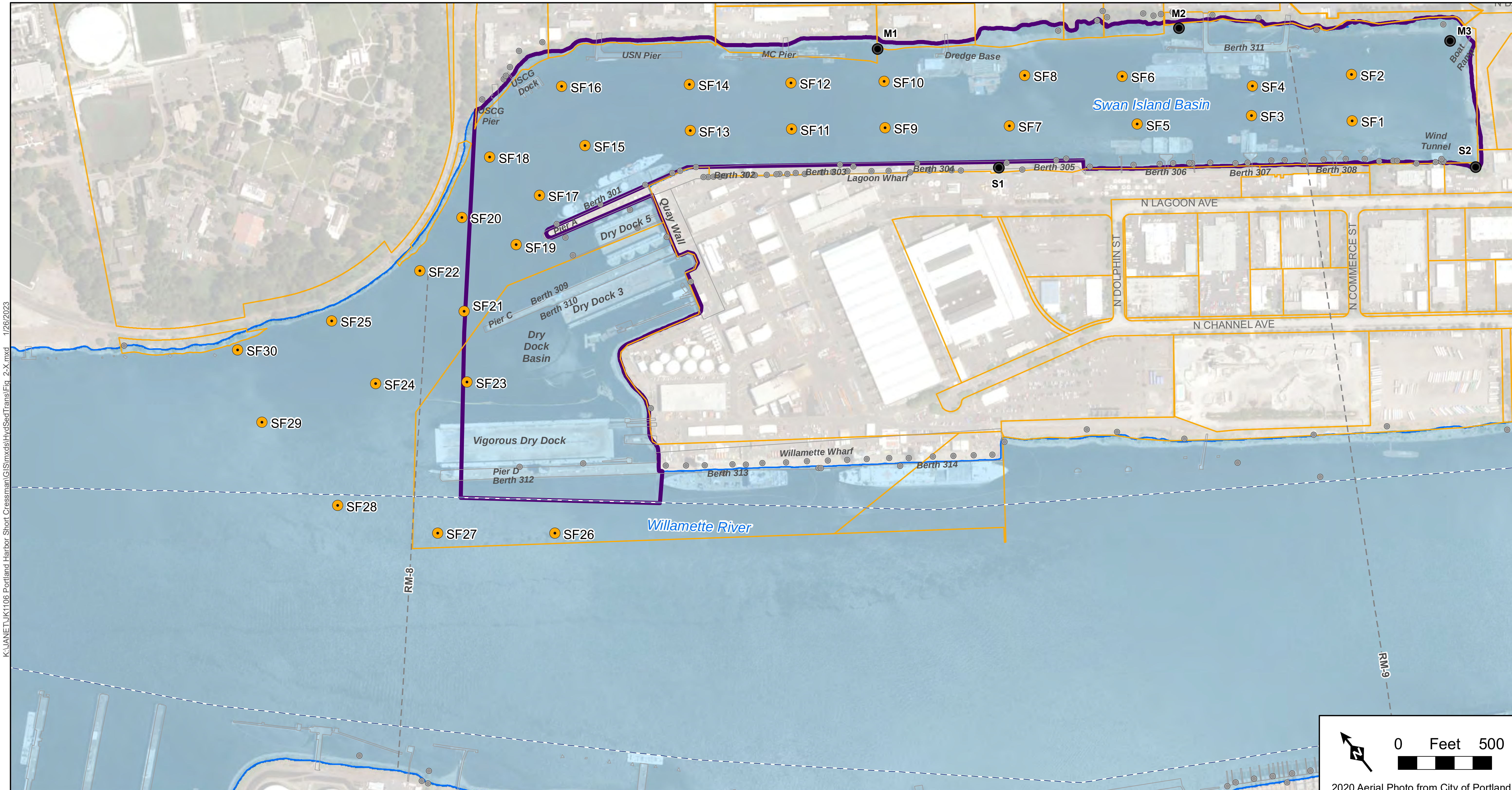
Figure 2-1

River Conditions at Morrison Street Bridge (USGS 14211720) and ADCP/Wave Gage Deployment Periods

Prepared on:1/6/2023

Hydrodynamics and Sediment Dynamics Surveys Report

Swan Island Basin



SEDflume Sample

City Stormwater Outfall

Non-City Outfall

River Mile (RM)

Swan Island Sediment Decision Unit (SDU)

Federal Navigation Channel (USACE, 2020)

Docks and Structures

Tax Lot

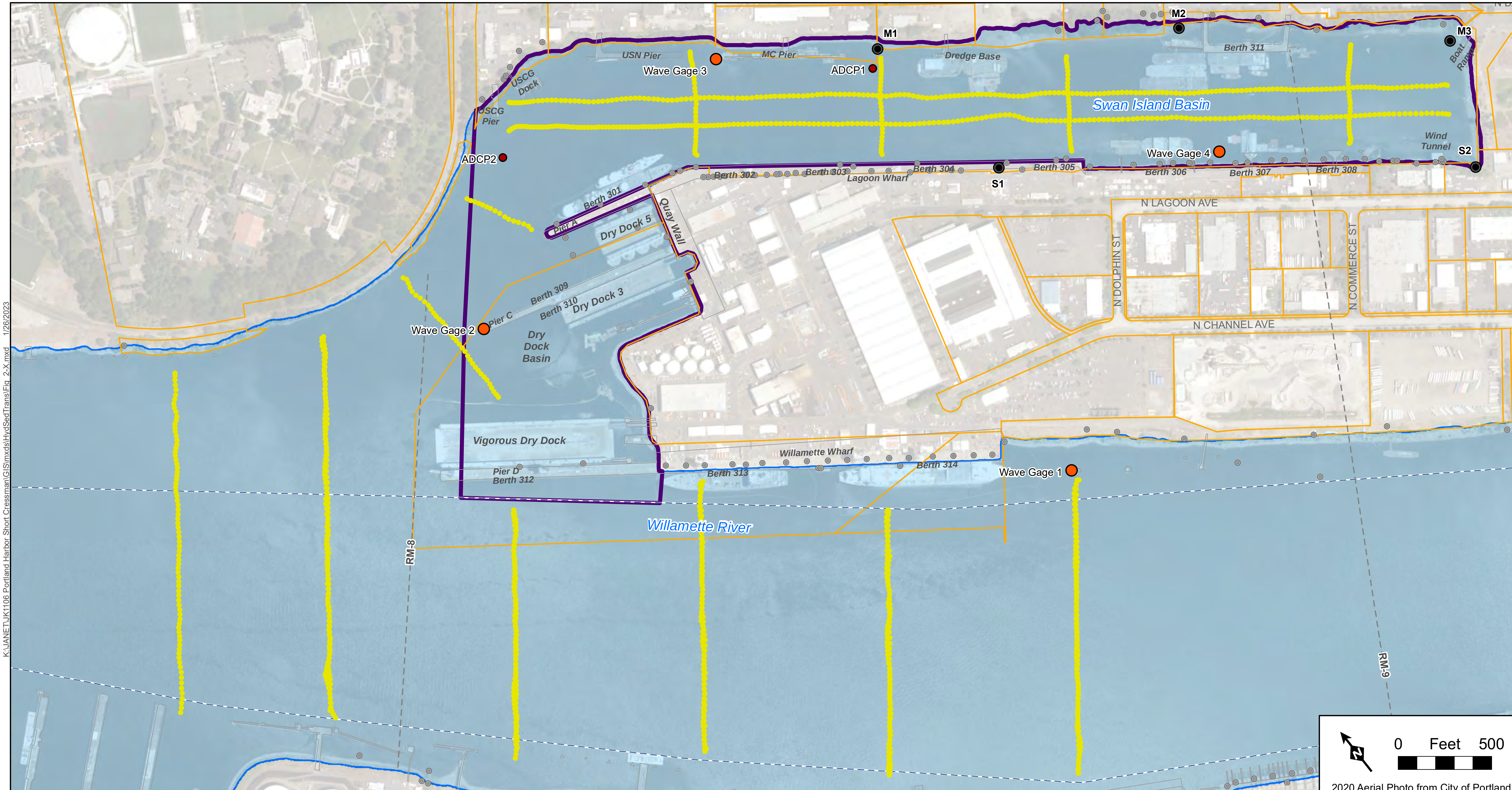
Ordinary High Water (City of Portland, 2013)

Notes:
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 2-2
SEDflume Sampling Locations

Prepared on: 1/26/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



- Bottom-Mounted ADCP
- Wave Gage
- Vessel-Mounted ADCP Transect
- City Stormwater Outfall
- Non-City Outfall
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
ADCP – Acoustic Doppler Current Profiler
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

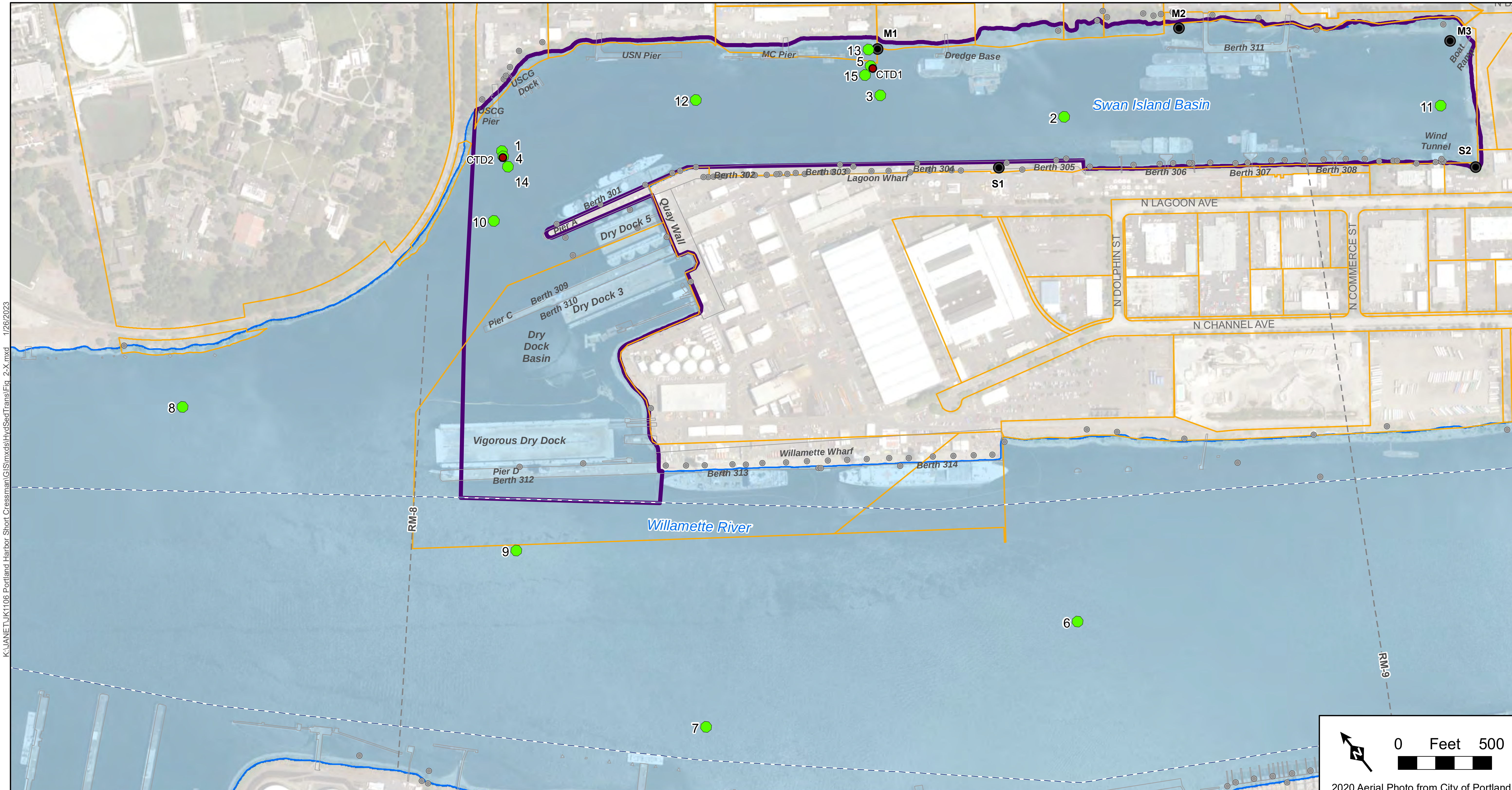
Figure 2-3

Deployment Locations of ADCPs and Wave Gages, and Transects Surveyed by Vessel-Mounted ADCPs

Prepared on: 1/26/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

K:\JANET\JK1106 Portland Harbor Short Cressman\GIS\mxds\HydSedTrans\Fig 2-X.mxd 1/26/2023



CTD Profiles (Casts)
CTD Turbidity Sensors

City Stormwater Outfall
Non-City Outfall
River Mile (RM)
Swan Island Sediment Decision Unit (SDU)
Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot
Ordinary High Water (City of Portland, 2013)

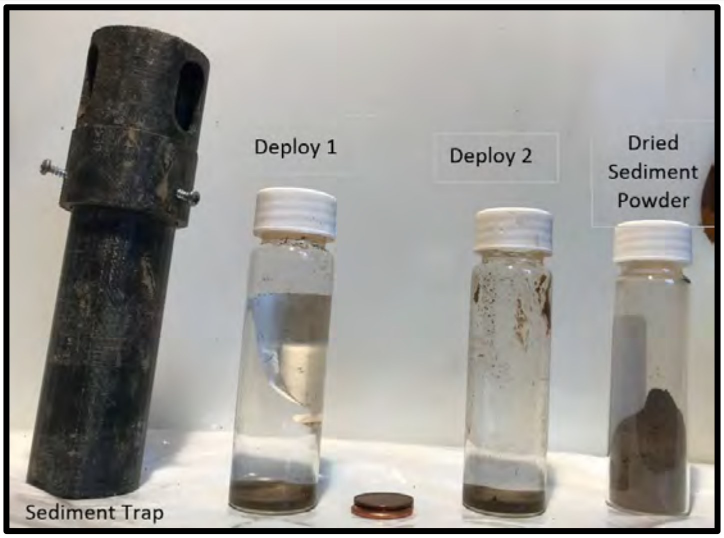
Notes:
CTD – Conductivity, Temperature, and Depth
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 2-4
Deployment Locations of CTD Turbidity Sensors and CTD Profiles (Casts)

Prepared on: 1/26/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

Sediment trap with recovered sediment samples and dried sediment from frame



Prepared sediment concentrations

Settled

Shaken

Notes:
TSS – Total Suspended Solids

Figure 2-5
Turbidity to TSS Preparation

Prepared on 8/8/2022
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

Water Grab Samples

NAME (eTrac)	Date (UTC)	Time (UTC)	ORSP-North (X)	ORSP-North (Y)	LATITUDE	LONGITUDE	CTD CAST Number	WATER SAMPLE	Date (PST)	Time (PST)
WQ 1	2/21/2022	23:32	7632785.07	701766.47	45° 34' 12.2398" N	122° 43' 24.1217" W	CAST1	None	None	None
WQ 2	2/22/2022	0:10	7635201.52	699967.52	45° 33' 55.1396" N	122° 42' 49.4716" W	CAST2	None	None	None
WQ 3	2/22/2022	0:17	7634523.8	700689.85	45° 34' 02.0855" N	122° 42' 59.2730" W	CAST3	SI-D1-WS-1	2/21/2022	16:00
WQ 4	2/22/2022	15:52	7632771.74	701740.42	45° 34' 11.9791" N	122° 43' 24.2990" W	CAST4	SI-D1-WS-2	2/22/2022	8:00
WQ 5	2/22/2022	16:10	7634585.71	700842.54	45° 34' 03.6093" N	122° 42' 58.4618" W	CAST5	SI-D1-WS-3	2/22/2022	8:10
WQ 6	2/22/2022	16:45	7633514.77	697856.81	45° 33' 33.8504" N	122° 43' 12.3574" W	CAST6	SI-D1-WS-4	2/22/2022	8:46
WQ 7	2/22/2022	17:10	7631633.05	698706.48	45° 33' 41.7251" N	122° 43' 39.1246" W	CAST7	SI-D1-WS-5	2/22/2022	9:10
WQ 8	2/22/2022	17:42	7630595.27	701822.28	45° 34' 12.1946" N	122° 43' 54.9156" W	CAST8	SI-D1-WS-6	2/22/2022	9:45
WQ 9	2/22/2022	18:30	7631465.02	700083.77	45° 33' 55.2729" N	122° 43' 42.0194" W	CAST9	SI-D1-WS-7	2/22/2022	10:34
WQ 10	2/22/2022	18:57	7632509.78	701508.85	45° 34' 09.6224" N	122° 43' 27.8906" W	CAST10	None	None	None
WQ 11	2/22/2022	19:20	7636780.12	698715.05	45° 33' 43.2044" N	122° 42' 26.8090" W	CAST11	SI-D1-WS-8	2/22/2022	11:20
WQ 12	2/22/2022	19:50	7633752.92	701308.2	45° 34' 07.9795" N	122° 43' 10.3440" W	CAST12	SI-D1-WS-9	2/22/2022	11:55
WQ 13	2/22/2022	20:00	7634633.37	700918.32	45° 34' 04.3701" N	122° 42' 57.8213" W	CAST13	SI-D1-WS-10	2/22/2022	12:00

Locations provided by eTrac

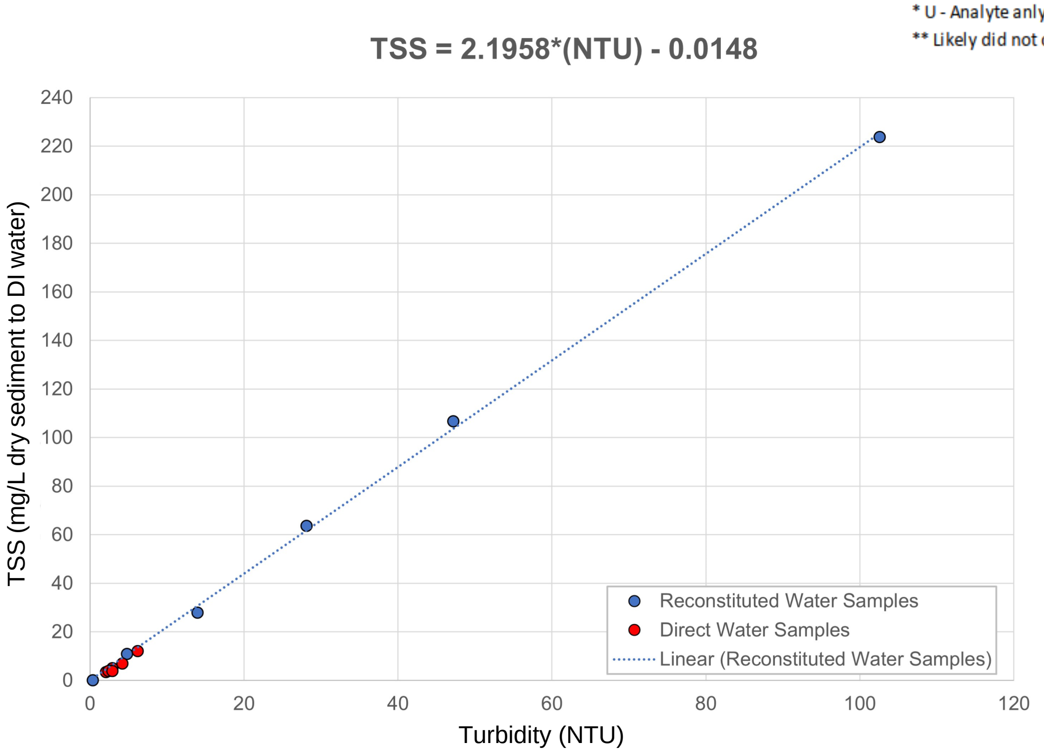
Water Grab Samples approximately 1-meter from bottom

Summary of Turbidity and Laboratory TSS Results

		Field Handheld Turbidimeter Results					Laboratory Results		CTD Turbidity (NTU)	
WATER SAMPLE	Date (PST)	Time (PST)	Turbidity (NTU) 1	Turbidity (NTU) 2	Turbidity (NTU) 3	Turbidity (NTU) AVG	Turbidity (NTU)	TSS (mg/L)	Depth Avgeraged)	~ 1m above bottom
SI-D1-WS-1	2/21/2022	16:00	4.84	4.74	4.84	4.81	4.2	6.80	13.3	18
SI-D1-WS-2	2/22/2022	8:00	3.49	3.16	2.92	3.19	2.9	5.00	4.37	3.4
SI-D1-WS-3	2/22/2022	8:10	10.95	9.12	12.98	11.02	6.2	12.00	7.59	9.1
SI-D1-WS-4	2/22/2022	8:46	2.25	2.75	2.58	2.53	2.1	3.30	6.12	2.7
SI-D1-WS-5	2/22/2022	9:10	2.28	2.26	2.74	2.43	2.3	U*	10.91	5.4
SI-D1-WS-6	2/22/2022	9:45	2.88	2.30	2.09	2.42	1.9	U	10.21	6.8
SI-D1-WS-7	2/22/2022	10:34	2.08	2.18	2.17	2.14	1.8	U	13.38	8.7
SI-D1-WS-8	2/22/2022	11:20	3.33	2.79	3.10	3.07	2.7	4.00	9.48	7.2
SI-D1-WS-9	2/22/2022	11:55	4.70	3.22	2.68	3.53	2.4	3.80	9.84	7.1
SI-D1-WS-10**	2/22/2022	12:00	3.09	2.95	2.94	2.99	2.9	3.80	27.75	34.3

* U - Analyte anlysed for but not detected at level above reporting limit of 3.0 mg/L

** Likely did not capture plume with water sampler due to drift. Vessel operator did not want to stay to long in area for safety. Understandable.



Typical Water Clarity in Samples

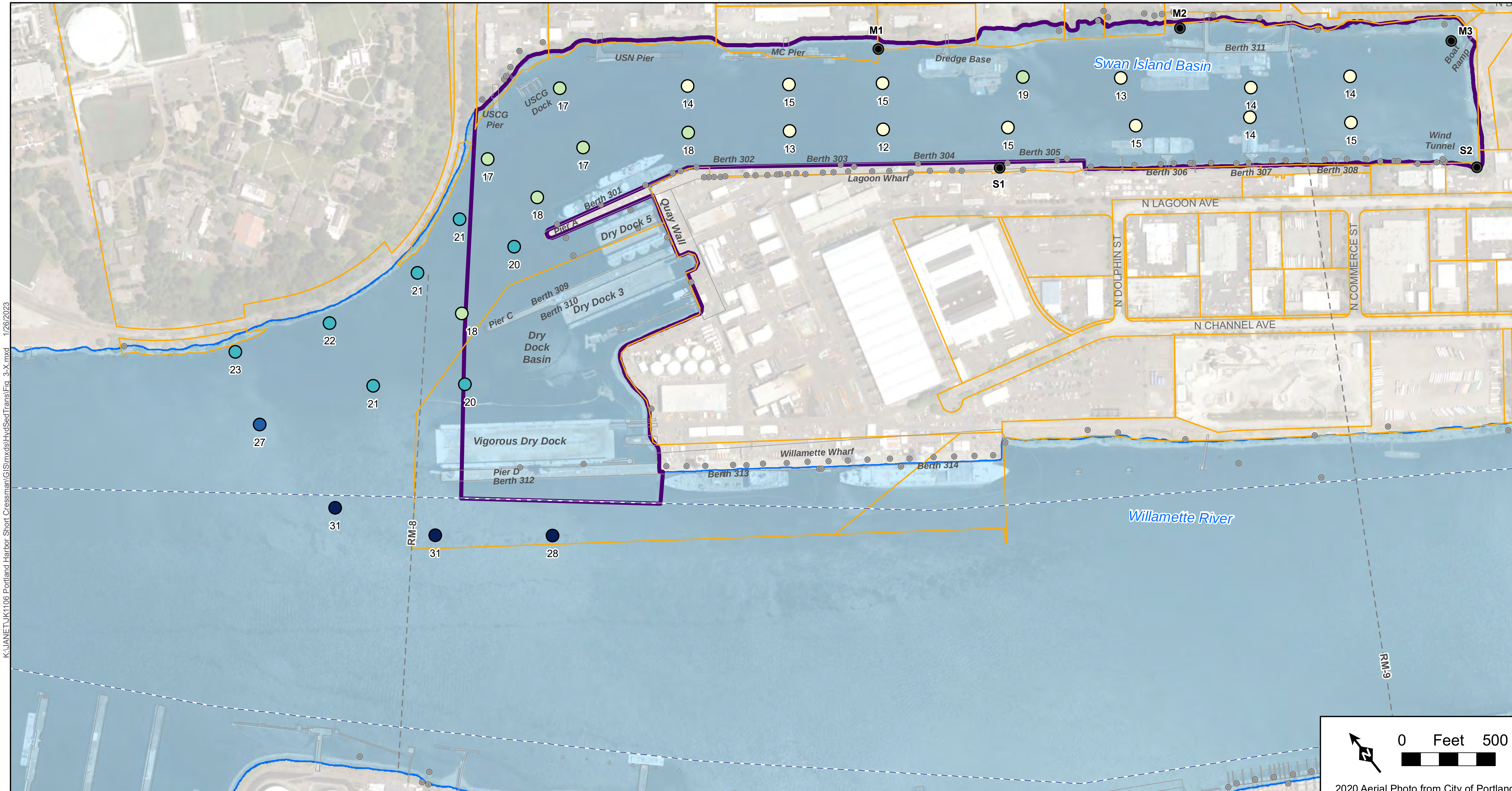
mg/L – milligrams per liter
NTU – nephelometric turbidity unit
DI – deionized
TSS – Total Suspended Solids

Figure 2-6

CTD Turbidity to TSS Correlation

Prepared on:1/20/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP HGL MOTT MACDONALD BRIDGEWATER GROUP



SEDflume Grain Size
D50 (micrometer [µm])

- 12.5 - 16.0
- 16.1 - 20.0
- 20.1 - 24.0
- 24.1 - 28.0
- 28.1 - 32.0

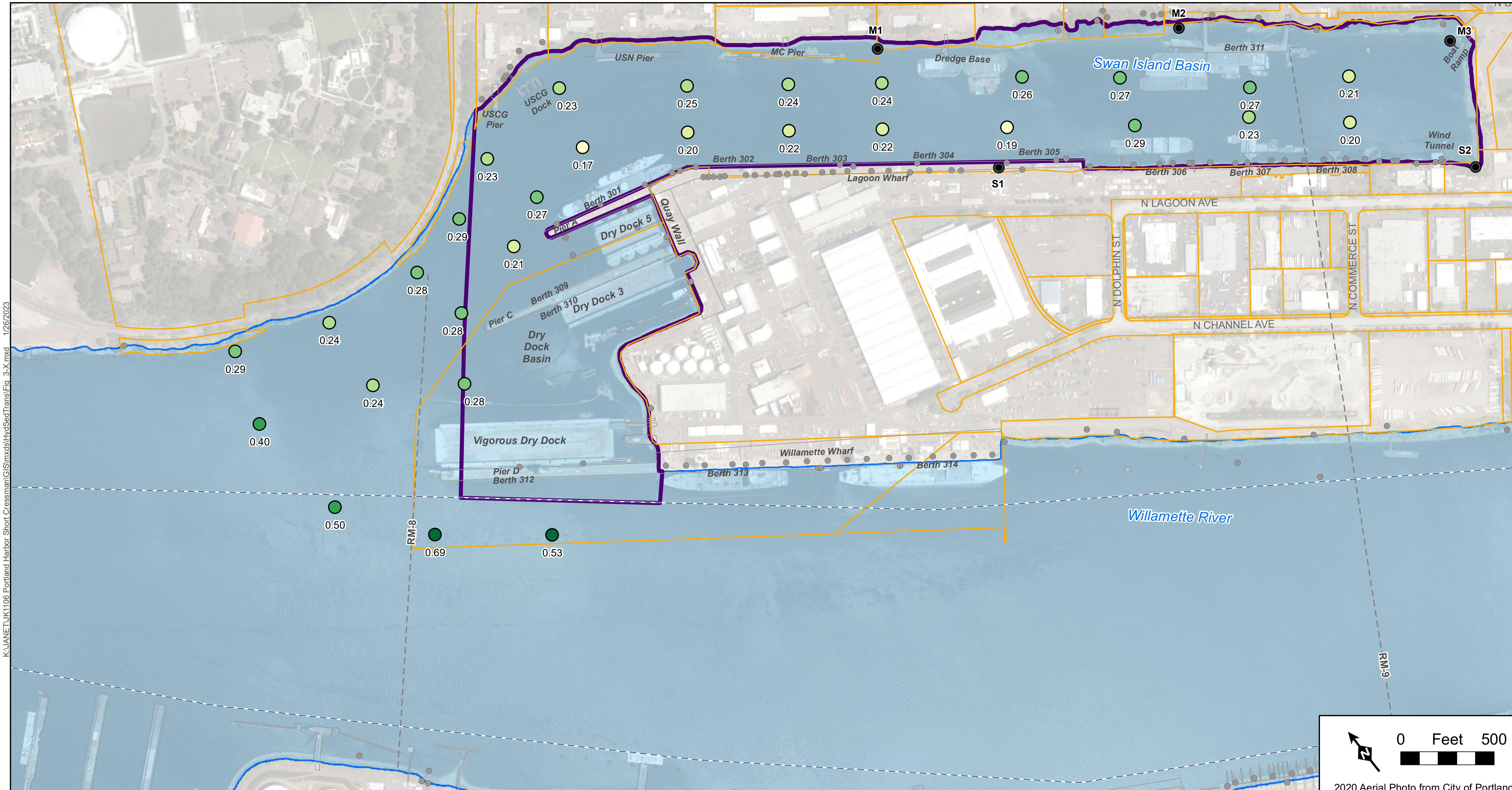
- City Stormwater Outfall
- Non-City Outfall
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-1
SEDflume Median Grain Size (Surface Layer)

Prepared on: 1/18/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



SEDflume Bulk Dry Density
grams per cubic centimeter [g/cm3])

- 0.17 - 0.20
- 0.21 - 0.22
- 0.23 - 0.25
- 0.26 - 0.30
- 0.31 - 0.50
- 0.51 - 0.69

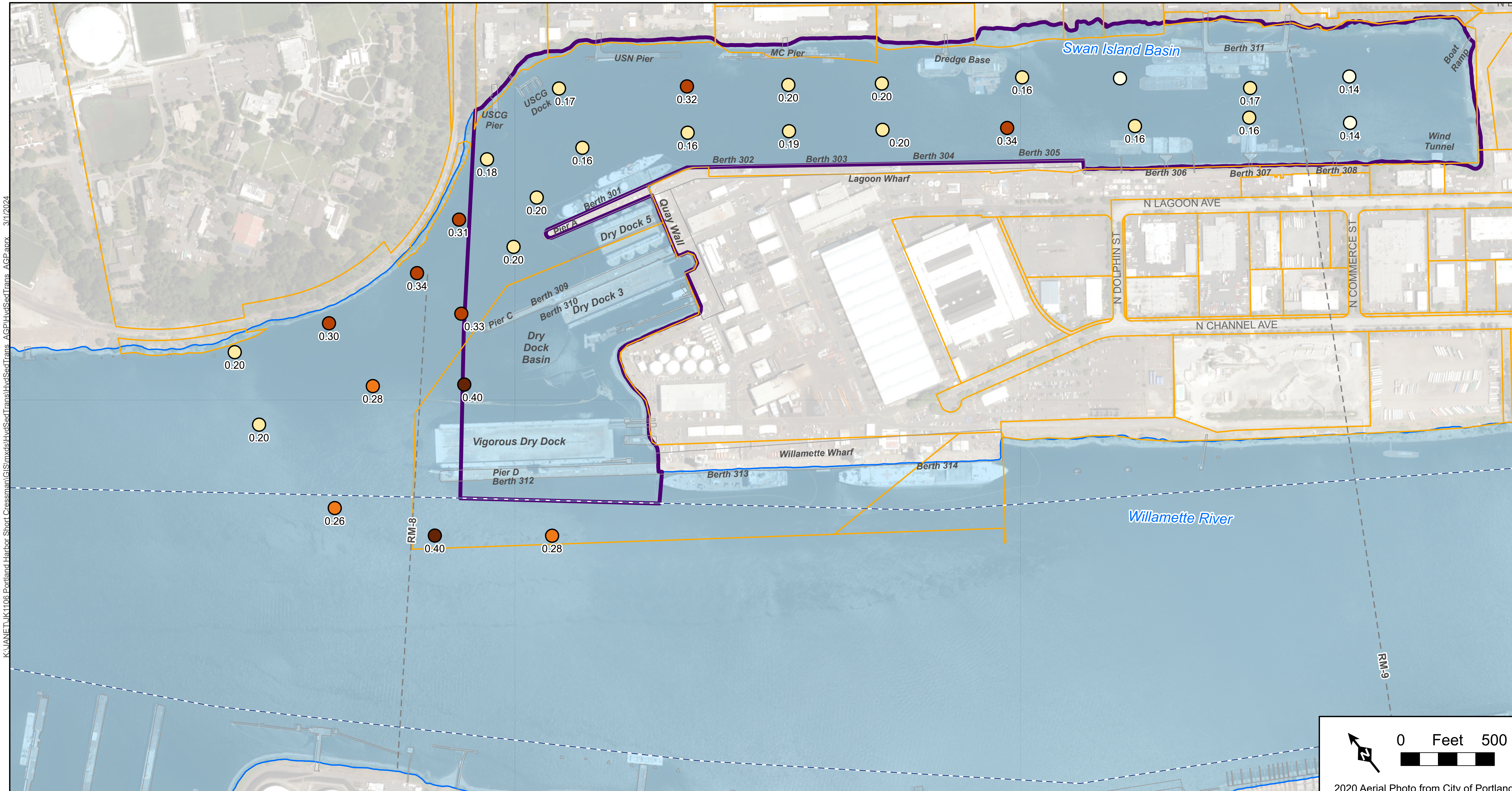
- City Stormwater Outfall
- Non-City Outfall
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-2
SEDflume Dry Bulk Density (Surface Layer)

Prepared on: 1/18/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

K:\JANET\JK1106 Portland Harbor Short Cressman\GIS\mxds\HydSedTrans\Fig_3-X.mxd 1/26/2023



SEDflume Critical Shear (Pascals (Pa))

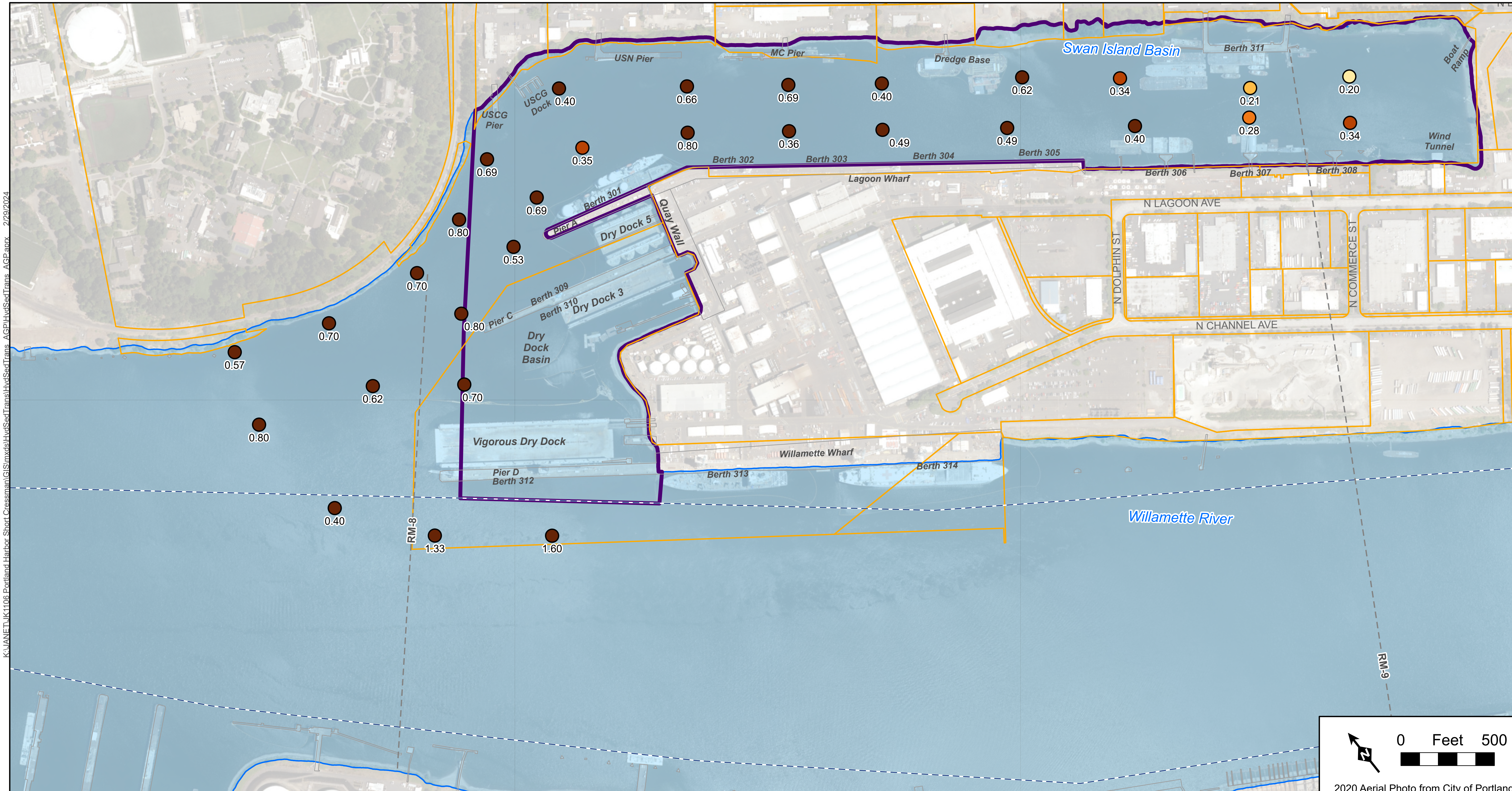
- 0.13 - 0.15
- 0.16 - 0.20
- 0.21 - 0.25
- 0.26 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40

- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-3a
SEDflume Critical Shear Stress for Erosion (Surface Layer)

Prepared on: 3/1/2024
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin



SEDflume Critical Shear (Pascals (Pa))

- 0.13 - 0.15
- 0.16 - 0.20
- 0.21 - 0.25
- 0.26 - 0.30
- 0.31 - 0.35
- 0.36 - 1.6

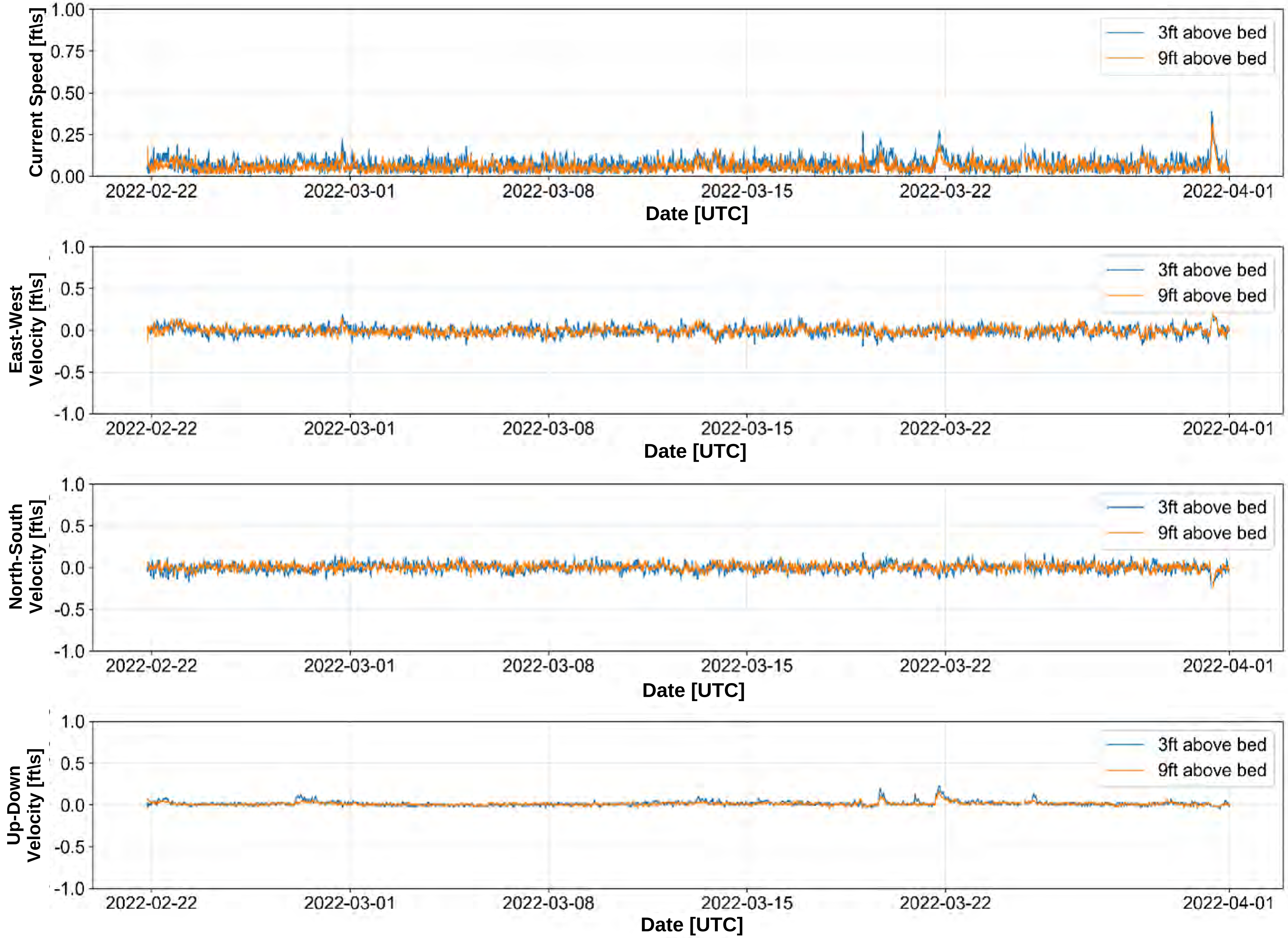
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-3b
SEDflume Critical Shear Stress for Erosion (Layer 2)

Prepared on: 2/29/2024
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

K:\ANEFT\JK1106 Portland Harbor Short Cressman\GIS\mxds\HydSedTrans\HydSedTrans_AGP\HydSedTrans_AGP.aprx 2/29/2024



ft - feet
ft/s - feet per second
ADCP - Acoustic Doppler Current Profiler
UTC - Coordinated Universal Time

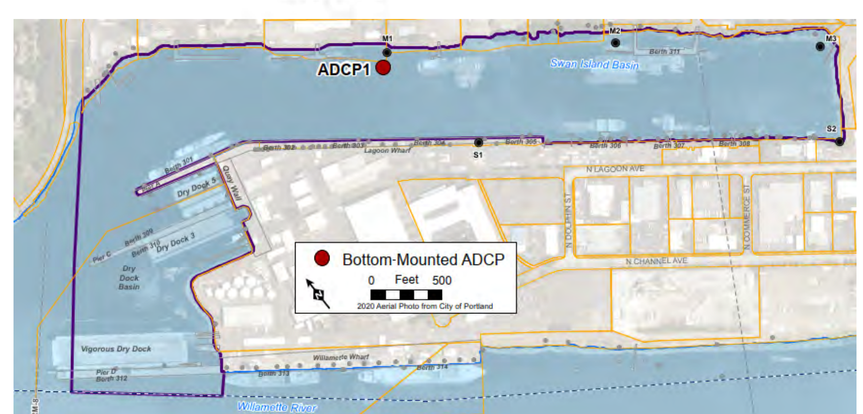
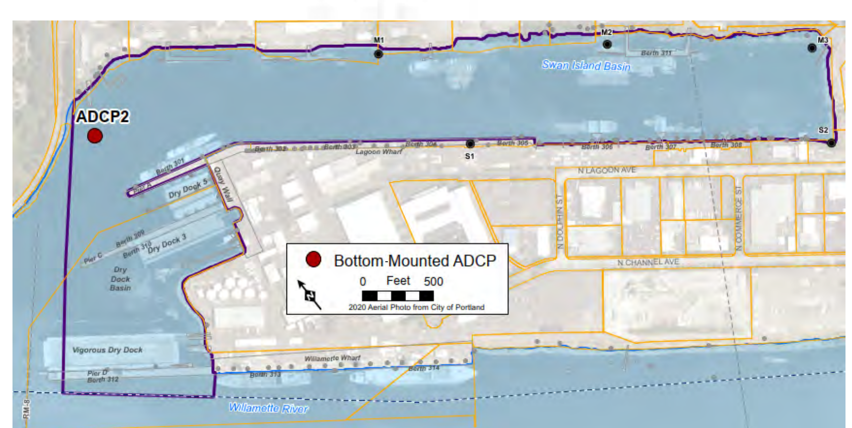


Figure 3-4
Measured Current Speed and Velocity Components at ADCP1, 3 ft and 9 ft Above Riverbed

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

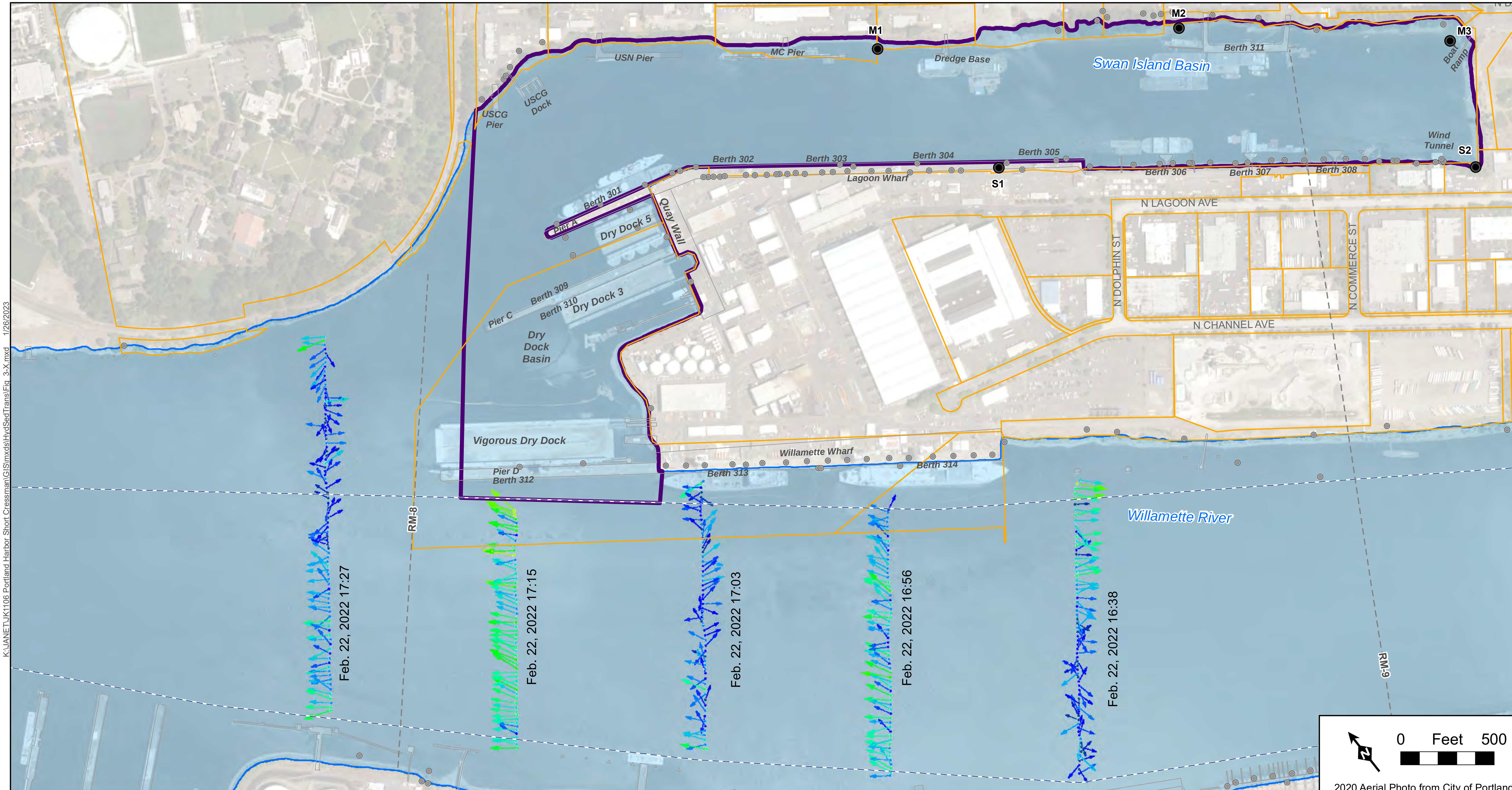


ft - feet
ft/s - feet per second
ADCP - Acoustic Doppler Current Profiler
UTC - Coordinated Universal Time

Figure 3-5
Measured Current Speed and Velocity Components at ADCP2, 3 ft and 9 ft Above Riverbed

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP HGL MOTT MACDONALD BRIDGEWATER GROUP



K:\JANET\JK1106 Portland Harbor Short Cressman\GIS\mxds\HydSedTrans\Fig_3-X.mxd 1/26/2023

Depth-Averaged Velocity Vectors (ft/s)
(magnitude given by length and color)

1.0
0.8
0.6
0.4
0.2
0.0

Maximum (1.0 ft/s)
Minimum (0.0 ft/s)

- City Stormwater Outfall
- Non-City Outfall
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

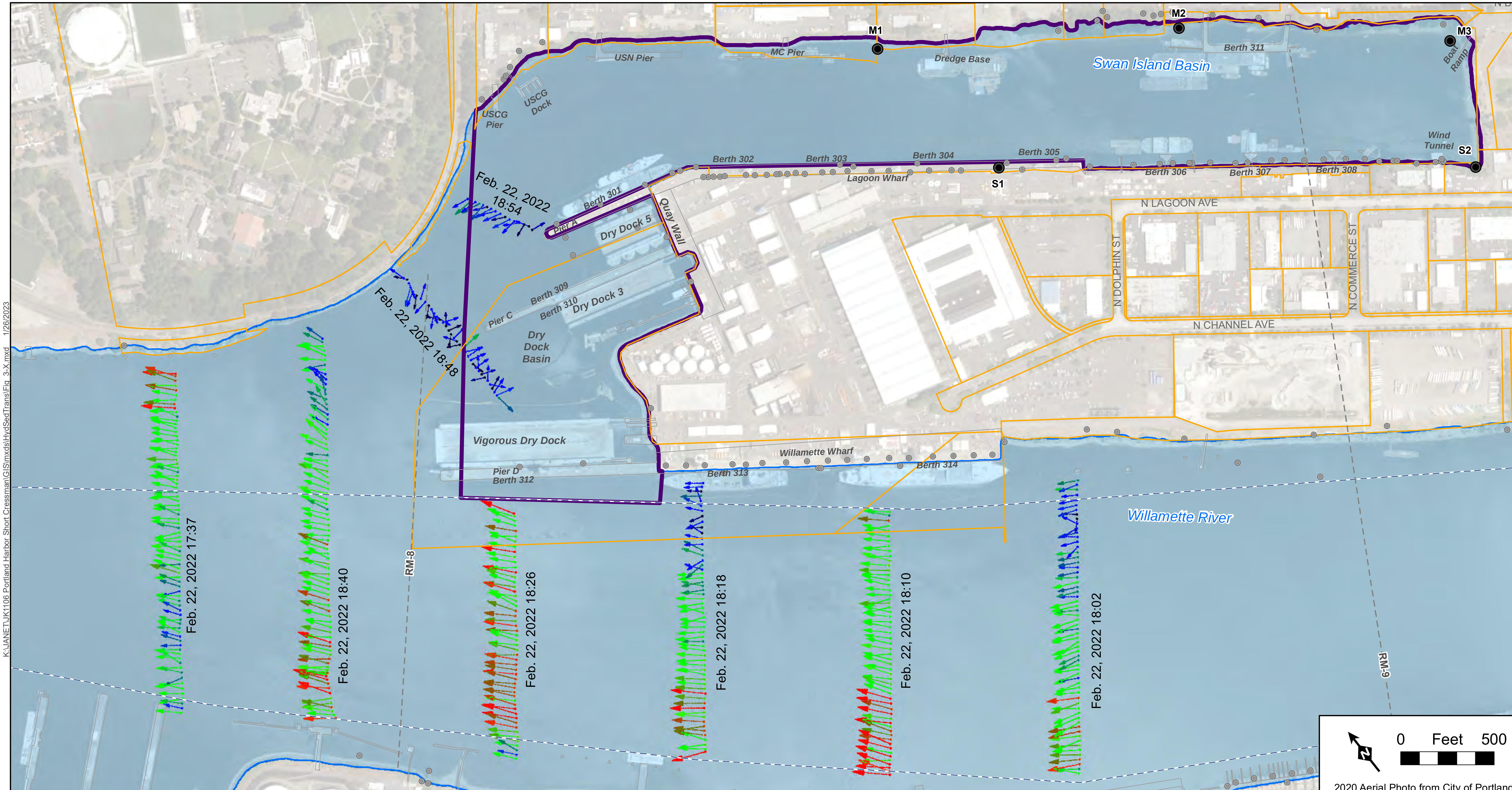
Notes:
Times in UTC (Coordinated Universal Time)

ft/s - feet per second
ADCP – Acoustic Doppler Current Profiler
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-6
Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in the Willamette River, Rising Tide Conditions

Prepared on: 1/18/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



Depth-Averaged Velocity Vectors [ft/s]
(magnitude given by length and color)

1.0
0.8
0.6
0.4
0.2
0.0

Maximum (1.0 ft/s)
Minimum (0.0 ft/s)

City Stormwater Outfall
Non-City Outfall
River Mile (RM)
Swan Island Sediment Decision Unit (SDU)
Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot
Ordinary High Water (City of Portland, 2013)

Notes:
Times in UTC (Coordinated Universal Time)

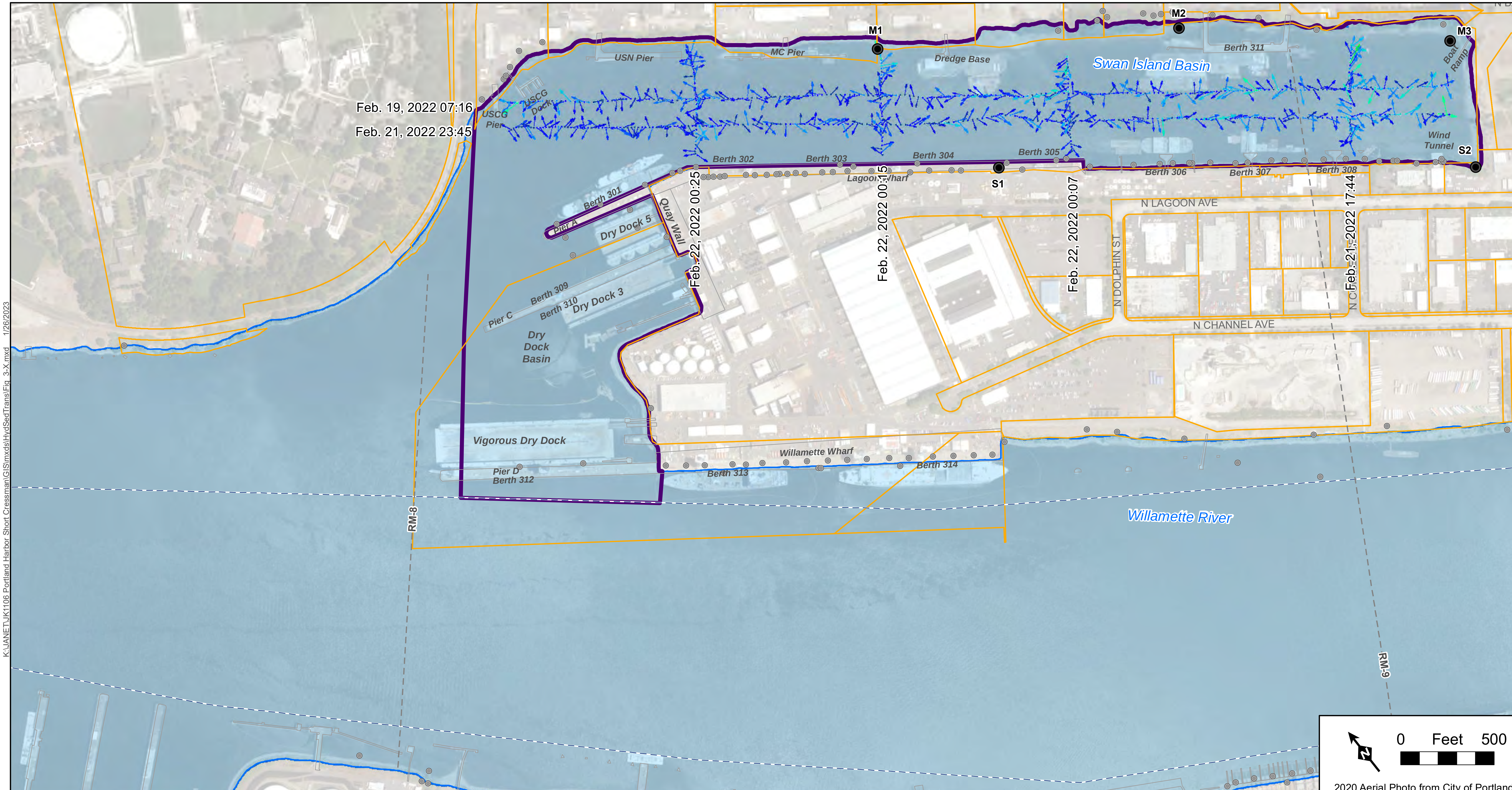
ft/s - feet per second
ADCP – Acoustic Doppler Current Profiler
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-7

Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in the Willamette River, Falling Tide Conditions

Prepared on: 1/18/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



K:\JANET\JK1106 Portland Harbor Short Cressman\GIS\mxds\HydSedTrans\Fig_3-X.mxd 1/26/2023

Depth-Averaged Velocity Vectors [ft/s]
(magnitude given by length and color)

1.0
0.8
0.6 Maximum (1.0 ft/s)
0.4 Minimum (0.0 ft/s)
0.2
0.0

- City Stormwater Outfall
- Non-City Outfall
- River Mile (RM)
- Swan Island Sediment Decision Unit (SDU)
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot
- Ordinary High Water (City of Portland, 2013)

Notes:
Times in UTC (Coordinated Universal Time)

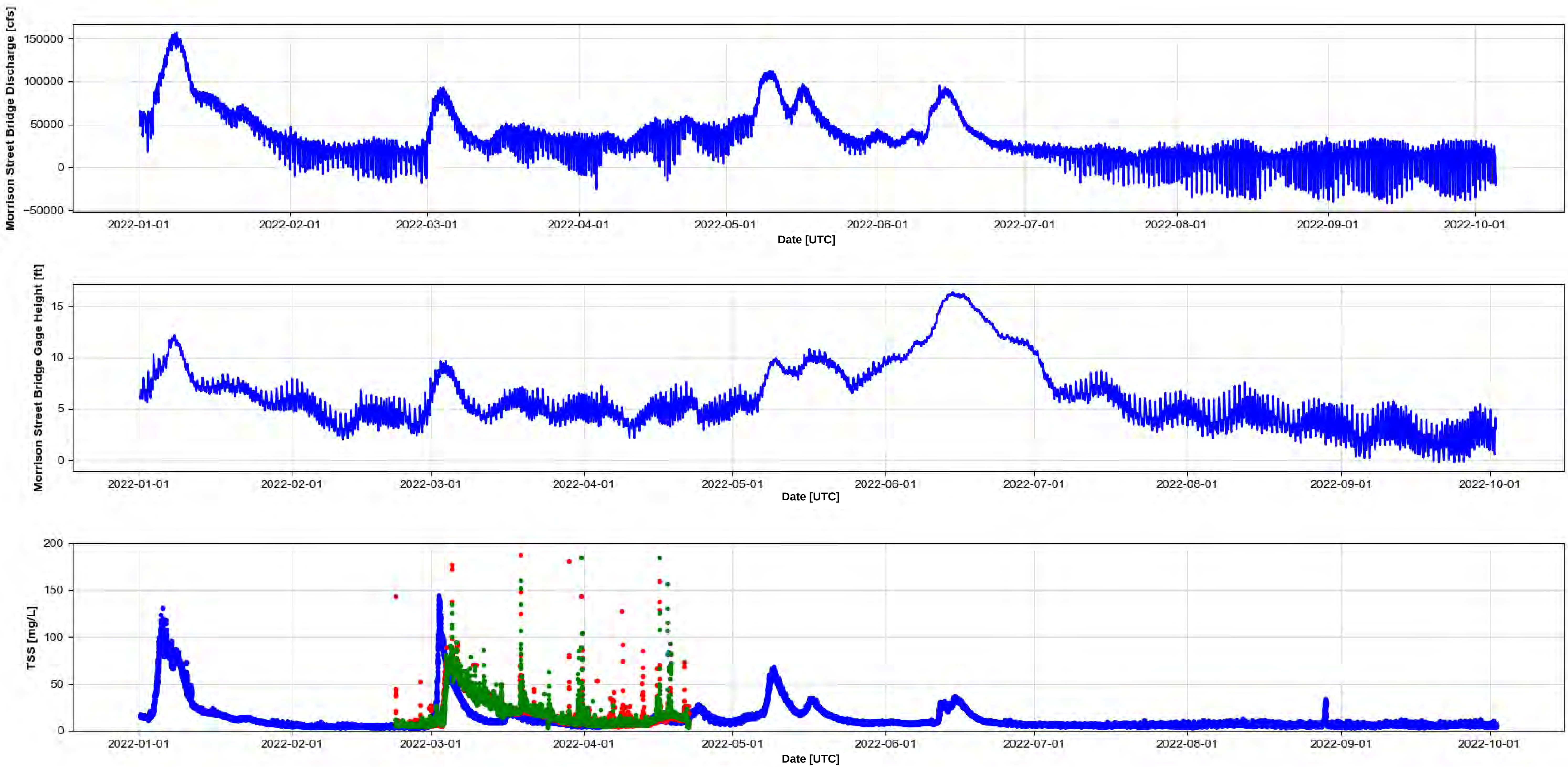
ft/s - feet per second
ADCP – Acoustic Doppler Current Profiler
MC – Marine Consortium
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USN – U.S. Navy

Figure 3-8

Vessel-Mounted ADCP Measurements (Depth-Averaged Velocities) in Swan Island Basin, Falling Tide Conditions

Prepared on: 1/18/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



- USGS Gage at Morrison Street Bridge
- CTD1
- CTD2

cfs - cubic feet per second
ft - feet
mg/L - milligrams per liter
CTD – Conductivity, Temperature, and Depth
TSS - Total Suspended Solids
USGS - U.S. Geological Survey
UTC - Coordinated Universal Time

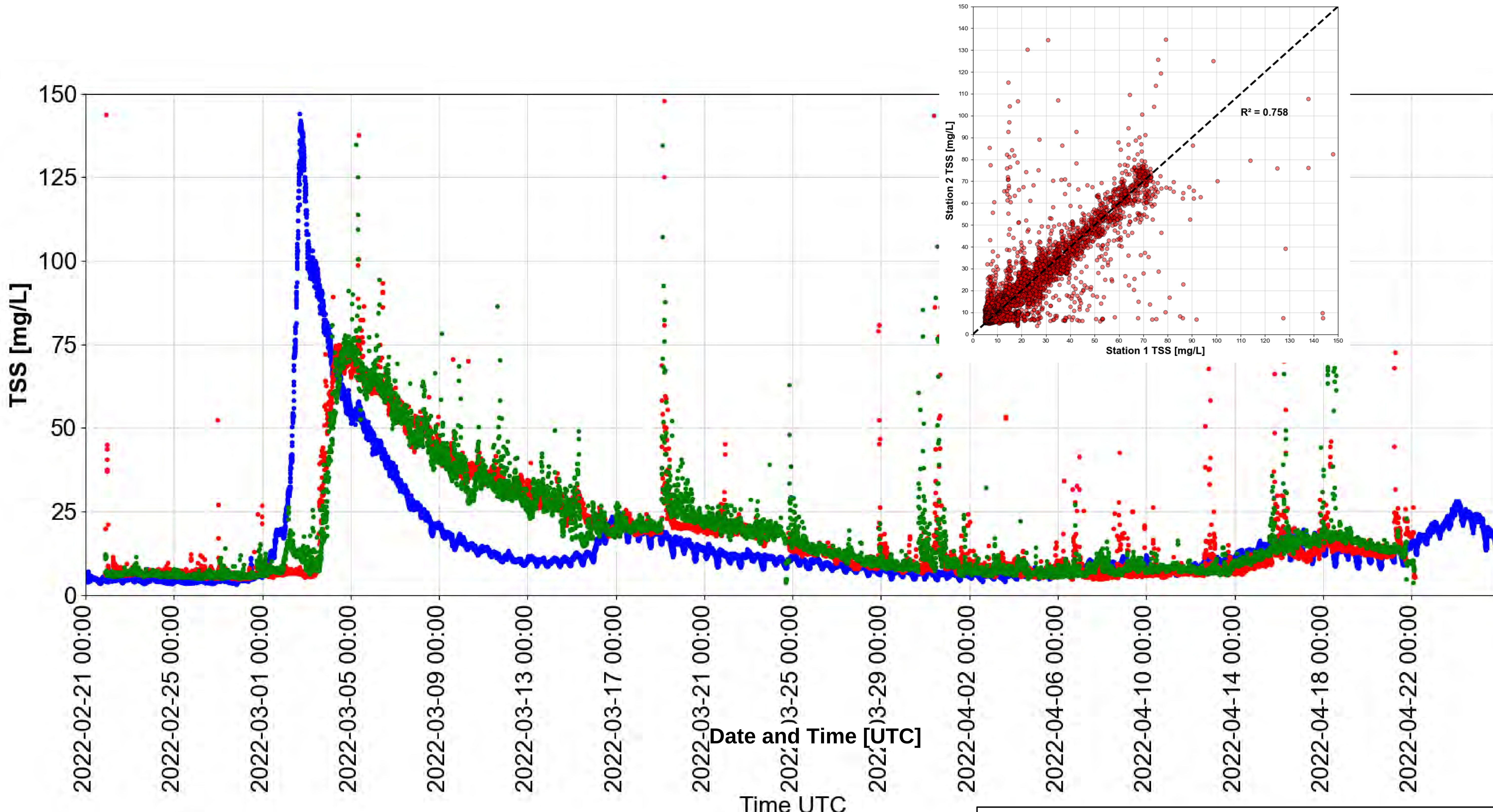
Figure 3-9

River Conditions and TSS

Concentrations in Swan Island Basin

Prepared on:2/9/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP HGL MOTT MACDONALD BRIDGEWATER GROUP



- USGS Gage at Morrison Street Bridge
- CTD1
- CTD2

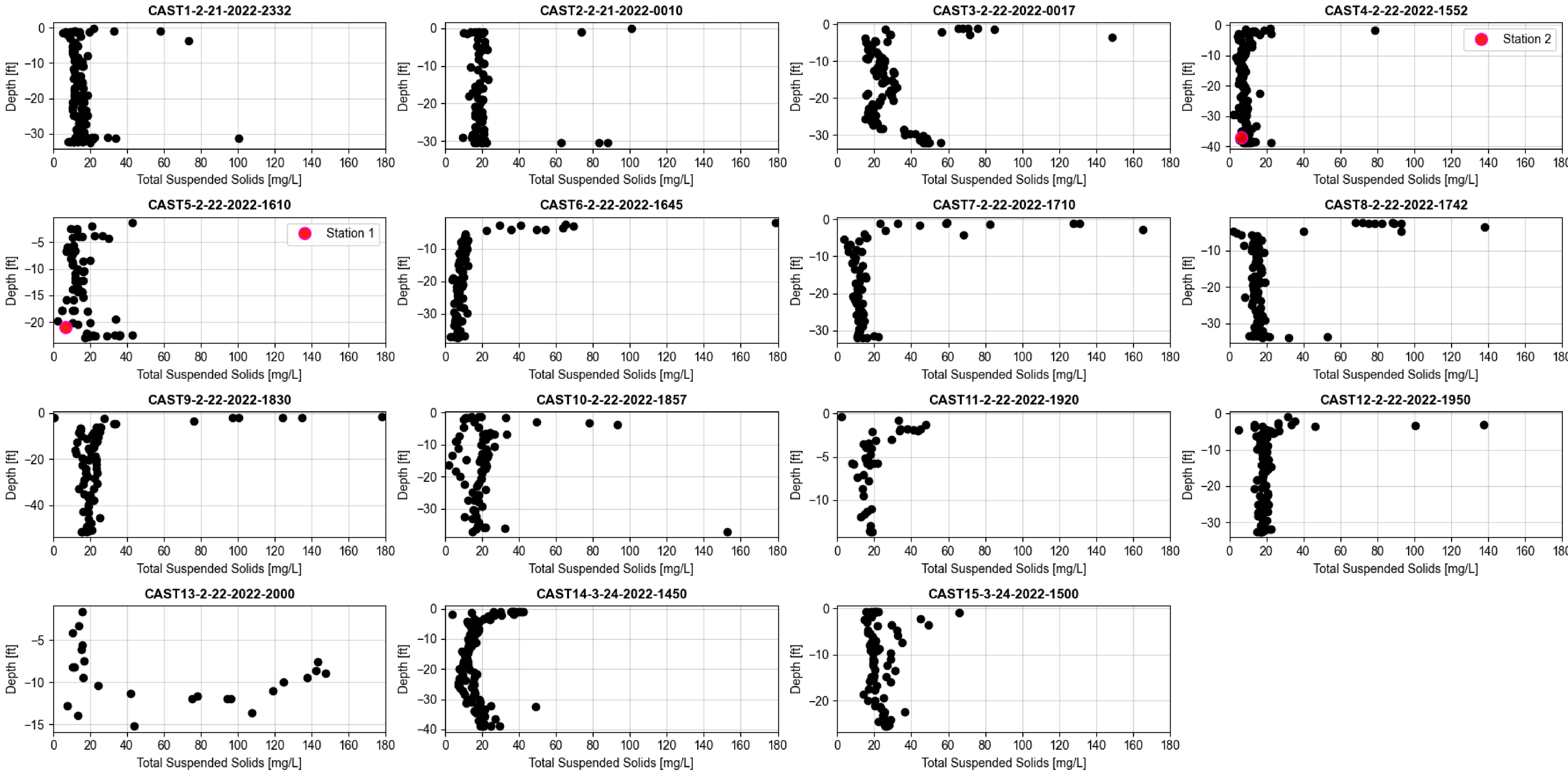
mg/L - milligrams per liter
CTD – Conductivity, Temperature, and Depth
TSS - Total Suspended Solids
USGS - U.S. Geological Survey
UTC - Coordinated Universal Time

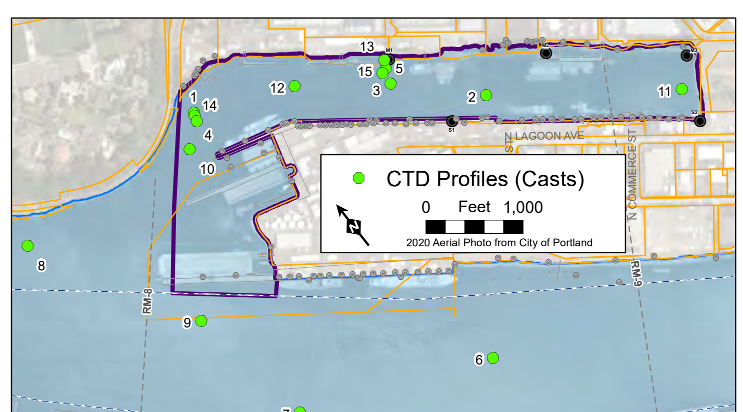
Figure 3-10

Closeup of TSS Concentrations in Willamette River and Swan Island Basin

Prepared on:2/9/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

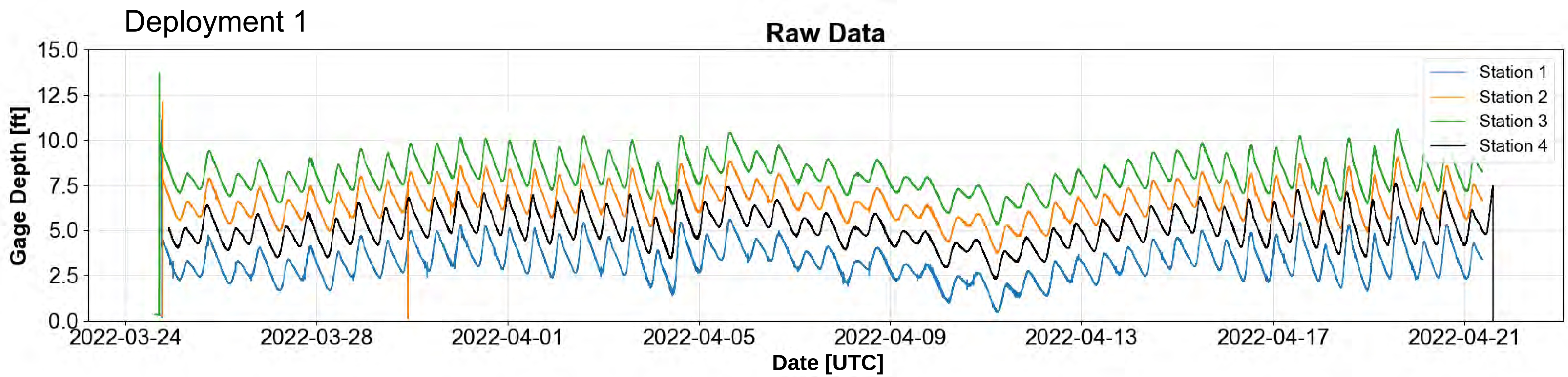


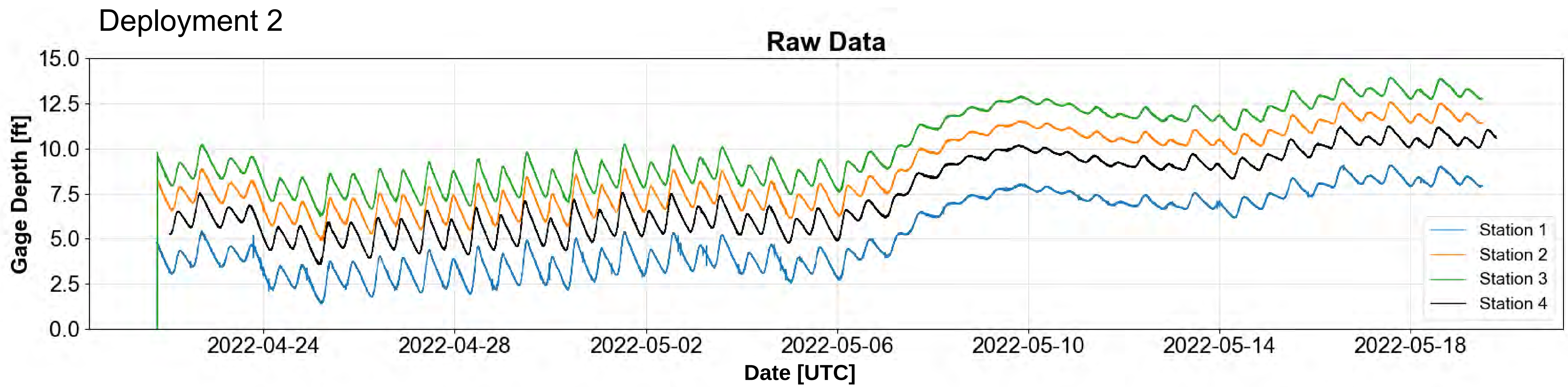


ft - feet
mg/L - milligrams per liter
CTD – Conductivity, Temperature, and Depth
TSS - Total Suspended Solids

Figure 3-11
Vertical Profiles of TSS Concentrations Measured During CTD Casts

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin





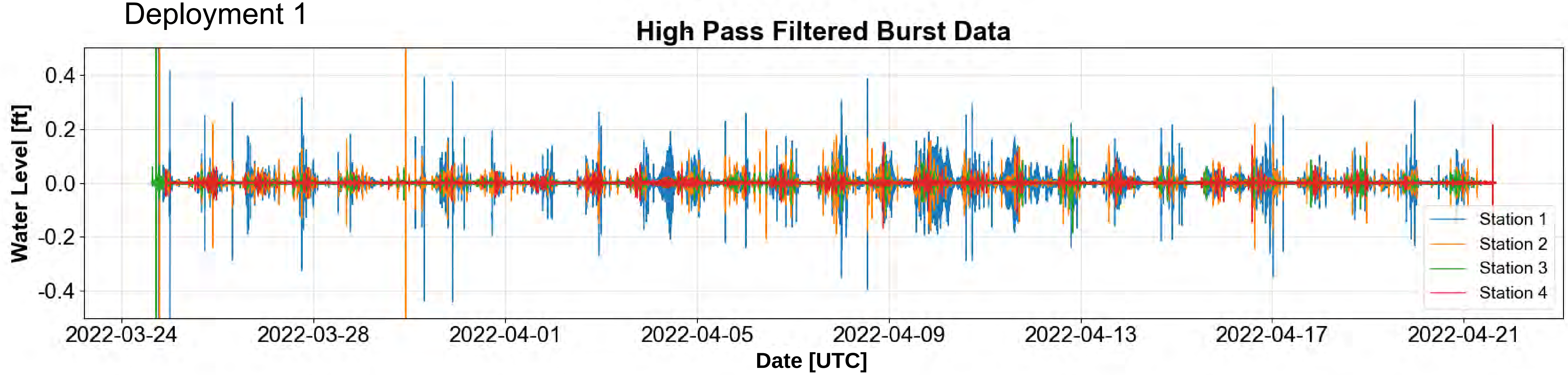
ft - feet
UTC - Coordinated Universal Time

Figure 3-12

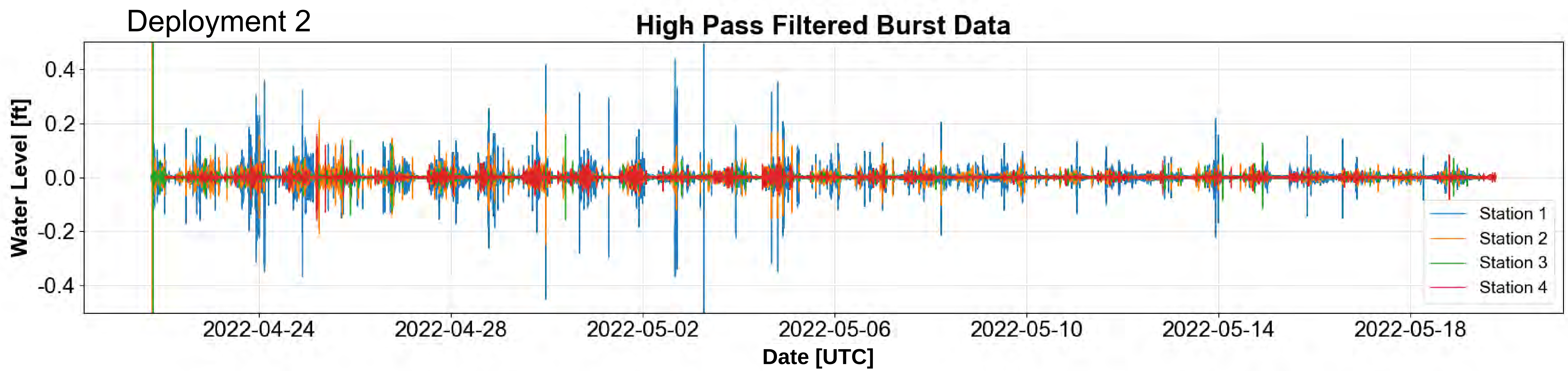
Measured Wave Gage Depth:
Deployment 1 and Deployment 2

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

Deployment 1



Deployment 2



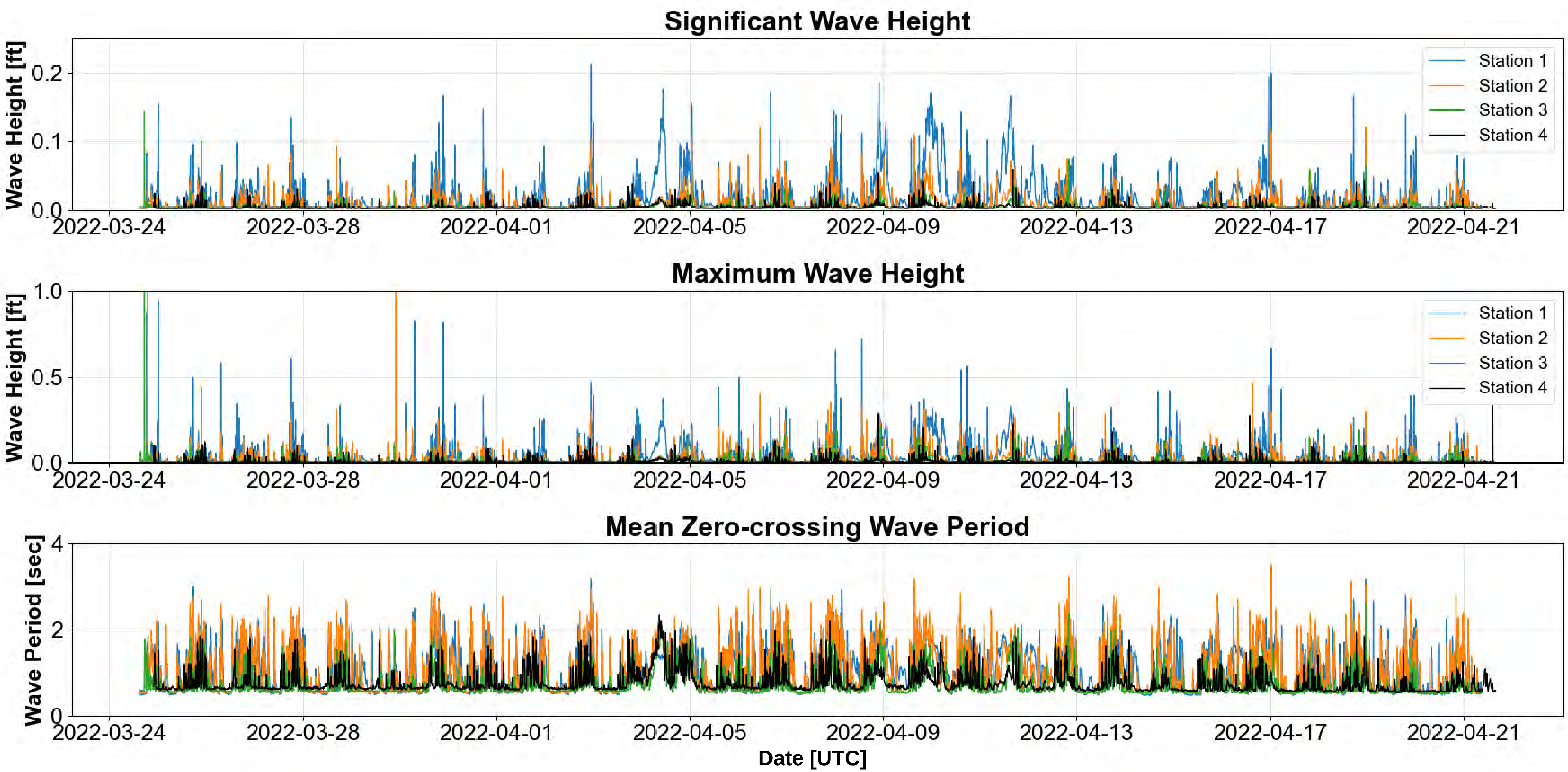
ft - feet
UTC - Coordinated Universal Time

Figure 3-13

High-Pass Filtered Water Level Fluctuations at Wave Gages: Deployment 1 and Deployment 2

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP HGL MOTT MACDONALD BRIDGEWATER GROUP

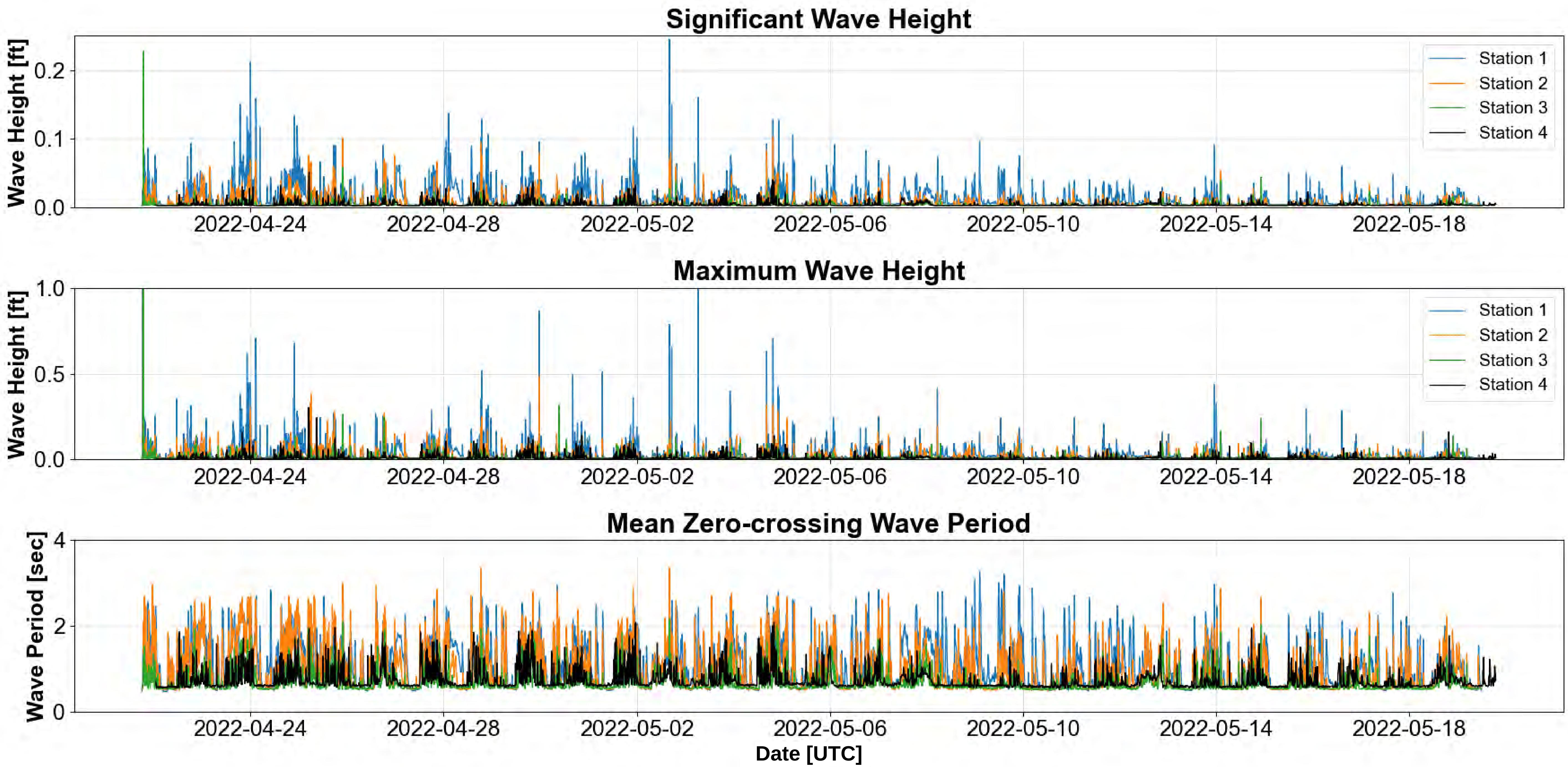


ft - feet
sec - second
UTC - Coordinated Universal Time

Figure 3-14

Calculated Wave Statistics, Deployment 1

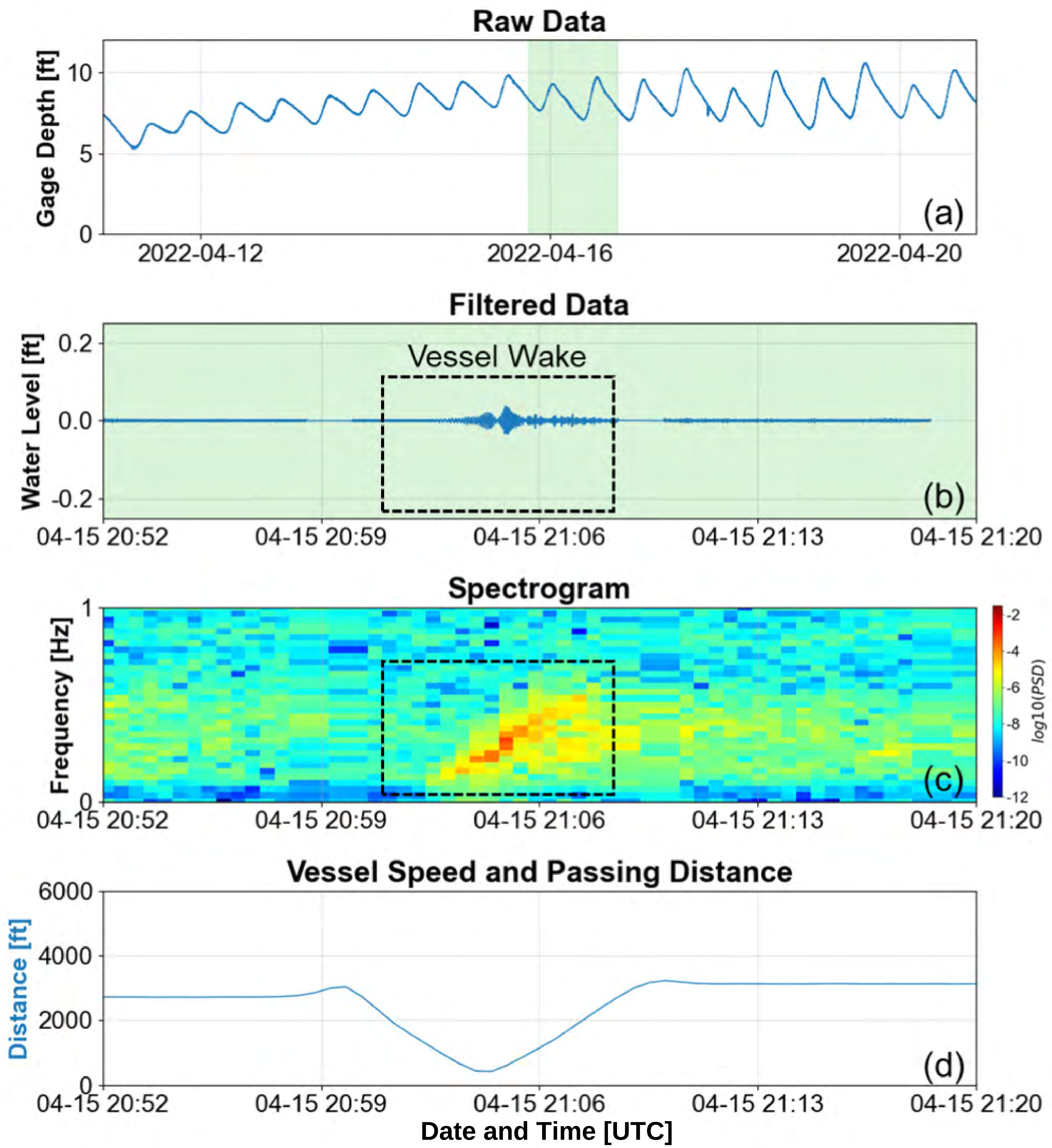
Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

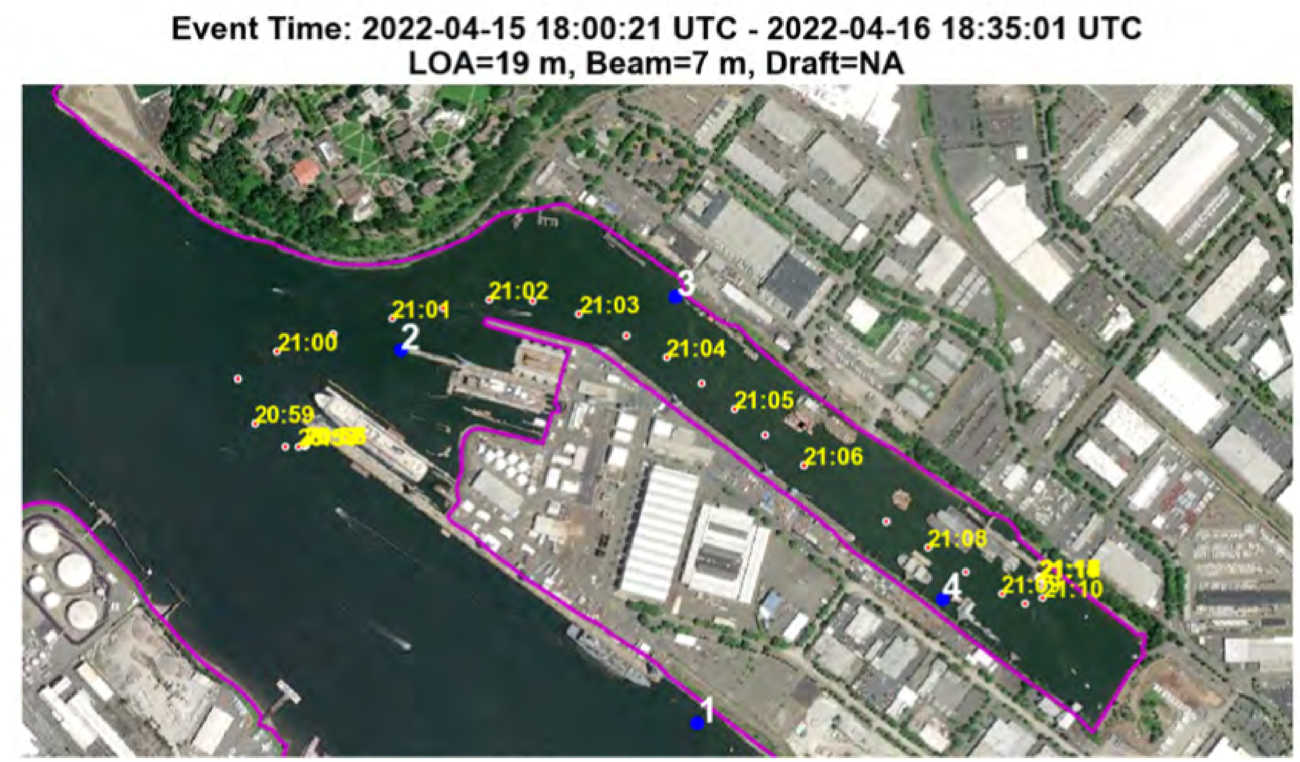


ft - feet
sec - second
UTC - Coordinated Universal Time

Figure 3-15
Calculated Wave Statistics,
Deployment 2

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin





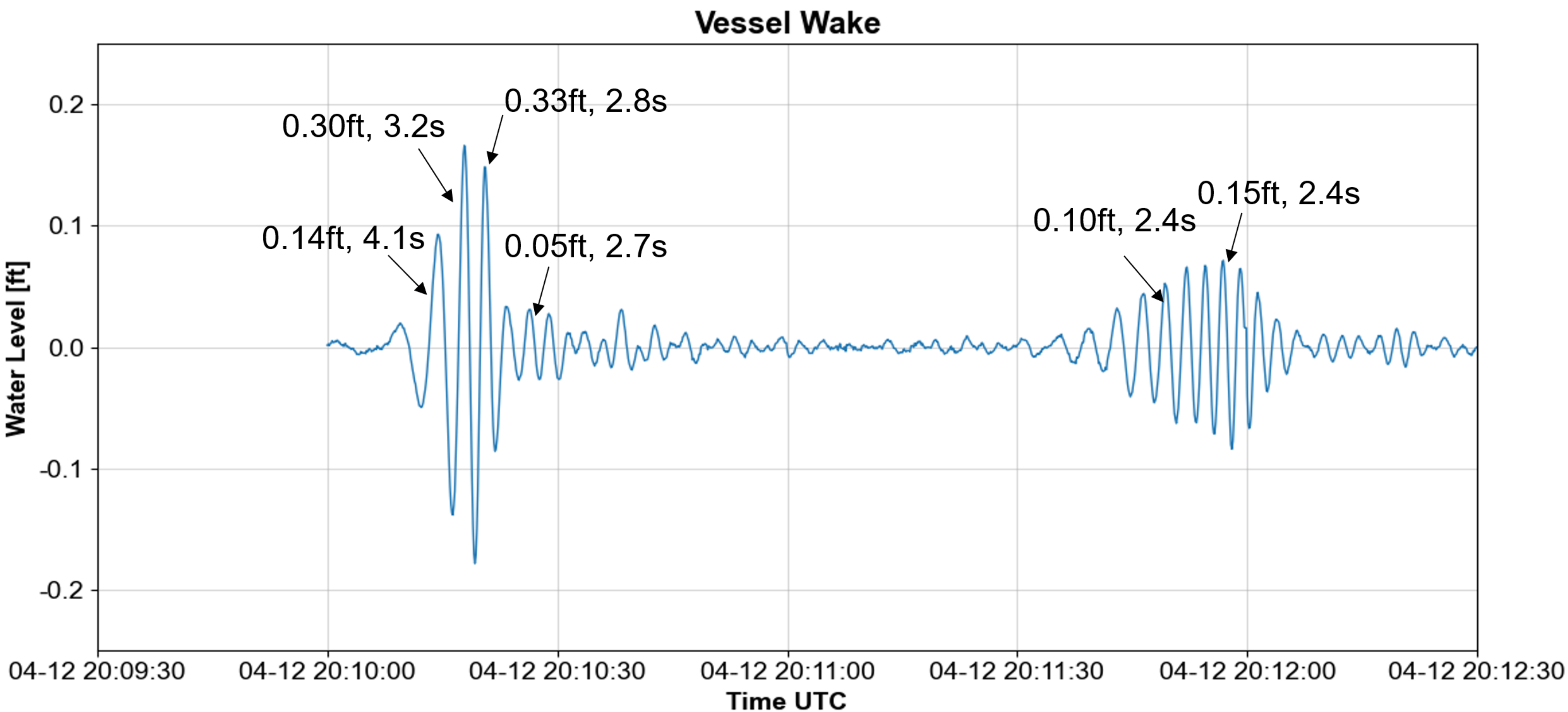
ft - feet
m - meter
Hz - hertz
LOA - Length Overall
NA - Not Available
PSD - Power Spectral Density
UTC - Coordinated Universal Time

Data Source:
Automatic Information System Data Provided by Astra Paging, Inc.

Figure 3-16
Vessel Wake Event Identified in Swan Island Basin at Station 3

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

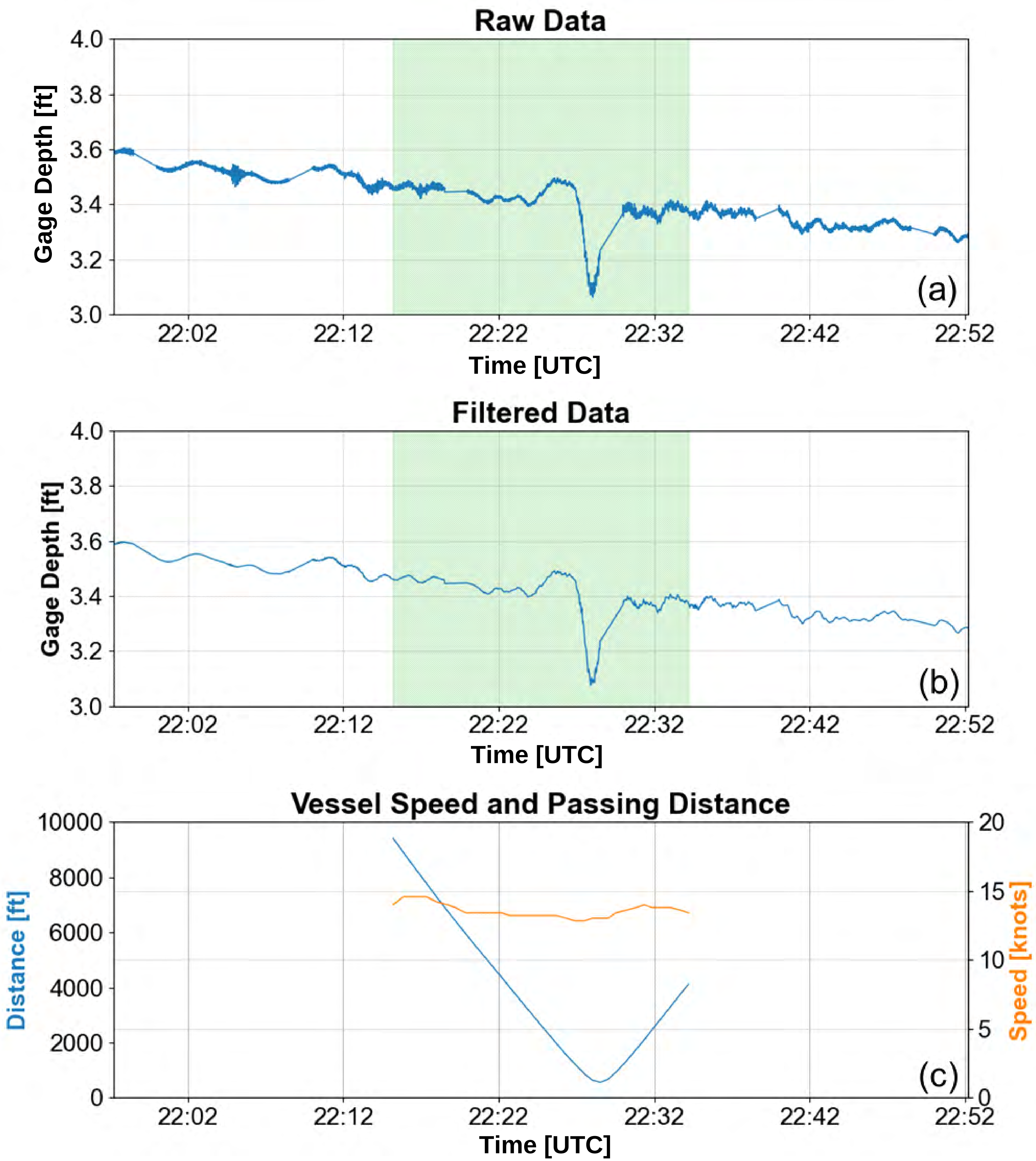
PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



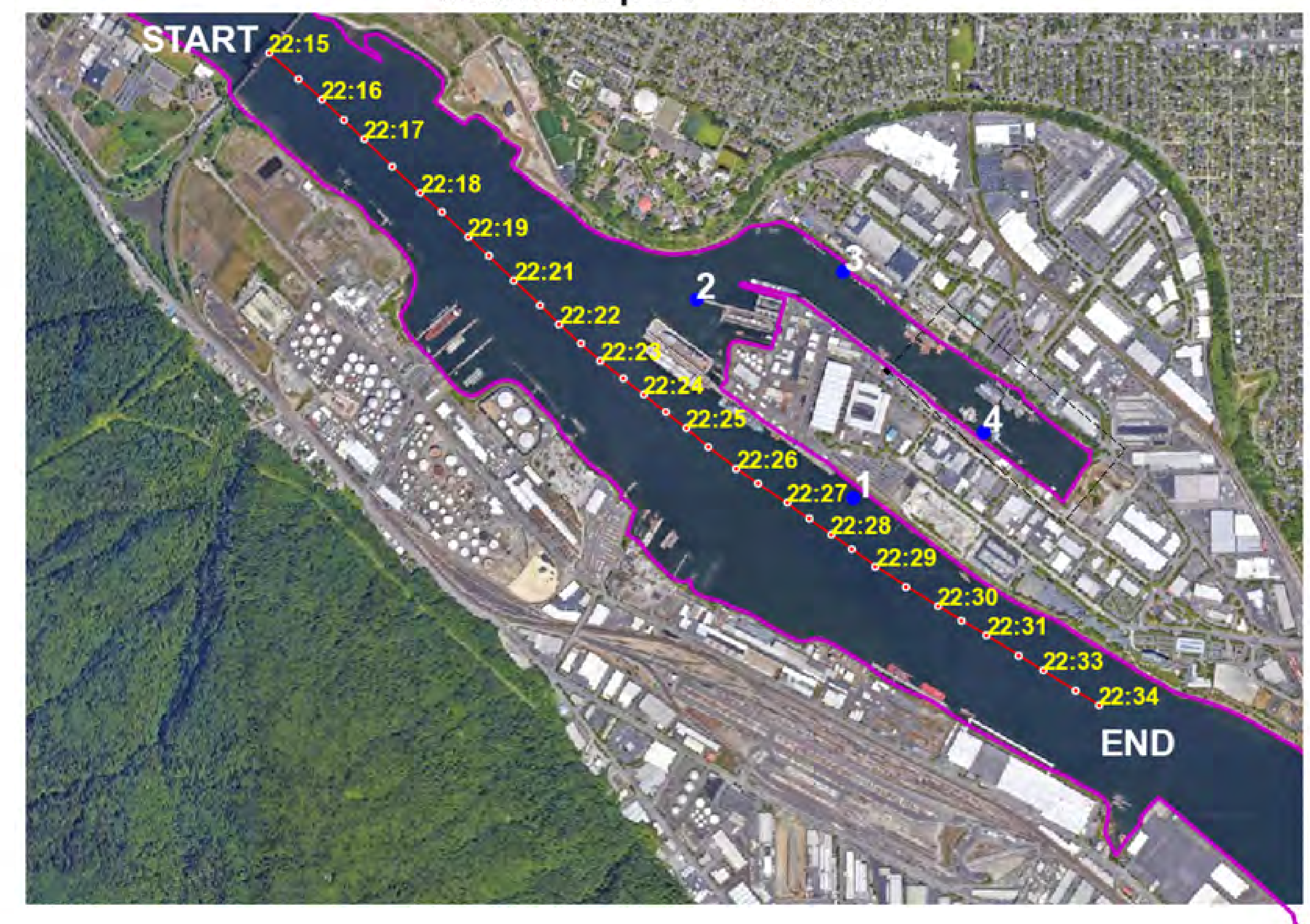
ft - feet
s -seconds
UTC - Coordinated Universal Time

Figure 3-17
Largest Vessel Wake Observed in Swan Island Basin at Station 3

Prepared on:5/24/2024
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin



Event Time: 2022-03-24 22:15:13 UTC - 2022-03-24 22:34:13 UTC
LOA=229 m, Beam=32 m, Draft=7.9 m
Maximum Speed = 14.6 knots



ft - feet
m - meter
LOA - Length Overall
UTC - Coordinated Universal Time

Data Source:
Automatic Information System Data Provided by Astra Paging, Inc.

Figure 3-18
Deep-Draft Vessel Drawdown Event Identified in Willamette River at Station 1

Prepared on:1/6/2023
Hydrodynamics and Sediment Dynamics Surveys Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

ATTACHMENTS

ATTACHMENT A

DAILY FIELD REPORTS

This page was intentionally left blank.

DAILY FIELD REPORT

DATE: **2-21-22**
PLANNED ACTIVITY PERIOD: **21-22 Feb 2022**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:					Partly Sunny		
Temperature:					50 F		
Wind:					ENE 15 mph		
Humidity:					60%		

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER: DT2002

HGL Staff: None

Teaming Partners/Subcontractors: eTRac: Adam Taylor (Project Manager), Cody Gibson (Hydrographer), Jensen Haebler (Vessel Operator), Delphis TSS: Kevin Smith (Oceanographer)

Regulatory Oversight: None

Equipment On Site: Survey Vessel Spectrum, (1) Rio Grande ADCP, (2) Workhorse Sentinel ADCP, CTD Sensors

Work Performed by PDI Activity:

Hydro/Sed Dynamic Measurements

1) Launched survey vessel from Swan Island Launch Ramp followed by multibeam patch test calibration.
2) Bathymetric imagery collected to verify there were no obstructions present that could affect successful bottom-mount deployment or recovery.
3) Deployed two (2) bottom-mounted ADCPs in Swan Island basin at predetermined locations
4) Began vessel-mounted transects (see attached photos). In total, six (6) transects were performed. During the transect data collection, one (1) water quality sample and three (3) vertical conductivity, temperature, and depth measurements (CTD casts) were performed as required.

Quality Control Activities (including field calibrations): Multibeam patch test calibration

Health and Safety Activities: Daily safety briefing - Bottom Mount Deployment, CTD & Water Sampling

Problems Encountered/Corrective Action Taken: None

Other Possible Documentation (See SP *Field Forms* Folder for photos, notes, field data, tech memo**):**

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)
☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details)
☐ No calibrations performed (if yes, list above and provide calibration forms)
☒ No unusual events (if yes, describe above in *Special Notes*)
☐ No photographs taken (if yes, place jpgs on SP with the details (see Documentation Guidance) in a spreadsheet)
☐ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Special Notes: None

Planned Activities for the Next Day:

- Continue ADCP Vessel Transects and perform water sampling and CTD casts.

DAILY QUALITY CONTROL REPORT

Signature:		**Title**: Field Coordinator

eTrac Inc.
617 S Knik-Goose Bay Rd, Ste C
Wasilla, AK 99654

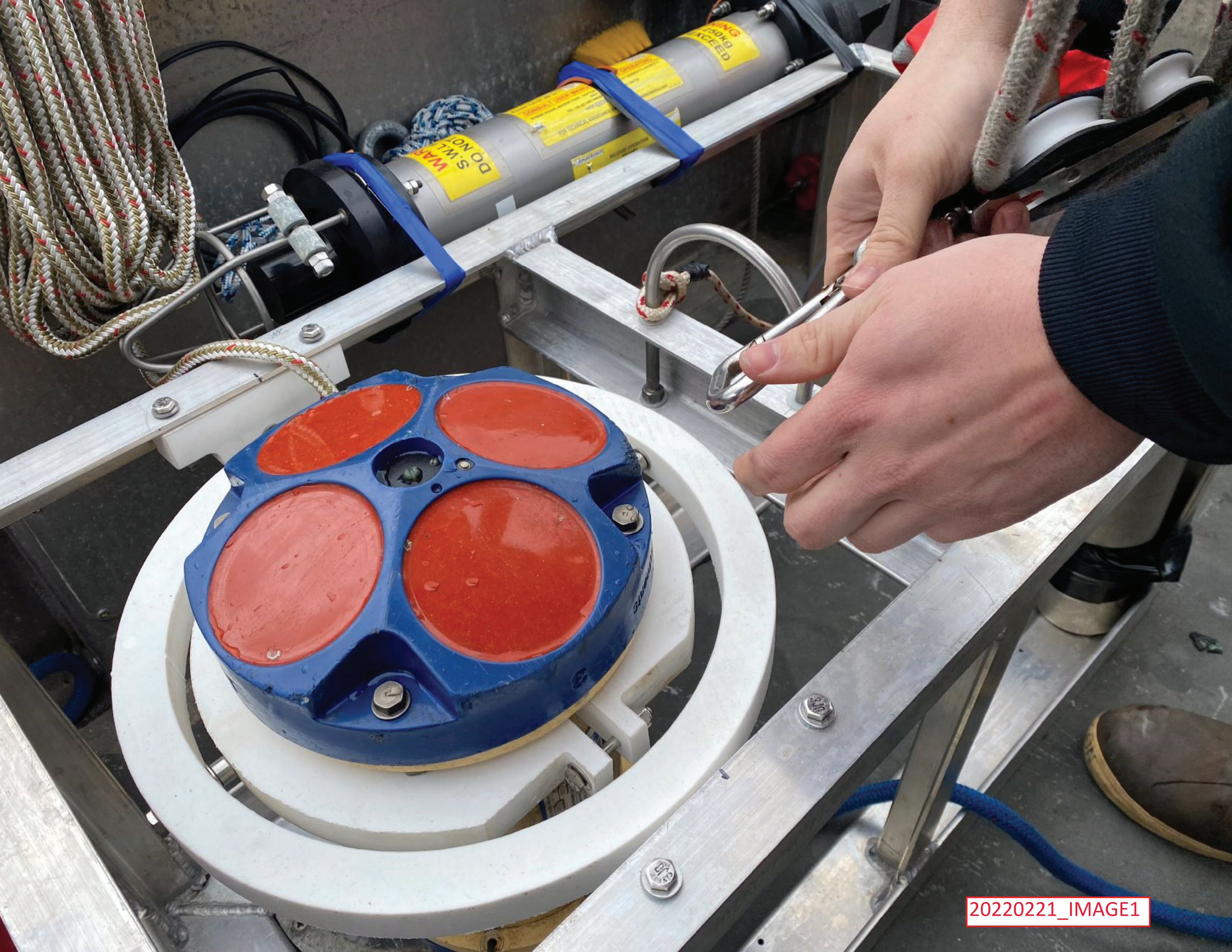
p: (415) 462-0421
f: (415) 480-2032
www.etracinc.com

Survey Field Notes:

ID	Time	Description
	2/21/22 11:10	CODY G., JENSEN H, AND ADAM T.AT SWAN ISLAND BOAT RAMP
	2/21/22 11:10	CONNECTED TO NTRIP "PDXA"
POSPAC START	2/21/22 11:12	POSPAC LOGGING
	2/21/22 13:03	ADCP 1 DEPLOYED AT (7634577.97E, E, 700828.92 N) 600KHZ ADCP, AAE RELEASE
	2/21/22 14:18	ADCP 2 DEPLOYED AT (7632764.24E, 701734.43N) 1200KHZ ADCP, EDGETECH RELEASE
	2/21/22 14:20	RETURN TO DOCK TO MOUNT ADCP AND PICK UP KEVIN S. BEGIN TRANSITS UPON MOUNTING
	2/21/22 15:09	ADCP SET UP, "SWAN ISLAND TRANSECTS"
	2/21/22 15:12	START FIRST TRANSECT "000", LINE 12 (0017),
	2/21/22 15:43	START SECOND TRANSETC "001", LINE 11 (0018), WQ SAMPLE 1 NEAR BEGINNING OF LINE
	2/21/22 15:58	START THIRD TRANSECT "002", LINE 16 NEW(0019)
	2/21/22 16:06	START 4TH TRANSECT "003, LINE 17 (0020)
	2/21/22 16:11	TRANSECT "004", FOR CTD "WC 2"
	2/21/22 16:15	TRANSECT "005", LINE 14 (0021)
	2/21/22 16:18	TRANSECT "006" FOR CTD "WC 3", WATER SAMPLE AS WELL
	2/21/22 16:25	TRANSECT "007", LINE 13 (0022)
	2/21/22 16:27	END COLLECTION FOR DAY
POSPAC STOP	2/21/22 16:28	END POSPAC LOGGING
	2/21/22 16:29	RETURN TO SWAN ISLAND BOAT LAUNCH

Photographic Log	
Taken By	Cody Gibson
20220221_IMAGE1.jpg	
Photographs date stamped	2/21/2022 12:46
Location of photographer (GPS coordinates)	LAT: 45 34 7.739, LONG: 122: 43 0.39
Direction photo was taken	N/A
Subject of Photo	ADCP
Significance (why it was taken)	SHOWING ADCP MOUNT
Photo ID number	20220221_IMAGE1.jpg
Brief description	ADCP BOTTOM MOUNT, SHOWING THE ORIENTATION AND CLOSE UP OF THE ADCP USED
Noteworthy characteristics (ex. sheen produced during collection)	

Photographic Log	
Taken By	Cody Gibson
20220221_IMAGE2.jpg	
Photographs date stamped	2/21/2022 12:55
Location of photographer (GPS coordinates)	LAT
Direction photo was taken	N/A
Subject of Photo	ADCP AND CTD BOTTOM MOUNT
Significance (why it was taken)	ADCP AND CTD AFFIXED TO THE BOTTOM MOUNT
Photo ID number	20220221_IMAGE2.jpg
Brief description	IMAGE SHOWS CREW GETTING THE ADCP AND CTD BOTTOM MOUNT READY FOR DEPLOYMENT
Noteworthy characteristics (ex. sheen produced during collection)	


20220221_IMAGE1

DAILY FIELD REPORT

DATE: **03-24-2022**
PLANNED ACTIVITY PERIOD: **24-25 FEB**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:					Sunny		
Temperature:					56 F		
Wind:					ENE 5 mph		
Humidity:					20%		

PROJECT:Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER:DT2002

HGL Staff: None

Teaming Partners/Subcontractors: eTrac: Adam Taylor (Project Manager), Cody Gibson (Hydrographer),Matthew Larson (Vessel Operator), Delphis TSS: Kevin Smith (Oceanographer)

Regulatory Oversight: None

Equipment On Site: Survey Vessel Spectrum,(2) Workhorse Sentinel ADCP, CTD, (4) Wave Gauge Sensors

Work Performed by PDI Activity:

Hydro/Sed Dynamic Measurements

1) Take CTD Casts over Bottom-Mount Locations.
2) Recover ADCP bottom mounts from two (2) locations, retrieve data from ADCP and CTDs.
3) Re-Deploy two (2) bottom-mounted ADCP's and CTD's.
4) Deployment of four (4) wave gauges

Quality Control Activities (including field calibrations): None

Health and Safety Activities: Daily safety briefing – Bottom Mount Recovery and Deployment, CTD and Wave Gauge Deployment

Problems Encountered/Corrective Action Taken: None

Special Notes: None

Other Possible Documentation:

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)

☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details)

☒ No calibrations performed (if yes, list above and provide calibration forms)

☒ No unusual events (if yes, describe above in *Special Notes*)

☐ No photographs taken (if yes, place jpgs on SP with the details (see Documentation Guidance) in a spreadsheet)

☒ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Planned Activities for the Next Day:

- None

Signature: **Title**: Field Coordinator

eTrac Inc.
617 S Knik-Goose Bay Rd, Ste C
Wasilla, AK 99654

p: (415) 462-0421
f: (415) 480-2032
www.etracinc.com

Survey Field Notes:

ID	UTC Time	Description
	3/24/22 14:55	CODY, ADAM, KEVIN AND MATT ON SV SPECTRUM TAKING CTD CASTS
	3/24/22 14:57	CTD & WC 1 20220324 E: 7632754.04 N: 701682.96
	3/24/22 15:05	CTD & WC 2 20220324 E: 7634531.59 N: 700825.39
	3/24/22 17:28	DEPLOYED WAVE GAUGE #3 E: 7633975.78 N: 701402.07
	3/24/22 17:48	DEPLOYED WAVE GAUGE #4 E: 7635716.43 N: 699287.65
	3/24/22 19:22	DEPOLOYED WAVE GAUGE # 1 E: 7634012.62 N: 698493.09
	3/24/22 19:24	DEPLOYED WAVE GAUGE #2 E: 7632097.40 N: 701099.26
	3/24/22 19:22	DEPLOYED ADCP BOTTOM MOUNT #2 EDGETECH, E: 7632765.02 N: 701733.16 1200KHZ
	3/24/22 19:41	DEPLOYED ADCP BOTTOM MOUNT #1 AAE, E: 7634581.73 N: 700832.00 600KHZ


WAVE GAUGE 3
WAVE GAUGE 2
WAVE GAUGE 4
WAVE GAUGE 1

Wave Gauge coordinates			
NAME	Northing	Easting	Property
WAVE GAUGE 1	698493.09	7634012.62	Port of Portland
WAVE GAUGE 2	701099.26	7632097.4	Vigor
WAVE GAUGE 3	701402.07	7633975.78	Fred Devine
WAVE GAUGE 4	699287.65	7635716	Vigor

Notes:

Datum is NAD83

Coordinate System is State Plane Oregon North, International Feet

20220221_IMAGE2

DAILY FIELD REPORT

DATE: **03-24-2022**
PLANNED ACTIVITY PERIOD: **24-25 FEB**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:					Sunny		
Temperature:					56 F		
Wind:					ENE 5 mph		
Humidity:					20%		

PROJECT:Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER:DT2002

HGL Staff: None

Teaming Partners/Subcontractors: eTrac: Adam Taylor (Project Manager), Cody Gibson (Hydrographer),Matthew Larson (Vessel Operator), Delphis TSS: Kevin Smith (Oceanographer)

Regulatory Oversight: None

Equipment On Site: Survey Vessel Spectrum,(2) Workhorse Sentinel ADCP, CTD, (4) Wave Gauge Sensors

Work Performed by PDI Activity:

Hydro/Sed Dynamic Measurements

1) Take CTD Casts over Bottom-Mount Locations.
2) Recover ADCP bottom mounts from two (2) locations, retrieve data from ADCP and CTDs.
3) Re-Deploy two (2) bottom-mounted ADCP's and CTD's.
4) Deployment of four (4) wave gauges

Quality Control Activities (including field calibrations): None

Health and Safety Activities: Daily safety briefing – Bottom Mount Recovery and Deployment, CTD and Wave Gauge Deployment

Problems Encountered/Corrective Action Taken: None

Special Notes: None

Other Possible Documentation:

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)
☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details)
☒ No calibrations performed (if yes, list above and provide calibration forms)
☒ No unusual events (if yes, describe above in *Special Notes*)
☐ No photographs taken (if yes, place jpgs on SP with the details (see Documentation Guidance) in a spreadsheet)
☒ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Planned Activities for the Next Day:

- None

Signature: **Title**: Field Coordinator

Delphis Technical Support and Solutions, LLC

Technical Memo

Project: Swan Island: Sensor Deployment and Recovery

Date: March 25,2022

Prepared For: Scott Fenical | Mott MacDonald (MM); Jeff Gadt | HydroGeoLogic, Inc.

Prepared By: Kevin Smith | Principal | Delphis Technical Support and Solutions, LLC. (DTSS)

Subject: Wave Gauge Deployment 1 - Locations

Per client and Port request, this memo was prepared to summarize the wave gauge deployment that occurred around Swan Island near Portland, Oregon on March 24, 2022. These waves gauges were to be deployed concurrently with the bottom mounted ADCPs and CTDs deployed at the site in February but were delayed and deployed during the 30-day service trip of the bottom mounts. Wave gauges were deployed concurrently at four (4) locations within the site during this deployment effort as identified in in Figure 1.

Figure 1. Wave Gauge Locations – Swan Island, Oregon.

Each wave gauge is secured to a chain at an estimated elevation of approximately +3’ NAVD88 based on provided depths for the site. The chain is in-turn suspended from a pile or whaler of opportunity at each location so the anchor is in contact with the bottom and the chain drawn taut to dampen any vertical motion in the system. The equipment is shown in Figure 2.

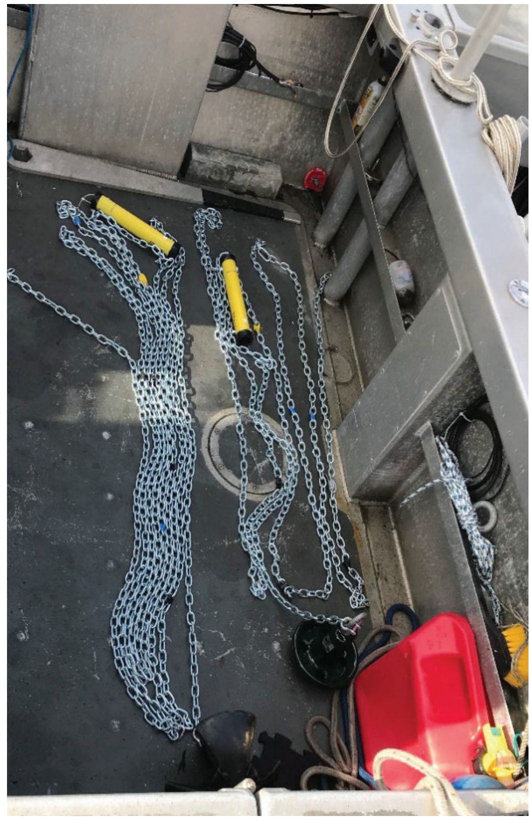


Figure 2. Suspended wave gauge equipment.

With the exception of Station 4, all gauges were deployed in their pre-planned locations. Station 4 was moved approximately 500 feet so uth to another exposed dolphin due to barge barges and line obstructing safe access to the planned location.

NAME	Date	Time (UTC)	ORSP-North (X)	ORSP-North (Y)	LATITUDE	LONGITUDE
Wave Gauge 1	3/24/2024	17:20	7634013	698493	45° 33' 39.72" N	122° 43' 32.74" W
Wave Gauge 2	3/24/2024	17:40	7632097	701099	45° 34' 05.45" N	122° 43' 33.75" W
Wave Gauge 3	3/24/2024	18:30	7633976	701402	45° 34' 08.95" N	122° 43' 07.46" W
Wave Gauge 4	3/24/2024	18:50	7635716	699288	45° 33' 48.55" N	122° 42' 42.19" W

While using ladder stand-offs to prevent slippage down the piles at Stations 1 and 2, the deployed wave gauges do not interfere with ladders or impinge navigational or terminal operational safety at any of the locations. These locations and mounting tactics were described prior to deployment. All gear will be removed from their locations at the completion of the project phase leaving no trace.

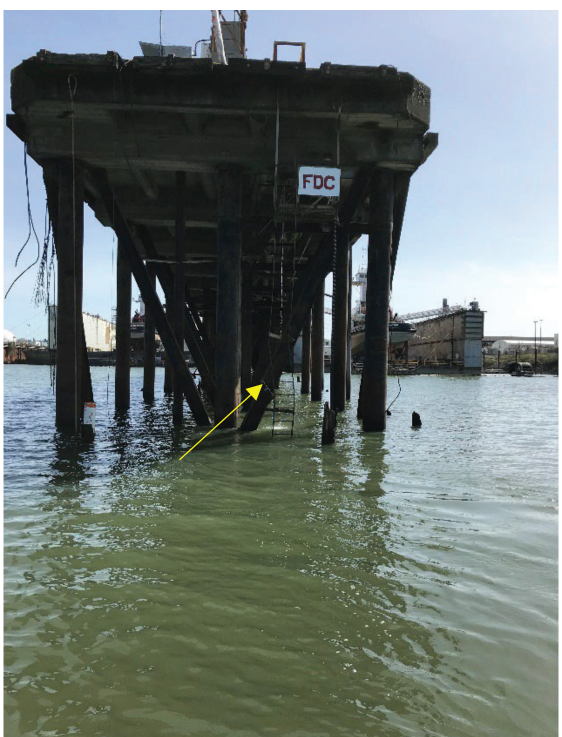
The following pages provide the deployed location with photograph for each gage.

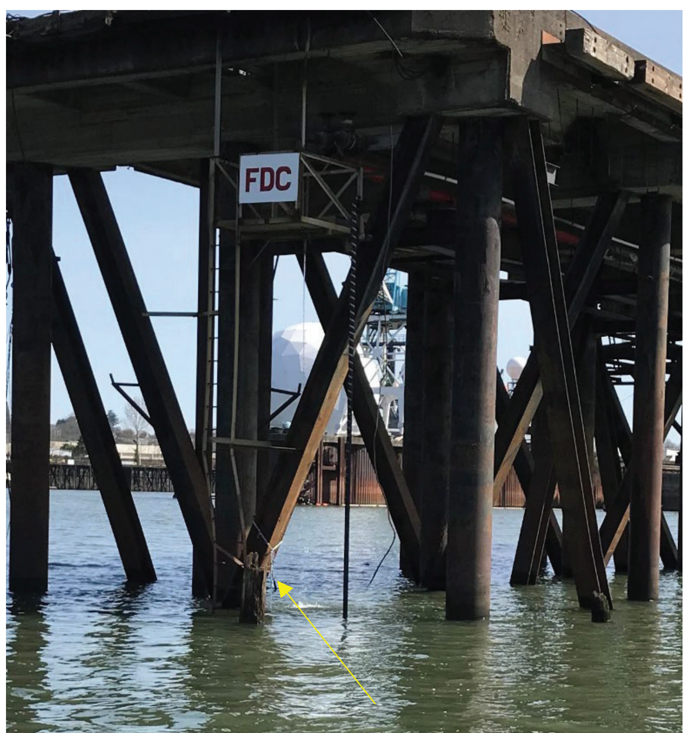
<u>WAVE GAUGE 1, OUTER (WILLAMETTE RIVER)</u>

Wave Gauge 1	3/24/2024	17:20	7634013	698493	45° 33' 39.72" N	122° 43' 32.74" W

Station Depth: Approx. -22’ NAVD88

<u>WAVE GAUGE 2, ENTRANCE (End of PIER C)</u>

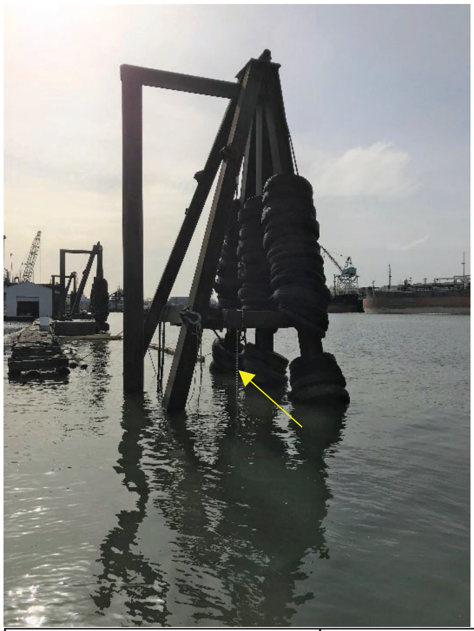




Wave Gauge 2	3/24/2024	17:40	7632097	701099	45° 34' 05.45" N	122° 43' 33.75" W

Station Depth: Approx. -26’ NAVD88

WAVE GAUGE 3, US ECOLOGY DOCK



Wave Gauge 3	3/24/2024	18:30	7633976	701402	45° 34' 08.95" N	122° 43' 07.46" W

Station Depth: Approx. -14' NAVD88

WAVE GAUGE 4, Berth 306

Wave Gauge 4	3/24/2024	18:50	7635716	699288	45° 33' 48.55" N	122° 42' 42.19" W

Station Depth: Approx. -12' NAVD88

eTrac Inc.
617 S Knik-Goose Bay Rd, Ste C
Wasilla, AK 99654

p: (415) 462-0421
f: (415) 480-2032
www.etracinc.com

Survey Field Notes:

ID	UTC Time	Description
	3/24/22 14:55	CODY, ADAM, KEVIN AND MATT ON SV SPECTRUM TAKING CTD CASTS
	3/24/22 14:57	CTD & WC 1 20220324 E: 7632754.04 N: 701682.96
	3/24/22 15:05	CTD & WC 2 20220324 E: 7634531.59 N: 700825.39
	3/24/22 17:28	DEPLOYED WAVE GAUGE #3 E: 7633975.78 N: 701402.07
	3/24/22 17:48	DEPLOYED WAVE GAUGE #4 E: 7635716.43 N: 699287.65
	3/24/22 19:22	DEPOLOYED WAVE GAUGE # 1 E: 7634012.62 N: 698493.09
	3/24/22 19:24	DEPLOYED WAVE GAUGE #2 E: 7632097.40 N: 701099.26
	3/24/22 19:22	DEPLOYED ADCP BOTTOM MOUNT #2 EDGETECH, E: 7632765.02 N: 701733.16 1200KHZ
	3/24/22 19:41	DEPLOYED ADCP BOTTOM MOUNT #1 AAE, E: 7634581.73 N: 700832.00 600KHZ


WAVE GAUGE 3
WAVE GAUGE 2
WAVE GAUGE 4
WAVE GAUGE 1

Wave Gauge coordinates			
NAME	Northing	Easting	Property
WAVE GAUGE 1	698493.09	7634012.62	Port of Portland
WAVE GAUGE 2	701099.26	7632097.4	Vigor
WAVE GAUGE 3	701402.07	7633975.78	Fred Devine
WAVE GAUGE 4	699287.65	7635716	Vigor

Notes:

Datum is NAD83

Coordinate System is State Plane Oregon North, International Feet

HGL
HydroGeoLogic, Inc
Exceeding Expectations

DAILY FIELD REPORT

DATE: **04-21-2022**
PLANNED ACTIVITY PERIOD: **21 APR**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:					Cloudy w/ showers		
Temperature:					50 F		
Wind:					SW 7 mph		
Humidity:					70%		

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER:DT2002

HGL Staff: None

Teaming Partners/Subcontractors:, Jensen Haebler (Vessel Operator), Samantha Czwalina (Vessel Crew) Delphis TSS: Kevin Smith (Oceanographer)

Regulatory Oversight: None

Equipment On Site: Survey Vessel Spectrum,(2) Workhorse Sentinel ADCP, 2 EXO CTDs, (4) Wave Gauge Sensors, 1 Cast CTD, 1 Vandorn water grab sampler, 1 Handheld laboratory turbidimeter

Work Performed by PDI Activity:

Hydro/Sed Dynamic Measurements

1) Recover four (4) wave gauges from site locations, download data, refresh batteries and desiccant.
2) Re-Deploy four (4) wave gauges at same locations previously occupied.
3) Recover ADCP bottom mounts from two (2) locations, retrieve data from ADCP and CTDs.
4) Final recovery of the two (2) bottom mounts. Demobilize and disassemble equipment from frames

Quality Control Activities (including field calibrations): None

Health and Safety Activities: Daily safety briefing – Wave gauge recovery and deployment. Bottom Mount Recovery.

Problems Encountered/Corrective Action Taken: Damaged cast CTD. Not performed as ancillary data. Water grab sample taken at location confirmed similar low turbidity levels encountered on previous trips. No lab samples taken.

Special Notes: None

Other Possible Documentation:

☐ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)
☒ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details)
☒ No calibrations performed (if yes, list above and provide calibration forms)
☒ No unusual events (if yes, describe above in *Special Notes*)
☐ No photographs taken (incorporated into the Station information pages)
☐ No Field Measurements collected (See field notes)

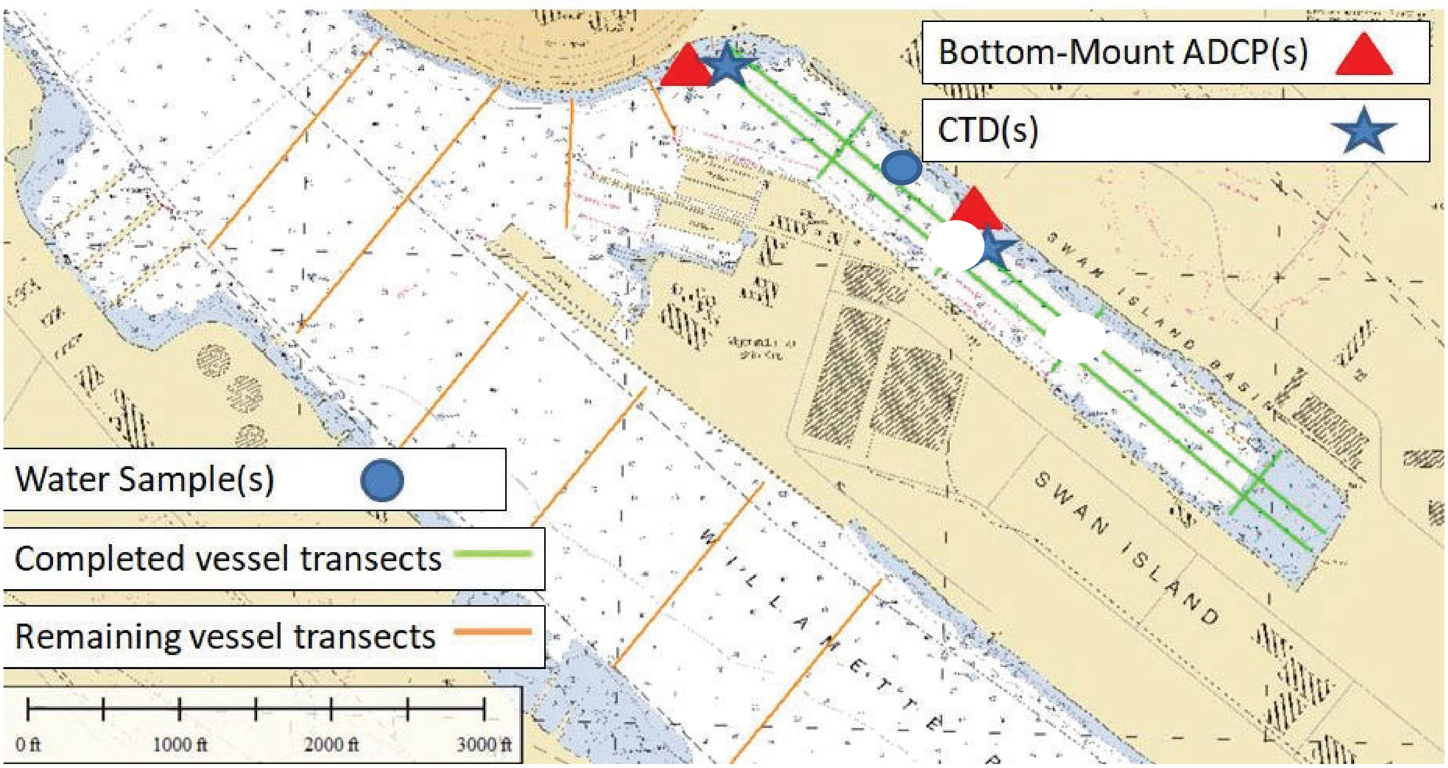
Planned Activities for the Next Day:

- None

Signature: **Title**: DTSS - Oceanographer

DAILY QUALITY CONTROL REPORT

Wave Gauge Deployed Locations



Bottom mounted ADCP/CTD as-deployed and final recovery locations (CTD Casts and transects were not performed)

Delphis Technical Support and Solutions, LLC

13332 69th DR SE
Snohomish, Washington 98296
Phone: (425) 773-0722
Email: kevinsmith@delphis-tss.com

For :

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER:DT2002

General Timeline of events during Final Recovery of two (2) ADCP/CTD bottom mounts and Servicing of four (4) suspended wave gauges. Transcribed from field notes:

Times PDT

0600 – Depart Hotel in Vancouver WA
0630 – Arrive US Ecology Dock and begin bringing equipment from truck to dock
0710 – eTrac boat arrives with Samantha Czwalina and Jensen Haebler
- Mobilize required equipment for wave gauge servicing onto boat.

0715 – Recover Wave Gauge Station 3 at US Ecology Dock
- Download takes longer than planned (~30-minutes each)
- Decision to collect all wave gauges and bring to dock to download while bottom mounts are recovered

0750 –Recover Station 1 Wave gauge. Leave suspension system in-place
0820 –Recover Station 2 Wave gauge. Leave suspension system in-place
0830 –Recover Station 4 Wave gauge. Leave suspension system in-place
0845- Back at US Ecology dock to begin downloading wave gauges on multiple laptops
0900 – eTrac heads out to pop- acoustic releases on bottom mounts. Success on inside station only. Outer Station (2) would not respond.
0940 – eTrac and DTSS recover Station 1 (Inside station) and return to dock for demobilization
- Wait on response from OARs for confirmation of release codes
- Continue downloading waves gauges and refresh for deployment 2

1030 – OARs confirms release codes. Station 2 buoy released from dock.
1045 – eTrac and DTSS recover Station 2 (outer station at USCG) and return to dock for demobilization
1100 – Depart dock to deploy Wave gauges
1105 – Deploy Station 3 at former station
1125 – Deploy Station 1 at former station
1140 – Deploy Station 2 at former station

1155 – Deploy Station 4 at former station
1200 – Return to US ecology dock and clean up instrument and load ADCPs and bottom mounts onto eTrac boat. CTDs and support gear to DTSS.
1230 – DTSS performs water grab sampling from Ecology dock to confirm turbidity levels relatively the same as previous trips. No CTD cast could be conducted due to bad sensor on CTD. Turbidity of water taken with handheld meter from water grab sample. (thru column Turbidity 6.7 to 7.8 NTU). Clear samples.
1255 – eTrac (by boat) and DTSS (by truck) depart site for their home bases.
1655 – DTSS arrives in Snohomish, WA.

- Wash down and demobilize equipment

1800 to 2100 – begin downloads of CTDS (Approximately 1 hour each). Back up data.

Please see Instrument field deployment/recovery logs for specific settings or file information.

Project: Swan Island Wave Study
DTSS No.: 202202
Client: HGL/Mott MacDonald

Deployment Date: 4/21/2022
Deployment Time (UTC): 18:05
Est. Duration: 30 Days

Deployment No.: 2
Station: 1

Recovery Date:
Recovery Time (UTC):

Description: Deployed Sensor — Structure where the Sensor is Deployed
Photos:
Directions:
Photo 1 - Down
Photo 2 - NE
Time: N/A
Coordinates: N/A


1


2

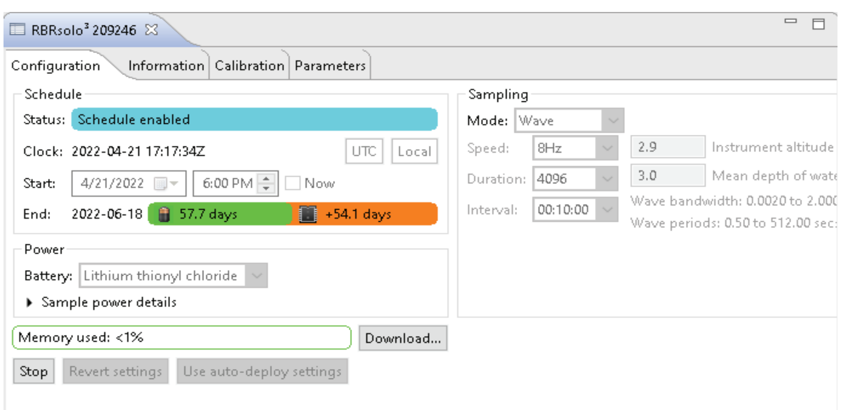
Deployment type: Suspended from fixed chain with bottom anchor (new hardware)
Est. Water Depth: -22 ft NAVD 88 May be adjusted upon review of Calculated levels
Est. Sensor Depth: 3 ft NAVD 88
Est. Height above Bottom: 25 ft

Instrument Model: RBRsolo3
Instrument Serial Number: 209246
Depth Rating: 20m
Date of Calibration: 12/17/2021

Sampling Rate: 8Hz
Mode: Wave burst
Samples per Ensemble: 4096

Battery Level: 3.6v Lithium NEW
O-rings: lubed and checked
Desiccant: NEW

System Enabled:



Delayed Start Time: 4/21/2022 18:00 UTC

Downloaded File:
File Size:
Time to Download:

Comments:

Project: Swan Island Wave Study
DTSS No.: 202202
Client: HGL/Mott MacDonald

Deployment Date: 4/21/2022
Deployment Time (UTC): 18:50
Est. Duration: 30 Days

Deployment No.: 2
Station: 2

Recovery Date:
Recovery Time (UTC):

Description: Structure where the Sensor is Deployed
Photo:
Directions:
Photo 1 - SE
Photo 2 - NNE
Time: N/A
Coordinates: N/A

1

Structure where the Sensor is Deployed

2

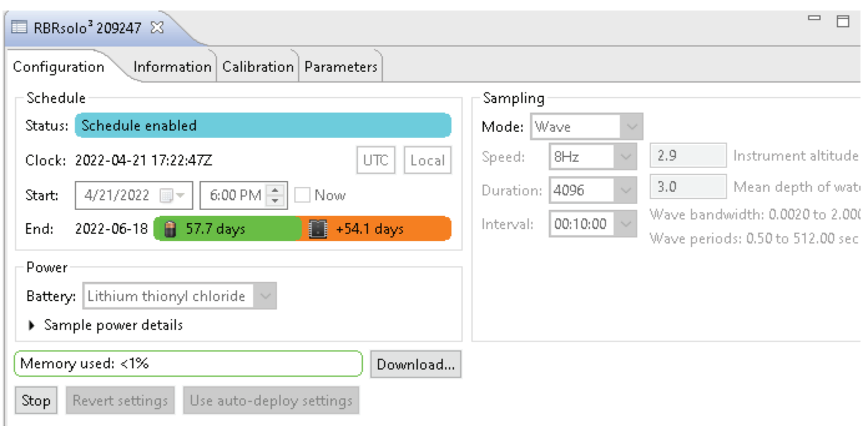
Deployment type: Suspended from fixed chain with bottom anchor (new hardware)
Est. Water Depth: -26 ft NAVD 88
Est. Sensor Depth: 3 ft NAVD 88
Est. Height above Bottom: 29 ft

Instrument Model: RBRsolo3
Instrument Serial Number: 209247
Depth Rating: 20m
Date of Calibration: 12/17/2021

Sampling Rate: 8Hz
Mode: Wave burst
Samples per Ensemble: 4096

Battery Level: 3.6v Lithium NEW
O-rings: lubed and checked
Desiccant: NEW

System Enabled:



Delayed Start Time: 4/21/2022 18:00 UTC

Downloaded File:
File Size:
Time to Download:

Comments:

Project: Swan Island Wave Study
DTSS No.: 202202
Client: HGL/Mott MacDonald

Deployment Date: 4/21/2022
Deployment Time (UTC): 17:20
Est. Duration: 30 Days

Deployment No.: 2
Station: 3
Description: Deployed Sensor

Recovery Date:
Recovery Time (UTC):

Photo:
Directions:
Photo 1 - SE
Photo 2 - NE
Time: N/A
Coordinates: N/A

Structure where the Sensor is Deployed

1

2

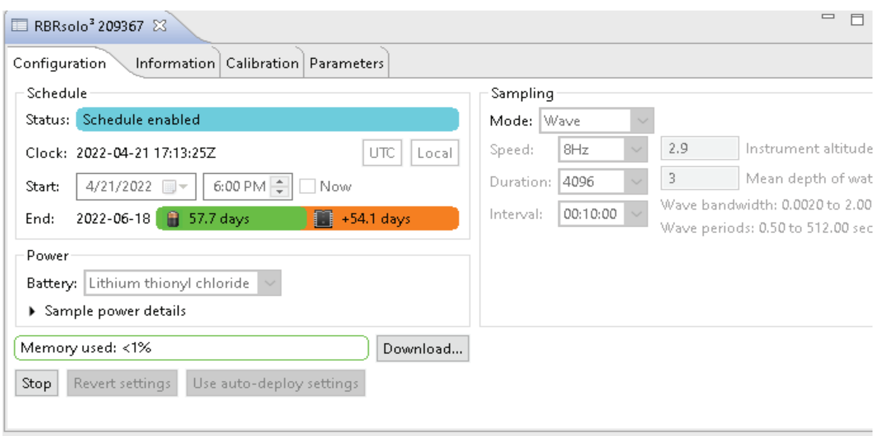
Deployment type: Suspended from fixed chain with bottom anchor (new hardware)
Est. Water Depth: -14 ft NAVD 88
Est. Sensor Depth: 3 ft NAVD 88
Est. Height above Bottom: 17 ft

Instrument Model: RBRsolo3
Instrument Serial Number: 209367
Depth Rating: 20m
Date of Calibration: 12/17/2021

Sampling Rate: 8Hz
Mode: Wave burst
Samples per Ensemble: 4096

Battery Level: 3.6v Lithium NEW
O-rings: lubed and checked
Desiccant: NEW

System Enabled:



Delayed Start Time: 4/21/2022 18:00 UTC

Downloaded File:
File Size:
Time to Download:

Comments:

Project: Swan Island Wave Study
DTSS No.: 202202
Client: HGL/Mott MacDonald

Deployment Date: 4/21/2022
Deployment Time (UTC): 17:40
Est. Duration: 30 Days

Deployment No.: 2
Station: 4

Recovery Date:
Recovery Time (UTC):

Description: Deployed Sensor | Structure where the Sensor is Deployed

Photo:
Directions:
Photo 1 - Down
Photo 2 - SSE
Time: N/A
Coordinates: N/A


1


2

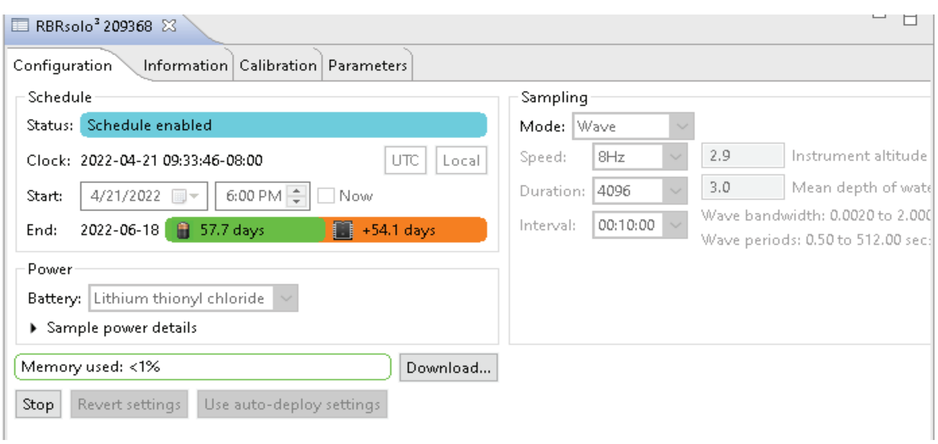
Deployment type: Suspended from fixed chain with bottom anchor (new hardware)
Est. Water Depth: -12 ft NAVD 88
Est. Sensor Depth: 3 ft NAVD 88
Est. Height above Bottom: 15 ft

Instrument Model: RBRsolo3
Instrument Serial Number: 209368
Depth Rating: 20m
Date of Calibration: 12/17/2021

Sampling Rate: 8Hz
Mode: Wave burst
Samples per Ensemble: 4096

Battery Level: 3.6v Lithium NEW
O-rings: lubed and checked
Desiccant: NEW

System Enabled:



Delayed Start Time: 4/21/2022 18:00 UTC

Downloaded File:
File Size:
Time to Download:

Comments:

DAILY FIELD REPORT

DATE: 05-24-2022
PLANNED ACTIVITY PERIOD: 24 MAY

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:			Overcast				
Temperature:			55°F				
Wind:			VAR				
Humidity:			50%				

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER:DT2002

HGL Staff: None

Teaming Partners/Subcontractors: Delphis TSS: Kevin Smith (Oceanographer), Rene Trudeau (Vessel Operator - Gravity),

Regulatory Oversight: None

Equipment On Site: GRAVITY Survey Vessel MAZAMA, (4) Wave Gauge Sensors,

Work Performed by PDI Activity: Hydro/Sed Dynamic Measurements**:** Onsite at 0700 hrs and departed site at 0845 hrs.

1) Final recovery of Recover four (4) wave gauges from site locations, download data. Demobilize.
2) Instruments returned to main office for cleaning, and data download before demobilizing.

Quality Control Activities (including field calibrations): None

Health and Safety Activities: Daily safety briefing – Wave gauge recovery.

Problems Encountered/Corrective Action Taken: No Problems encountered Operation lasted less than 1 hour

Special Notes: None

Other Possible Documentation:

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)
☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details)
☐ No calibrations performed (if yes, list above and provide calibration forms)
☒ No unusual events (if yes, describe above in *Special Notes*)
☐ No photographs taken (if yes, place jpgs on SP with the details (see Documentation Guidance) in a spreadsheet)
☐ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Planned Activities for the Next Day:

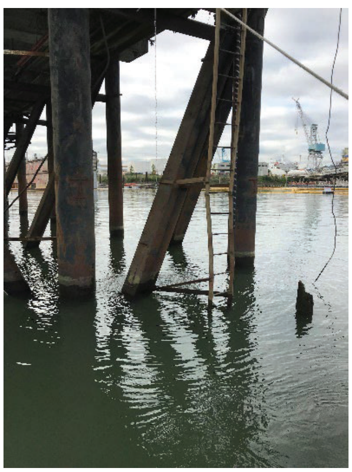
- None

Signature: **Title**: DTSS - Oceanographer

DAILY QUALITY CONTROL REPORT

Wave Gauge Deployed Locations

Station 1 – Gauge Removed



Station 2 – Gauge Removed

Station 3 – Gauge Removed

Station 4 – Gauge Removed

Reference *SwanIsland-Wave Gauge Deployment 1- TechMemo.pdf* (3/25/22) for as deployed photos.

All material removed from stations. All stations in same state prior to deployment.

DAILY FIELD REPORT

DATE: 02-22-2022
PLANNED ACTIVITY PERIOD: 02-21 through 02-25-2022

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:			Clear				
Temperature:			28°				
Wind:			NE 12+mph				
Humidity:			71%				

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER: DT2002

HGL Staff: None

Subcontractors: Orbislogic LLC, Integral Consulting Inc., Gravity Marine LLC

Equipment On Site: RV Ingalls, SedFlume frame

Work Performed:

1) Meet at US Ecology Swan Island facility for tailgate.
2) Collect SedFlume box core samples for offsite sediment erosion analyses at locations; SF09, SF10, SF11, SF12, SF13, SF14, SF15 SF17, SF18. SF19, SF23
3) Store and secure accepted SedFlume cores and demob to US Ecology facility Swan Island.

Quality Control Activities (including field calibrations): RV Ingalls integrated GPS benchmark check (form not available)

Health and Safety Activities: Daily safety briefing – Cold Stress, SOP review

Problems Encountered/Corrective Action Taken: None

Special Notes: None

Other Possible Documentation: (See SP Field Forms Folder for photos, notes, field data)

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)

☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details, SP *Field Forms* folder)

☐ No calibrations performed (if yes, list above and provide calibration forms)

☒ No unusual events (if yes, describe above in *Special Notes*)

☐ No photographs taken (if yes, place jpgs on SP *Field Forms* folder with the details (see Documentation Guidance) in a spreadsheet)

☐ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Planned Activities for the Next Day:

- Continue SedFlume core collection at remaining locations.

Signature:

Title: HGL Field Coordinator

Photo 1 Inserting SedFlume piston seal

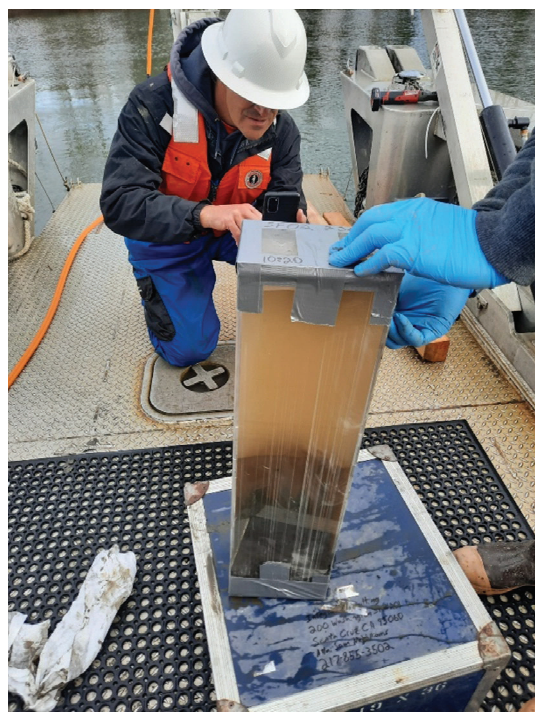


Photo 2 Post processing SedFlume core

SedFlume Coring Photo Log

Photo Number (assigned by camera, or 1, 2..etc. but it then needs to be in the filename)	Taken By (initials)	Description	Direction	Date	Time	GPS Coordinates	
						Lat	Long
1	JM	Inserting SedFlume piston seal	Down	2/22/2022	NA	NA	NA
2	JM	Post processing SedFlume core	Down	2/22/2022	NA	NA	NA

NA = not available

8/22/22 SIB - HCC - SEDFLUME J. MOORE

0800: MEET AT US ECOLOGY SWAN ISLAND FACILITY.

ORBISLOGIC - JOSS MOORE
INTEGRAL - FRANK SPADA
MANAI FABIO
GRAVITY - GREG WATSON
LOGAN NELSON

* SCOPE: TO CONTINUE COLLECTING SEDFLUME BOX CORES FROM LOCATION SF09 ONWARDS.

0825: TAILGATE COMPLETE, NEW CORING SUPPLIES ON BOARD - MOB TO SF09

0850 ON LOCATION SF03, WATER DEPTH 37.7 ft.
FIRST ATTEMPT REJECTED - LOW RECOVERY - 25 cm.

0905 SF09 SECOND ATTEMPT REJECTED LOW RECOVERY - 22 cm

2/22/22 HGL-SIB-SEDFLUME J. Moore

0914 SF09 THIRD ATTEMPT ACCEPTED
31cm RECOVERY.
EAST 7634419.07
NORTH 700536.99

0935 ON LOCATION AT SF10
WATER DEPTH 28.7 ft.
FIRST ATTEMPT REJECTED -
LOW RECOVERY - 22cm

0950: SF10 SECOND ATTEMPT
ACCEPTED - 32 cm.
EAST: 7634562.12
NORTH: 700728.05

1005: MOB TO SF11 WATER
DEPTH 33.4 ft

1009: FIRST ATTEMPT ACCEPTED
31 cm RECOVERY,
EAST: 7634023.43
NORTH: 700857.21

1020: MOB TO SF12 WATER

2/22/22 HGL-SIB-SEDFLUME J. Moore

DEPTH 30.9 ft.
FIRST ATTEMPT REJECTED,
LOW RECOVERY - 21cm AND
SLOPED.

1035: SF12 SECOND ATTEMPT REJECTED
LOW RECOVERY - 18cm.

1047: SF12 THIRD ATTEMPT. GOOD
RECOVERY - 34cm BUT ONE
SIDE WASHES OUT DUE TO DEBRIS.

1059 SF12 FOURTH ATTEMPT ACCEPTED
32cm RECOVERY
EAST: 7634190.96
NORTH: 701046.12

1115: MOB TO SF13 WATER DEPTH
38.4 ft. FIRST ATTEMPT

1146: ACCEPTED. 31cm RECOVERY
EAST: 7633607.44
NORTH: 701198.91

1205: MOB TO SF14, JM WATER DEPTH

2/22/22 HGL-SIB-SEDFLUME J. MOORE

31.8 ft. FIRST ATTEMPT
ACCEPTED. 35 cm RECOVERY
EAST : 7633766.39
NORTH : 701386.64

1222: MOB TO SF15. WATER
DEPTH 39.5 ft. ACCEPT
FIRST ATTEMPT 33 cm RECOVERY
EAST: 7633127.73
NORTH: 701501.33

1242: MOB TO SF17, WATER
DEPTH 40.8 ft. FIRST
ATTEMPT ACCEPTED. 33 cm
RECOVERY.
EAST : 7632770.83
NORTH : 701453.30

1300: MOB TO SF18, WATER DEPTH
28.6 ft. FIRST ATTEMPT
ACCEPTED. 34 cm RECOVERY
EAST: 7632701.41
NORTH: 708781.83

2/22/22 HGL-SIB-SEDFLUME J. MOORE

1320: MOB TO SF19. WATER DEPTH
39.4 ft. FIRST ATTEMPT
REJECTED - LOW RECOVERY 20cm,

1330: SF 19 SECOND ATTEMPT, REJECTED
POOR RECOVERY 19cm.

1342: SF 19 ~~SECOND~~ JM THIRD ATTEMPT
REJECTED, POOR RECOVERY 17cm

1350: SF 19 FOURTH ATTEMPT,
REJECTED, POOR RECOVERY 18cm
AND DISTURBED SURFACE.

1401: SF 19 SIXTH ATTEMPT, ACCEPTED
29 cm RECOVERY - THIS IS ACCEPTED
AS THIS LOCATION HAS GIVEN POOR
RECOVERY IN FIVE PREVIOUS ATTEMPTS
EAST : 7632499.55
NORTH : 701326.59

1415: MOB TO SF23. WATER DEPTH 38.9ft
1435: FIRST ATTEMPT ACCEPTED 30cm
EAST: 7631828.78
NORTH: 700941.04

2/22/22 HGL-SIB SEDFLUME J. MOORE

1500: DUE TO WINDS INCREASING
TO OVER 20 MPH, DECIDE
TO END COLLECTION OF CORES.
VESSEL WILL REFUEL AND
PERFORM MAINTENANCE, ORBIS
& INTEGRAL WILL POST PROCESS
COLLECTED CORES AND SECURE.

1700: ALL CREW OFF SITE FOR THE
DAY.

JM

HGL HydroGeoLogic, Inc
Exceeding Expectations

DAILY QUALITY CONTROL REPORT

DATE: **02-23-2022**
PLANNED ACTIVITY PERIOD: **02-21 through 02-25-2022**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weather:				Clear			
Temperature:				24°F			
Wind:				NE 8mph			
Humidity:				70%			

PROJECT: Portland Harbor Superfund Site - Swan Island Basin Project Area
CONTRACT NUMBER: DT2002

HGL Staff: None

Subcontractors: Orbislogic LLC, Integral Consulting Inc., Gravity Marine LLC

Equipment On Site: RV Ingalls, SedFlume frame

Work Performed:

1) Meet at US Ecology Swan Island facility for tailgate.
2) Collect SedFlume box core samples for offsite sediment erosion analyses at locations; SF16, SF20, SF21, SF22, SF24, SF25, SF30, SF29, SF28, SF27, SF26
3) Store and secure accepted SedFlume cores and demob to US Ecology facility Swan Island.

Quality Control Activities (including field calibrations): RV Ingalls integrated GPS benchmark check (form not available)

Health and Safety Activities: Daily safety briefing, SOP review

Problems Encountered/Corrective Action Taken: None

Special Notes: None

Other Possible Documentation: (See SP Field Forms Folder for photos, notes, field data)

☒ No deviations from the PDI-WP (if yes, describe in *Problems Encountered/Corrective Action Taken*)

☐ No samples collected (if yes, list above and provide sample sheets or spreadsheet of sample details, SP *Field Forms* folder)

☐ No calibrations performed (if yes, list above and provide calibration forms)

☐ No unusual events (if yes, describe above in *Special Notes*)

☐ No photographs taken (if yes, place jpgs on SP *Field Forms* folder with the details (see Documentation Guidance) in a spreadsheet)

☐ No Field Measurements collected (if yes, provide them in *Work Performed by PDI Activity* above or provide a spreadsheet if measurements are numerous)

Planned Activities for the Next Day:

- Continue SedFlume core collection at remaining locations.

Signature: **Title**: HGL Project Manager

1/23/22 HGL - SIB - SEDFLUME J. MOORE

0730: MEET AT US ECOLOGY SWAN ISLAND FACILITY.
ORBISIOLOGIC - JOSS MOORE
INTEGRAL - FRANK SYADA
MAURI FABIO
CDM - CURT CHRISTOPHER
GRAVITY - GREG WATSON
LOGAN NELSON.

0745: CONDUCT TAILGATE MEETING
MOB TO SF16

0800: ON LOCATION AT SF16 WATER DEPTH 27.7 ft. FIRST ATTEMPT

0810: ACCEPTED 3 cm RECOVERY.
EAST : 7633238.58
NORTH : 701823.86

0820: MOB TO SF20. WATER DEPTH 31.5 ft FIRST ATTEMPT ACCEPTED

0825: 31 cm RECOVERY.
EAST : 7632376.88
NORTH : 701630.12

2/23/22 HGL - SIB - SEDFLUME J. MOORE

0835: MOB TO SF21, WATER DEPTH
41.5 ft - FIRST ATTEMPT
REJECTED - LOW RECOVERY 25cm
AND DISTURBED SURFACE.

0851: SF21, SECOND ATTEMPT
ACCEPTED 3 cm RECOVERY.
EAST: 7632059.94
NORTH: 701238.46

0900: WIND HAS PICKED UP AND DUE
TO WIND CHILL OF 16°F THE
DECK IS FREEZING SLIGHTLY
SO BRIEF STOP WORK TO
WARM UP AND DE-ICE DECK
WITH GRIT.

0943: DECK CLEARED OF ICE. MOB TO
SF 22. WATER DEPTH 31 ft

0950: SF 22 FIRST ATTEMPT REJECTED
NO RECOVERY - DEBRIS?

1003: SF 22 SECOND ATTEMPT

2/23/22 HGL - SIB - SEDFLUME J. MOORE

NO BOX TUBE IN FRAME - BROKEN
SHARDS FOUND - POSSIBLY
SMASHED ON RIP-RAP SEEN
ON SLOPE ADJACENT TO LOCATION

1008: SF 22 THIRD ATTEMPT IS
~20 ft AWAY FROM TARGET AND
AWAY FROM RIP-RAP SLOPE
THIRD ATTEMPT 29cm - KEEP
BUT TRY AGAIN FOR A BETTER
RECOVERY. - NOTE GRAVELS IN
CORE.

1020: FOURTH ATTEMPT - JUST GRAVEL
IN BASE OF TUBE, < 2" DIAMETER
- DECIDE TO KEEP THE 29cm
THIRD ATTEMPT.

1030: MOB TO SF 24. WATER
DEPTH 42 ft.

1039: FIRST ATTEMPT ACCEPTED 30cm
EAST: 7631449.76 NORTH: 701248.67

2/23/22 HGL-SIB-SEDFLUME J. MOORE

1050: MOB TO SF25. 26 FT WATER DEPTH, NEAR RIP RAP SLOPE. FIRST ATTEMPT REJECTED LOW RECOVERY GRAVEL + WOOD DEBRIS. ALSO ON STEEP SLOPE.

1056: SF 25, SECOND ATTEMPT MOVED ~25 FT OFFSHORE TO AVOID RIP-RAP AND SLOPE. 34 FT WATER DEPTH.

1059 SF 25, SECOND ATTEMPT ACCEPTED, 30cm RECOVERY.
EAST: 7631479.19
NORTH: 701627.22

1110: MOB TO SF26. WATER DEPTH 52.2 FT. FIRST ATTEMPT REJECTED, SAND WITH WOOD DEBRIS AND SILT ONLY ~10cm RECOVERY.

1120: SF26 SECOND ATTEMPT.

2/23/22 HGL-SIB-SEDFLUME J. MOORE

REJECTED - ~8cm WOOD/SILT DEBRIS.

1135: SF 26 THIRD ATTEMPT REJECTED MAINLY WOOD DEBRIS, 8cm RECOVERY

1140: SF 26 FOURTH ATTEMPT REJECTED MAINLY WOOD DEBRIS, 5cm. RECOVERY.

1150: SF 26 FIFTH ATTEMPT SAME AS PREVIOUS - MAKE A CALL TO INTEGRAL + MOTT MACDONALD TO ADVISE.

1210: WHILE WAITING FOR DECISION ON SF26 - MOB TO SF 30 TO CONTINUE COLLECTION.

1216: SF 30, TARGET LOCATION ON RIP RAP SLOPE - MOVE ~30 FT OFFSHORE - 30.2 FT WATER DEPTH

2/23/22 HGL-SIB - SEDFLUME J. MOORE

1220: SF30 FIRST ATTEMPT REJECTED

LOW RECOVERY - 23 cm.

1225: SF30 SECOND ATTEMPT

ACCEPTED, 30 cm RECOVERY

EAST : 7630977.61

NORTH : 701831.50

1233: SF29, WATER DEPTH

45.1 ft. FIRST ATTEMPT

REJECTED LOW RECOVERY

24 cm.

1249: SF29 SECOND ATTEMPT

ACCEPTED 30.5 cm

EAST : 7630860.29

NORTH : 701479.47

1255: MOB TO SF28, WATER

DEPTH 60.5 ft, FIRST ATTEMPT

REJECTED. 10 cm of WOOD +

SILT DEBRIS.

1329: SF28 SECOND ATTEMPT

2/23/22 HGL-SIB SEDFLUME J. MOORE

21 cm RECOVERY, KEEP BUT

TRY AGAIN FOR BETTER RECOVERY

1348: SF28 THIRD ATTEMPT ACCEPTED

30 cm RECOVERY (NOTE: SECOND

ATTEMPT ALSO RETAINED FOR LAB)

EAST : 7630885.11

NORTH : 700860.74

1400: MOB TO SF27. WATER

DEPTH 50.7 ft.

1420: SF27 FIRST ATTEMPT, REJECTED

LOW RECOVERY AND WASHED OUT

ON ONE SIDE.

1435: SF27 SECOND ATTEMPT REJECTED

LOW RECOVERY AND WASHED OUT ON

ONE SIDE

1445: SF27 THIRD ATTEMPT, REJECTED

LOW RECOVERY AND WASHED OUT ON

ONE SIDE.

1453 SF27 FOURTH ATTEMPT, REJECTED

2/23/22 HGL-SIB-SEDFLUME J. MOORE

1446: SF27, FIFTH ATTEMPT ACCEPTED, 22 cm RECOVERY GOOD CONDITION CORE WITH SOME WOOD DEBRIS.
EAST: 7631184.00
NORTH: 703447.48

1500: MOB BACK TO SF26 TO ATTEMPT AGAIN, WATER DEPTH 51.7 FT. ATTEMPT SIX REJECTED, LOW RECOVERY AND WASHED OUT ON ONE SIDE DUE TO WOOD DEBRIS.

1519: SF26 SEVENTH ATTEMPT ACCEPTED cm RECOVERY
EAST: 7631654.73
NORTH: 703006.22

1540: MOB BACK TO US ECOLOGY TO DEMOB EQUIPMENT AND CORES.

2/23/22 HGL-SIB SEDFLUME J. MOORE

1630: CORES SECURED, VESSEL EQUIPMENT DEMOBILIZED. ALL CREW OFFSITE.

Photo 1 RV Ingalls with SedFlume Core frame, looking NW

Photo 2 Example low recovery SedFlume core due to wood debris

SedFlume Coring Photo Log

Photo Number (assigned by camera, or 1, 2..etc. but it then needs to be in the filename)	Taken By (initials)	Description	Direction	Date	Time	GPS Coordinates	
						Lat	Long
1	JM	RV Ingalls with SedFlume Core frame	NW	2/23/2022	NA	NA	NA
2	JM	Example low recovery SedFlume core due to wood debris	Down	2/23/2022	NA	NA	NA

NA = not available

HGL HydroGeoLogic, Inc. Exceeding Expectations

SAFETY MEETING/TRAINING LOG

- ☑ Tailgate (daily)
- ☑ Activity Hazard Analysis
- ☑ Pre-Task Hazard Analysis (prior to new task or operation)
- ☑ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: ______
- ☐ Other: ___

Date/Time: FEB 23, 2022 0730 hrs   Client: DTNA / VIGOR

Location: SWAN ISLAND BASIN - PORTLAND HARBOR   Job No.: DT2002

Meeting/training conducted by: JOSS MOORE [signature] 2/23/22

Work Activities: SEDFLUME CORE COLLECTION

Safety / Training Topics Presented

Chemical Hazards: PROJECTS COCs - SEDIMENT + SW

Physical Hazards: OVERWATER ACTIVITIES, A-FRAME OPERATIONS

Specific Safety Topic(s): COLD STRESS, COMMUNICATION.

Specific Training Covered: —

Attendees

Name Printed and Employee Number:	Signature:
Greg Watson	[signature]
Mauri Fabio	[signature]
Cort Christopher	[signature]
Frank Spadola	[signature]
Logan Nelson	[signature]

ATTACHMENT B

SEDFLUME SAMPLING SUMMARY

SEDFLUME SAMPLING SUMMARY
REVISION 0

REMEDIAL DESIGN SERVICES
SWAN ISLAND BASIN PROJECT AREA
CERCLA DOCKET NO. 10-2021-001

PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

Prepared for:
Swan Island Basin Remedial Design Group

Prepared by:

integral consulting inc.

On behalf of:

HGL HydroGeoLogic, Inc

11107 Sunset Hills Road, Suite 400
Reston, Virginia 20190

and

MOTT MACDONALD

March 2023

This page was intentionally left blank.

SEDFLUME SAMPLING SUMMARY
REVISION 0

REMEDIAL DESIGN SERVICES
SWAN ISLAND BASIN PROJECT AREA
CERCLA DOCKET NO. 10-2021-001

PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

Contract Number: DT2002

Prepared for:

Swan Island Basin Remedial Design Group

Prepared by:

Integral Consulting, Inc.
505 Montgomery Street
11th Floor
San Francisco, CA 94111

On behalf of:
HydroGeoLogic, Inc.
11107 Sunset Hills Road, Suite 400
Reston, Virginia 20190
Chantilly, VA 20151

and

Mott MacDonald

March 2023

This page was intentionally left blank.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1-1
1.1 OBJECTIVES AND SCOPE 1-1
1.2 PROJECT AREA BACKGROUND 1-1
1.3 REPORT ORGANIZATION 1-1

2.0 SEDFLUME SAMPLING AND TESTING PROCEDURES 2-1
2.1 SEDFLUME SAMPLING PROCEDURE 2-1
2.2 SEDIMENT TESTING AND ANALYSIS PROCEDURE 2-2
2.2.1 SEDflume Laboratory Configuration and Testing Procedure 2-2
2.2.2 Measurement of Sediment Erosion Rate 2-2
2.2.2.1 Determination of Critical Shear Stress 2-3
2.2.2.2 Power Law Regression 2-4
2.2.3 Measurement of Sediment Bulk Properties 2-5

3.0 RESULTS 3-1
3.1 SEDFLUME ANALYSIS SUMMARY 3-1
3.2 SEDFLUME ANALYSIS CONCLUSIONS 3-13

4.0 REFERENCES 4-1

LIST OF TABLES

Table 2-1	SEDflume Sample Locations
Table 2-2	SEDflume Sample Information
Table 2-3	Parameters Measured and Computed During the SEDflume Analysis

LIST OF FIGURES

Figure 1-1	SEDflume Sampling Locations
Figure 2-1	Sediment Core Sampling
Figure 2-2	Sediment Core Post-Retrieval
Figure 2-3	Laboratory Configuration of SEDflume
Figure 3-1	Sediment Core Erodibility Comparison

LIST OF APPENDICES

Appendix A	Particle Size Distributions
Appendix B	SEDflume Core Results

LIST OF ACRONYMS AND ABBREVIATIONS

%	percent
cm	centimeter
cm/s	centimeter per second
g/cm^3	grams per cubic centimeter
mm	millimeter
Pa	pascal
Δz	distance that sediment is raised during a particular measurement period
ρ	sediment bulk density
ρ_{dry}	dry bulk density
ρ_w	density of water
ρ_{wet}	wet bulk density
ρ_s	density of sediment particle
µm	micrometer
τ	bed shear stress
τ_0	bracketed shear stress value
τ_1	bracketed shear stress value
τ_{cr}	critical shear stress
τ_{first}	the lowest applied shear stress where erosion *did occur*
τ_{linear}	estimate of critical shear stress with a good linear regression fit
τ_{no}	the highest applied shear stress where erosion *did not occur*
τ_{power}	shear stress required to cause 10^{-4} cm/s of erosion
A	constant that is a function of the sediment bulk density and other difficult properties to measure, such as sediment geochemistry and biological influences
E	erosion rate
EPA	U.S. Environmental Protection Agency
GPS	global positioning system
HGL	HydroGeoLogic, Inc.
IG	% loss on ignition based on wet weight (ASTM International Method D7348-13)
Integral	Integral Consulting, Inc.
m	constant that depends on sediment characteristics
MC	moisture content
M_d	dry weight of sample
M_w	wet weight of sample
n	constant that depends on sediment characteristics

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

Orbislogic	Orbislogic Consulting
r	Pearson's r, which is a measure of the linear dependence between two variables
r^2	coefficient of determination
r^2_{thresh}	coefficient of determination of 0.7
RM	River Mile
SIB	Swan Island Basin
T	measurement time interval
W	water content

SEDFLUME SAMPLING SUMMARY
SWAN ISLAND BASIN PROJECT AREA
PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

1.0 INTRODUCTION

This sampling summary presents an overview of the SEDflume study conducted in the Swan Island Basin (SIB) Project Area of the Portland Harbor Superfund Site in Portland, Multnomah County, Oregon. Integral Consulting, Inc. (Integral) performed the work in response to a request from HydroGeoLogic, Inc. (HGL) and Mott MacDonald and on behalf of the SIB Remedial Design Group based on the requirements of the Portland Harbor Superfund Site Record of Decision (U.S. Environmental Protection Agency [EPA], 2017) and the Administrative Settlement Agreement and Order on Consent (EPA, 2021). The scope of work was proposed in the December 2021 Pre-Design Investigation Work Plan. The scope of the survey remained consistent with that detailed in the final Pre-Design Investigation Work Plan that was fully approved in May 2022 (HGL, 2022a).

1.1 OBJECTIVES AND SCOPE

Previous SEDflume sampling programs conducted in Portland Harbor included two samples at SIB: one near the SIB entrance and one in the SIB central interior (Sea Engineering, Inc., 2006). Analysis of those testing results indicated significant differences in sediment erodibility properties, including erosion rates and fines content. Because of the significant differences in sediment erodibility, a robust sampling program to support the Remedial Design was warranted. The SEDflume study provides data necessary to evaluate recontamination potential by providing inputs to hydrodynamic and sediment transport modeling.

This new SEDflume analysis dataset that represents the entire SIB as well as the main Willamette River channel at the mouth of SIB provides essential model information for hydrodynamic and sediment transport modeling. This information will be used to evaluate the fate and relative contribution of contaminated sediments resuspended/scoured from un-remediated areas within the SIB Project Area through both natural forces and anthropogenic forces, including dredging.

1.2 PROJECT AREA BACKGROUND

The SIB Project Area is between approximately River Mile (RM) 8.1 and RM 9.2 on the northeast side of the Willamette River. The SEDflume sampling area encompassed SIB and a portion of the main Willamette River channel. To collect the necessary data to support the study objectives, the survey area within the Willamette River channel begins at approximately RM 7.8 and extends within the Willamette River channel to RM 8.2 and within SIB to approximately RM 9.2 (Figure 1-1).

1.3 REPORT ORGANIZATION

This report is organized into the following sections:

- Section 1 presents the objectives and scope of the study,
- Section 2 describes SEDflume sampling and testing procedures,
- Section 3 summarizes SEDflume sampling activities and analysis results, and
- Section 4 presents the references cited in this report.

Accompanying appendices include the following:

- Appendix A presents particle size distributions as determined using laser diffraction analysis and quality control results.
- Appendix B presents graphical and tabular SEDflume analysis data for each core.

2.0 SEDFLUME SAMPLING AND TESTING PROCEDURES

SEDflume sampling activities were conducted from February 21 through 23, 2022. Integral conducted sampling activities with the support of Gravity Marine and Orbislogic Consulting (Orbislogic). Gravity Marine provided the vessel, support personnel, and apparatus used to collect each sediment sample. Orbislogic provided project oversight on behalf of HGL and Mott MacDonald. SEDflume analysis activities were conducted at Integral's SEDflume laboratory in Santa Cruz, California, from March 3 to 25, 2022. The following sections describe the activities completed and demonstrate achievement of the data quality objectives established for the SEDflume sampling and analysis program in the Uniform Federal Policy-Quality Assurance Project Plan for SIB (HGL, 2022b).

2.1 SEDFLUME SAMPLING PROCEDURE

Sediment cores to be used in SEDflume analysis were collected at 30 prescribed locations within and adjacent to the SIB Project Area as shown in Figure 1-1 and listed in Table 2-1. At each sediment coring location, a GPS device was used to position the vessel at a fixed sampling station. The 10-centimeter (cm) by 15-cm plastic, rectangular core barrel affixed to a pole with clamps was used to obtain the sediment sample by inserting the core into the hydraulic apparatus. The objective was to collect a core that was undisturbed throughout and of sufficient length to process multiple test intervals. The device and core barrel were lowered via pulley system onto the sediment bed (Figure 2-1). Once the apparatus was on the sediment bed, a hydraulic pressure system was applied to the core barrel to penetrate the sediment, a check valve was closed, and bed material was retained during retrieval. Once the sample was collected, the apparatus was lifted to the surface of the water and safely brought back to the boat (Figure 2-1), where the sample was measured for recovery, and the collected material and core barrel were removed from the apparatus.

After a core was successfully collected, it was inspected to determine if it would be accepted or if another collection attempt would be required. Acceptance criteria included overall length of recovered material; sample devoid of subsurface disturbance (e.g., wood waste); and levelness of the surface. If accepted, the outer portion of the core was cleaned, and the core was sealed for storage and photographed (Figure 2-2). Cores were orientated in an upright position with a full head of water to remain as undisturbed as practical during transport for analysis. If rejected, sample material was disposed of by Gravity Marine and Orbislogic personnel in accordance with the Waste Management Plan (HGL, 2022c), and another attempt was conducted. Sampling required as few as one and as many as seven attempts to recover an acceptable sample. Multiple attempts were required in instances where there was poor recovery length and difficult bed conditions to obtain sufficient sample retention. Sample collection dates, lengths as measured on the vessel, and number of attempts are summarized in Table 2-2.

The collection process produced acceptable samples for testing. Sediment samples were securely stored and shipped to Integral's SEDflume laboratory for testing. The recovered material remained intact and undisturbed during travel, resulting in four to five test intervals per sample.

2.2 SEDIMENT TESTING AND ANALYSIS PROCEDURE

This section provides descriptions of SEDflume testing and analysis procedures used in this study. Supplemental analyses of grain-size distribution using laser diffraction, water content, bulk density, and loss on ignition also were implemented at the beginning of each depth interval to quantify physical sediment characteristics.

2.2.1 SEDflume Laboratory Configuration and Testing Procedure

The SEDflume laboratory setup consists of a straight flume with an open bottom section through which a rectangular, cross-sectional core barrel containing sediment can be inserted (Figure 2-3). The main components of the flume are the water tank; pump; inlet flow converter, which establishes uniform, fully developed, turbulent flow; the main duct; test section; hydraulic jack; and the core barrel containing sediment (Figure 2-3). The core barrel, test section, flow inlet section, and flow exit section are made of transparent acrylic so that the sediment–water interactions can be observed visually. The core barrel has a rectangular cross section, 10 cm by 15 cm, and a length of 60 cm.

Water is pumped from an approximately 80-liter storage tank into a 5-cm-diameter pipe and then through the flow converter into the main duct. The flow converter changes the shape of the cross section from circular to rectangular while maintaining a constant cross-sectional area. A ball valve regulates the amount of water entering the flume so that the flow rates can be carefully controlled. The flume also has a small valve immediately downstream from the test section that opens to the atmosphere, preventing a pressure vacuum from forming and enhancing erosion.

At the start of each test, a core barrel and the sediment it contains were inserted into the bottom of the test section. The sediment surface is aligned with the bottom of the SEDflume channel. When fully enclosed, water is forced through the duct and test section over the surface of the sediment. The shear stress produced by the flow and imparted on the particles causes sediment erosion. As the sediment on the surface of the core erodes, the remaining sediment in the core barrel is slowly moved upward so that the sediment-water interface remains level with the bottom of the flume. An operator moves the sediment upward using a hydraulically controlled piston that is inside the core barrel. The jack is driven by a release of pressure that is regulated with a switch and valve system. In this manner, the sediment can be raised and made level with the bottom of the test section. The movement of the hydraulic jack can be controlled for measurable increments as small as 0.5 millimeter (mm).

2.2.2 Measurement of Sediment Erosion Rate

At the start of each core analysis, an initial reference measurement is made of the starting core length. The flume is then operated at a specific flow rate corresponding to a particular shear stress, and sediment is eroded (McNeil et al., 1996; Jepsen et al., 1997). As erosion proceeds, the core is raised, if needed, to keep the core's surface level with the bottom of the flume. This process is continued until either 10 minutes have elapsed or the core has been raised roughly 2 cm.

The erosion rate for the applied shear stress is then calculated as:

$$E = \frac{\Delta z}{T} \qquad [1]$$

Where:

E	=	erosion rate
Δz	=	distance that sediment is raised during a particular measurement period
T	=	measurement time interval

Because material is eroded and the core structure is broken down, repetitive erosion measurements at a given depth are not possible. The following procedures were performed for all cores to best determine the erosion rate at several different shear stresses and depths using only one core:

1. The core was inserted into the bottom of the SEDflume test section.
2. The total length of sediment in the core barrel was measured and recorded.
3. Two approximate 5-gram subsamples of sediment from the core surface were collected using a clean spoon to be used in particle-size distribution and bulk density measurements. Sediment sampling was constrained to the downstream (relative to the SEDflume flow direction) end of the sediment surface, to minimize potential scour effects.
4. Shear stresses (from low to high) were applied to the core's surface, and sediment erosion was measured if it occurred (0.5 mm of erosion in 10 minutes was considered quantifiable). Applied shear stresses started at 0.1 pascal (Pa) and were sequentially doubled until a given shear stress caused approximately 2 cm of erosion in 20 seconds, or a maximum of 5 cm was eroded in a given interval (defined as a continuous succession of increasing shear stress cycles where erosion is measured). Each shear stress cycle was applied for a minimum of 20 seconds and a maximum of 10 minutes. To the extent possible, no more than 2 cm of sediment was allowed to erode at a single shear stress.
5. Once the threshold (2 cm of erosion in 20 seconds, or a maximum of 5 cm of erosion in a single interval) was met, a new depth interval was started and the testing process of steps 3 and 4 was repeated.[1] Depth intervals are defined as a set of applied shears with an associated set of aliquots for physical parameter testing. Also, if the sediment composition changed noticeably in appearance or erosion properties, the depth interval was stopped, sediment subsamples were collected, and a new depth interval was started (Step 4).
6. Where practical, at least three and up to five depth intervals were tested per core.

2.2.2.1 <u>Determination of Critical Shear Stress</u>

The critical shear stress of a sediment bed, τ_{cr}, is the applied shear stress at which sediment motion is initiated. In this study, it is operationally defined as the shear stress required to produce 0.001

[1] If a particular shear stress did not cause any observable erosion over a 10-minute period for consecutive depth intervals (e.g., less than 0.5 mm eroded in 10 minutes), that shear stress was removed from subsequent testing cycles and higher shear stresses were added, as appropriate, to attempt to measure at least three erosion rates.

mm of erosion in 1 second. This represents an erosion rate of 10^{-4} cm per second (cm/s), or roughly 1 mm of erosion in 15 minutes.[2]

Because it is difficult to measure τ_{cr} exactly at the 10^{-4} cm/s threshold, erosion was instead measured over a range of shear stresses designed to bracket the initiation of erosion threshold. The highest applied shear stress where erosion *did not occur* is defined by τ_{no}, and τ_{first} is the lowest applied shear stress where erosion *did occur*.

Using the measured erosion rate data in each depth interval, Integral employed a power law regression analysis (see Section 2.2.2.2) to determine the shear stress (τ_{power}) required to cause 10^{-4} cm/s of erosion. The bracketed shear stress values (τ_0 and τ_1) and τ_{power} were assimilated, and the critical shear stress of each interval was then chosen according to the following criteria (where τ_{no} and τ_{first} are determined directly from the SEDflume measurements):

- If $\tau_{no} \leq \tau_{power} \leq \tau_{first}$, then τ_{power} was the selected critical shear stress, τ_{cr}, for the interval.
- If $\tau_{no} \geq \tau_{power}$, then τ_{no} was the selected critical shear stress for the interval.
- If $\tau_{power} \geq \tau_{first}$, then τ_{first} was the selected critical shear stress for the interval.
- If $r^2 < r^2_{thresh}$, then τ_{linear} was selected as the critical shear stress for the interval.

The τ_{cr} criteria allowed for selection of critical shear stresses using the power law results where the regression analysis was in agreement with measured erosion rate data.

2.2.2.2 Power Law Regression

Following the methods identified in the article titled "Effects of Particle Size and Bulk Density on Erosion of Quartz Particles" (Roberts et al., 1998), the erosion rates for sediment can be approximated by the power law regression:

$$E = A\tau^n \rho^m \qquad [2]$$

Where:

E	=	erosion rate (cm/s)
τ	=	bed shear stress (Pa)
ρ	=	sediment bulk density (grams per cubic centimeter [g/cm^3])
A, n, and m	=	constants that depend on sediment characteristics

The equation used in the present analysis is an abbreviated variation of Equation 2:

$$E = A\tau^n \qquad [3]$$

Where the constant A is a function of the sediment bulk density and other difficult properties to measure, such as sediment geochemistry and biological influences.

[2] Though other definitions of critical shear stress erosion rate thresholds can be argued (and considered valid), the value of 10^{-4} cm/s threshold is used here for consistency with previous SEDflume efforts and to keep testing times to a practical duration.

The variation of erosion rate with density typically cannot be determined for field sediment because of natural variation in other sediment properties (e.g., mineralogy, particle size, and electrochemical forces). Therefore, the density term from equation number 3, for a particular interval of approximately constant density, is incorporated into the constant *A*.

For each depth interval, the measured erosion rates (*E*) and applied shear stresses (τ) were used to determine the *A* and *n* constants that provide a best-fit power law curve to the data for that interval. Good regression fits of these parameters, where they existed, were then used to estimate the critical shear stress (τ_{linear}) for the respective intervals. A coefficient of determination (r^2) of 0.70 was used as a threshold criterion (r^2_{thresh}) for acceptance.[3]

2.2.3 Measurement of Sediment Bulk Properties

In addition to the measurement of erosion rates during the analysis, sediment subsamples were periodically collected at depth to determine the water content, particle size distribution, and loss on ignition of the sediment in each core. Water content and loss on ignition values are incorporated into the determination of wet and dry bulk densities. Subsamples were collected from the undisturbed core surface (prior to analysis) as well as the sediment surface at the beginning of each subsequent depth interval. Samples were weighed, dried, and reweighed to determine the mass of water. Samples were then subjected to sufficient heat to ignite the organic material to determine loss on ignition.

Wet bulk density was determined by first measuring the wet and dry weight of the collected sample to determine the water content (W) (Håkanson and Jansson, 1983):

$$W = \frac{M_w - M_d}{M_w} \qquad [4]$$

Where:

W = water content
M_w = wet weight of sample
M_d = dry weight of sample

For the determination of wet bulk density, water content in this formulation has a value from 0 to 1. Wet bulk densities were then determined using the method described in the article titled "Principles of Lake Sedimentology" (Håkanson and Jansson, 1983):

[3] The coefficient of determination, r^2, is a function of Pearson's *r,* which is a measure of the linear dependence (correlation) between two variables. Pearson's *r* can be positive or negative and is a value between –1 and +1. The more common usage of the correlation coefficient is to square Pearson's *r*, r^2, and report that value.

$$\rho_{wet} = \frac{(100 * \rho_s)}{100 + (100\% * W + IG)(\rho_s - 1)} \quad [5]$$

Where:

ρ_{dry}	=	wet bulk density
ρ_w	=	density of water (assumed 1 g/cm^3)
ρ_{wet}	=	wet bulk density
ρ_s	=	density of sediment particle (assumed 2.65 g/cm^3)
IG	=	percent (%) loss on ignition based on wet weight (ASTM International Method D7348-13) (ASTM International, 2007)

Dry bulk densities are based on the moisture content (*MC*) defined by ASTM D2216-05 as:

$$MC = \frac{M_w - M_d}{M_d} \quad [6]$$

This formulation represents the ratio of water to solids. Using the *MC* value, dry bulk densities were calculated using the following relationship:

$$\rho_{dry} = \frac{\rho_{wet}}{1 + MC} \quad [7]$$

Particle size distributions were determined using laser diffraction analysis (Appendix A). Sediment samples were screened with a 2,000-micrometer (µm) sieve to remove large pieces of organic material, dispersed in water, and inserted into a Beckman Coulter LS 13-320 laser diffraction analyzer. Each sample was analyzed in three, 1-minute intervals, and the results of the three analyses were averaged automatically by the instrument. The Beckman Coulter LS 13-320 measures volumetric distribution of particles from 0.4 to 2,000 µm. Caution should be taken when comparing directly to more narrowly ranged instruments such as a laser *in situ* scattering and transmissometry instrument or traditional mass-based sieve and hydrometer studies. A laser *in situ* scattering and transmissometry instrument measures aggregated particles in the natural environment and has detection ranges different from that of the desktop instrument. Use of the Beckman Coulter involves the disaggregation of particles, so any direct comparison must consider these factors.

The relationships used to determine sediment bulk properties are summarized in Table 2-3.

3.0 RESULTS

Graphical depictions of core-specific erosion rate, particle-size distribution with depth, and wet bulk density and median particle size with depth are provided in Appendix B (Figures B-1 through B-30). Erosion rates at applied shear stresses are shown with depths next to an image of the core. The indication of no erosion measured refers to the thin dotted line at 10^{-5} cm/s. As described in the previous sections, values of 10^{-4} cm/s are defined as the erosion rate related to minimum measurable critical shear stress.

Appendix B (Figures B-1 through B-30) also includes summary tables of median particle sizes, wet and dry bulk densities, loss on ignition, greatest applied shear with no erosion measured, first applied shear with erosion measured, and two derived critical shears for each core. The column labeled "Recommended τ_{cr}" provides the value derived from the criteria described in Section 2.2.2.1. The power law-derived critical shear was determined using the *A* and *n* values described in Section 2.2.2.2. Each figure includes a table of the derived constants *A* and *n* resulting from the power law fit, along with the r^2 value for each interval, for each core. Values of *A* can vary by orders of magnitude. Values of *n* typically range from 1 to 4, and values outside of this range may be indicative of a spurious data fit.

3.1 SEDFLUME ANALYSIS SUMMARY

Qualitative descriptions of the type of erosion for each core are provided in the following sections, as necessary, to highlight changing processes. Erosion of the core surface generally occurs via individual particles becoming suspended, aggregated clumps of sediment (clump erosion) breaking off causing an uneven surface, or sheets of material peeling off the sediment bed. Non-cohesive materials such as sands will erode as individual particles. Fine-grained sediment such as silts and clays can bind together and will move together under an applied shear. Cracks and uneven sedimentation may cause this bonded sediment to move together as clumps. Sediment deposited cyclically may deposit in uniform layers and can erode as thin sheets.

Core SF01

Core SF01 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows in the upper 10 cm of sediment. The surface of the core contains traces of small worm casings. A photograph of Core SF01 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Appendix B, Figure B-1(1). The number listed in parenthesis after the B series figure number, for example, Figure B-1(1), identifies the image or table in the figure that is being described.

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.14 and 0.67 Pa throughout all depths tested, with an interval average critical shear stress of 0.45 Pa (Figure B-1(2)). Average median grain size and wet bulk density were 15.03 µm and 1.10 g/cm^3, respectively (Figure B-1(2)). Median particle size remained in the silt range throughout the core (Figure B-1(3)). Bulk density increased slightly at depth, while the particle size distribution remained relatively steady (Figure B-1(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps at the lower applied shear stresses, and larger (1/2 cm) clumps at the highest applied shear stress (6.4 Pa). Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-1(5)).

Core SF02

Core SF02 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 34 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows and some organic debris. The surface of the core contains traces of small worm casings. A photograph of Core SF02 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-2(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.14 and 0.75 Pa throughout all depths tested, with an interval average critical shear stress of 0.48 Pa (Figure B-2(2)). Average median grain size and wet bulk density were 16.55 µm and 1.15 g/cm^3, respectively (Figure B-2(2)). Median particle size remained in the silt range throughout the core (Figure B-2(3)). Bulk density increased slightly at depth, and the particle size distribution increased slightly beyond 15.6 cm depth (Figure B-2(4)).

Sediment generally eroded in plumes and small (1/8 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-2(5)).

Core SF03

Core SF03 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 32 cm of sediment. The core contains orange-brown to gray-brown clayey silt with occasional worm burrows and trace organic debris. The surface of the core contains traces of very small worm casings. A photograph of Core SF03 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-3(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.16 and 1.41 Pa throughout all depths tested, with an interval average critical shear stress of 0.65 Pa (Figure B-3(2)). Average median grain size and wet bulk density were 13.61 µm and 1.10 g/cm^3, respectively (Figure B-3(2)). Median particle size remained in the silt range throughout the core (Figure B-3(3)). Bulk density increased slightly at depth while the particle size distribution remained relatively consistent (Figure B-3(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps at the lower applied shear stresses and larger (1/2 cm) clumps at the highest applied shear stress (6.4 Pa). Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-3(5)).

Core SF04

Core SF04 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 28.5 cm of sediment. The core contains orange-brown to gray-brown clayey silt with some worm burrows and trace organic debris. A small bivalve was found at a depth of 2.6 cm. A photograph of Core SF04 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-4(1).

Shear stresses ranging between 0.1 and 3.2 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.17 and 0.35 Pa throughout all depths tested, with an interval average critical shear stress of 0.26 Pa (Figure B-4(2)). Average median grain size and wet bulk density were 12.53 µm and 1.17 g/cm^3, respectively (Figure B-4(2)). Median particle size remained in the silt range throughout the core (Figure B-4(3)). Bulk density increased gradually at depth, and the particle size distribution remained relatively consistent (Figure B-4(4).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps and plumes at the lower applied shear stresses and larger (1/2-1 cm) clumps and plates at the higher applied shear stresses (3.2 Pa). Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-4(5)).

<u>Core SF05</u>

Core SF05 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains orange-brown to gray-brown clayey silt with some worm burrows. The surface of the core contains traces of small worm casings. A photograph of Core SF05 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-5(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.16 and 0.7 Pa throughout all depths tested, with an interval average critical shear stress of 0.48 Pa (Figure B-5(2)). Average median grain size and wet bulk density were 14.62 µm and 1.17 g/cm^3, respectively (Figure B-5(2)). Median particle size remained in the silt range throughout the core (Figure B-5(3)). Bulk density increased gradually at depth, and the particle size distribution decreased slightly (Figure B-5(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps and plumes at the lower applied shear stresses and larger (1/2-1 cm) clumps at the higher applied shear stresses. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-5(5)).

<u>Core SF06</u>

Core SF06 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 35 cm of sediment. The core contains orange-brown to gray-brown clayey silt with trace biotic activity and organic debris. The surface of the core contains traces of small worm casings. A photograph of Core SF06 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-6(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.13 and 0.63 Pa throughout all depths tested, with an interval average critical shear stress of 0.51 Pa (Figure B-6(2)). Average median grain size and wet bulk density were 15.17 µm and 1.13 g/cm^3, respectively (Figure B-6(2)). Median particle size remained in the silt range throughout the core (Figure B-6(3)). Bulk density increased gradually at depth, and the particle size distribution decreased slightly (Figure B-6(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-6(5)).

Core SF07

Core SF07 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 31 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with trace organic debris and worm burrows. The surface of the core contains traces of small worm casings and debris. A photograph of Core SF07 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-7(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.34 and 0.80 Pa throughout all depths tested, with an interval average critical shear stress of 0.48 Pa (Figure B-7(2)). Average median grain size and wet bulk density were 13.29 µm and 1.16 g/cm^3, respectively (Figure B-7(2)). Median particle size remained in the silt range throughout the core (Figure B-7(3)). Bulk density increased in the first 4.3 cm of the core and then gradually decreased, while the particle size distribution remained relatively steady (Figure B-7(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasionally larger (1/2-3/4 cm) clumps at the highest applied shear stress (6.4 Pa). Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-7(5)).

Core SF08

Core SF08 was collected on February 21, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with worm burrows. The surface of the core contains traces of small worm casings and organic debris. A photograph of Core SF08 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-8(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.16 and 0.63 Pa throughout all depths tested, with an interval average critical shear stress of 0.54 Pa (Figure B-8(2)). Average median grain size and wet bulk density were 17.94 µm and 1.17 g/cm^3, respectively (Figure B-8(2)). Median particle size remained in the silt range throughout the core (Figure B-8(3)). Bulk density increased gradually with depth, and the particle size distribution remained steady (Figure B-8(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-8(5)).

Core SF09

Core SF09 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 31 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows. The surface of the core contains traces of small worm casings and organic debris. A photograph of Core SF09 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-9(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.20 and 1.16 Pa throughout all depths tested, with an interval average critical shear stress of 0.66 Pa (Figure B-9(2)). Average median grain size and wet bulk density were 14.56 µm and 1.11 g/cm^3, respectively (Figure B-9(2)). Median particle size remained in the silt range throughout the core (Figure B-9(3)). Bulk density increased at depth, while the particle size distribution remained relatively steady (Figure B-9(4)).

Sediment generally eroded in plumes and small (1/8 cm) clumps throughout the first test interval, and small to medium (1/8-1/4 cm) clumps through the remaining test intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-9(5)).

Core SF10

Core SF10 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 32 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some worm burrows and organic debris. The surface of the core contains traces of small worm casings. A photograph of Core SF10 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-10(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.2 and 1.14 Pa throughout all depths tested, with an interval average critical shear stress of 0.64 Pa (Figure B-10(2)). The average median grain size and wet bulk density were 16.03 µm and 1.12 g/cm^3, respectively (Figure B-10(2)). Median particle size remained in the silt range throughout the core (Figure B-10(3)). Bulk density increased in the first 6.3 cm of the core and then gradually decreased, while the particle size distribution remained relatively steady (Figure B-10(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasional plumes. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-10(5)).

Core SF11

Core SF11 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 31 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some organic debris and worm burrows. The surface of the core contains traces of small worm casings and organic debris. A photograph of Core SF11 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-11(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.19 and 1.27 Pa throughout all depths tested, with an interval average critical shear stress of 0.66 Pa (Figure B-11(2)). Average median grain size and wet bulk density were 15.13 µm and 1.15 g/cm^3, respectively (Figure B-11(2)). Median particle size remained in the silt range throughout the core (Figure B-11(3)). Bulk density increased at depth, while the particle size distribution remained relatively steady (Figure B-11(4)).

Sediment generally eroded in small (1/8 cm) clumps with occasionally medium to large (1/4–1/2 cm) clumps at the higher applied shear stresses. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-11(5)).

Core SF12

Core SF12 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 35 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some organic debris and worm burrows. The surface of the core contains traces of small worm casings and organic debris. A photograph of Core SF12 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-12(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.2 and 1.42 Pa throughout all depths tested, with an interval average critical shear stress of 0.86 Pa (Figure B-12(2)). Average median grain size and wet bulk density were 12.69 µm and 1.18 g/cm^3, respectively (Figure B-12(2)). Median particle size remained in the silt range throughout the core (Figure B-12(3)). Bulk density increased at depth, while the particle size distribution decreased beyond 5 cm depth (Figure B-12(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasional larger (1/2-3/4 cm) clumps and plumes at the higher applied shear stresses. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-12(5)).

Core SF13

Core SF13 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 31 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with trace organic debris and some worm burrows. A photograph of Core SF13 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-13(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.16 and 0.8 Pa throughout all depths tested, with an interval average critical shear stress of 0.56 Pa (Figure B-13(2)). Average median grain size and wet bulk density were 16.07 µm and 1.17 g/cm^3, respectively (Figure B-13(2)). Median particle size remained in the silt range throughout the core (Figure B-13(3)). Bulk density generally increased at depth, while the particle size distribution remained steady until 10.7 cm depth and then decreased (Figure B-13(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-13(5)).

Core SF14

Core SF14 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 35 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with trace organic debris and occasional worm burrows. A photograph of Core SF14 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-14(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.32 and 1.19 Pa throughout all depths tested, with an interval average critical shear stress of 0.81 Pa (Figure B-14(2)). Average median grain size and wet bulk density were 16.17 µm and 1.16 g/cm^3, respectively (Figure B-14(2)). Median particle size remained in the silt range throughout the core (Figure B-14(3)). Bulk density generally increased at depth, while the particle size distribution remained relatively steady (Figure B-14(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-14(5)).

<u>Core SF15</u>

Core SF15 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 33 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with common worm burrows. The surface of the core contains traces of small worm casings and organic debris. A photograph of Core SF15 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-15(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.16 and 1.37 Pa throughout all depths tested, with an interval average critical shear stress of 0.67 Pa (Figure B-15(2)). Average median grain size and wet bulk density were 18.78 µm and 1.17 g/cm^3, respectively (Figure B-15(2)). Median particle size remained in the silt range throughout the core (Figure B-15(3)). Bulk density and particle size distribution increased in the first 2 cm of the core and then remained steady (Figure B- 15(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasionally larger (1/2-3/4 cm) clumps at the higher applied shear stresses. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-15(5)).

<u>Core SF16</u>

Core SF16 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 35 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with common worm burrows and some organic debris. A photograph of Core SF16 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-16(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.17 and 1.37 Pa throughout all depths tested, with an interval average critical shear stress of 0.86 Pa (Figure B-16(2)). Average median grain size and wet bulk density were 19.32 µm and 1.17 g/cm^3, respectively (Figure B-16(2)). Median particle size remained in the silt range throughout the core (Figure B-16(3)). Bulk density increased at depth, while the particle size distribution remained generally steady (Figure B-16(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-16(5)).

Core SF17

Core SF17 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 33 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with trace worm burrows and organic debris. A photograph of Core SF17 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-17(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.2 and 1.31 Pa throughout all depths tested, with an interval average critical shear stress of 0.73 Pa (Figure B-17(2)). Average median grain size and wet bulk density were 19.13 µm and 1.22 g/cm^3, respectively (Figure B-17(2)). Median particle size remained in the silt range throughout the core (Figure B-17(3)). Bulk density increased until 6 cm depth and then decreased slightly, while the particle size distribution remained generally steady (Figure B-17(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-17(5)).

Core SF18

Core SF18 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 34 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with common worm burrows and trace organic debris. A photograph of Core SF18 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-18(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.18 and 1.28 Pa throughout all depths tested, with an interval average critical shear stress of 0.89 Pa (Figure B-18(2)). Average median grain size and wet bulk density were 19.27 µm and 1.17 g/cm^3, respectively (Figure B-18(2)). Median particle size remained in the silt range throughout the core (Figure B-18(3)). Bulk density increased with depth, while the particle size distribution remained generally steady (Figure B-18(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasional larger (1/2 cm) clumps at the higher shear stresses. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-18(5)).

Core SF19

Core SF19 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 29 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows and trace organic debris. A photograph of Core SF19 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-19(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.2 and 1.24 Pa throughout all depths tested, with an interval average critical shear stress of 0.65 Pa (Figure B-19(2)). Average median grain size and wet bulk density were 24.61 µm and 1.20 g/cm^3, respectively (Figure B-19(2)). Median particle size remained in the silt range throughout the core (Figure B-19(3)). Bulk density generally increased with depth, while the particle size distribution remained relatively steady (Figure B-19(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-19(5)).

Core SF20

Core SF20 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 31 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with common worm burrows and organic debris. A photograph of Core SF20 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-20(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.21 and 2.51 Pa throughout all depths tested, with an interval average critical shear stress of 1.16 Pa (Figure B-20(2)). Average median grain size and wet bulk density were 21.15 µm and 1.25 g/cm^3, respectively (Figure B-20(2)). Median particle size remained in the silt range throughout the core (Figure B-20(3)). Bulk density generally increased with depth, while the particle size distribution increased in the first 2 cm and then gradually decreased (Figure B-20(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. A large stick (15 cm by 2.5 cm) was recovered at a depth of 4.3 cm and may have affected erosion in the third interval. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-20(5)).

Core SF21

Core SF21 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 35 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some worm burrows and trace organic debris. A photograph of Core SF21 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-21(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.33 and 3.09 Pa throughout all depths tested, with an interval average critical shear stress of 1.50 Pa (Figure B-21(2)). Average median grain size and wet bulk density were 23.24 µm and 1.19 g/cm^3, respectively (Figure B-21(2)). Median particle size remained in the silt range throughout the core (Figure B-21(3)). Bulk density increased gradually with depth, and the particle size distribution increased until 7 cm and then gradually decreased (Figure B-21(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-21(5)).

Core SF22

Core SF22 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 29 cm of sediment. The core contains light gray-brown clayey silt with sand and small gravels. A sandy layer with gravel is present at a depth of 4.2 to 12.5 cm. Some small worm burrows and bivalves are present throughout. A photograph of Core SF22 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-22(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.27 and 0.80 Pa throughout all depths tested, with an interval average critical shear stress of 0.49 Pa (Figure B-22(2)). Average median grain size and wet bulk density were 22.39 µm and 1.35 g/cm^3, respectively (Figure B-22(2)). Median particle size remained in the silt range throughout the core (Figure B-22(3)). Bulk density generally increased with depth, while the particle size distribution remained relatively constant (Figure B- 22(4)).

Sediment eroded in a plume and very small clumps in the first interval, and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-22(5)).

Core SF23

Core SF23 was collected on February 22, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light gray-brown silt. No evidence of epifauna was present in the core. Changes in color, moving from lighter brown to grey, occurred 8 to 12 cm from the surface. A photograph of Core SF23 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-23(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.40 and 1.29 Pa throughout all depths tested, with an interval average critical shear stress of 0.82 Pa at the surface and generally increased to 1.29 Pa at the last interval (Figure B-23(2)). Average median grain size and wet bulk density were 27.73 µm and 1.20 g/cm^3, respectively (Figure B-23(2)). Median particle size remained in the silt range throughout the core (Figure B-23(3)). Bulk density generally increased with depth, while the particle size distribution remained relatively constant (Figure B-23(4)).

Sediment eroded in a plume and very small clumps in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-23(5)).

Core SF24

Core SF24 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows. A photograph of Core SF24 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-24(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.28 and 1.34 Pa throughout all depths tested, with an interval average critical shear stress of 0.85 Pa (Figure B-24(2)). Average median grain size and wet bulk density were 26.57 µm and 1.18 g/cm^3, respectively (Figure B-24(2)). Median particle size remained in the silt range throughout the core (Figure B-24(3)). Bulk density and particle size distribution increased gradually with depth (Figure B-24(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-24(5)).

Core SF25

Core SF25 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some worm burrows and trace organic debris. A photograph of Core SF25 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-25(1).

Shear stresses ranging between 0.1 and 12.8 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.30 and 1.35 Pa throughout all depths tested, with an interval average critical shear stress of 0.88 Pa (Figure B-25(2)). Average median grain size and wet bulk density were 26.98 µm and 1.17 g/cm^3, respectively (Figure B-25(2)). Median particle size remained in the silt range throughout the core (Figure B-25(3)). Bulk density increased gradually with depth, while the particle size distribution remained relatively steady (Figure B-25(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-25(5)).

Core SF26

Core SF26 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 22 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some worm burrows and common organic debris. A photograph of Core SF26 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-26(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in four test intervals. Derived critical shear stresses were between 0.28 and 1.60 Pa throughout all depths tested, with an interval average critical shear stress of 0.83 Pa (Figure B-26(2)). Average median grain size and wet bulk density were 28.07 µm and 1.31 g/cm^3, respectively (Figure B-26(2)). Median particle size remained in the silt range throughout the core (Figure B-26(3)). Bulk density increased in the first 1 cm, then decreased until a depth of 4 cm, and then increased again until the final depth tested. The particle size distribution decreased slightly and gradually with depth (Figure B-26(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the four test intervals (Figure B-26(5)).

Core SF27

Core SF27 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 22 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional sand and gravel. Some worm burrows and common organic debris are present throughout the core. A photograph of Core SF27 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-27(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in four test intervals. Derived critical shear stresses were between 0.25 and 1.33 Pa throughout all depths tested, with an interval average critical shear stress of 0.60 Pa (Figure B-27(2)). Average median grain size and wet bulk density were 30.75 µm and 1.33 g/cm^3, respectively (Figure B-27(2)). Median particle size remained in the silt range throughout the core (Figure B-27(3)). Bulk density increased in the first 1 cm, then decreased until a depth of 4 cm, and then increased again until the final depth tested. The particle size distribution decreased slightly and gradually with depth (Figure B-27(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the four test intervals (Figure B-27(5)).

Core SF28

Core SF28 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with some sand and very common organic debris (leaves, twigs, sticks). A photograph of Core SF28 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-28(1).

Shear stresses ranging between 0.1 and 3.2 Pa were applied to the core in four test intervals. Derived critical shear stresses were between 0.26 and 0.56 Pa throughout all depths tested, with an interval average critical shear stress of 0.41 Pa (Figure B-28(2)). Average median grain size and wet bulk density were 27.38 µm and 1.17 g/cm^3, respectively (Figure B-28(2)). Median particle size remained in the silt range throughout the core (Figure B-28(3)). Bulk density generally decreased with depth, and the particle size distribution remained relatively constant (Figure B-28(4)).

Sediment generally eroded in small to medium (1/8-1/4 cm) clumps with occasionally large to very large (1/2-2 cm) clumps where organic debris undermined sediment resulting in weak layers. Power law fit parameters relating shear stress and erosion rate are provided for the four test intervals (Figure B-28(5)).

Core SF29

Core SF29 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 30.5 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with trace sand, and occasional worm burrows and common organic debris are present throughout. A photograph of Core SF29 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-29(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.20 and 0.99 Pa throughout all depths tested, with an interval average critical shear stress of 0.66 Pa (Figure B-29(2)). Average median grain size and wet bulk density were 28.27 µm and 1.19 g/cm^3, respectively (Figure B-29(2)). Median particle size remained in the silt range throughout the core (Figure B-29(3)). Bulk density and particle size distribution increased gradually with depth (Figure B-29(4)).

Sediment generally eroded in a plume in the first interval and small to medium (1/8-1/4 cm) clumps in the remaining intervals. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-29(5)).

<u>Core SF30</u>

Core SF30 was collected on February 23, 2022, as described in Table 2-2, and resulted in the recovery of 30 cm of sediment. The core contains light orange-brown to gray-brown clayey silt with occasional worm burrows and trace organic debris. A photograph of Core SF30 aligned vertically with the applied shear stress and corresponding erosion rate data is presented in Figure B-30(1).

Shear stresses ranging between 0.1 and 6.4 Pa were applied to the core in five test intervals. Derived critical shear stresses were between 0.2 and 1.60 Pa throughout all depths tested, with an interval average critical shear stress of 0.90 Pa (Figure B-30(2)). Average median grain size and wet bulk density were 29.55 µm and 1.17 g/cm^3, respectively (Figure B-30(2)). Median particle size remained in the silt range throughout the core (Figure B-30(3)). Bulk density generally increased with depth, and the particle size distribution increased until 7 cm and then remained steady (Figure B-30(4)).

Sediment generally eroded in a plume and small to medium (1/8-1/4 cm) clumps. Power law fit parameters relating shear stress and erosion rate are provided for the five test intervals (Figure B-30(5)).

3.2 SEDFLUME ANALYSIS CONCLUSIONS

Characterization of sediment erodibility properties produced a data set that includes erosion rates, critical shear stresses for erosion, and physical measurements of native sediment throughout the system. Samples can be compared on a sitewide basis by comparing the erodibility of each core or interval to the sitewide average. The erosion rate ratio for each core is relative to the average over all cores. By comparing this way, Integral identified general trends or cores with similar erodibility traits. Figure 3-1 shows a summary of mass erosion rate ratios comparing between cores, as well as comparing between intervals within cores. Within this data set, Core SF03, located toward the upper portion of the site away from the mouth of SIB, was most erodible, while samples SF21 and SF23, located near the ship berths at the end of Swan Island, were the least erodible samples tested. This can be further extended to look at each interval tested. When comparing the intervals, which can vary in size but are generally 3 to 5 cm thick, Integral found that the surface was generally most erodible across the site and the last interval was the least erodible; however, there is variability across the site. The noted variation in erodibility could be due to physical attributes, such as grain size and bulk density, or the presence or absence of benthic epifauna that was noted in some samples. Overall, the site includes a range of sediment erodibility properties and physical characteristics that can be considered when developing remedial strategies.

4.0 REFERENCES

ASTM International, 2007. *Annual book of ASTM standards.* Vol. 04.08, Soil and Rock (I): D420–D5611. ASTM International, West Conshohocken, PA. pp. 314–315.

Håkanson, L. and M. Jansson, 1983. "Principles of Lake Sedimentology." 320 pp. Berlin–New York: Springer-Verlag. ISBN 3–540 (Berlin) 0–387 (New York)–12645–7. DM 98, *Int. Revue ges. Hydrobiol.*

HydroGeoLogic, Inc. (HGL), 2022a. *Pre-Design Investigation Work Plan, Revision 3,* CERCLA Docket No. 10-2021-001. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2022b. *Uniform Federal Policy-Quality Assurance Project Plan, Revision 3, CERCLA Docket No. 10-2021-001.* Appendix B of the Pre-Design Investigation Work Plan, Revision 3. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2022c. *Waste Management Plan, Revision 3, CERCLA Docket No. 10-2021-001.* Appendix C of the Field Sampling Plan. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

Jepsen, R., Roberts, J., and Lick, W., 1997. "Effects of Bulk Density on Sediment Erosion Rates." *Water, Air, and Soil Pollution.* 99: 21–31.

McNeil, J., Taylor, C., and Lick, W., 1996. "Measurements of Erosion of Undisturbed Bottom Sediments with Depth." *Journal of Hydraulic Engineering.* 122(6): 316–324.

Roberts, J., Jepsen, R., Gotthard, D., and Lick, W., 1998. "Effects of Particle Size and Bulk Density on Erosion of Quartz Particles." *Journal of Hydraulic Engineering.* 124(12): 1261–1267.

Sea Engineering, Inc., 2006. *SEDflume Analysis*, Willamette River, Portland, OR.

U.S. Environmental Protection Agency (EPA), 2017. *Record of Decision, Portland Harbor Superfund Site*, Portland, Oregon.

EPA, 2021. Administrative Settlement Agreement and Order on Consent for Remedial Design, Swan Island Basin Project Area, CERCLA Docket No. 10-2021-001-7, Region 10. January 20.

TABLES

This page was intentionally left blank.

Table 2-1
SEDflume Sample Locations

Location Identification	Proposed Locations (NAD83) [a] Easting (ft)	Northing (ft)	Mudline Depth (ft, NAVD88) [b]	Mudline Depth (below CRD ft) [c]
SF1	7,636,366	698,959	13.2	18.5
SF2	7,636,523	699,150	12.5	17.8
SF3	7,635,972	699,327	17.3	22.6
SF4	7,636,062	699,444	17.5	22.7
SF5	7,635,476	699,687	19.7	25.0
SF6	7,635,564	699,932	20.0	25.3
SF7	7,634,947	700,120	25.8	31.1
SF8	7,635,167	700,274	21.0	26.2
SF9	7,634,431	700,542	26.9	32.2
SF10	7,634,588	700,733	17.4	22.7
SF11	7,634,044	700,858	28.2	33.5
SF12	7,634,201	701,050	19.4	24.7
SF13	7,633,624	701,202	27.9	33.2
SF14	7,633,781	701,393	21.4	26.6
SF15	7,633,142	701,503	29.8	35.0
SF16	7,633,251	701,826	18.9	24.1
SF17	7,632,784	701,457	30.5	35.8
SF18	7,632,713	701,785	18.3	23.6
SF19	7,632,519	701,335	29.6	34.9
SF20	7,632,390	701,634	20.6	25.9
SF21	7,632,075	701,242	31.1	36.4
SF22	7,632,034	701,561	12.4	17.6
SF23	7,631,843	700,943	29.9	35.2
SF24	7,631,464	701,251	31.2	36.5
SF25	7,631,502	701,659	13.7	19.0
SF26	7,631,682	700,022	41.9	47.2
SF27	7,631,203	700,427	41.1	46.4
SF28	7,630,888	700,884	51.1	56.4
SF29	7,630,866	701,486	35.3	40.6
SF30	7,631,017	701,866	9.6	14.9

Footnotes:
a) Horizontal Projection: NAD83 Oregon State Plane North (international ft)
b) Elevations from 2018 NOAA multi-beam bathymetry and 2014 Otago Regional Council LiDAR
c) USACE conversion from CRD to NAVD88 for RM 7.5 to 11.7 at Broadway Bridge: CRD is 5.28 ft above NAVD88 at RM 9.7.

Acronyms:
ft = feet
CRD = Columbia River datum
LiDAR = light detection and ranging
NAD83 = North American Datum of 1983
NAVD88 = North American Vertical Datum of 1988
NOAA = National Oceanic and Atmospheric Administration
OLC = Oregon LiDAR Consortium
RM = river mile
USACE = U.S. Army Corps of Engineers

Table 2-2
SEDFlume Sample Information

Locations	Collection Date	Collection Time	Recovery (cm)	Best Attempt
SF01	2/21/2022	12:01	30	Fifth attempt
SF02	2/21/2022	10:20	34	Third attempt
SF03	2/21/2022	12:51	32	Second attempt
SF04	2/21/2022	13:32	28.5	Second attempt, best attempt of four
SF05	2/21/2022	14:38	30	First attempt
SF06	2/21/2022	15:12	35	First attempt
SF07	2/21/2022	15:39	31	First attempt
SF08	2/21/2022	17:09	30	Seventh attempt
SF09	2/22/2022	9:14	31	Third attempt
SF10	2/22/2022	9:50	32	Second attempt
SF11	2/22/2022	10:09	31	First attempt
SF12	2/22/2022	10:59	35	Fourth attempt
SF13	2/22/2022	11:46	31	First attempt
SF14	2/22/2022	12:05	35	First attempt
SF15	2/22/2022	12:22	33	First attempt
SF16	2/23/2022	8:10	35	First attempt
SF17	2/22/2022	12:42	33	First attempt
SF18	2/22/2022	13:00	34	First attempt
SF19	2/22/2022	14:01	29	Sixth attempt
SF20	2/23/2022	8:25	31	First attempt
SF21	2/23/2022	8:51	35	Second attempt
SF22	2/23/2022	10:08	29	Third attempt
SF23	2/22/2022	14:35	30	First attempt
SF24	2/23/2022	10:39	30	First attempt
SF25	2/23/2022	10:59	30	Second attempt
SF26	2/23/2022	15:19	22	Seventh attempt
SF27	2/23/2022	14:46	22	Fifth attempt
SF28	2/23/2022	13:48	30	Third attempt
SF29	2/23/2022	12:49	30.5	Second attempt
SF30	2/23/2022	12:25	30	Second attempt

Acronyms:
cm = centimeter

Table 2-3
Parameters Measured and Computed During the SEDflume Analysis

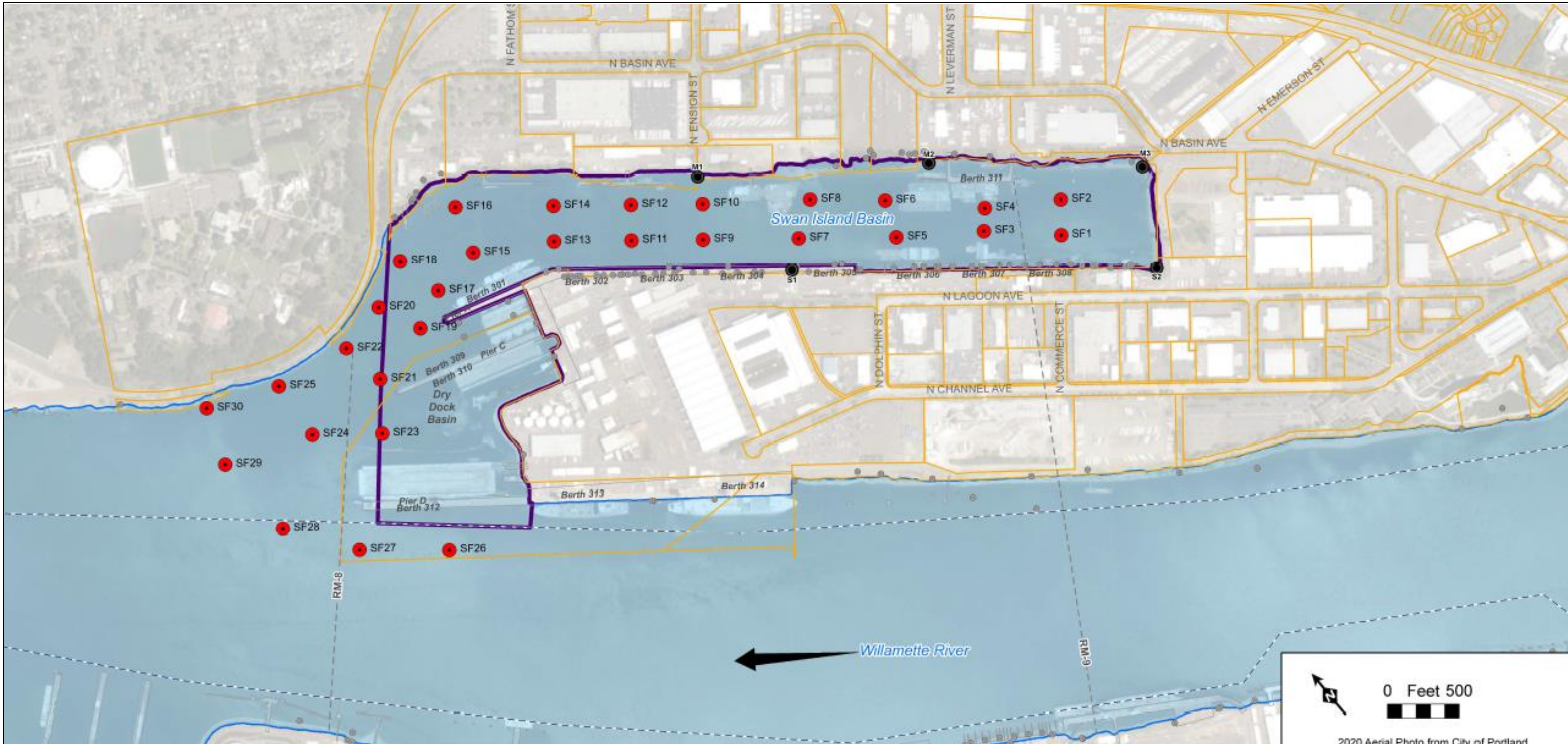
Measurement	Definition	Units	Detection Limit	Internal Consistency
Water Content	$W = \frac{M_w - M_d}{M_w}$	Dimensionless	0.001 g in sample weight ranging from 1 to 50 g	$0 < W < 1$
Moisture Content	$MC = \frac{M_w - M_d}{M_d}$	Dimensionless	0.001 g in sample weight ranging from 1 to 50 g	NA
Wet Bulk Density	$\rho_{wet} = \frac{(100 * \rho_s)}{100 + (100 * W + IG)(\rho_s - 1)}$	g/cm^3	0.001 g in sample weight ranging from 1 to 50 g	$\rho_w < \rho_{wet} < 2.6\ \rho_w$
Dry Bulk Density	$\rho_{dry} = \frac{\rho_{wet}}{1 + MC}$	g/cm^3	0.001 g in sample weight ranging from 1 to 50 g	$\rho_w < \rho_{dry} < \rho_{wet}$
Particle Size Distribution Below 2,000 µm	Distribution of particle sizes by volume percentage using laser diffraction	µm	Method specific	1 µm < grain size < 2,000 µm

Notes:
M_d = dry weight of sample
M_w = wet weight of sample
ρ_w = density of water (assumed 1 g/cm^3)
ρ_s = density of sediment particle (assumed 2.65 g/cm^3)

Acronyms:
% = percent
µm = micrometer
g = gram
g/cm^3 = grams per cubic centimeter
IG = percent loss on ignition based on wet weight
MC = moisture content
NA = not applicable
ρ_{dry} = dry bulk density
ρ_{wet} = wet bulk density
W = water content

FIGURES

This page was intentionally left blank.



City of Portland Stormwater Outfall
Non-City Outfall
Dock Drain
River Mile (RM)
Swan Island Sediment Decision Unit (SDU)
Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot Boundary
Ordinary High Water (City of Portland, 2013)
River Flow Direction
SedFlume Cores (30 Total)

Figure 1-1

SEDflume Sampling Locations

Prepared on 6/13/2022

SEDflume Sampling Summary
Swan Island Basin

PACIFIC groundwater GROUP
HGL HydroGeoLogic, Inc
MOTT MACDONALD
BRIDGEWATER GROUP

Sediment Core Collection Apparatus	Retrieval of Sediment Core Sample
	

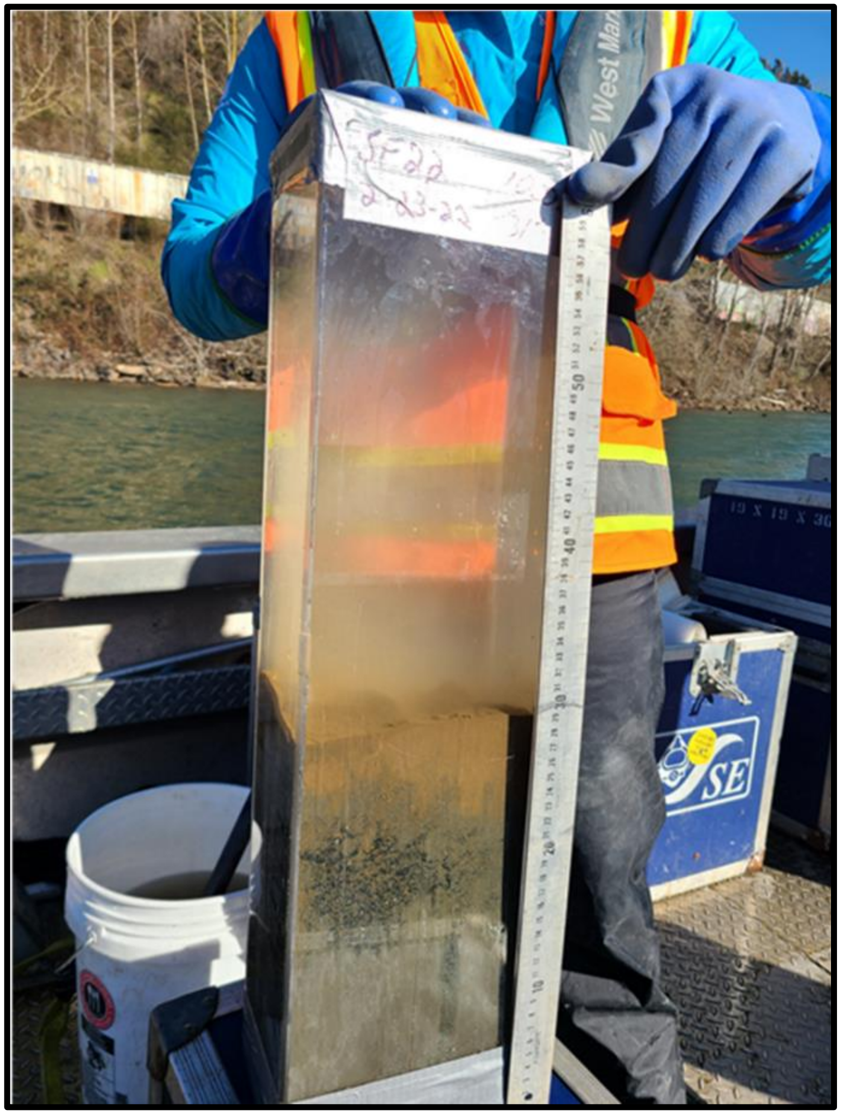
Prepared on 6/13/2022

SEDflume Sampling Summary
Swan Island Basin

Figure 2-1
Sediment Core Sampling

SEDflume Sample SF14

SEDflume Sample SF22



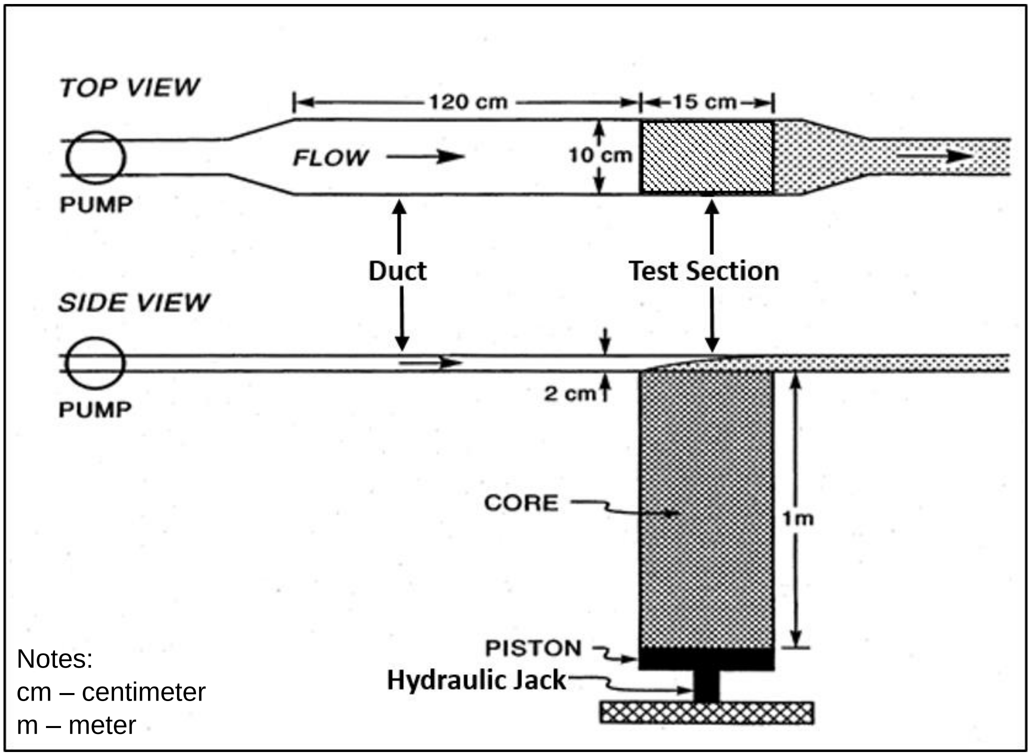
Prepared on 6/13/2022

SEDflume Sampling Summary
Swan Island Basin

Figure 2-2

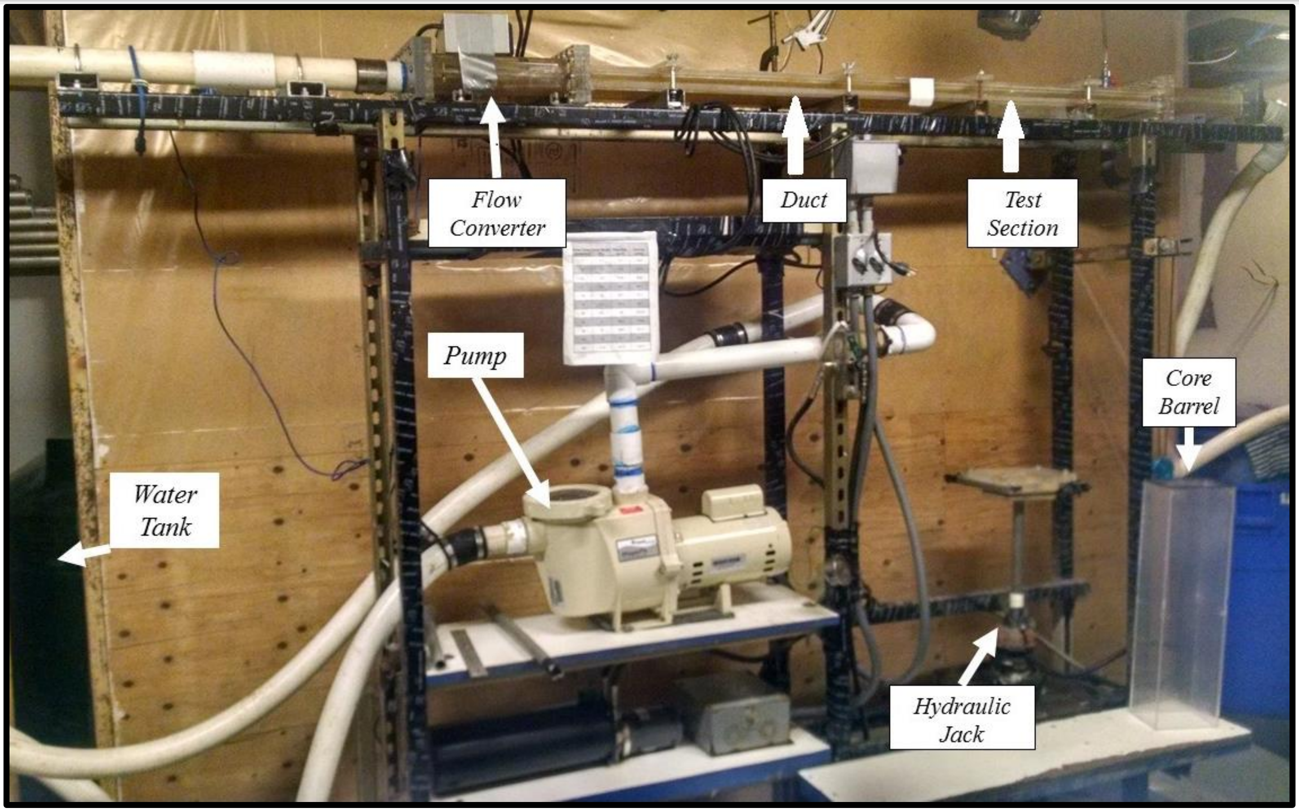
Sediment Core Post-Retrieval

Schematic of SEDflume Setup Showing Top and Side Views (McNeil et al., 1996)



Notes:
cm – centimeter
m – meter

SEDflume Configuration in Integral's Laboratory, Santa Cruz, California



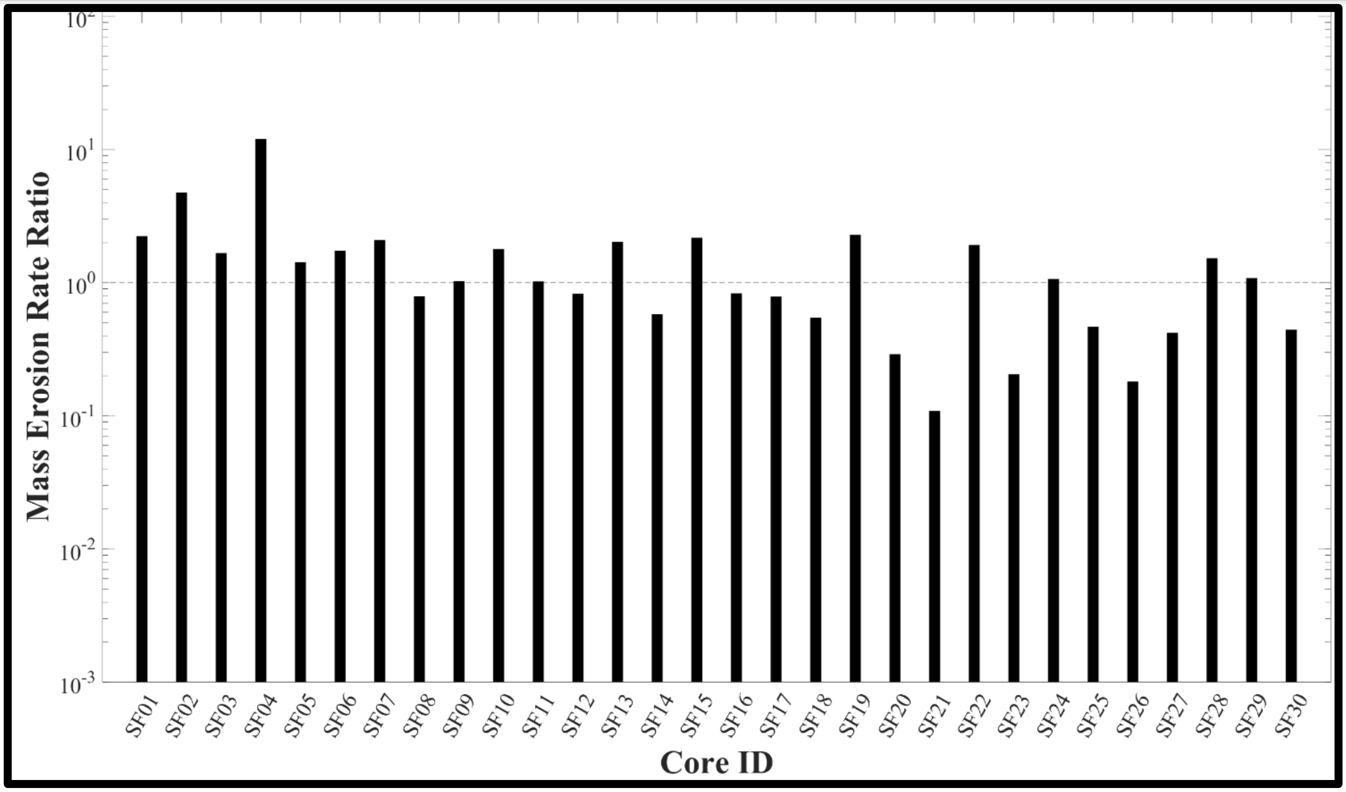
Prepared on 6/13/2022

SEDflume Sampling Summary
Swan Island Basin

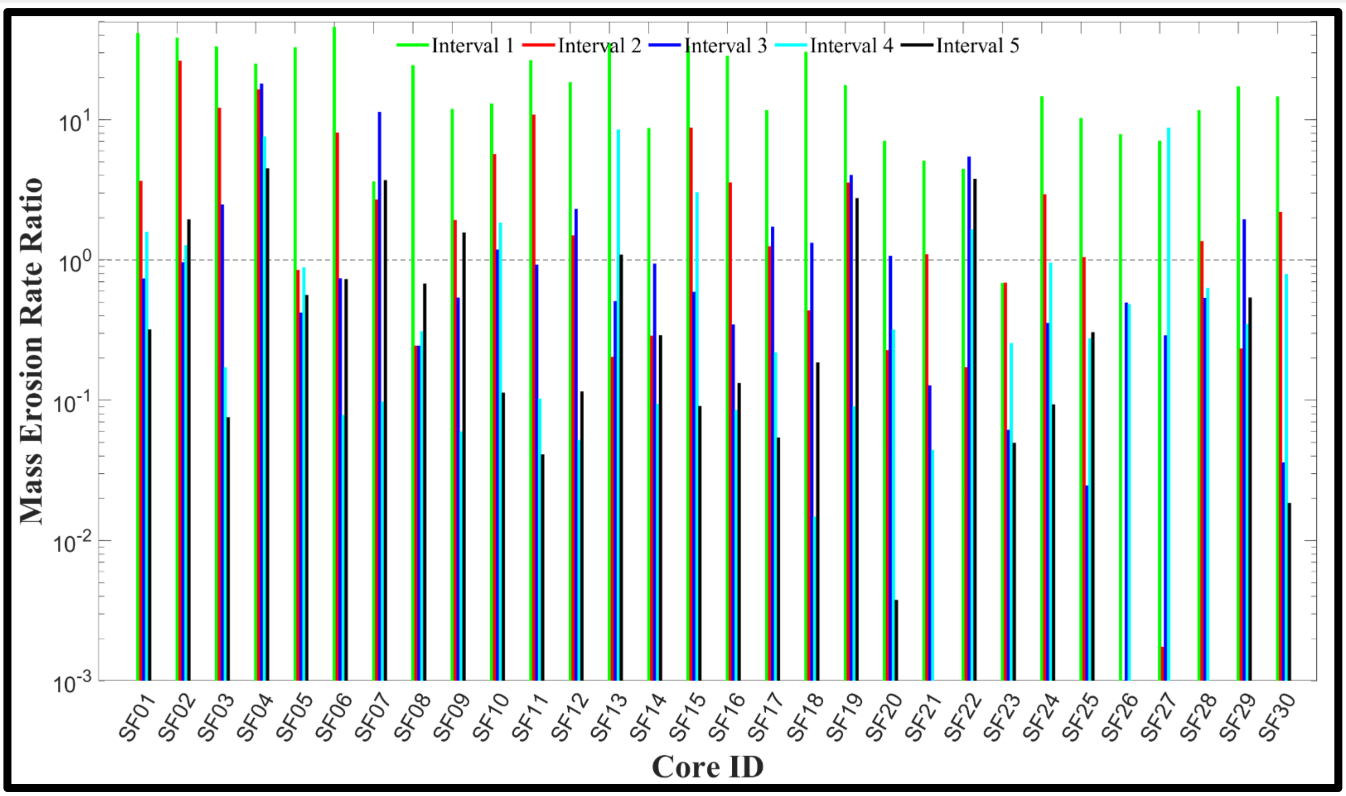
Figure 2-3

Laboratory Configuration of SEDflume

Inter-core Erodibility Comparison



Intra-core Erodibility Comparison



Prepared on 6/13/2022

SEDflume Sampling Summary
Swan Island Basin

Figure 3-1

Sediment Core Erodibility Comparison

APPENDIX A

PARTICLE SIZE DISTRIBUTIONS

This page was intentionally left blank.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

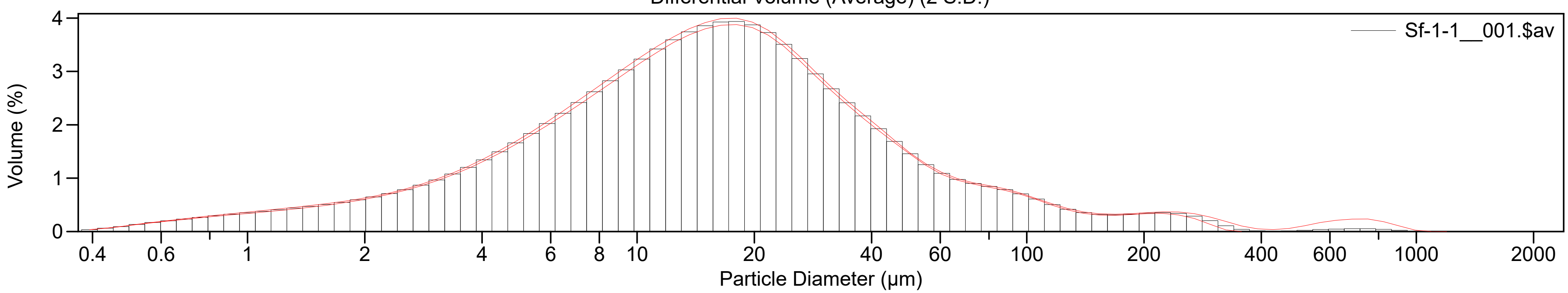
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-1-1__001.$av
	Sf-1-1__001.$av
File ID:	SF-1-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-1-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.60 µm	S.D.:	3.192
Median:	15.26 µm	Variance:	10.19
Mean/Median ratio:	0.957	Skewness:	-0.082 Left skewed
Mode:	18.00 µm	Kurtosis:	0.561 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.352 µm	7.485 µm	15.26 µm	28.93 µm	58.62 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

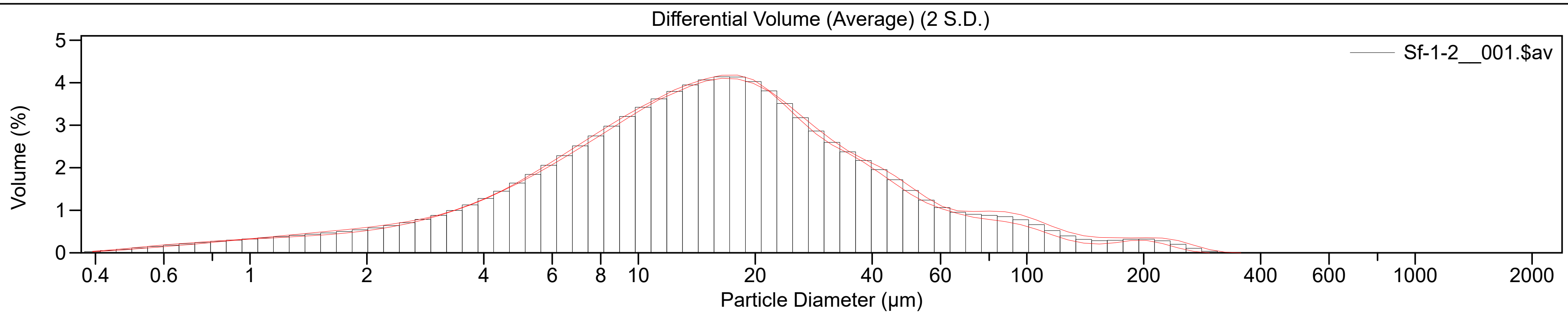
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-1-2__001.$av
	Sf-1-2__001.$av
File ID:	SF-1-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-1-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.38 µm	S.D.:	2.978
Median:	15.09 µm	Variance:	8.867
Mean/Median ratio:	0.953	Skewness:	-0.247 Left skewed
Mode:	16.40 µm	Kurtosis:	0.449 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.629 µm	7.729 µm	15.09 µm	27.93 µm	54.40 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

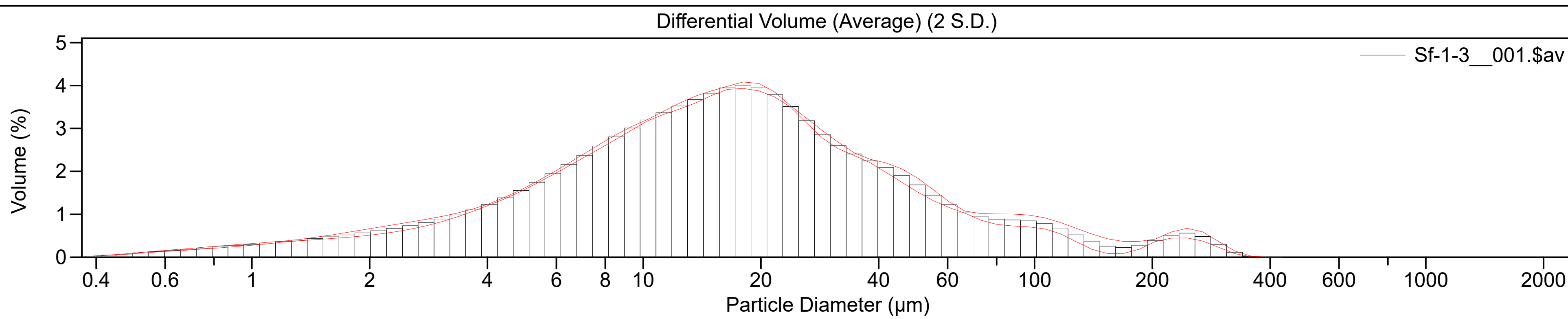
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-1-3__001.$av
	Sf-1-3__001.$av
File ID:	SF-1-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-1-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.56 µm	S.D.:	3.148
Median:	16.03 µm	Variance:	9.909
Mean/Median ratio:	0.971	Skewness:	-0.111 Left skewed
Mode:	18.00 µm	Kurtosis:	0.369 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.659 µm	7.967 µm	16.03 µm	30.86 µm	64.03 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

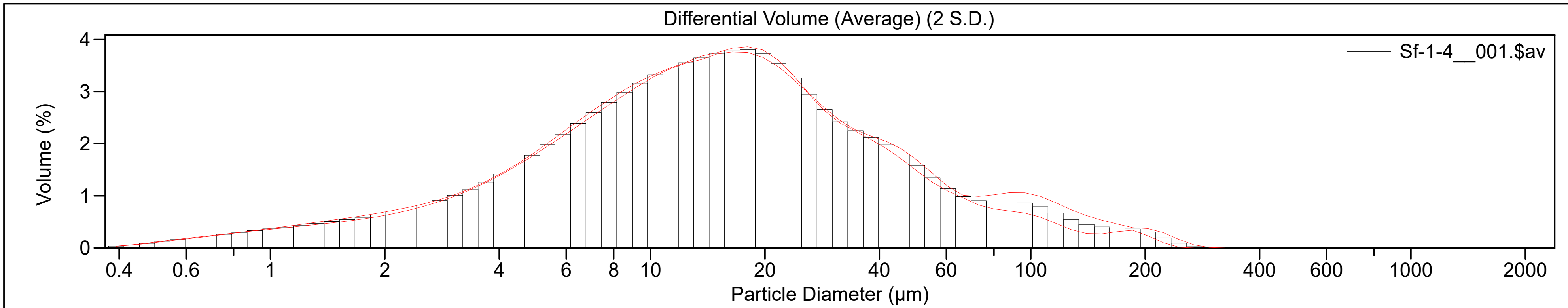
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-1-4__001.$av
	Sf-1-4__001.$av
File ID:	SF-1-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-1-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.92 µm	S.D.:	3.103
Median:	14.58 µm	Variance:	9.631
Mean/Median ratio:	0.955	Skewness:	-0.225 Left skewed
Mode:	18.00 µm	Kurtosis:	0.166 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.228 µm	7.105 µm	14.58 µm	28.44 µm	57.35 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

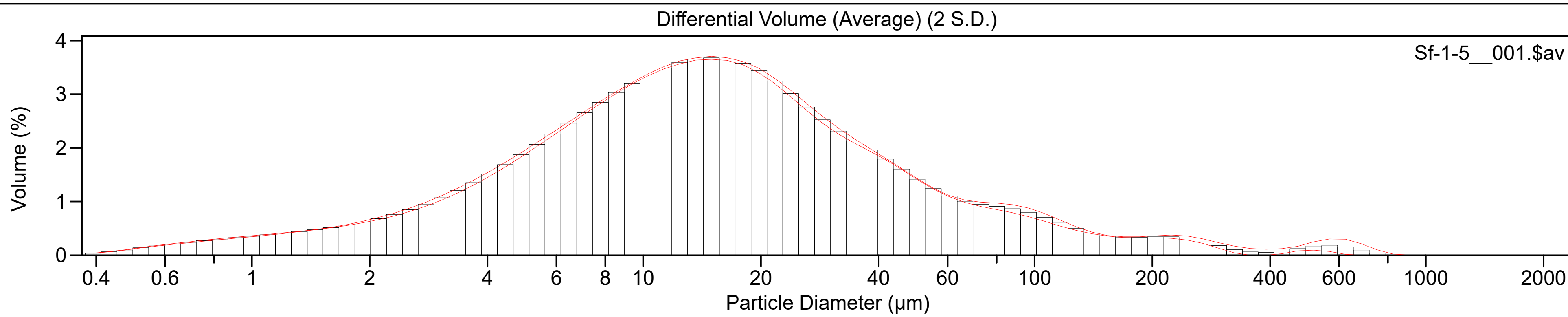
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-1-5__001.$av
	Sf-1-5__001.$av
File ID:	SF-1-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-1-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.31 µm	S.D.:	3.361
Median:	14.19 µm	Variance:	11.30
Mean/Median ratio:	1.009	Skewness:	0.106 Right skewed
Mode:	14.94 µm	Kurtosis:	0.511 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.219 µm	6.919 µm	14.19 µm	28.90 µm	65.45 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

File name: C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-2-1__001.$av
Sf-2-1__001.$av
File ID: SF-2-1
Optical model: Fraunhofer.rf780z

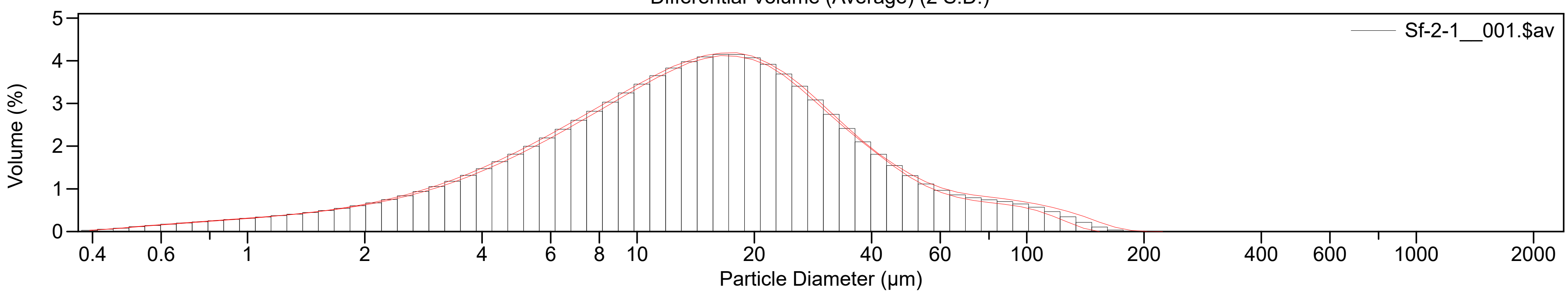
Volume Statistics (Geometric) Sf-2-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume: 100%
Mean: 13.10 µm S.D.: 2.798
Median: 14.28 µm Variance: 7.826
Mean/Median ratio: 0.917 Skewness: -0.421 Left skewed
Mode: 16.40 µm Kurtosis: 0.317 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.385 µm	7.184 µm	14.28 µm	25.67 µm	44.87 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

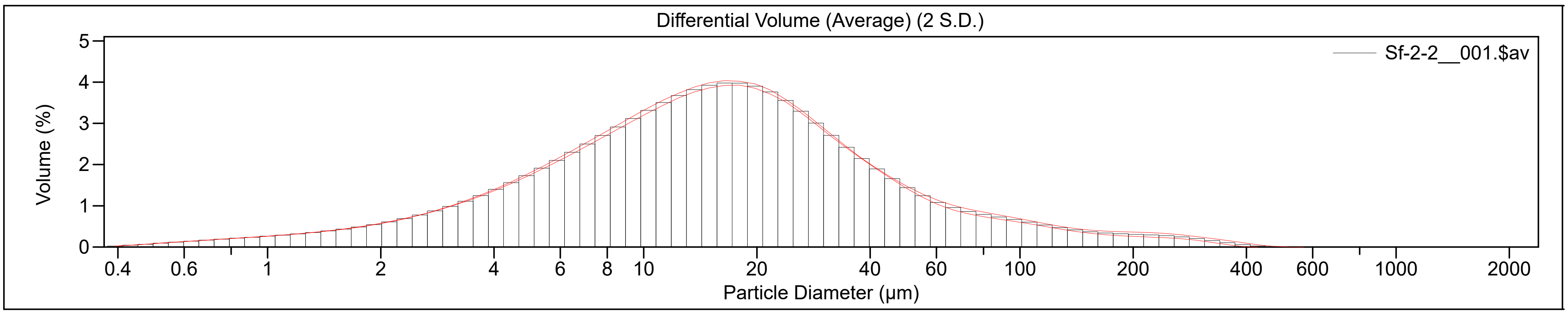
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-2-2__001.$av
	Sf-2-2__001.$av
File ID:	SF-2-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-2-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.80 µm	S.D.:	3.034
Median:	15.24 µm	Variance:	9.206
Mean/Median ratio:	0.971	Skewness:	-0.063 Left skewed
Mode:	16.40 µm	Kurtosis:	0.455 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.674 µm	7.638 µm	15.24 µm	28.60 µm	57.10 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

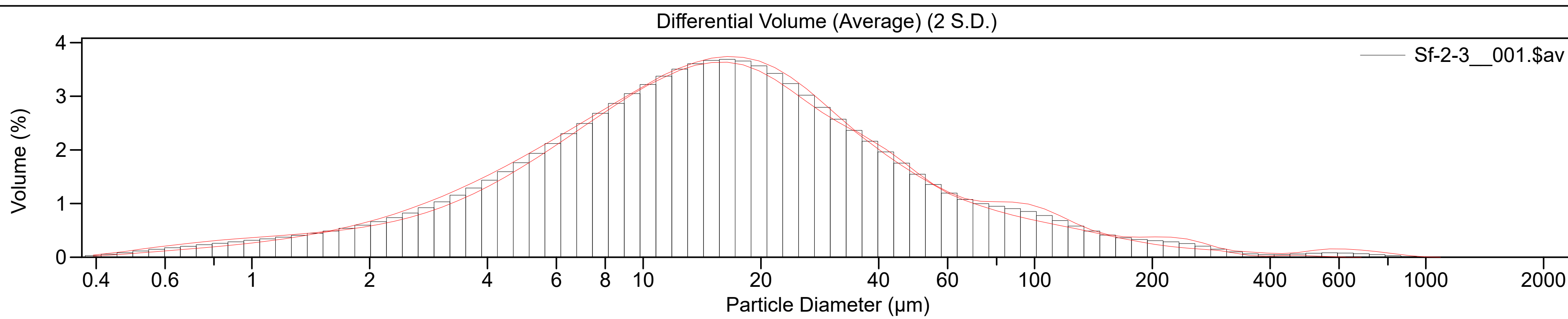
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-2-3__001.$av
	Sf-2-3__001.$av
File ID:	SF-2-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-2-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.93 µm	S.D.:	3.251
Median:	15.14 µm	Variance:	10.57
Mean/Median ratio:	0.986	Skewness:	-0.0042 Left skewed
Mode:	16.40 µm	Kurtosis:	0.410 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.398 µm	7.321 µm	15.14 µm	30.37 µm	65.42 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

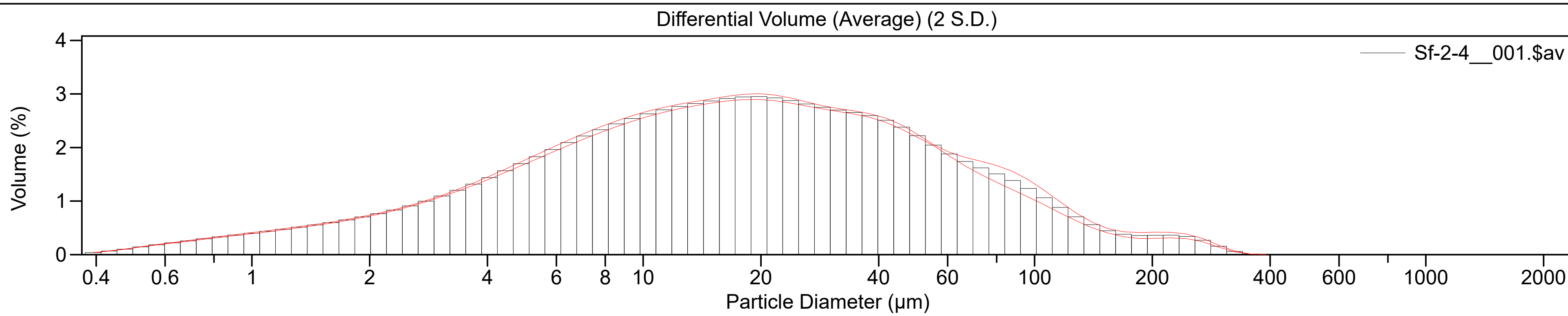
File name:	**C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-2-4__001.$av**
	Sf-2-4__001.$av
File ID:	**SF-2-4**
Optical model:	**Fraunhofer.rf780z**

Volume Statistics (Geometric) Sf-2-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.91 µm	S.D.:	3.506
Median:	17.03 µm	Variance:	12.29
Mean/Median ratio:	0.934	Skewness:	-0.271 Left skewed
Mode:	19.76 µm	Kurtosis:	-0.213 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.959 µm	7.044 µm	17.03 µm	39.09 µm	76.90 µm



Swan Island Basin SEDflume Study

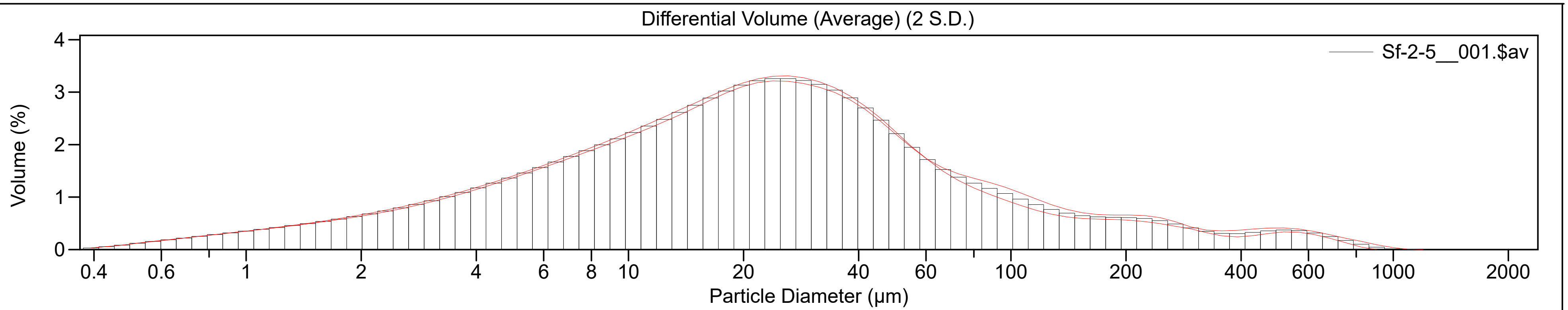
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-2-5__001.$av Sf-2-5__001.$av
File ID:	SF-2-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-2-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.14 µm	S.D.:	3.955
Median:	21.08 µm	Variance:	15.65
Mean/Median ratio:	0.956	Skewness:	0.0015 Right skewed
Mode:	26.15 µm	Kurtosis:	0.134 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.337 µm	8.614 µm	21.08 µm	45.15 µm	112.8 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

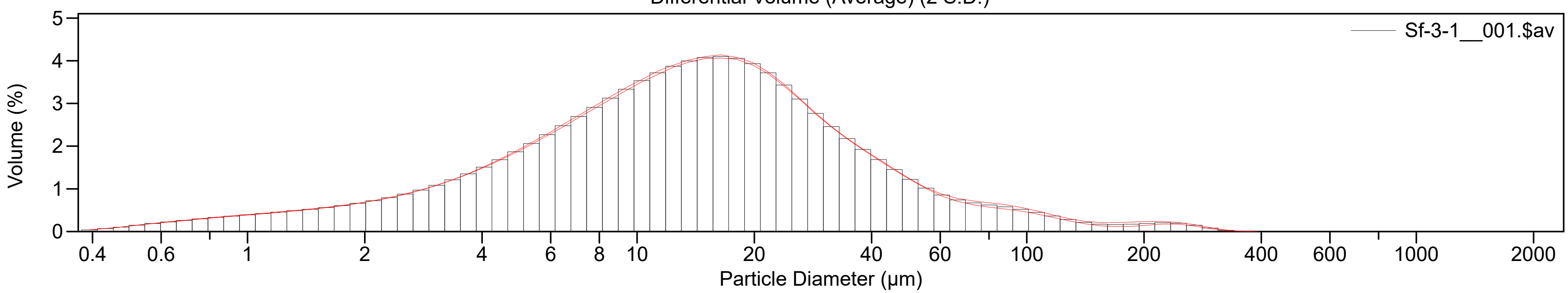
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-3-1__001.$av
	Sf-3-1__001.$av
File ID:	SF-3-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-3-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.56 µm	S.D.:	2.965
Median:	13.56 µm	Variance:	8.792
Mean/Median ratio:	0.927	Skewness:	-0.260 Left skewed
Mode:	16.40 µm	Kurtosis:	0.461 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.050 µm	6.755 µm	13.56 µm	24.61 µm	44.73 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

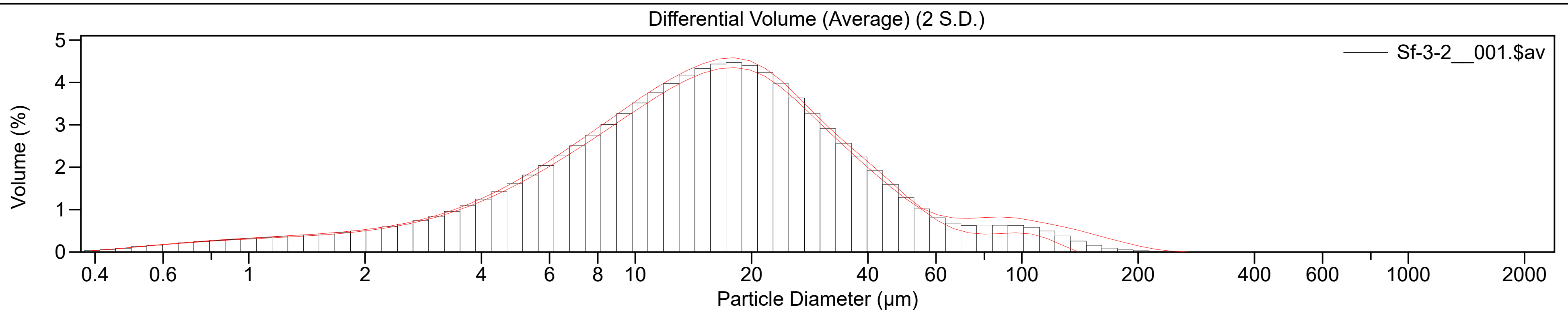
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-3-2__001.$av
	Sf-3-2__001.$av
File ID:	SF-3-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-3-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.69 µm	S.D.:	2.745
Median:	15.01 µm	Variance:	7.536
Mean/Median ratio:	0.912	Skewness:	-0.507 Left skewed
Mode:	18.00 µm	Kurtosis:	0.677 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.769 µm	7.893 µm	15.01 µm	25.96 µm	43.58 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

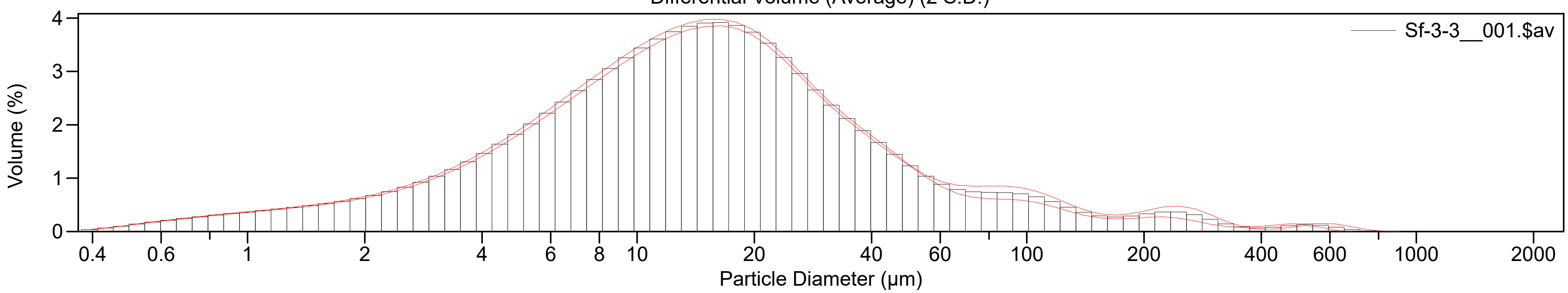
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-3-3__001.$av
	Sf-3-3__001.$av
File ID:	SF-3-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-3-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.90 µm	S.D.:	3.257
Median:	14.11 µm	Variance:	10.61
Mean/Median ratio:	0.985	Skewness:	0.067 Right skewed
Mode:	16.40 µm	Kurtosis:	0.626 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.218 µm	7.009 µm	14.11 µm	26.88 µm	57.61 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

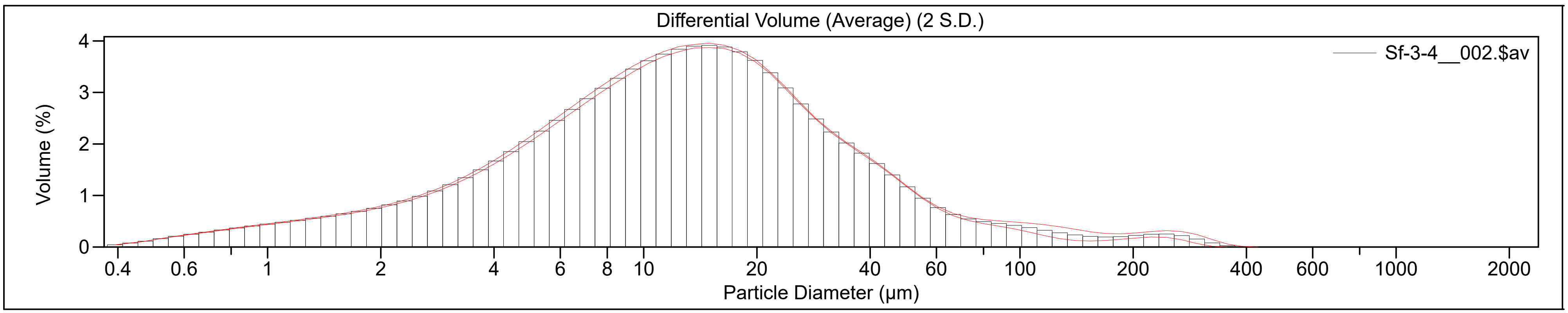
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-3-4__002.$av
	Sf-3-4__002.$av
File ID:	SF-3-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-3-4__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	11.78 µm	S.D.:	3.056
Median:	12.50 µm	Variance:	9.341
Mean/Median ratio:	0.942	Skewness:	-0.135 Left skewed
Mode:	14.94 µm	Kurtosis:	0.432 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.747 µm	6.147 µm	12.50 µm	23.38 µm	43.33 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

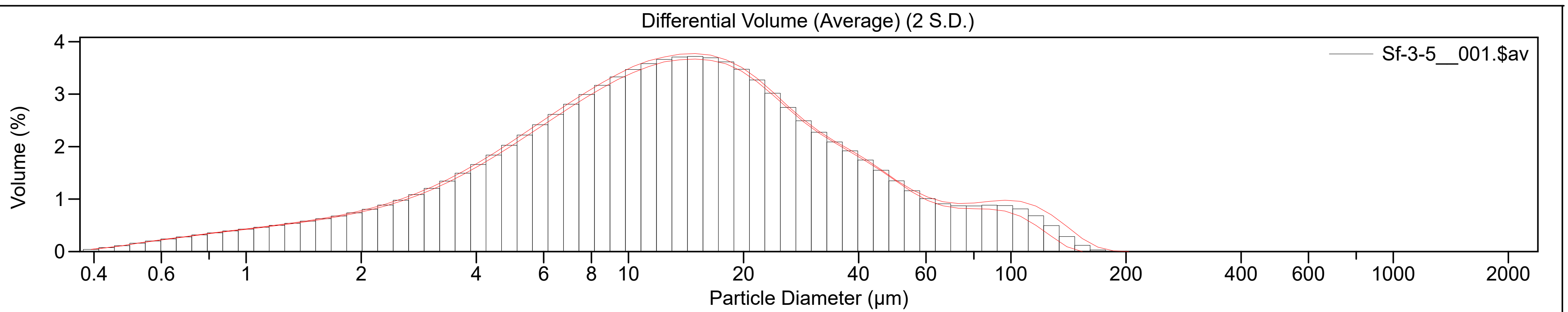
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-3-5__001.$av
	Sf-3-5__001.$av
File ID:	SF-3-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-3-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.15 µm	S.D.:	3.037
Median:	12.89 µm	Variance:	9.223
Mean/Median ratio:	0.943	Skewness:	-0.299 Left skewed
Mode:	14.94 µm	Kurtosis:	0.033 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.802 µm	6.228 µm	12.89 µm	25.11 µm	49.19 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

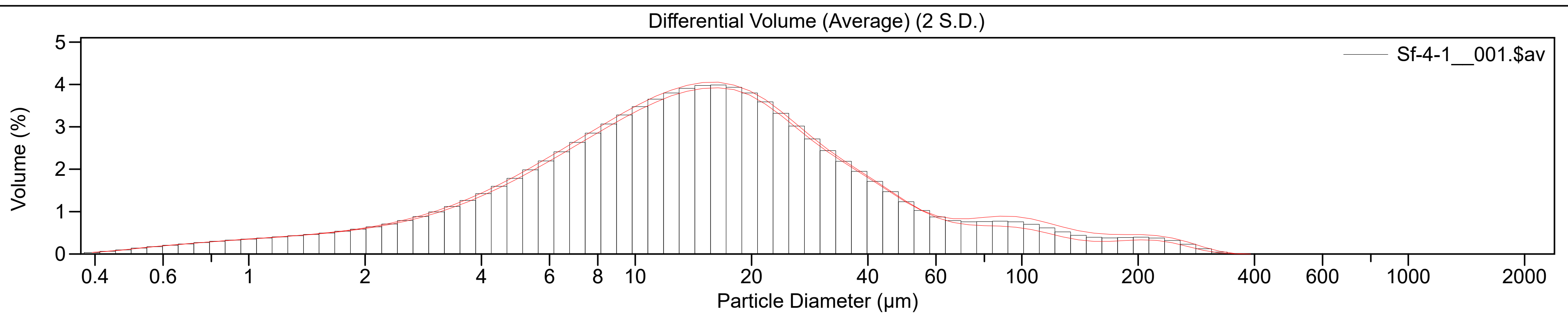
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-4-1__001.$av Sf-4-1__001.$av
File ID:	SF-4-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-4-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.87 µm	S.D.:	3.116
Median:	14.27 µm	Variance:	9.711
Mean/Median ratio:	0.972	Skewness:	-0.107 Left skewed
Mode:	16.40 µm	Kurtosis:	0.405 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.341 µm	7.187 µm	14.27 µm	26.91 µm	56.12 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

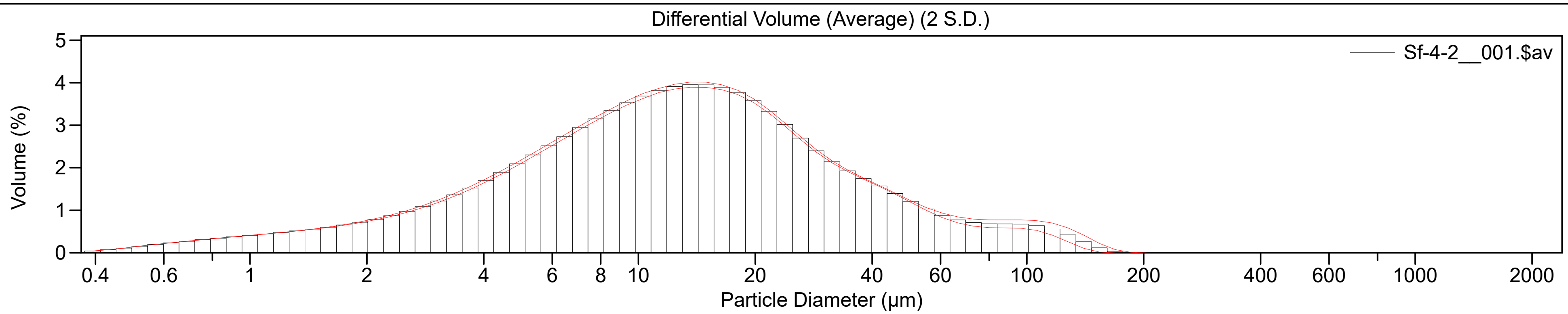
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-4-2__001.$av
	Sf-4-2__001.$av
File ID:	SF-4-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-4-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	11.67 µm	S.D.:	2.924
Median:	12.42 µm	Variance:	8.548
Mean/Median ratio:	0.940	Skewness:	-0.301 Left skewed
Mode:	13.61 µm	Kurtosis:	0.175 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.870 µm	6.199 µm	12.42 µm	23.16 µm	43.92 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

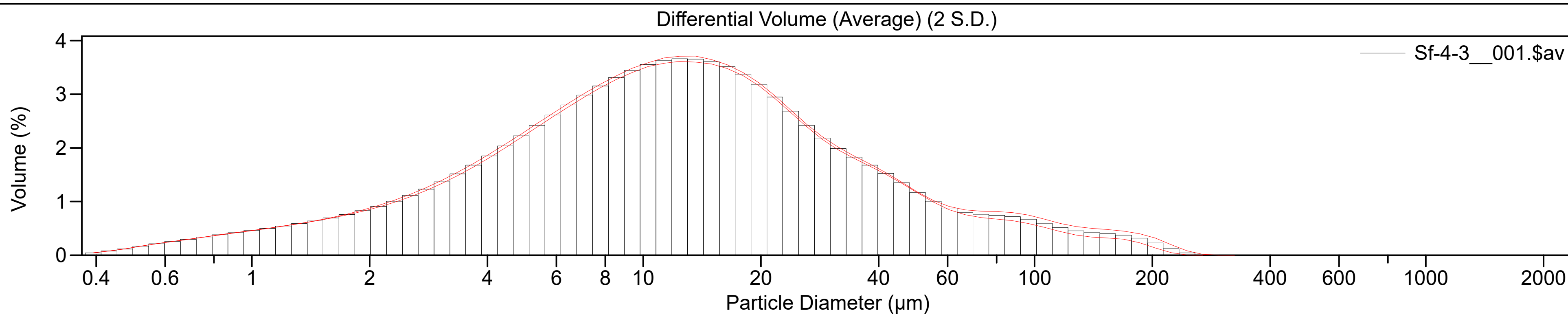
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-4-3__001.$av
	Sf-4-3__001.$av
File ID:	SF-4-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-4-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	11.47 µm	S.D.:	3.153
Median:	11.78 µm	Variance:	9.943
Mean/Median ratio:	0.973	Skewness:	-0.098 Left skewed
Mode:	12.40 µm	Kurtosis:	0.063 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.583 µm	5.676 µm	11.78 µm	23.47 µm	48.86 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

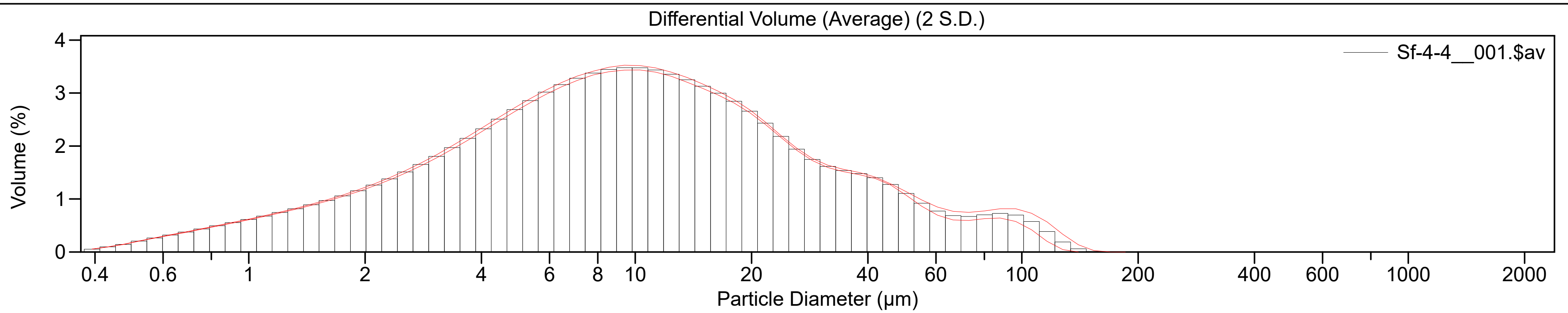
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-4-4__001.$av
	Sf-4-4__001.$av
File ID:	SF-4-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-4-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	9.153 µm	S.D.:	3.094
Median:	9.382 µm	Variance:	9.575
Mean/Median ratio:	0.976	Skewness:	-0.110 Left skewed
Mode:	9.371 µm	Kurtosis:	-0.239 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.030 µm	4.418 µm	9.382 µm	19.40 µm	40.29 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

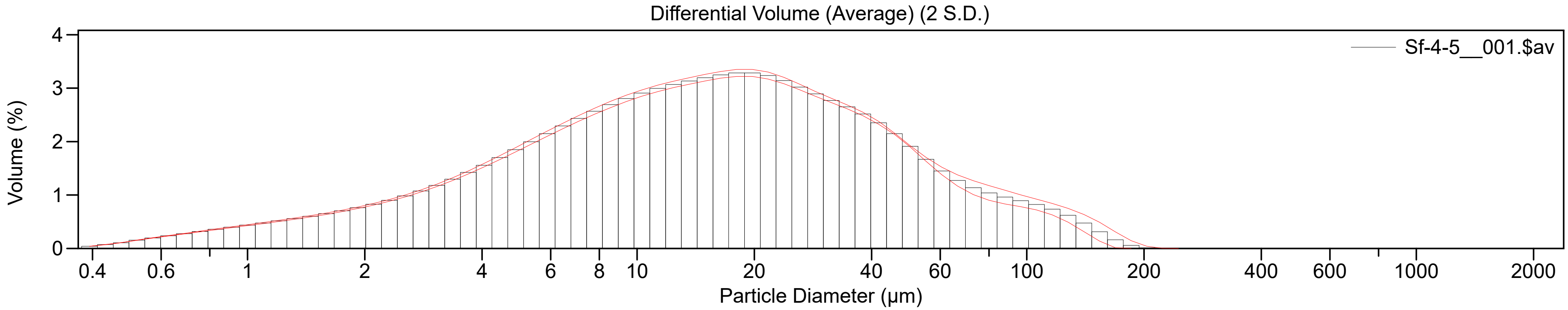
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-4-5__001.$av
	Sf-4-5__001.$av
File ID:	SF-4-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-4-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.54 µm	S.D.:	3.220
Median:	14.82 µm	Variance:	10.37
Mean/Median ratio:	0.914	Skewness:	-0.364 Left skewed
Mode:	18.00 µm	Kurtosis:	-0.158 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.761 µm	6.471 µm	14.82 µm	31.11 µm	57.65 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

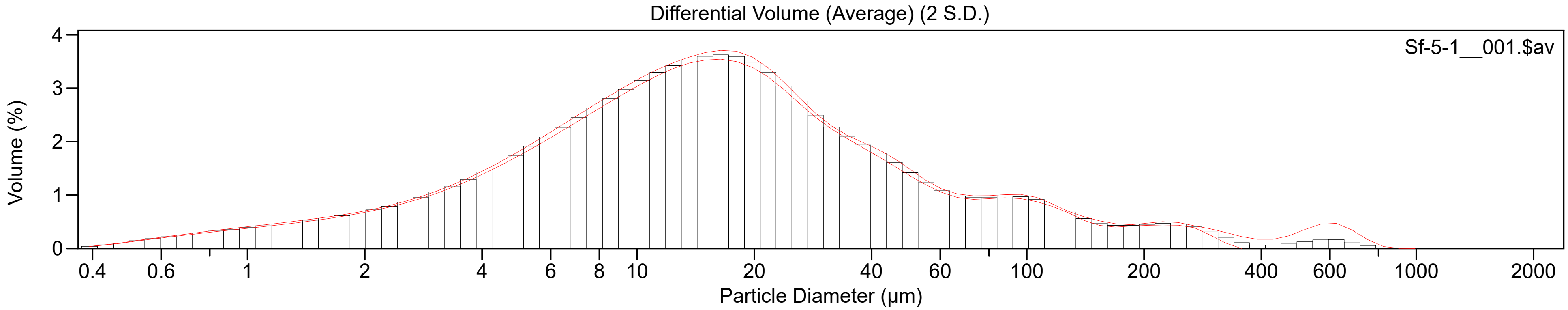
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-5-1__001.$av Sf-5-1__001.$av
File ID:	SF-5-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-5-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.06 µm	S.D.:	3.558
Median:	14.93 µm	Variance:	12.66
Mean/Median ratio:	1.008	Skewness:	0.088 Right skewed
Mode:	16.40 µm	Kurtosis:	0.296 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.063 µm	7.029 µm	14.93 µm	31.17 µm	80.25 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

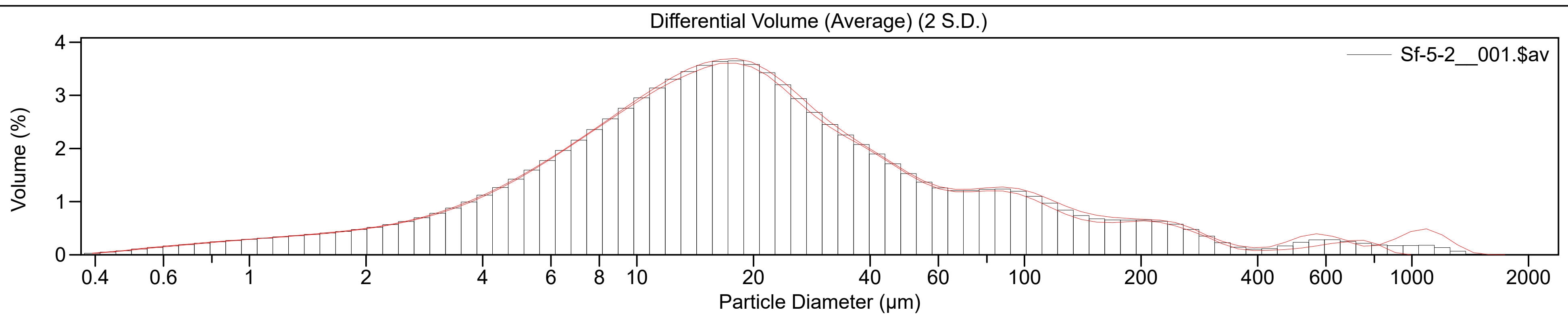
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-5-2__001.$av
	Sf-5-2__001.$av
File ID:	SF-5-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-5-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.39 µm	S.D.:	3.826
Median:	17.83 µm	Variance:	14.64
Mean/Median ratio:	1.087	Skewness:	0.278 Right skewed
Mode:	18.00 µm	Kurtosis:	0.532 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.005 µm	8.697 µm	17.83 µm	40.08 µm	113.2 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

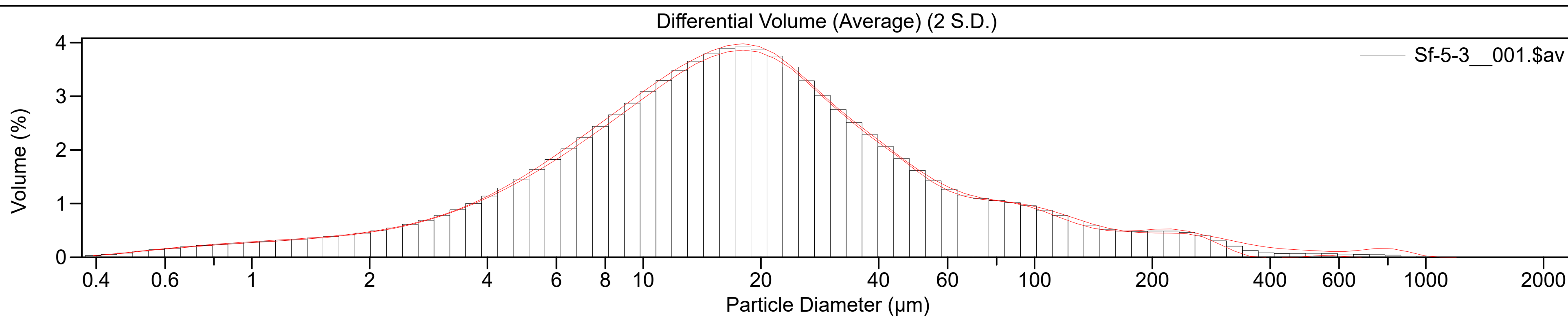
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-5-3__001.$av
	Sf-5-3__001.$av
File ID:	SF-5-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-5-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.25 µm	S.D.:	3.286
Median:	17.14 µm	Variance:	10.80
Mean/Median ratio:	1.006	Skewness:	-0.0097 Left skewed
Mode:	18.00 µm	Kurtosis:	0.515 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.079 µm	8.634 µm	17.14 µm	33.98 µm	79.98 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

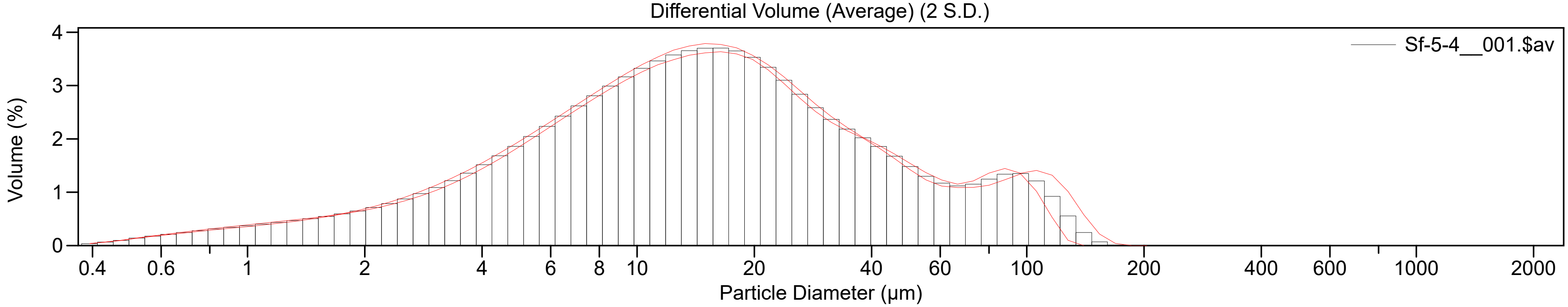
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-5-4__001.$av
	Sf-5-4__001.$av
File ID:	SF-5-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-5-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.50 µm	S.D.:	3.074
Median:	14.17 µm	Variance:	9.450
Mean/Median ratio:	0.953	Skewness:	-0.314 Left skewed
Mode:	16.40 µm	Kurtosis:	-0.00090 Platykurtic

<10%	<25%	<50%	<75%	<90%
3.120 µm	6.844 µm	14.17 µm	28.29 µm	59.68 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

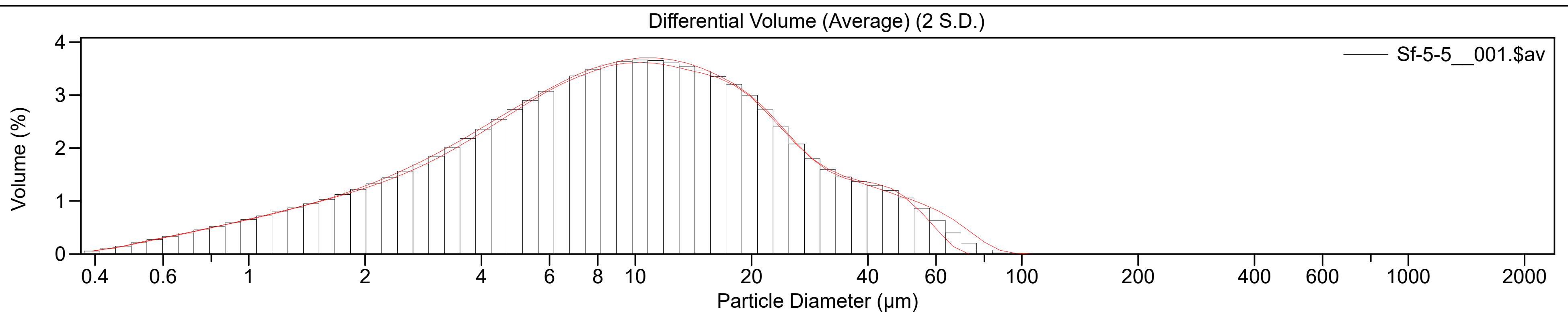
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-5-5__001.$av
	Sf-5-5__001.$av
File ID:	SF-5-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-5-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	8.263 µm	S.D.:	2.825
Median:	9.006 µm	Variance:	7.981
Mean/Median ratio:	0.918	Skewness:	-0.358 Left skewed
Mode:	10.29 µm	Kurtosis:	-0.263 Platykurtic

<10%	<25%	<50%	<75%	<90%
1.944 µm	4.262 µm	9.006 µm	17.37 µm	30.38 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

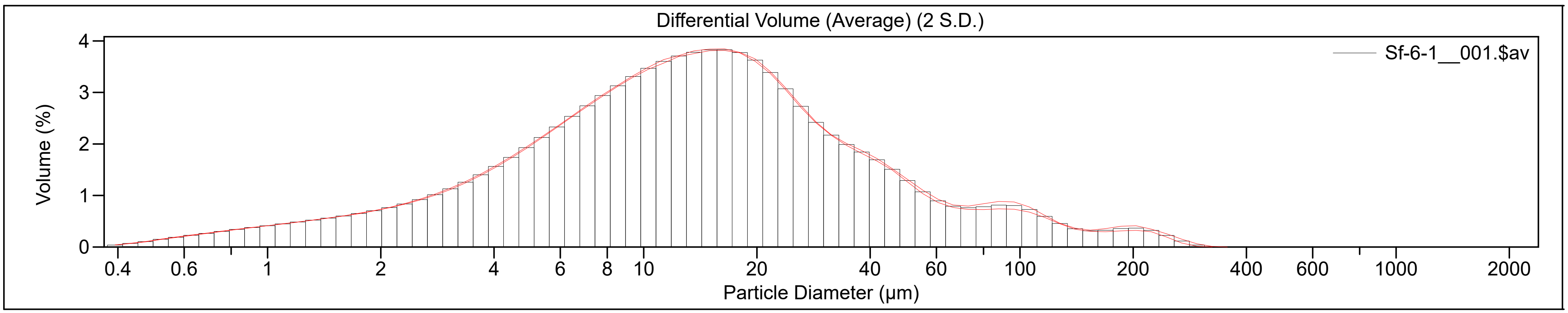
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-6-1__001.$av
	Sf-6-1__001.$av
File ID:	SF-6-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-6-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.84 µm	S.D.:	3.154
Median:	13.35 µm	Variance:	9.949
Mean/Median ratio:	0.962	Skewness:	-0.130 Left skewed
Mode:	16.40 µm	Kurtosis:	0.223 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.921 µm	6.519 µm	13.35 µm	25.66 µm	53.26 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

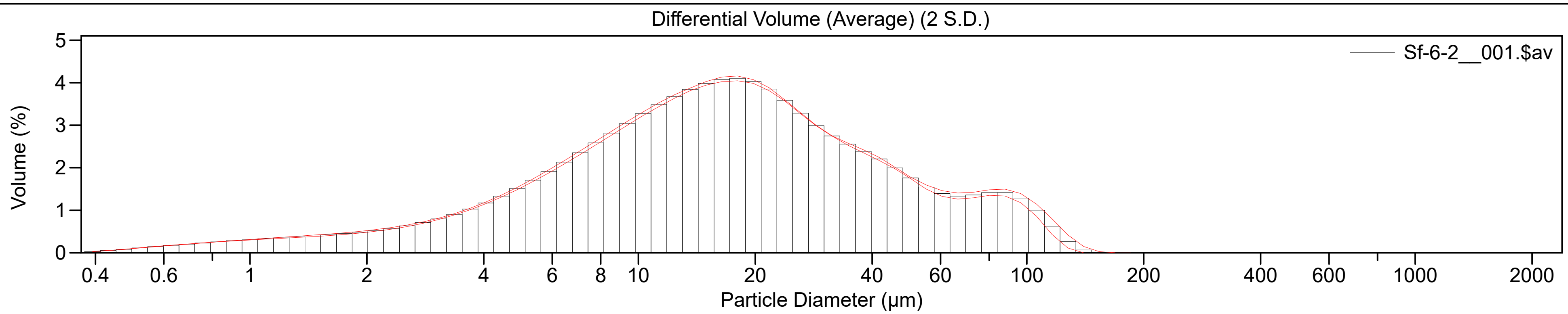
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-6-2__001.$av
	Sf-6-2__001.$av
File ID:	SF-6-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-6-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.10 µm	S.D.:	2.878
Median:	16.14 µm	Variance:	8.284
Mean/Median ratio:	0.936	Skewness:	-0.497 Left skewed
Mode:	18.00 µm	Kurtosis:	0.340 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.902 µm	8.264 µm	16.14 µm	30.47 µm	58.44 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

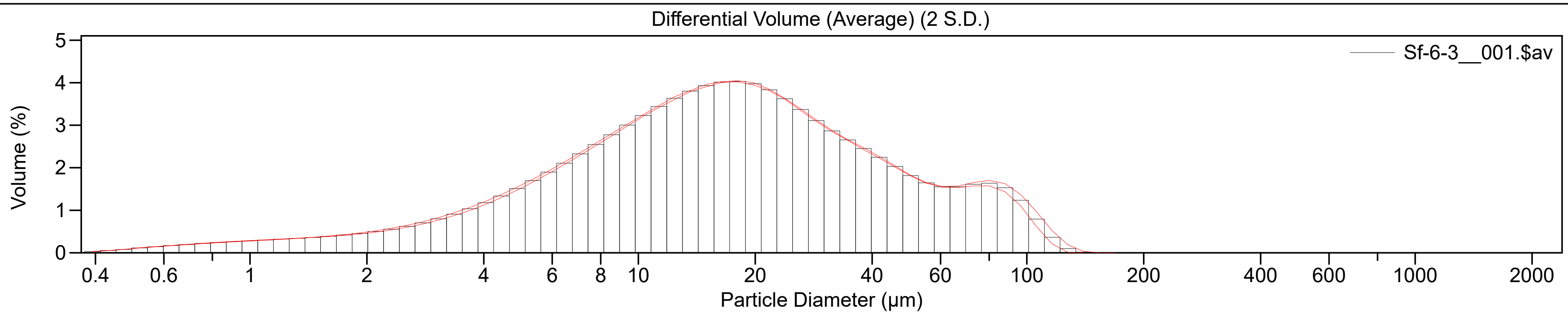
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-6-3__001.$av
	Sf-6-3__001.$av
File ID:	SF-6-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-6-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.36 µm	S.D.:	2.845
Median:	16.44 µm	Variance:	8.095
Mean/Median ratio:	0.934	Skewness:	-0.528 Left skewed
Mode:	18.00 µm	Kurtosis:	0.348 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.019 µm	8.401 µm	16.44 µm	31.21 µm	59.20 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

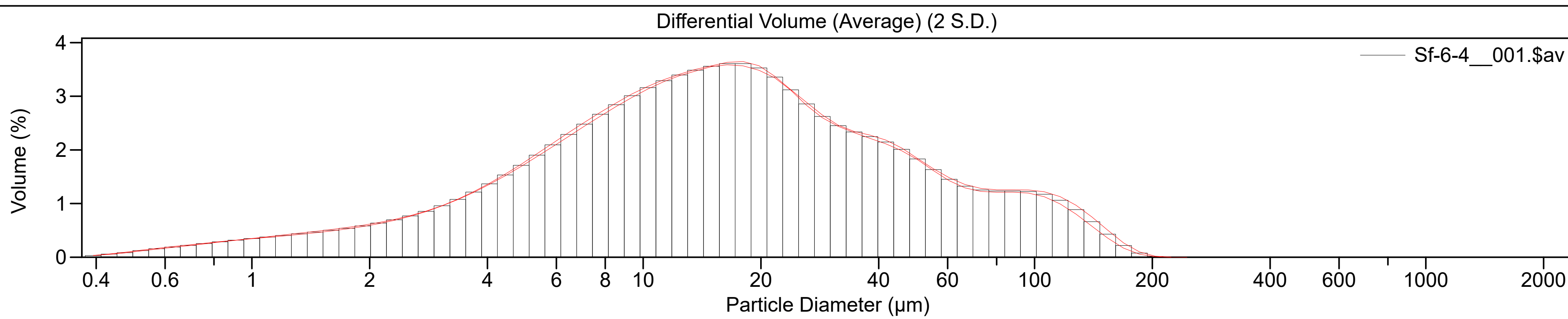
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-6-4__001.$av
	Sf-6-4__001.$av
File ID:	SF-6-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-6-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.91 µm	S.D.:	3.136
Median:	15.50 µm	Variance:	9.834
Mean/Median ratio:	0.962	Skewness:	-0.312 Left skewed
Mode:	16.40 µm	Kurtosis:	-0.0040 Platykurtic

<10%	<25%	<50%	<75%	<90%
3.408 µm	7.428 µm	15.50 µm	32.36 µm	67.15 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

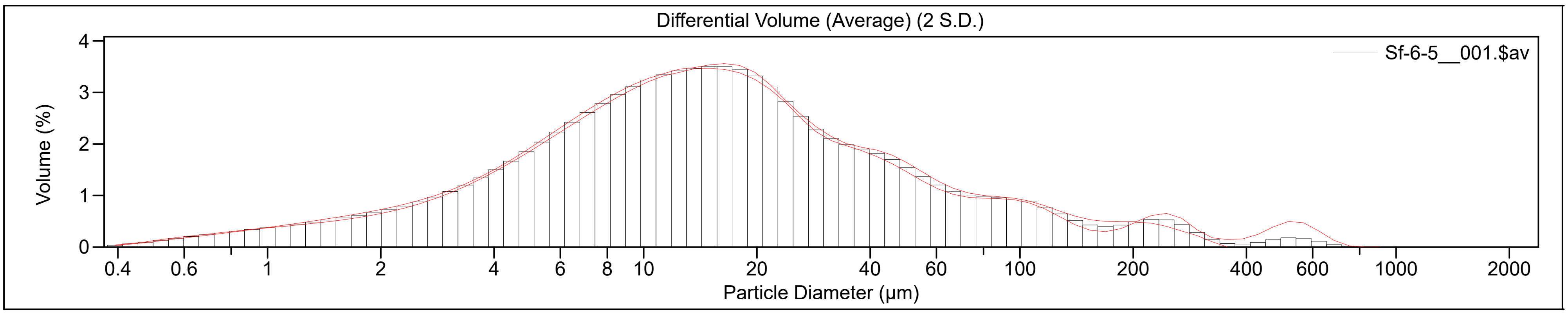
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-6-5__001.$av Sf-6-5__001.$av
File ID:	SF-6-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-6-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.86 µm	S.D.:	3.528
Median:	14.44 µm	Variance:	12.45
Mean/Median ratio:	1.029	Skewness:	0.110 Right skewed
Mode:	16.40 µm	Kurtosis:	0.226 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.110 µm	6.860 µm	14.44 µm	31.35 µm	77.98 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

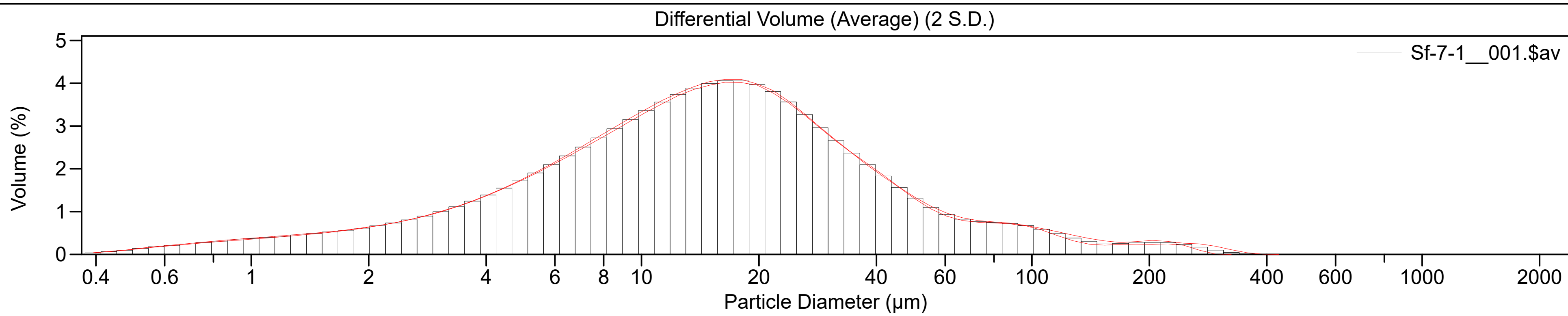
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-7-1__001.$av Sf-7-1__001.$av
File ID:	SF-7-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-7-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.65 µm	S.D.:	3.040
Median:	14.60 µm	Variance:	9.239
Mean/Median ratio:	0.935	Skewness:	-0.235 Left skewed
Mode:	16.40 µm	Kurtosis:	0.442 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.248 µm	7.243 µm	14.60 µm	26.83 µm	50.66 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

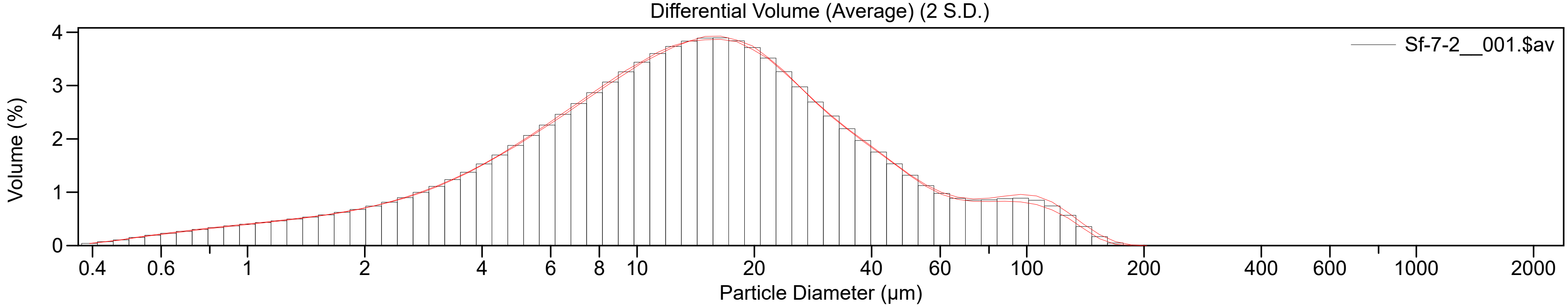
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-7-2__001.$av
	Sf-7-2__001.$av
File ID:	SF-7-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-7-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.73 µm	S.D.:	3.004
Median:	13.66 µm	Variance:	9.025
Mean/Median ratio:	0.932	Skewness:	-0.339 Left skewed
Mode:	16.40 µm	Kurtosis:	0.146 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.988 µm	6.675 µm	13.66 µm	25.84 µm	49.82 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

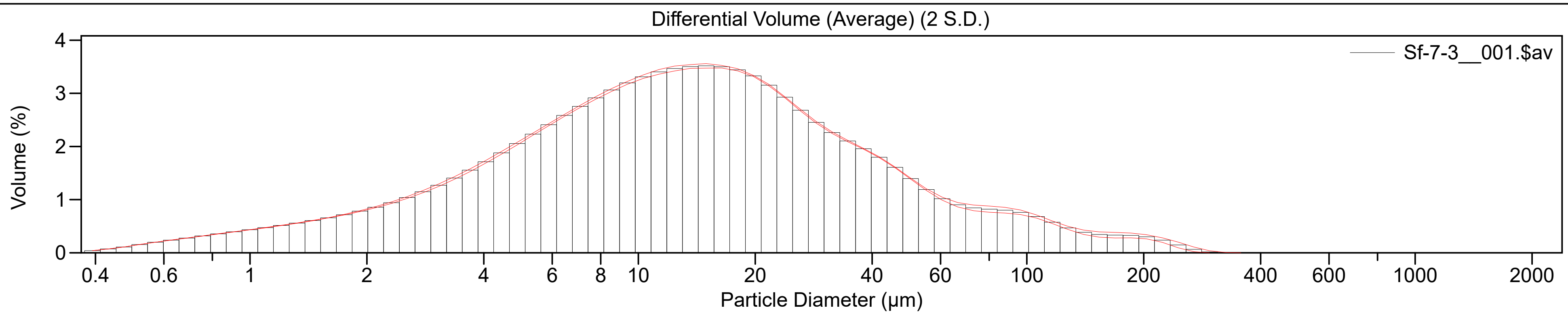
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-7-3__001.$av
	Sf-7-3__001.$av
File ID:	SF-7-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-7-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.46 µm	S.D.:	3.209
Median:	12.95 µm	Variance:	10.29
Mean/Median ratio:	0.962	Skewness:	-0.141 Left skewed
Mode:	14.94 µm	Kurtosis:	0.029 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.715 µm	6.061 µm	12.95 µm	26.31 µm	53.62 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

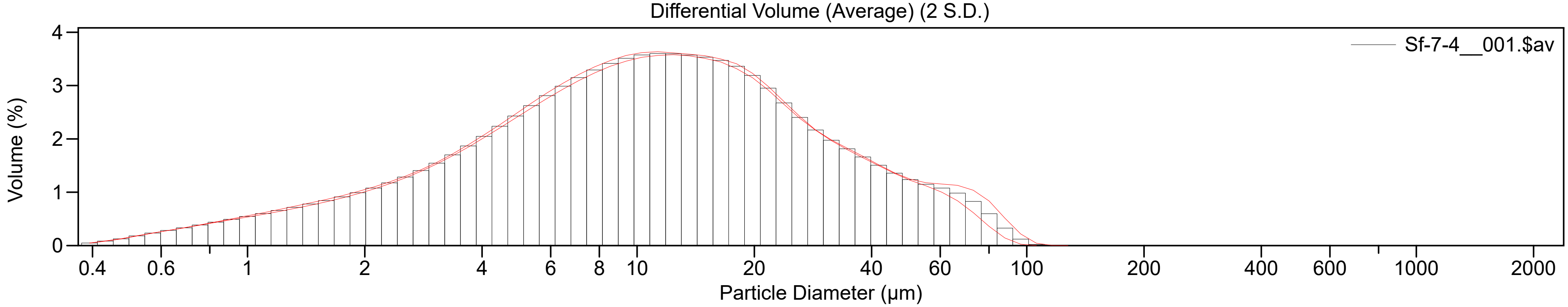
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-7-4__001.$av
	Sf-7-4__001.$av
File ID:	SF-7-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-7-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	9.784 µm	S.D.:	2.914
Median:	10.56 µm	Variance:	8.493
Mean/Median ratio:	0.926	Skewness:	-0.358 Left skewed
Mode:	11.29 µm	Kurtosis:	-0.177 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.254 µm	5.028 µm	10.56 µm	20.63 µm	38.11 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

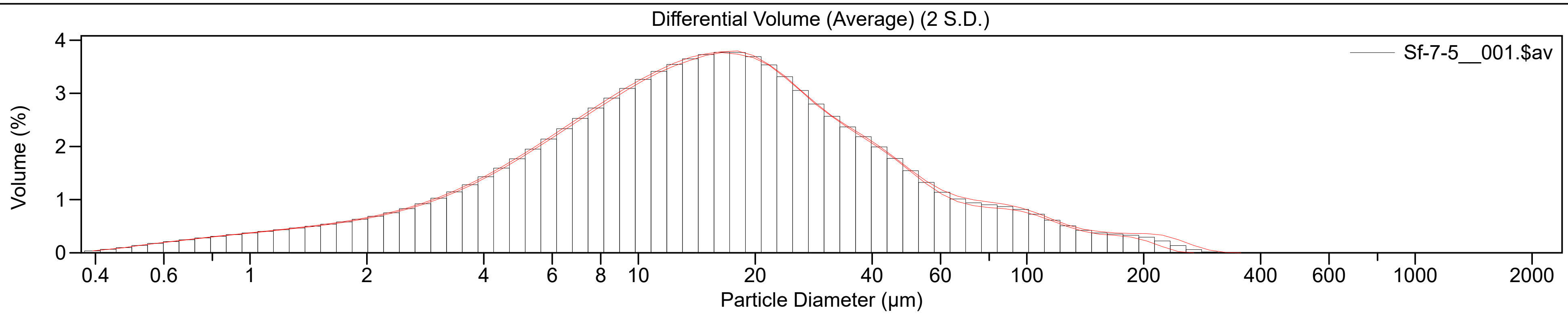
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-7-5__001.$av
	Sf-7-5__001.$av
File ID:	SF-7-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-7-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.91 µm	S.D.:	3.115
Median:	14.70 µm	Variance:	9.706
Mean/Median ratio:	0.947	Skewness:	-0.247 Left skewed
Mode:	16.40 µm	Kurtosis:	0.194 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.190 µm	7.099 µm	14.70 µm	28.64 µm	56.78 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

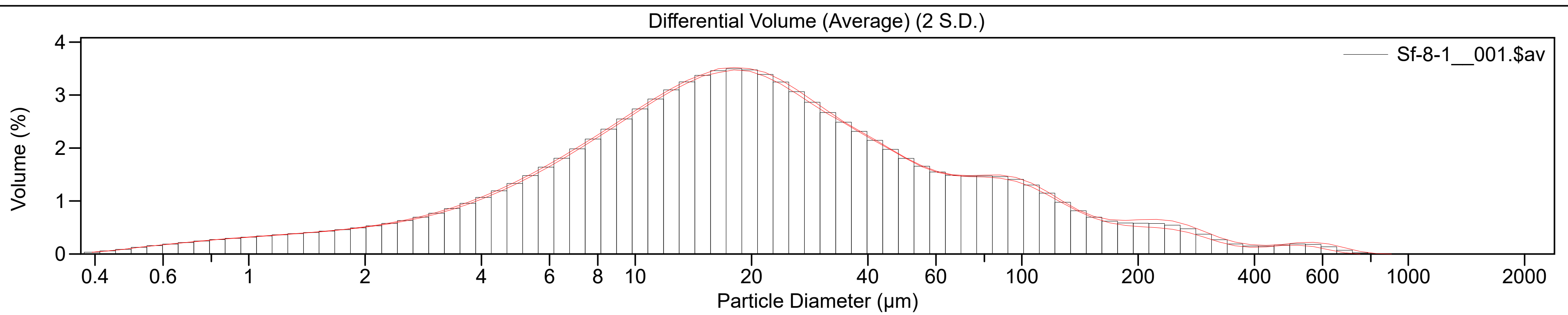
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-8-1__001.$av Sf-8-1__001.$av
File ID:	SF-8-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-8-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.28 µm	S.D.:	3.610
Median:	18.96 µm	Variance:	13.03
Mean/Median ratio:	1.017	Skewness:	-0.076 Left skewed
Mode:	18.00 µm	Kurtosis:	0.173 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.899 µm	8.968 µm	18.96 µm	42.80 µm	102.9 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

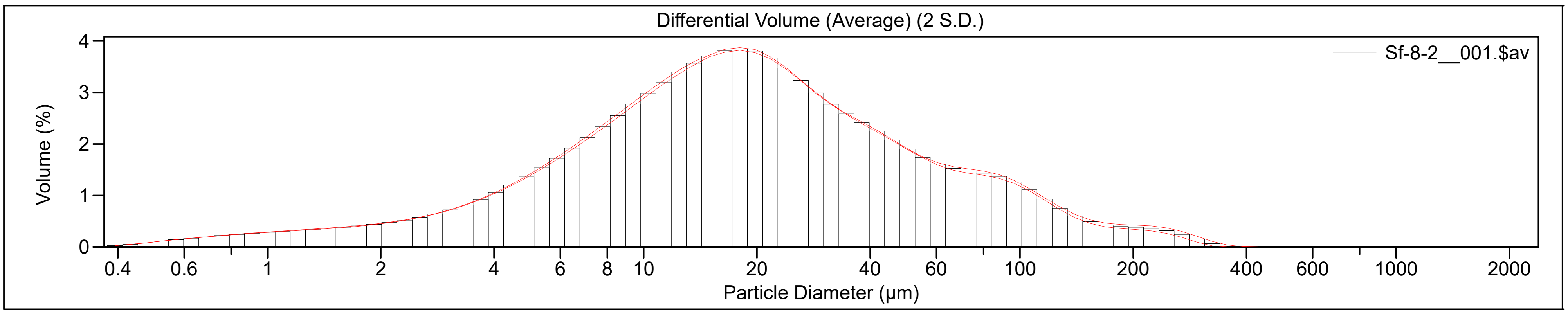
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-8-2__001.$av
	Sf-8-2__001.$av
File ID:	SF-8-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-8-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.56 µm	S.D.:	3.159
Median:	17.92 µm	Variance:	9.978
Mean/Median ratio:	0.980	Skewness:	-0.277 Left skewed
Mode:	18.00 µm	Kurtosis:	0.291 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.197 µm	8.985 µm	17.92 µm	36.71 µm	78.16 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

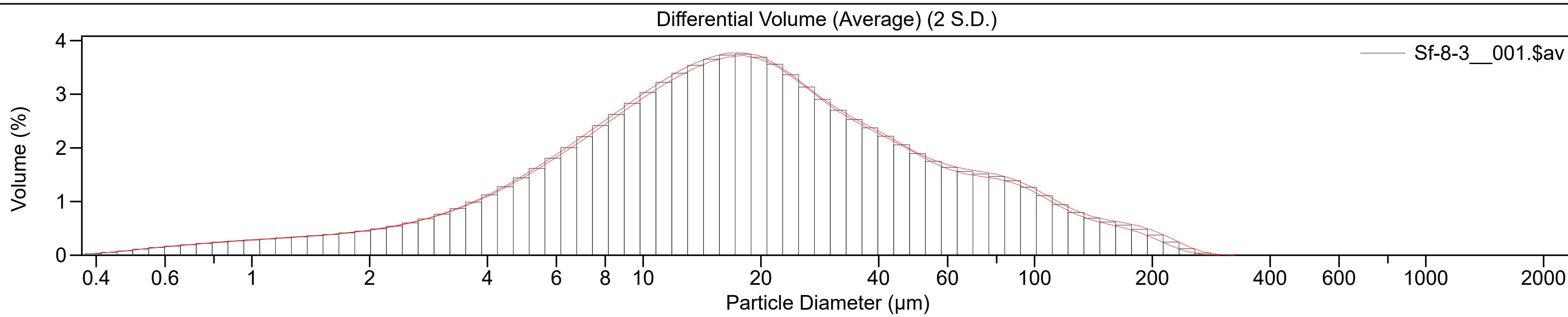
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-8-3__001.$av Sf-8-3__001.$av
File ID:	SF-8-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-8-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.15 µm	S.D.:	3.139
Median:	17.52 µm	Variance:	9.852
Mean/Median ratio:	0.979	Skewness:	-0.301 Left skewed
Mode:	18.00 µm	Kurtosis:	0.183 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.089 µm	8.687 µm	17.52 µm	36.43 µm	77.01 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

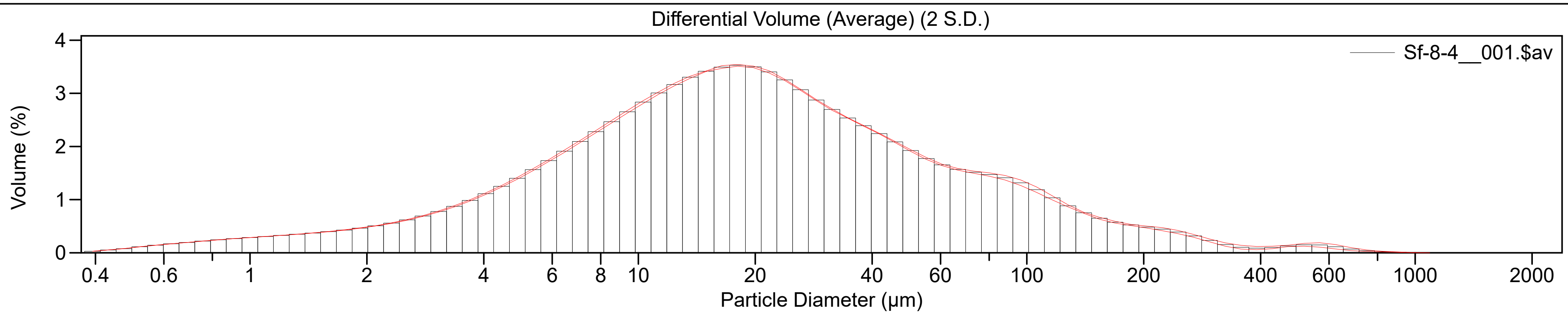
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-8-4__001.$av
	Sf-8-4__001.$av
File ID:	SF-8-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-8-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.67 µm	S.D.:	3.439
Median:	18.54 µm	Variance:	11.82
Mean/Median ratio:	1.007	Skewness:	-0.087 Left skewed
Mode:	18.00 µm	Kurtosis:	0.257 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.045 µm	8.853 µm	18.54 µm	40.81 µm	91.74 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

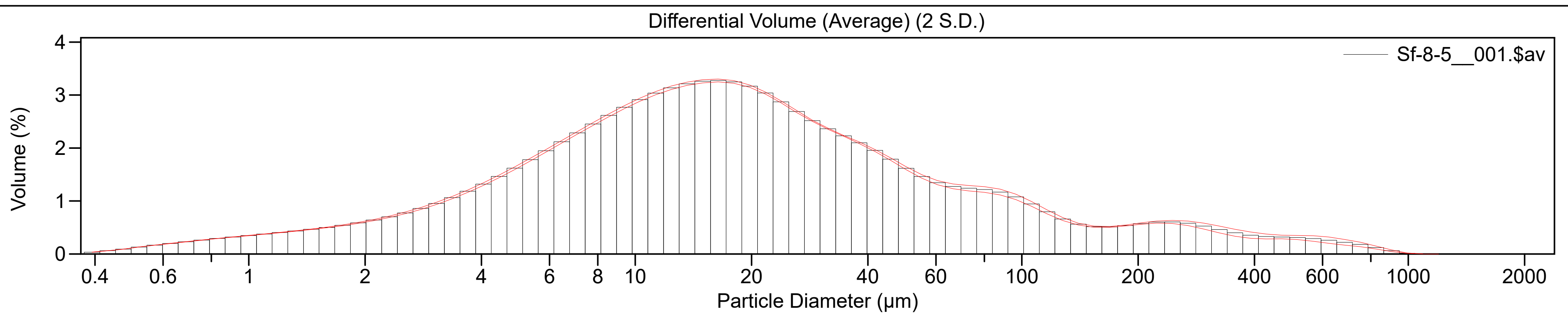
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-8-5__001.$av
	Sf-8-5__001.$av
File ID:	SF-8-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-8-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.98 µm	S.D.:	3.949
Median:	16.78 µm	Variance:	15.60
Mean/Median ratio:	1.071	Skewness:	0.206 Right skewed
Mode:	16.40 µm	Kurtosis:	0.183 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.385 µm	7.665 µm	16.78 µm	39.64 µm	109.0 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

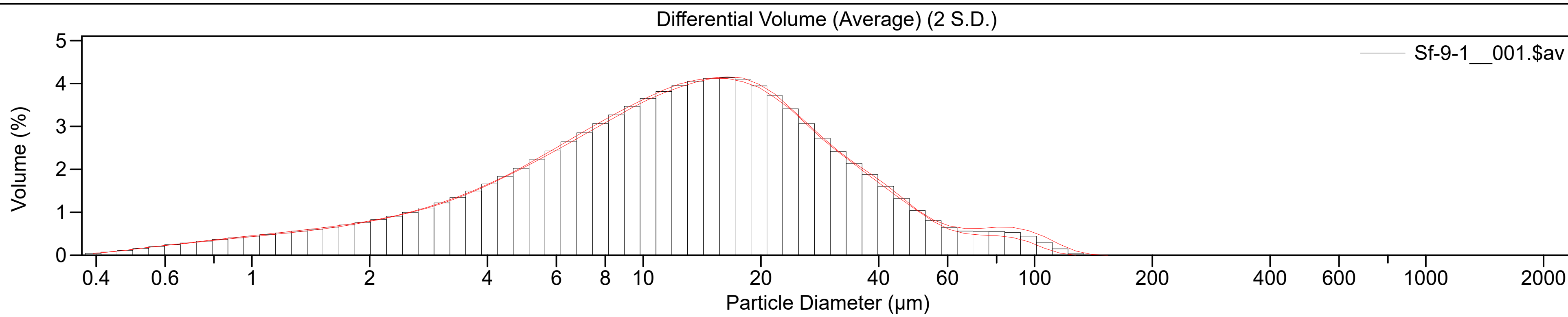
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-9-1__001.$av Sf-9-1__001.$av
File ID:	SF-9-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-9-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	11.11 µm	S.D.:	2.793
Median:	12.48 µm	Variance:	7.798
Mean/Median ratio:	0.890	Skewness:	-0.515 Left skewed
Mode:	16.40 µm	Kurtosis:	0.228 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.732 µm	6.150 µm	12.48 µm	22.29 µm	37.06 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-9-2__002.$av Sf-9-2__002.$av
File ID:	SF-9-2
Optical model:	Fraunhofer.rf780z

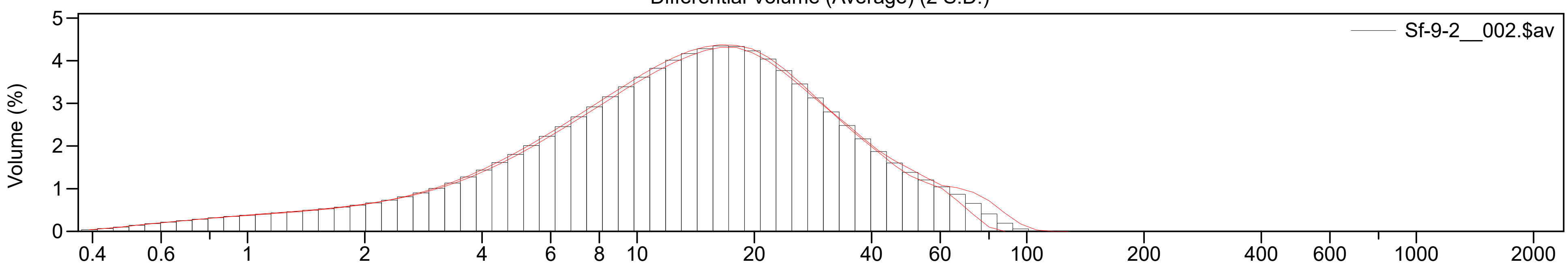
Volume Statistics (Geometric) Sf-9-2__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.12 µm	S.D.:	2.677
Median:	13.75 µm	Variance:	7.167
Mean/Median ratio:	0.881	Skewness:	-0.697 Left skewed
Mode:	16.40 µm	Kurtosis:	0.463 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.219 µm	7.030 µm	13.75 µm	23.97 µm	38.63 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

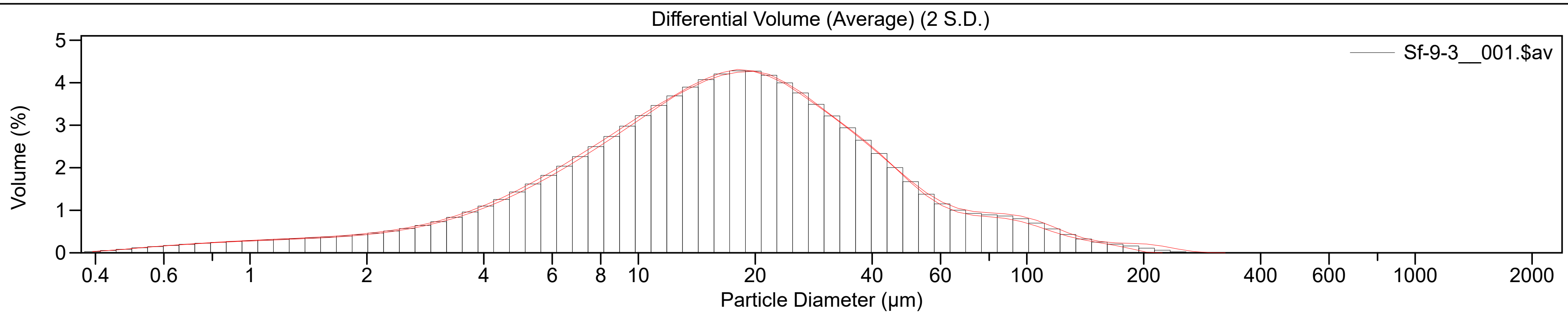
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-9-3__001.$av
	Sf-9-3__001.$av
File ID:	SF-9-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-9-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.43 µm	S.D.:	2.814
Median:	16.69 µm	Variance:	7.917
Mean/Median ratio:	0.924	Skewness:	-0.493 Left skewed
Mode:	18.00 µm	Kurtosis:	0.658 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.191 µm	8.709 µm	16.69 µm	29.82 µm	52.22 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

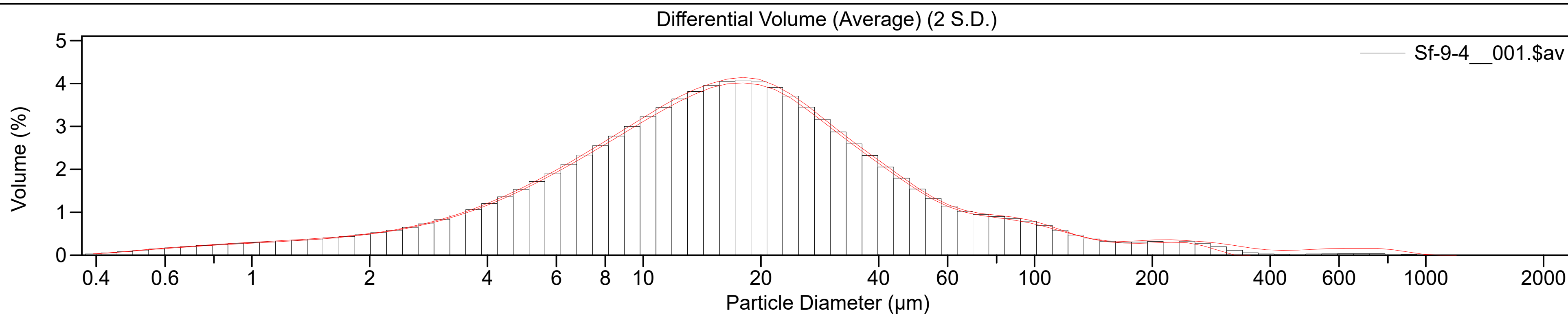
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-9-4__001.$av
	Sf-9-4__001.$av
File ID:	SF-9-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-9-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.68 µm	S.D.:	3.080
Median:	16.24 µm	Variance:	9.484
Mean/Median ratio:	0.965	Skewness:	-0.119 Left skewed
Mode:	18.00 µm	Kurtosis:	0.678 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.906 µm	8.263 µm	16.24 µm	30.23 µm	60.97 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

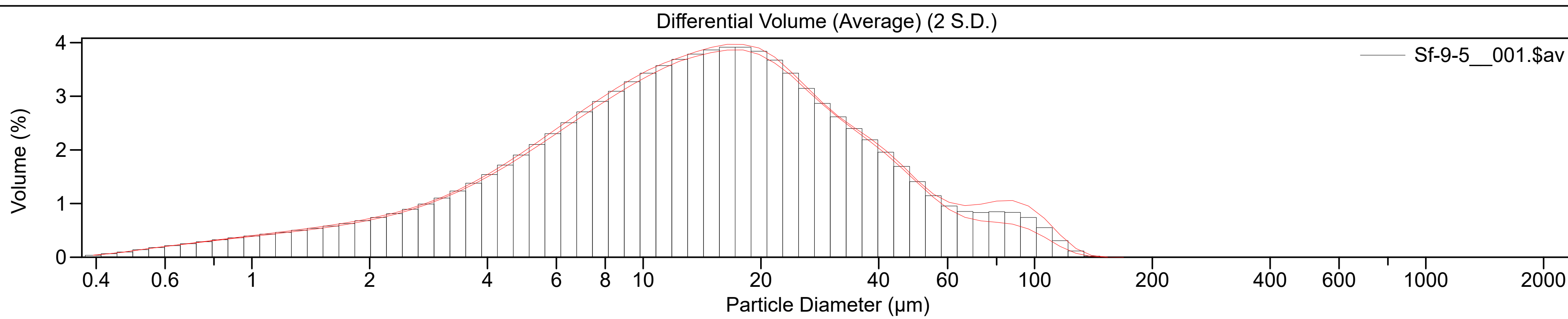
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-9-5__001.$av Sf-9-5__001.$av
File ID:	SF-9-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-9-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.39 µm	S.D.:	2.877
Median:	13.63 µm	Variance:	8.277
Mean/Median ratio:	0.909	Skewness:	-0.465 Left skewed
Mode:	18.00 µm	Kurtosis:	0.165 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.016 µm	6.660 µm	13.63 µm	25.34 µm	44.48 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

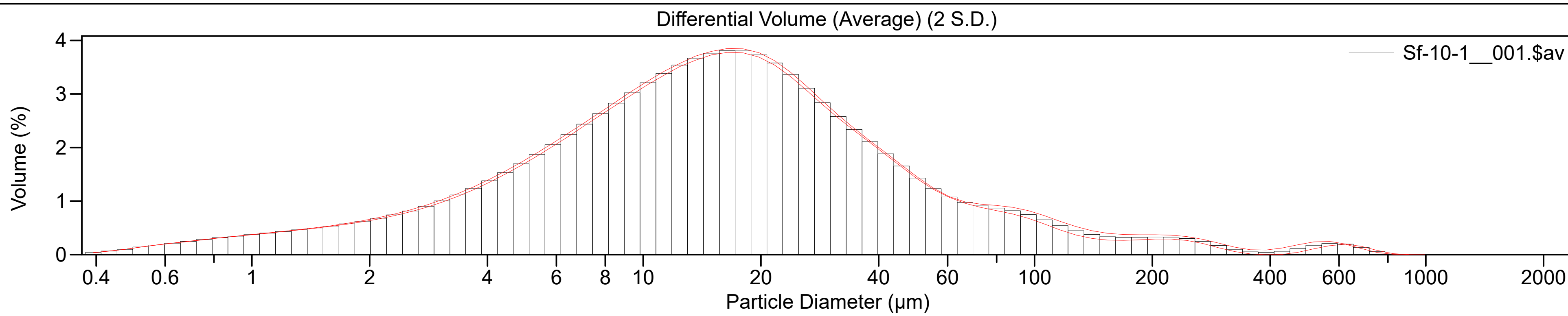
File name:	**C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-10-1__001.$av**
	Sf-10-1__001.$av
File ID:	**SF-10-1**
Optical model:	**Fraunhofer.rf780z**

Volume Statistics (Geometric) Sf-10-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.66 µm	S.D.:	3.346
Median:	15.06 µm	Variance:	11.20
Mean/Median ratio:	0.973	Skewness:	0.045 Right skewed
Mode:	16.40 µm	Kurtosis:	0.629 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.210 µm	7.274 µm	15.06 µm	29.29 µm	62.72 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

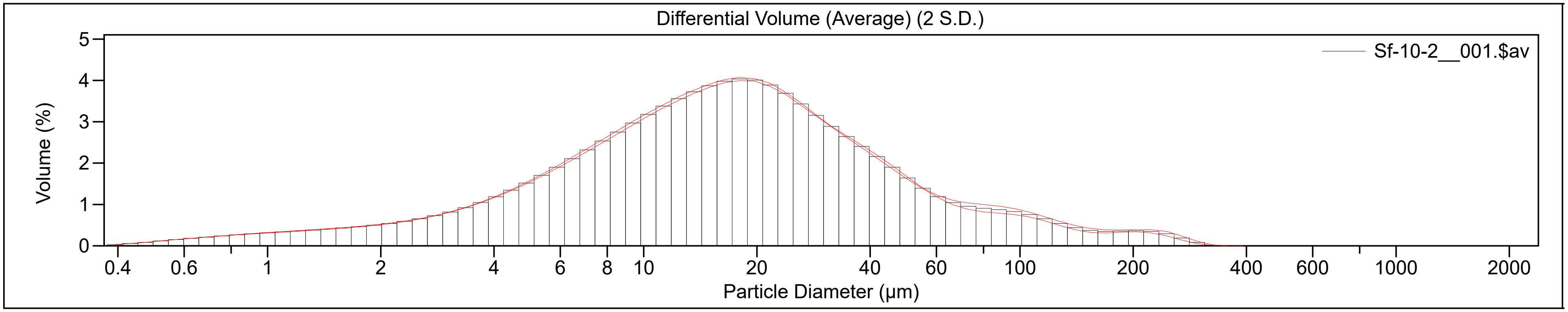
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-10-2__001.$av
	Sf-10-2__001.$av
File ID:	SF-10-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-10-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.53 µm	S.D.:	3.049
Median:	16.34 µm	Variance:	9.296
Mean/Median ratio:	0.950	Skewness:	-0.264 Left skewed
Mode:	18.00 µm	Kurtosis:	0.445 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.818 µm	8.217 µm	16.34 µm	30.69 µm	60.54 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

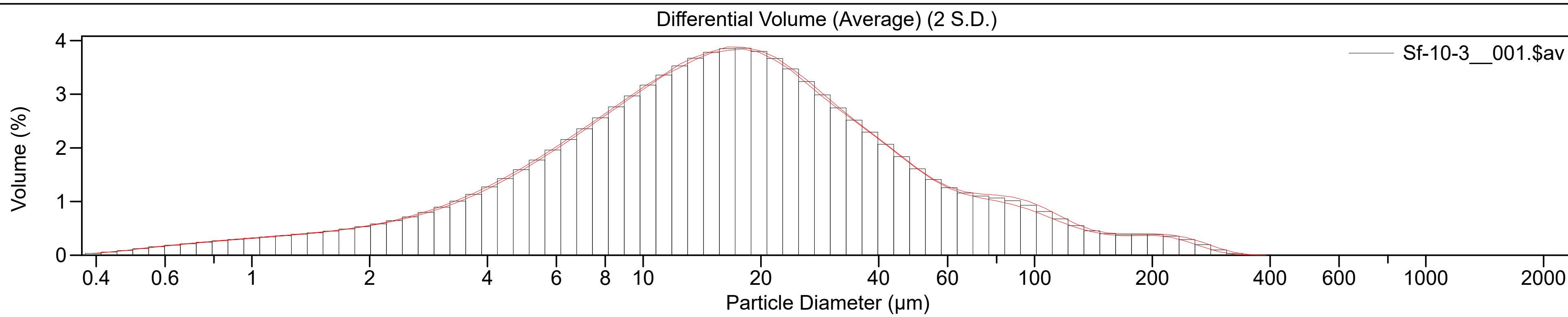
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-10-3__001.$av
	Sf-10-3__001.$av
File ID:	SF-10-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-10-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.40 µm	S.D.:	3.125
Median:	16.01 µm	Variance:	9.764
Mean/Median ratio:	0.962	Skewness:	-0.221 Left skewed
Mode:	18.00 µm	Kurtosis:	0.301 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.636 µm	7.907 µm	16.01 µm	31.19 µm	65.04 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

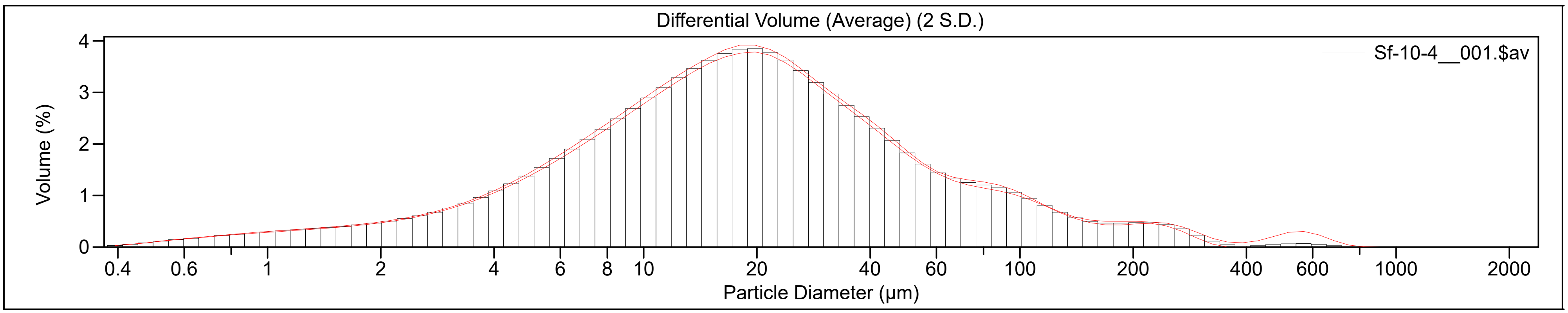
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-10-4__001.$av
	Sf-10-4__001.$av
File ID:	SF-10-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-10-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.59 µm	S.D.:	3.238
Median:	18.08 µm	Variance:	10.48
Mean/Median ratio:	0.973	Skewness:	-0.173 Left skewed
Mode:	19.76 µm	Kurtosis:	0.407 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.067 µm	8.901 µm	18.08 µm	35.80 µm	78.14 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

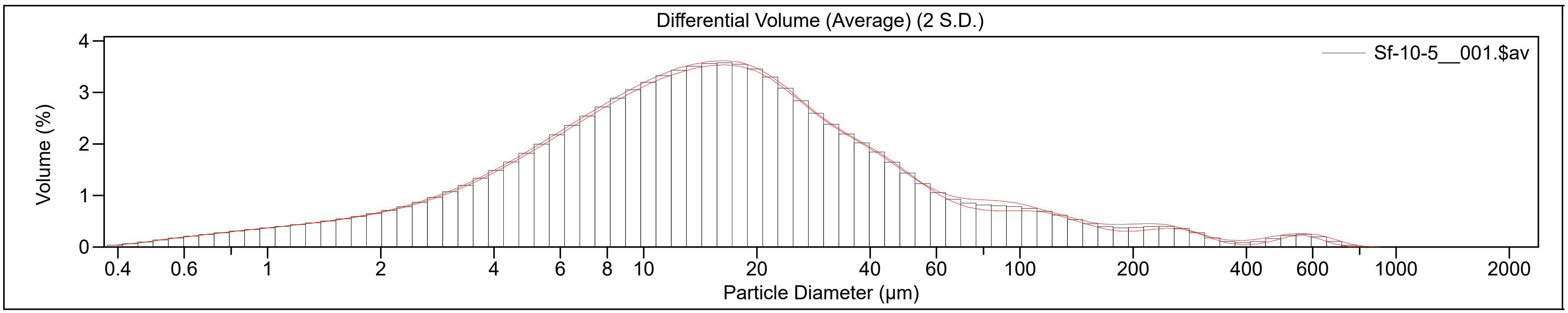
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-10-5__001.$av
	Sf-10-5__001.$av
File ID:	SF-10-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-10-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.81 µm	S.D.:	3.507
Median:	14.67 µm	Variance:	12.30
Mean/Median ratio:	1.010	Skewness:	0.145 Right skewed
Mode:	16.40 µm	Kurtosis:	0.441 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.136 µm	6.946 µm	14.67 µm	30.17 µm	72.40 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

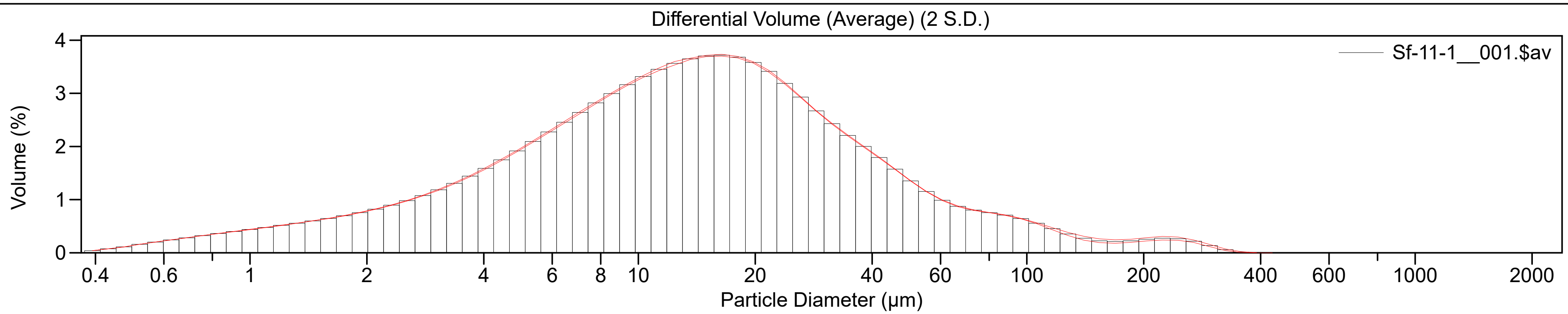
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-11-1__001.$av Sf-11-1__001.$av
File ID:	SF-11-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-11-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.64 µm	S.D.:	3.171
Median:	13.46 µm	Variance:	10.06
Mean/Median ratio:	0.939	Skewness:	-0.173 Left skewed
Mode:	16.40 µm	Kurtosis:	0.212 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.758 µm	6.348 µm	13.46 µm	26.14 µm	50.76 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

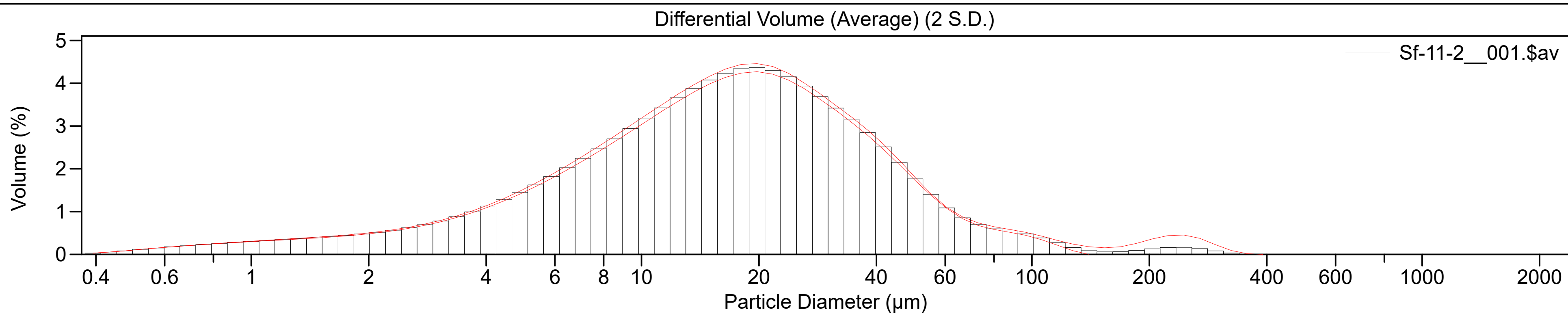
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-11-2__001.$av Sf-11-2__001.$av
File ID:	SF-11-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-11-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.81 µm	S.D.:	2.777
Median:	16.52 µm	Variance:	7.714
Mean/Median ratio:	0.897	Skewness:	-0.541 Left skewed
Mode:	19.76 µm	Kurtosis:	0.809 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.961 µm	8.518 µm	16.52 µm	28.89 µm	46.55 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

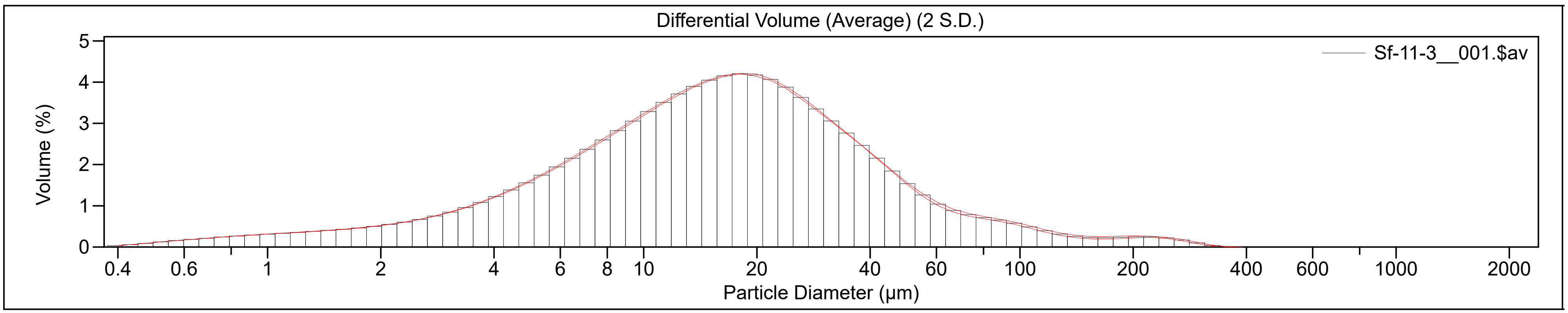
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-11-3__001.$av
	Sf-11-3__001.$av
File ID:	SF-11-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-11-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.63 µm	S.D.:	2.908
Median:	15.80 µm	Variance:	8.459
Mean/Median ratio:	0.926	Skewness:	-0.341 Left skewed
Mode:	18.00 µm	Kurtosis:	0.648 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.766 µm	8.068 µm	15.80 µm	28.41 µm	49.89 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

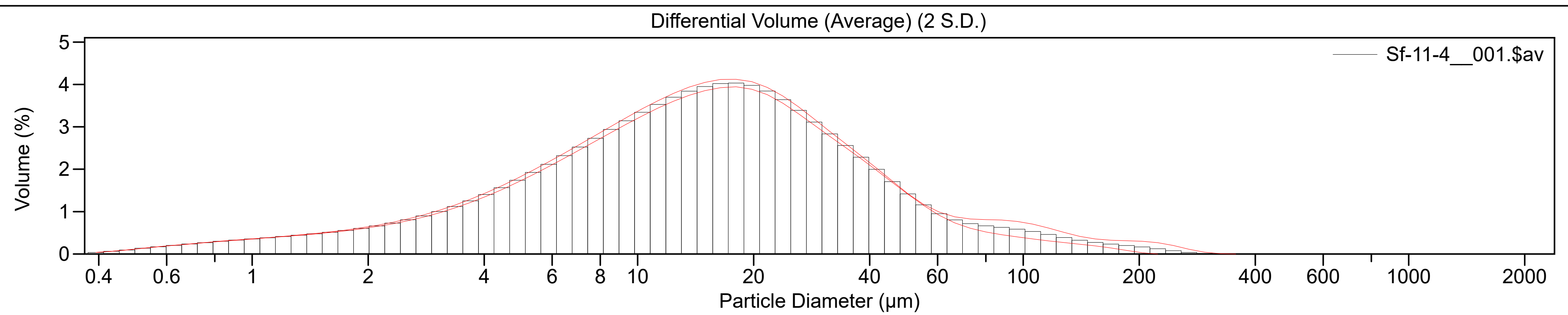
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-11-4__001.$av Sf-11-4__001.$av
File ID:	SF-11-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-11-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.46 µm	S.D.:	2.937
Median:	14.65 µm	Variance:	8.626
Mean/Median ratio:	0.919	Skewness:	-0.358 Left skewed
Mode:	18.00 µm	Kurtosis:	0.390 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.292 µm	7.249 µm	14.65 µm	26.86 µm	47.35 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

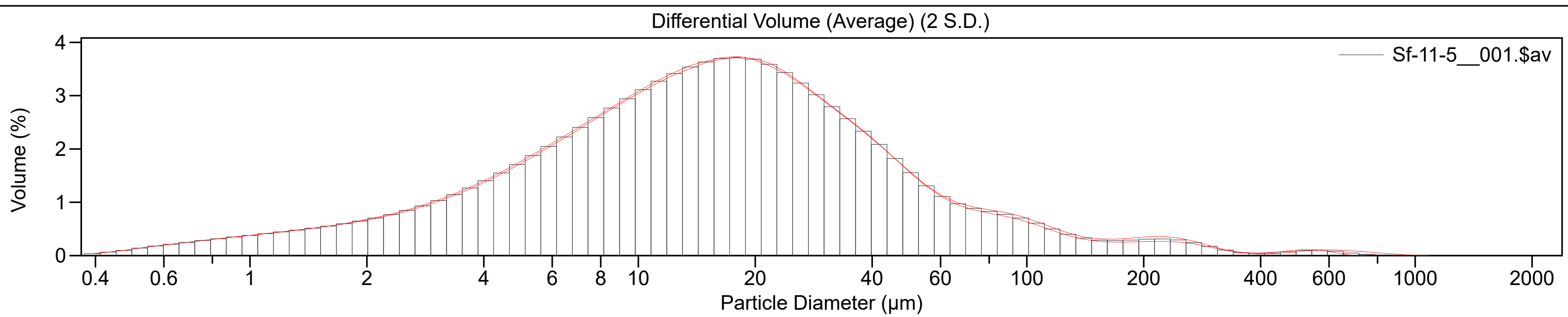
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-11-5__001.$av
	Sf-11-5__001.$av
File ID:	SF-11-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-11-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.41 µm	S.D.:	3.262
Median:	15.22 µm	Variance:	10.64
Mean/Median ratio:	0.947	Skewness:	-0.087 Left skewed
Mode:	18.00 µm	Kurtosis:	0.473 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.137 µm	7.181 µm	15.22 µm	29.61 µm	57.82 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

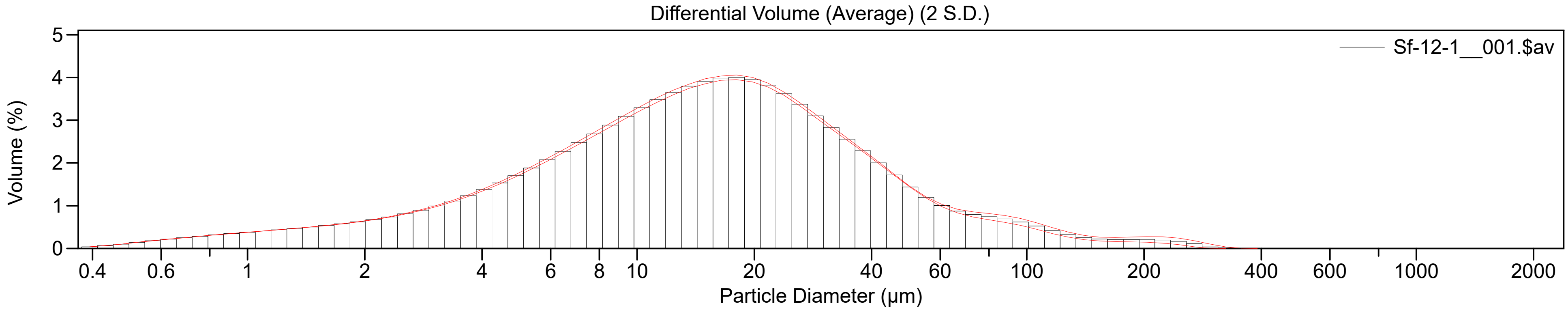
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-12-1__001.$av
	Sf-12-1__001.$av
File ID:	SF-12-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-12-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	13.55 µm	S.D.:	3.000
Median:	14.78 µm	Variance:	8.997
Mean/Median ratio:	0.917	Skewness:	-0.339 Left skewed
Mode:	18.00 µm	Kurtosis:	0.395 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.203 µm	7.242 µm	14.78 µm	27.24 µm	48.89 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

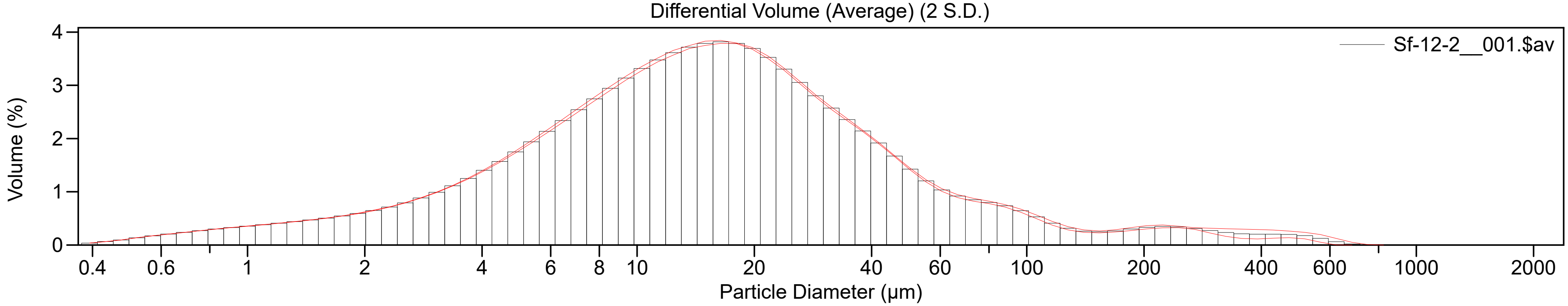
File name:	**C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-12-2__001.$av**
	Sf-12-2__001.$av
File ID:	**SF-12-2**
Optical model:	**Fraunhofer.rf780z**

Volume Statistics (Geometric) Sf-12-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.57 µm	S.D.:	3.308
Median:	14.79 µm	Variance:	10.95
Mean/Median ratio:	0.985	Skewness:	0.082 Right skewed
Mode:	16.40 µm	Kurtosis:	0.659 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.324 µm	7.260 µm	14.79 µm	28.79 µm	59.77 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

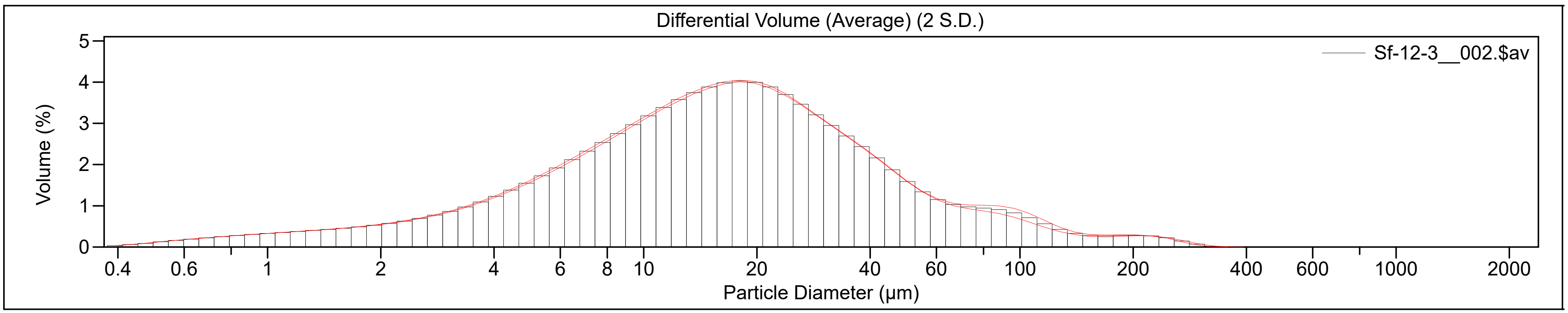
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-12-3__002.$av
	Sf-12-3__002.$av
File ID:	SF-12-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-12-3__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.00 µm	S.D.:	3.019
Median:	16.04 µm	Variance:	9.112
Mean/Median ratio:	0.935	Skewness:	-0.321 Left skewed
Mode:	18.00 µm	Kurtosis:	0.440 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.644 µm	8.007 µm	16.04 µm	29.86 µm	56.66 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

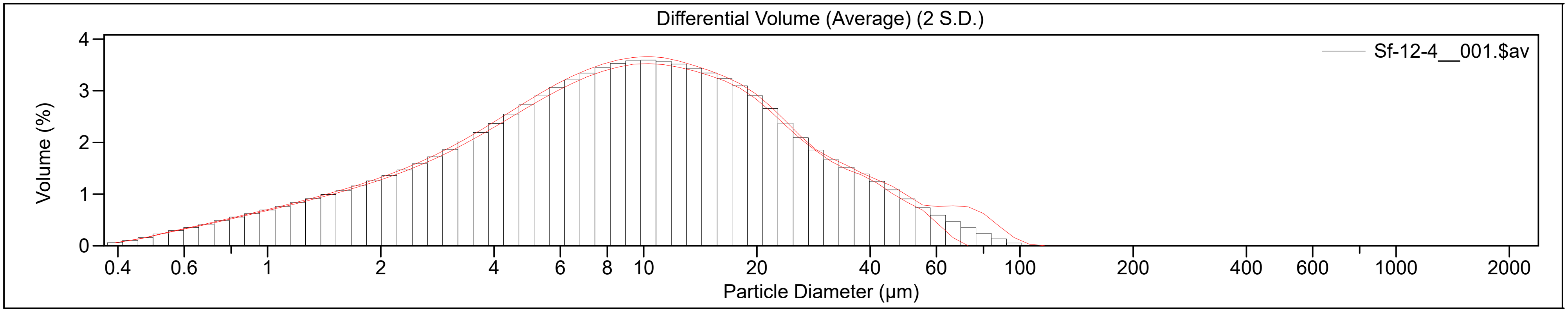
File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-12-4__001.$av Sf-12-4__001.$av
File ID:	SF-12-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-12-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	8.174 µm	S.D.:	2.878
Median:	8.867 µm	Variance:	8.285
Mean/Median ratio:	0.922	Skewness:	-0.320 Left skewed
Mode:	10.29 µm	Kurtosis:	-0.285 Platykurtic

<10%	<25%	<50%	<75%	<90%
1.871 µm	4.149 µm	8.867 µm	17.39 µm	30.80 µm



Beckman Coulter LS Particle Size Analyzer

21 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\PSD Data\PSD Data\Sf-12-5__002.$av
	Sf-12-5__002.$av
File ID:	SF-12-5
Optical model:	Fraunhofer.rf780z

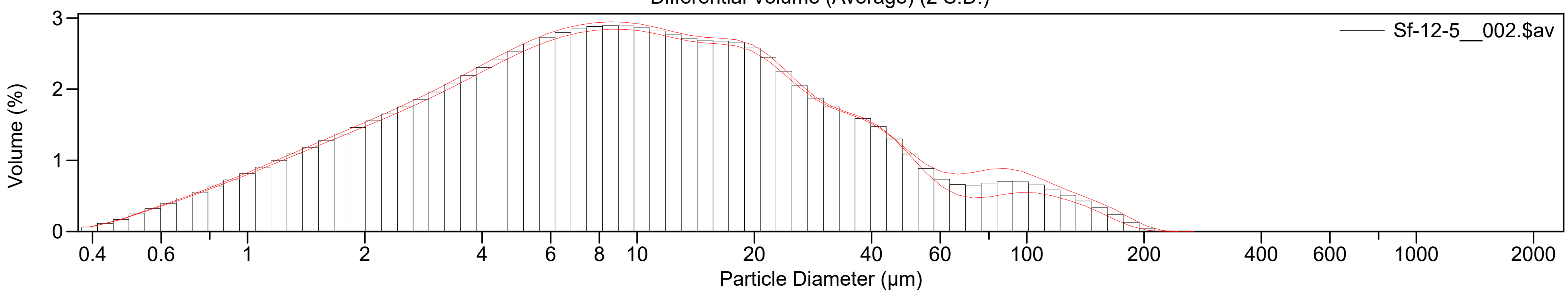
Volume Statistics (Geometric) Sf-12-5__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	8.912 µm	S.D.:	3.474
Median:	8.978 µm	Variance:	12.07
Mean/Median ratio:	0.993	Skewness:	0.016 Right skewed
Mode:	8.537 µm	Kurtosis:	-0.445 Platykurtic

<10%	<25%	<50%	<75%	<90%
1.672 µm	3.730 µm	8.978 µm	21.09 µm	44.85 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

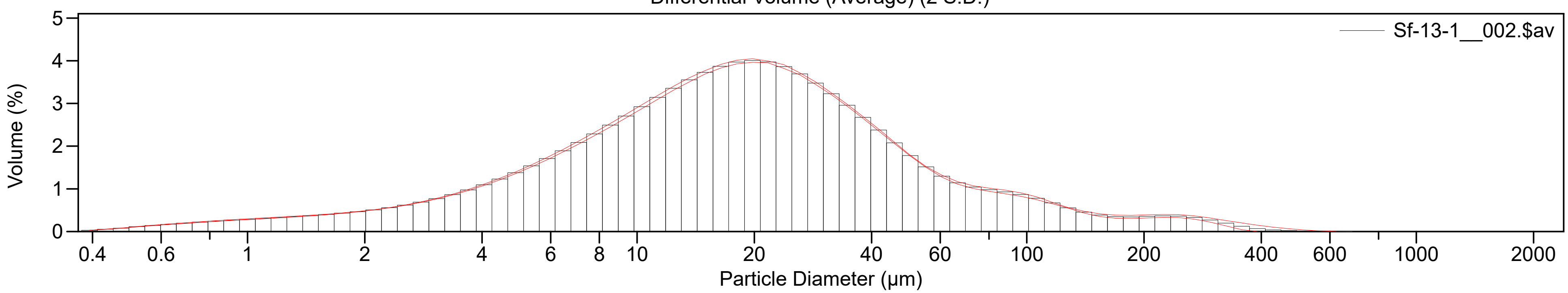
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-13-1__002.$av Sf-13-1__002.$av
File ID:	SF-13-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-13-1__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.93 µm	S.D.:	3.119
Median:	17.84 µm	Variance:	9.729
Mean/Median ratio:	0.949	Skewness:	-0.222 Left skewed
Mode:	19.76 µm	Kurtosis:	0.543 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.050 µm	8.891 µm	17.84 µm	33.38 µm	66.98 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

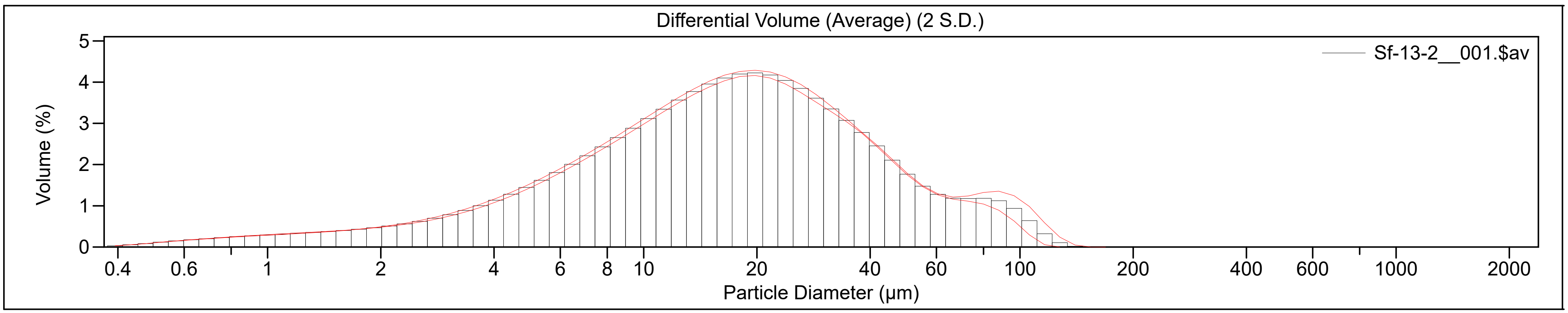
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-13-2__001.$av
	Sf-13-2__001.$av
File ID:	SF-13-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-13-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.13 µm	S.D.:	2.775
Median:	16.83 µm	Variance:	7.700
Mean/Median ratio:	0.899	Skewness:	-0.639 Left skewed
Mode:	19.76 µm	Kurtosis:	0.548 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.996 µm	8.585 µm	16.83 µm	30.05 µm	51.16 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

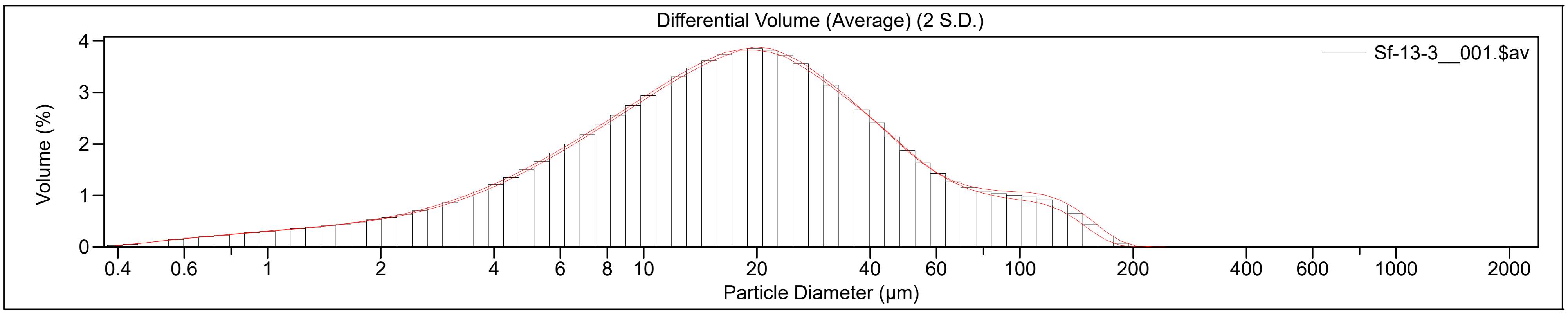
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-13-3__001.$av
	Sf-13-3__001.$av
File ID:	SF-13-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-13-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.80 µm	S.D.:	3.009
Median:	17.17 µm	Variance:	9.056
Mean/Median ratio:	0.920	Skewness:	-0.440 Left skewed
Mode:	19.76 µm	Kurtosis:	0.234 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.724 µm	8.292 µm	17.17 µm	32.73 µm	62.02 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

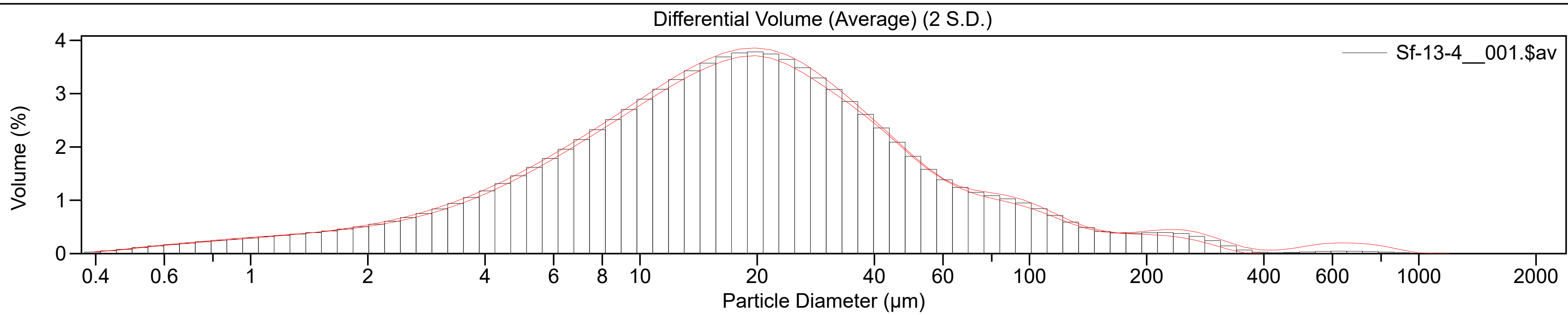
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-13-4__001.$av
	Sf-13-4__001.$av
File ID:	SF-13-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-13-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.89 µm	S.D.:	3.219
Median:	17.64 µm	Variance:	10.36
Mean/Median ratio:	0.957	Skewness:	-0.159 Left skewed
Mode:	19.76 µm	Kurtosis:	0.442 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.845 µm	8.521 µm	17.64 µm	34.41 µm	71.38 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-13-5__001.$av
	Sf-13-5__001.$av
File ID:	SF-13-5
Optical model:	Fraunhofer.rf780z

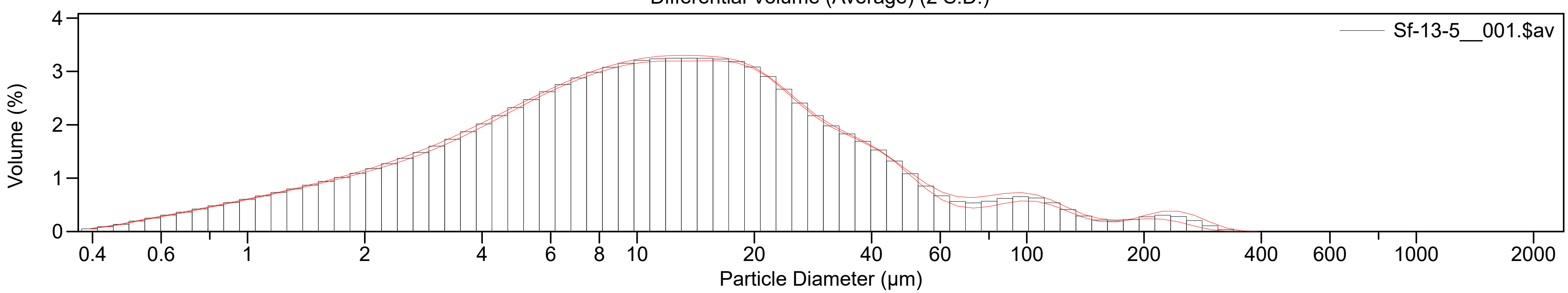
Volume Statistics (Geometric) Sf-13-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	10.47 µm	S.D.:	3.352
Median:	10.87 µm	Variance:	11.23
Mean/Median ratio:	0.963	Skewness:	-0.0024 Left skewed
Mode:	13.61 µm	Kurtosis:	-0.033 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.083 µm	4.801 µm	10.87 µm	22.65 µm	45.65 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

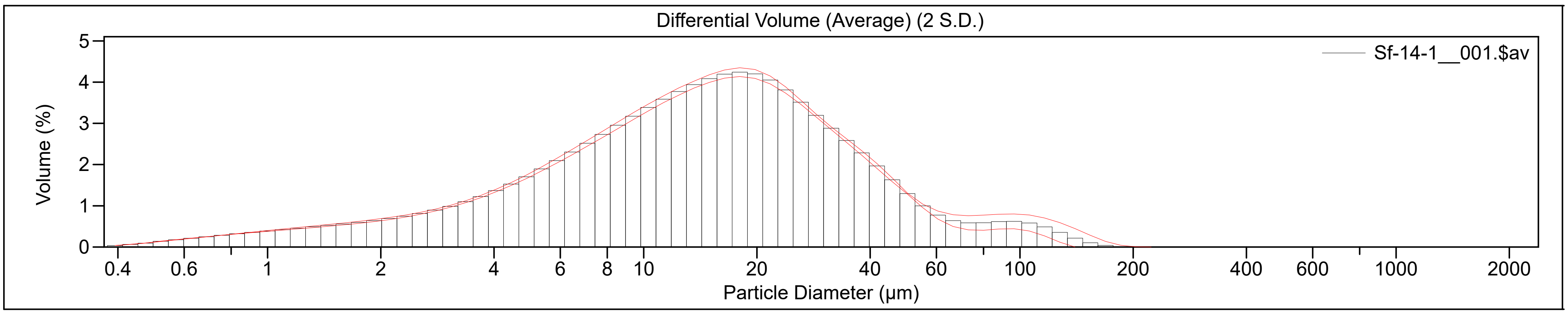
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-14-1__001.$av
	Sf-14-1__001.$av
File ID:	SF-14-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-14-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	12.88 µm	S.D.:	2.845
Median:	14.45 µm	Variance:	8.093
Mean/Median ratio:	0.891	Skewness:	-0.516 Left skewed
Mode:	18.00 µm	Kurtosis:	0.388 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.160 µm	7.187 µm	14.45 µm	25.63 µm	42.79 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

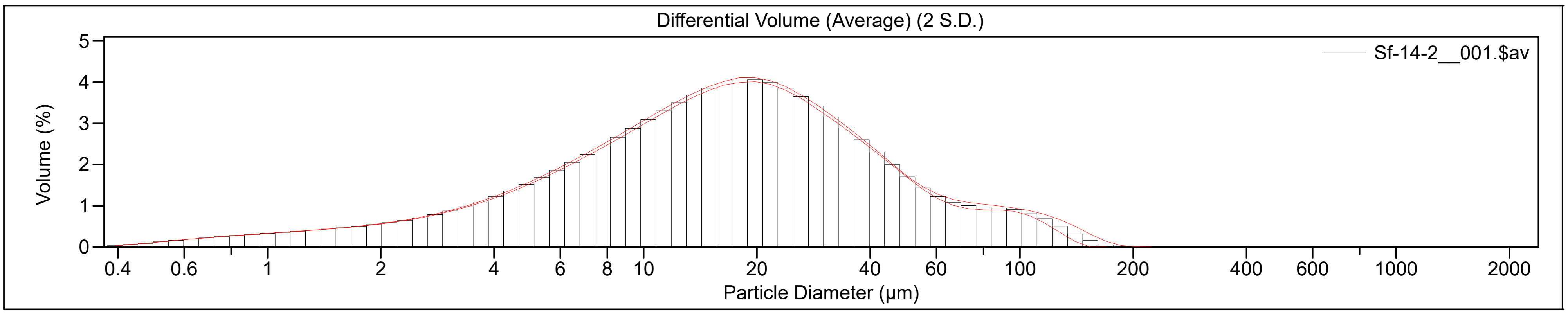
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-14-2__001.$av Sf-14-2__001.$av
File ID:	SF-14-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-14-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.77 µm	S.D.:	2.912
Median:	16.34 µm	Variance:	8.481
Mean/Median ratio:	0.904	Skewness:	-0.522 Left skewed
Mode:	19.76 µm	Kurtosis:	0.366 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.601 µm	8.079 µm	16.34 µm	29.91 µm	53.13 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

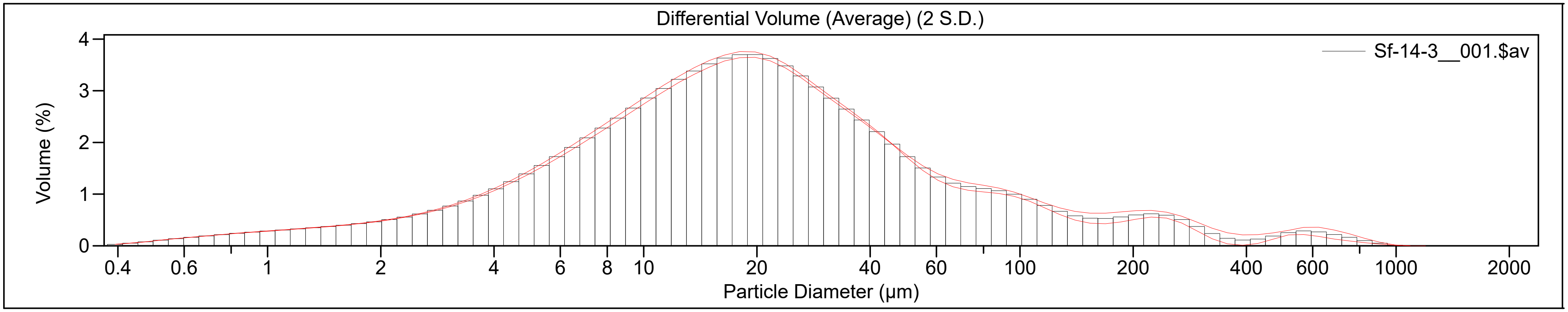
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-14-3__001.$av
	Sf-14-3__001.$av
File ID:	SF-14-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-14-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.80 µm	S.D.:	3.566
Median:	18.32 µm	Variance:	12.71
Mean/Median ratio:	1.026	Skewness:	0.124 Right skewed
Mode:	19.76 µm	Kurtosis:	0.517 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.066 µm	8.889 µm	18.32 µm	37.89 µm	95.98 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

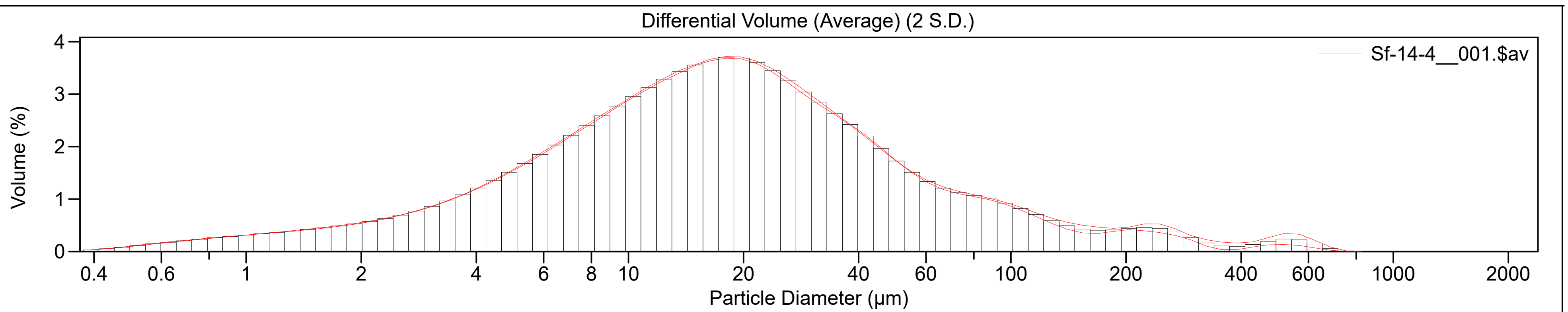
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-14-4__001.$av
	Sf-14-4__001.$av
File ID:	SF-14-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-14-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.95 µm	S.D.:	3.402
Median:	17.14 µm	Variance:	11.58
Mean/Median ratio:	0.989	Skewness:	0.0058 Right skewed
Mode:	18.00 µm	Kurtosis:	0.461 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.706 µm	8.227 µm	17.14 µm	34.64 µm	77.90 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

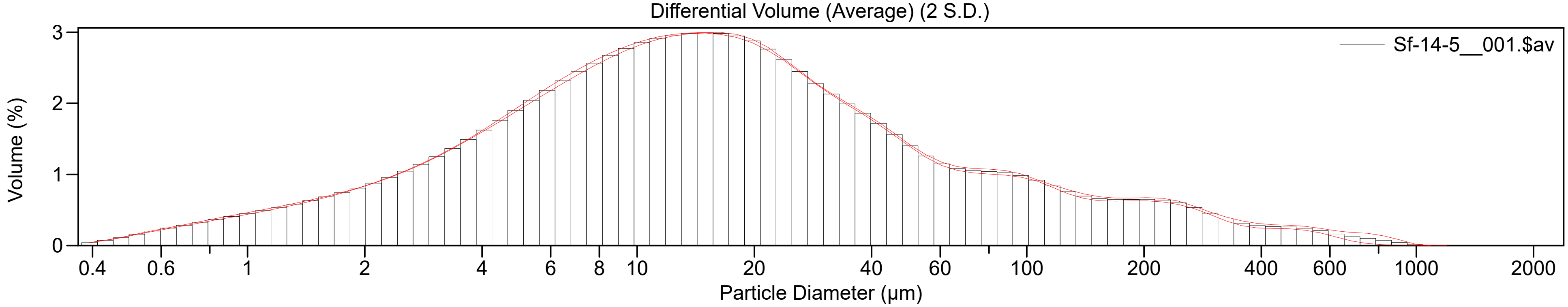
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-14-5__001.$av
	Sf-14-5__001.$av
File ID:	SF-14-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-14-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.49 µm	S.D.:	4.088
Median:	14.58 µm	Variance:	16.71
Mean/Median ratio:	1.062	Skewness:	0.208 Right skewed
Mode:	14.94 µm	Kurtosis:	-0.041 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.649 µm	6.207 µm	14.58 µm	35.70 µm	106.7 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

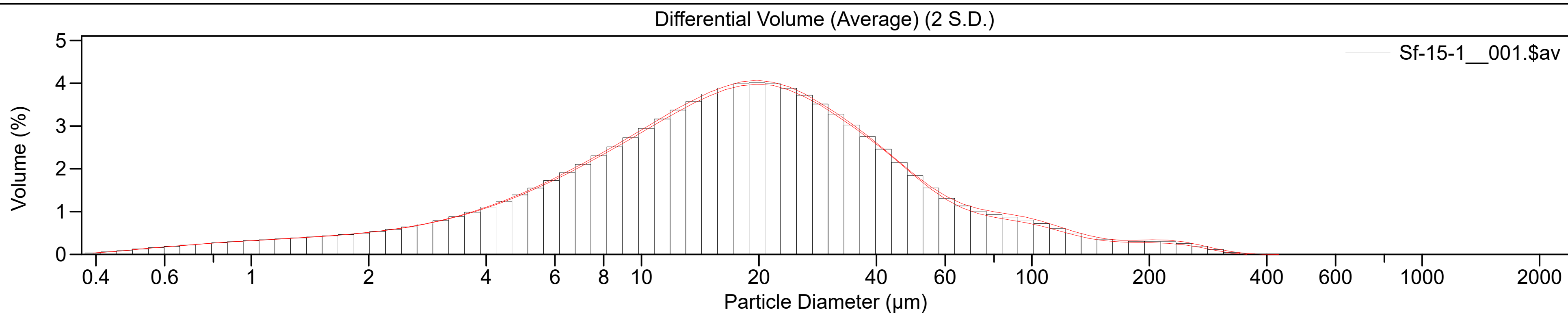
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-15-1__001.$av
	Sf-15-1__001.$av
File ID:	SF-15-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-15-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.11 µm	S.D.:	3.045
Median:	17.46 µm	Variance:	9.271
Mean/Median ratio:	0.923	Skewness:	-0.374 Left skewed
Mode:	19.76 µm	Kurtosis:	0.505 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.845 µm	8.656 µm	17.46 µm	32.36 µm	59.91 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

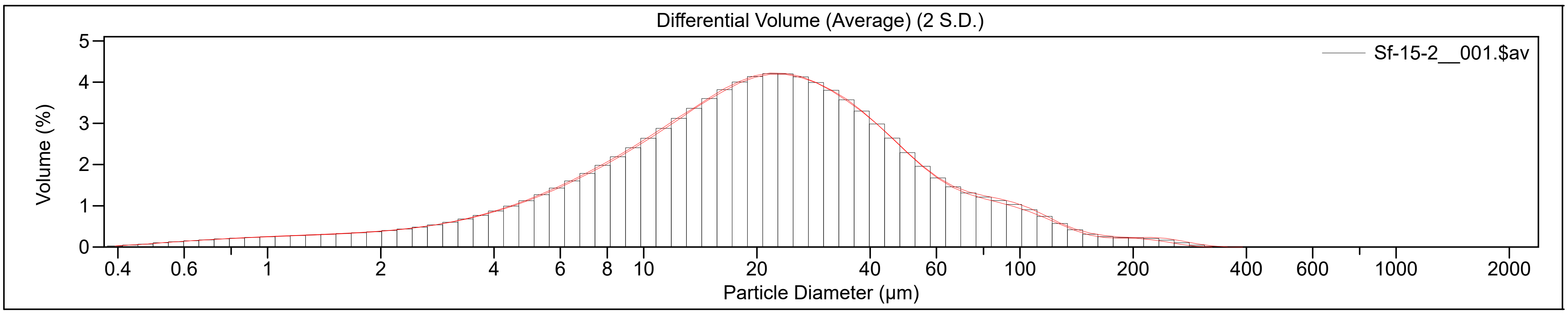
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-15-2__001.$av
	Sf-15-2__001.$av
File ID:	SF-15-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-15-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.51 µm	S.D.:	2.883
Median:	20.29 µm	Variance:	8.310
Mean/Median ratio:	0.912	Skewness:	-0.558 Left skewed
Mode:	21.70 µm	Kurtosis:	0.752 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.831 µm	10.42 µm	20.29 µm	36.43 µm	64.82 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

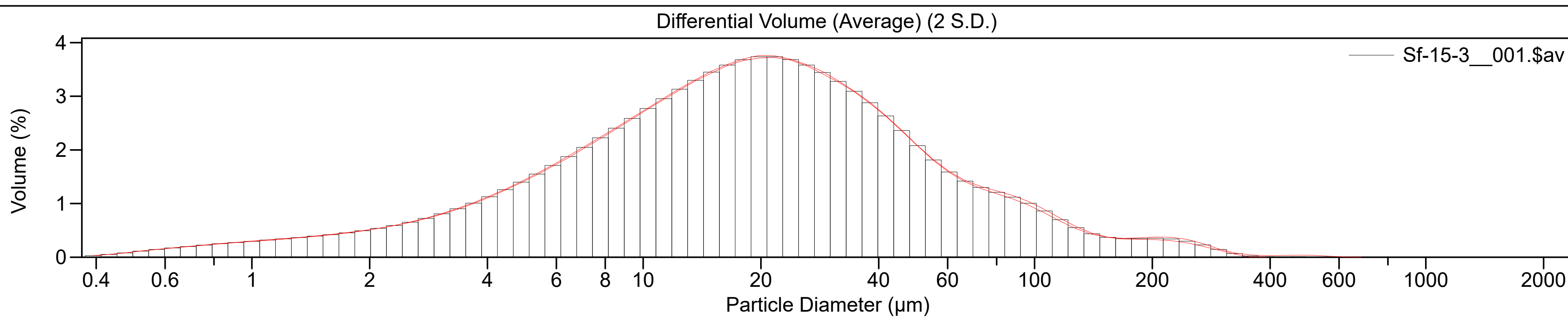
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-15-3__001.$av
	Sf-15-3__001.$av
File ID:	SF-15-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-15-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.11 µm	S.D.:	3.130
Median:	18.44 µm	Variance:	9.796
Mean/Median ratio:	0.928	Skewness:	-0.346 Left skewed
Mode:	21.70 µm	Kurtosis:	0.338 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.908 µm	8.789 µm	18.44 µm	35.74 µm	68.52 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

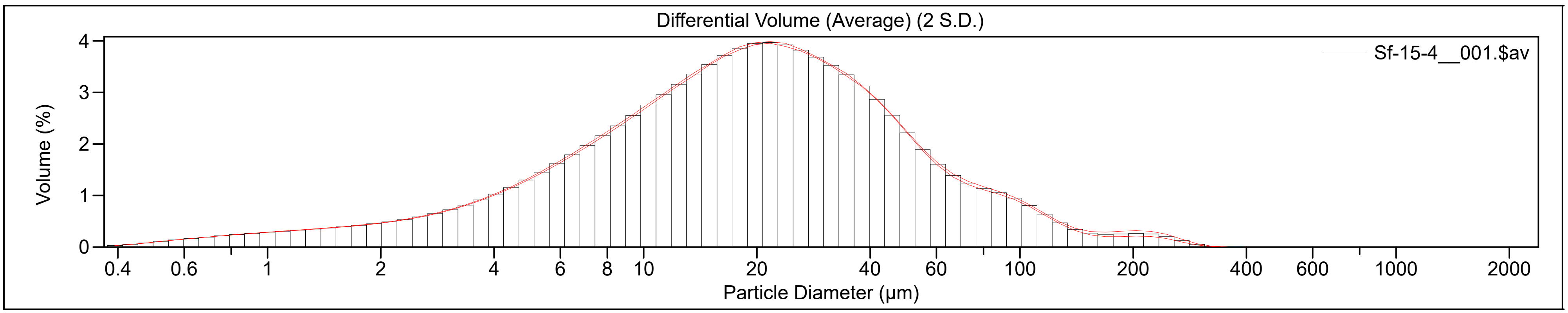
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-15-4__001.$av
	Sf-15-4__001.$av
File ID:	SF-15-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-15-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.23 µm	S.D.:	2.978
Median:	18.95 µm	Variance:	8.868
Mean/Median ratio:	0.909	Skewness:	-0.486 Left skewed
Mode:	21.70 µm	Kurtosis:	0.515 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.197 µm	9.314 µm	18.95 µm	35.24 µm	62.39 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-15-5__001.$av Sf-15-5__001.$av
File ID:	SF-15-5
Optical model:	Fraunhofer.rf780z

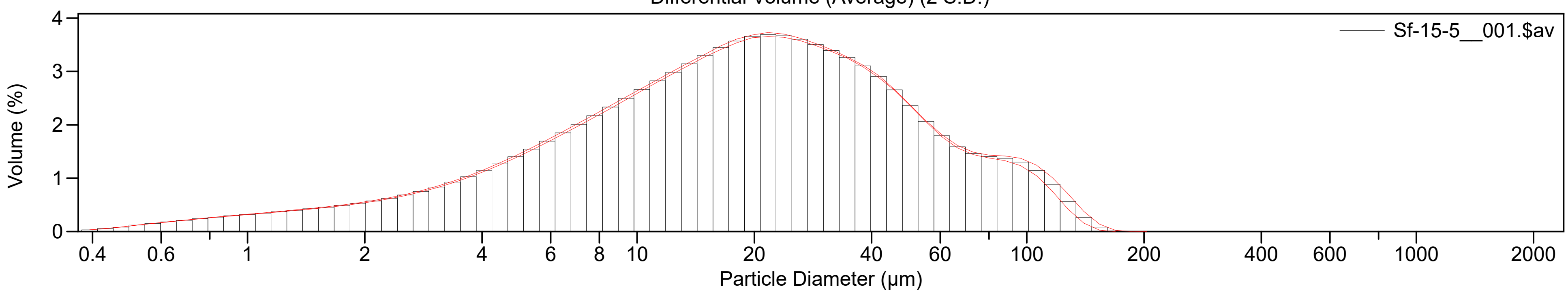
Volume Statistics (Geometric) Sf-15-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.59 µm	S.D.:	3.027
Median:	18.75 µm	Variance:	9.161
Mean/Median ratio:	0.885	Skewness:	-0.596 Left skewed
Mode:	21.70 µm	Kurtosis:	0.215 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.727 µm	8.666 µm	18.75 µm	36.22 µm	63.77 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

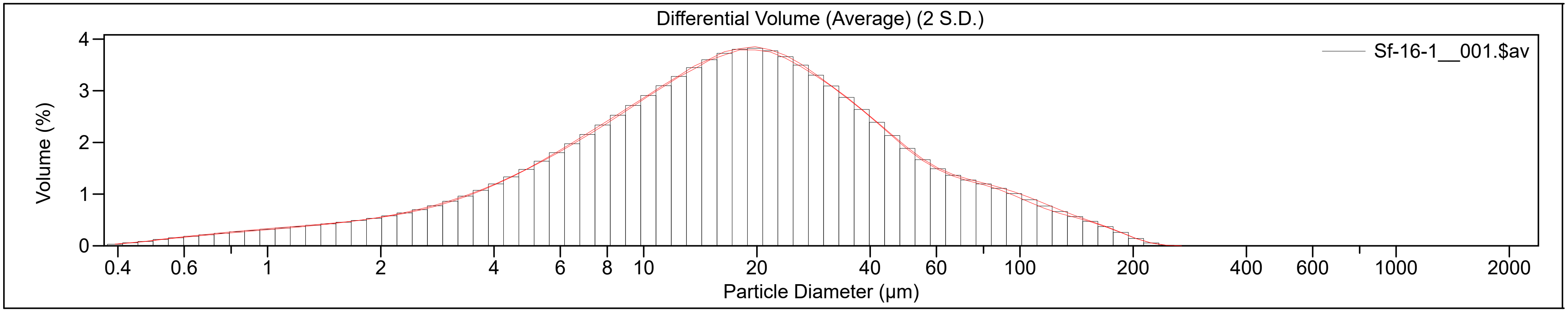
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-16-1__001.$av
	Sf-16-1__001.$av
File ID:	SF-16-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-16-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.93 µm	S.D.:	3.062
Median:	17.27 µm	Variance:	9.375
Mean/Median ratio:	0.922	Skewness:	-0.424 Left skewed
Mode:	19.76 µm	Kurtosis:	0.234 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.673 µm	8.302 µm	17.27 µm	33.29 µm	64.17 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

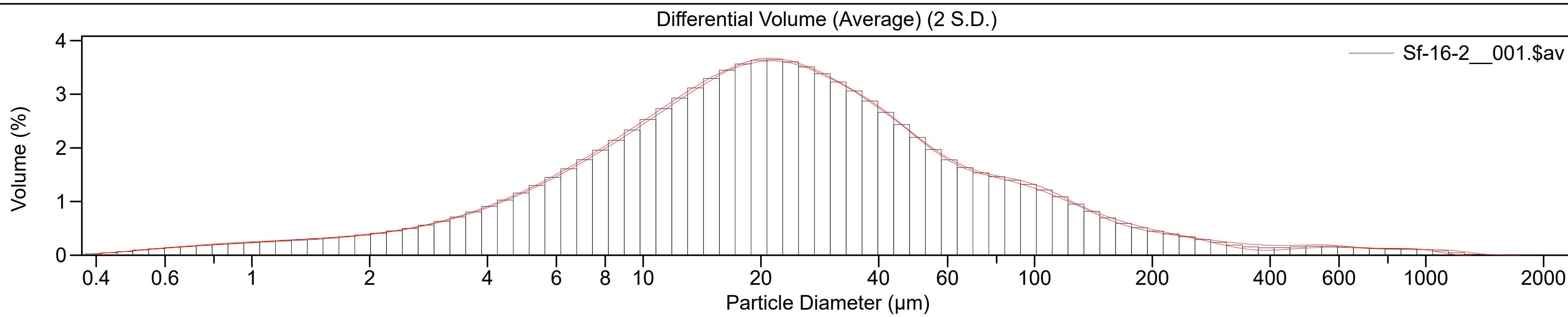
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-16-2__001.$av
	Sf-16-2__001.$av
File ID:	SF-16-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-16-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	21.38 µm	S.D.:	3.429
Median:	21.44 µm	Variance:	11.76
Mean/Median ratio:	0.997	Skewness:	-0.025 Left skewed
Mode:	21.70 µm	Kurtosis:	0.654 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.771 µm	10.41 µm	21.44 µm	44.28 µm	98.51 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

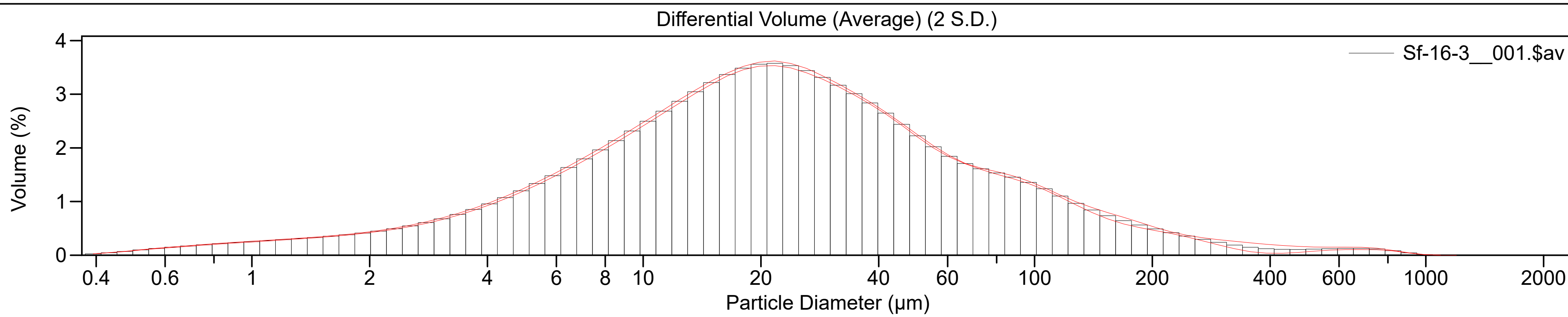
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-16-3__001.$av Sf-16-3__001.$av
File ID:	SF-16-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-16-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.83 µm	S.D.:	3.399
Median:	21.30 µm	Variance:	11.55
Mean/Median ratio:	0.978	Skewness:	-0.148 Left skewed
Mode:	21.70 µm	Kurtosis:	0.417 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.515 µm	10.12 µm	21.30 µm	44.58 µm	96.63 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

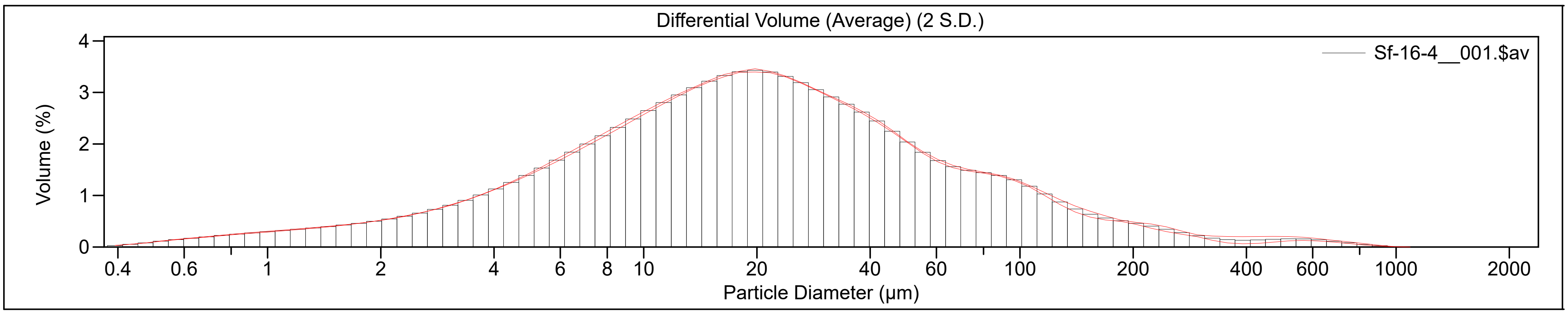
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-16-4__001.$av
	Sf-16-4__001.$av
File ID:	SF-16-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-16-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.95 µm	S.D.:	3.504
Median:	19.31 µm	Variance:	12.28
Mean/Median ratio:	0.981	Skewness:	-0.093 Left skewed
Mode:	19.76 µm	Kurtosis:	0.275 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.891 µm	8.865 µm	19.31 µm	41.62 µm	92.28 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

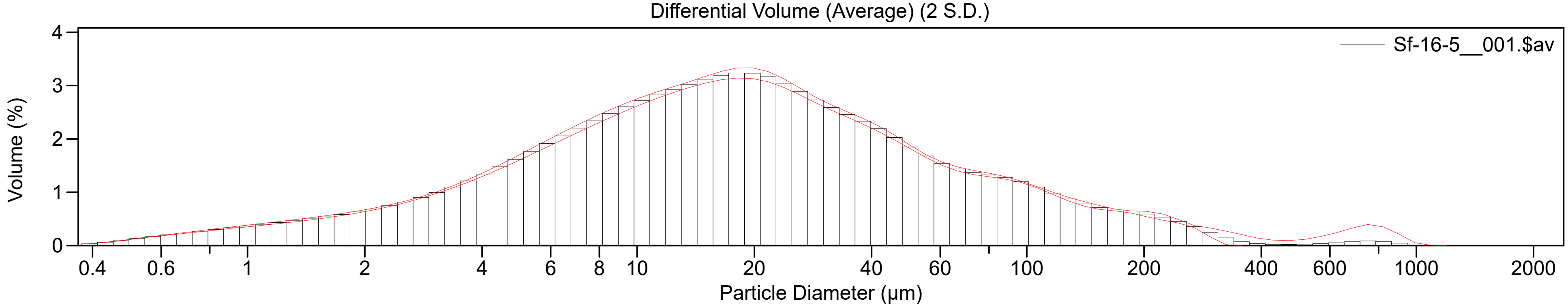
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-16-5__001.$av
	Sf-16-5__001.$av
File ID:	SF-16-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-16-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.99 µm	S.D.:	3.624
Median:	17.30 µm	Variance:	13.13
Mean/Median ratio:	0.982	Skewness:	-0.083 Left skewed
Mode:	18.00 µm	Kurtosis:	0.010 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.233 µm	7.550 µm	17.30 µm	39.08 µm	91.14 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

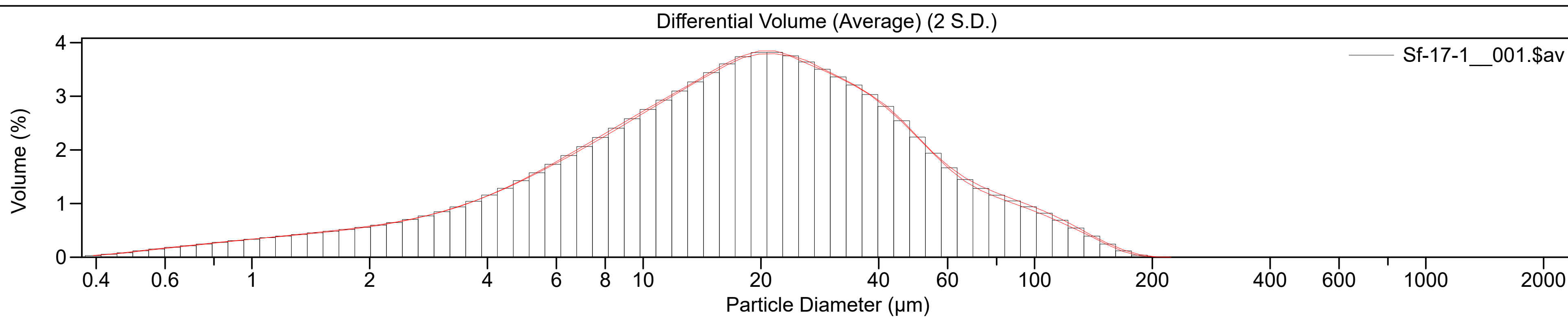
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-17-1__001.$av
	Sf-17-1__001.$av
File ID:	SF-17-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-17-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.93 µm	S.D.:	3.003
Median:	17.99 µm	Variance:	9.016
Mean/Median ratio:	0.885	Skewness:	-0.572 Left skewed
Mode:	21.70 µm	Kurtosis:	0.255 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.615 µm	8.441 µm	17.99 µm	34.20 µm	59.14 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

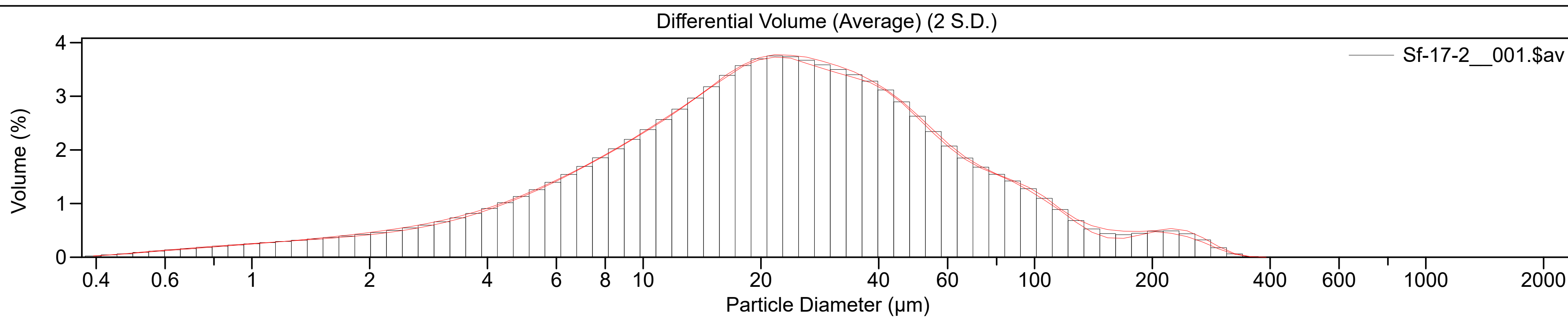
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-17-2__001.$av
	Sf-17-2__001.$av
File ID:	SF-17-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-17-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.19 µm	S.D.:	3.124
Median:	21.92 µm	Variance:	9.761
Mean/Median ratio:	0.921	Skewness:	-0.439 Left skewed
Mode:	21.70 µm	Kurtosis:	0.399 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.595 µm	10.53 µm	21.92 µm	42.68 µm	79.99 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

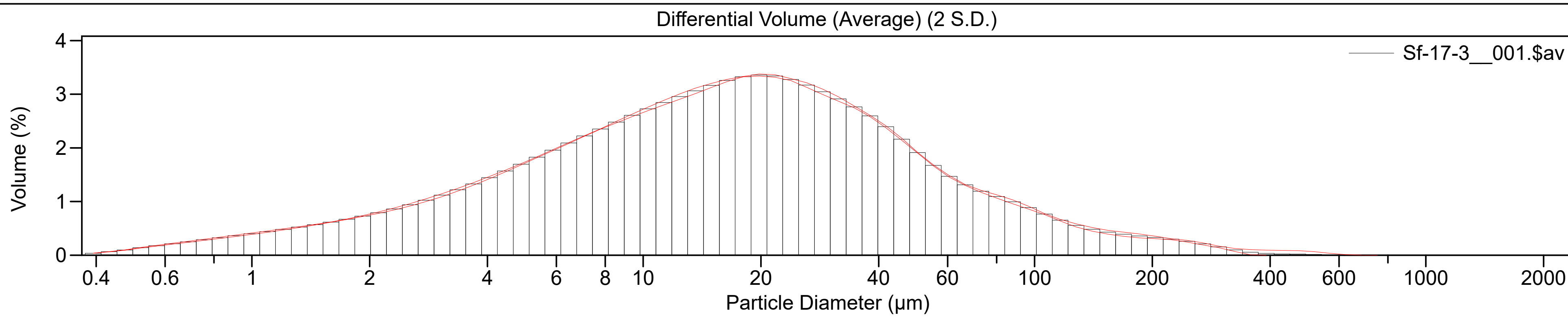
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-17-3__001.$av Sf-17-3__001.$av
File ID:	SF-17-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-17-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.97 µm	S.D.:	3.376
Median:	16.27 µm	Variance:	11.40
Mean/Median ratio:	0.920	Skewness:	-0.233 Left skewed
Mode:	19.76 µm	Kurtosis:	-0.014 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.916 µm	6.977 µm	16.27 µm	33.73 µm	66.46 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

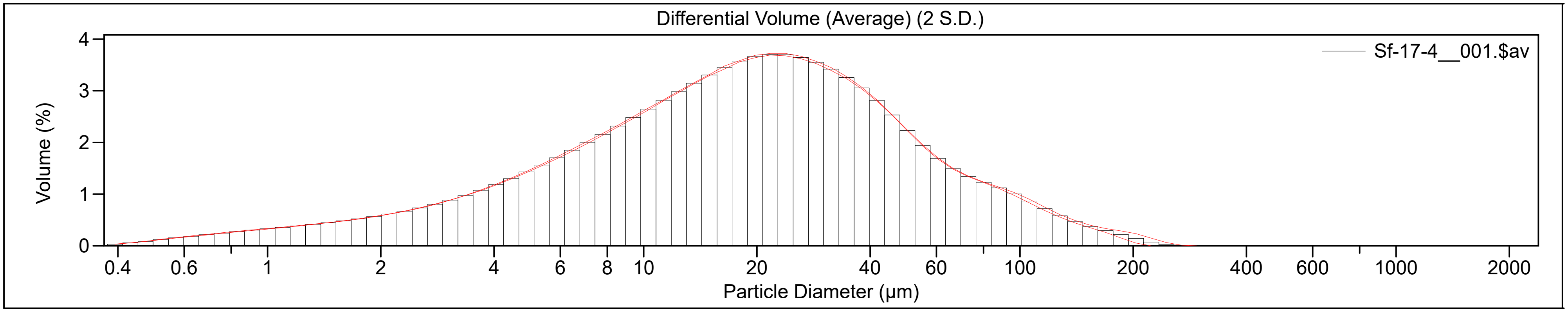
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-17-4__001.$av
	Sf-17-4__001.$av
File ID:	SF-17-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-17-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.38 µm	S.D.:	3.090
Median:	18.47 µm	Variance:	9.545
Mean/Median ratio:	0.887	Skewness:	-0.513 Left skewed
Mode:	21.70 µm	Kurtosis:	0.197 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.562 µm	8.448 µm	18.47 µm	35.47 µm	63.30 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

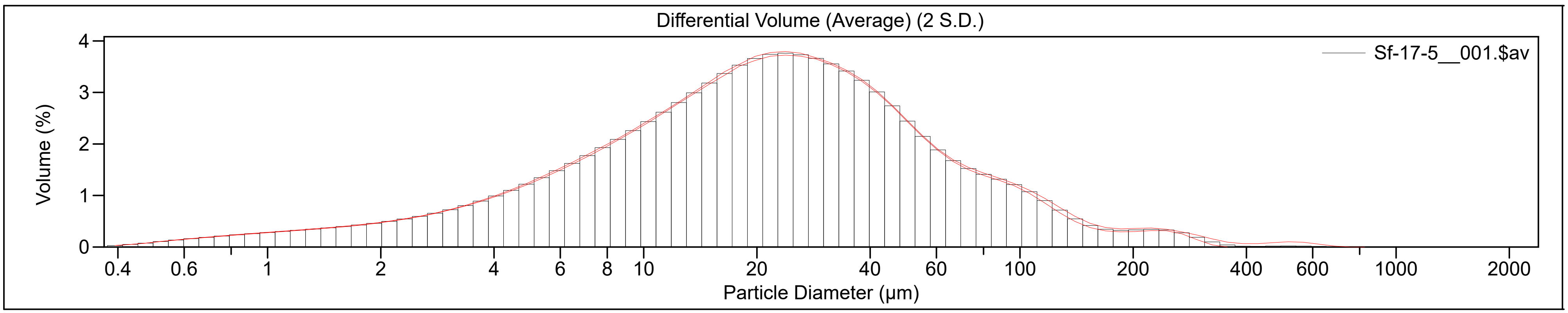
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-17-5__001.$av
	Sf-17-5__001.$av
File ID:	SF-17-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-17-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.07 µm	S.D.:	3.166
Median:	20.99 µm	Variance:	10.03
Mean/Median ratio:	0.909	Skewness:	-0.426 Left skewed
Mode:	23.82 µm	Kurtosis:	0.396 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.212 µm	9.859 µm	20.99 µm	40.32 µm	76.38 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

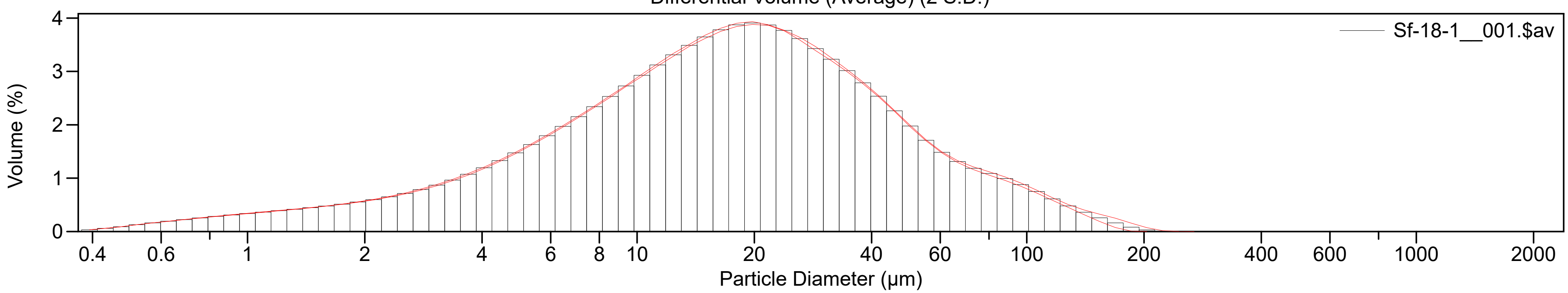
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-18-1__001.$av
	Sf-18-1__001.$av
File ID:	SF-18-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-18-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.32 µm	S.D.:	2.978
Median:	17.05 µm	Variance:	8.871
Mean/Median ratio:	0.899	Skewness:	-0.533 Left skewed
Mode:	19.76 µm	Kurtosis:	0.300 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.573 µm	8.213 µm	17.05 µm	32.08 µm	56.84 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

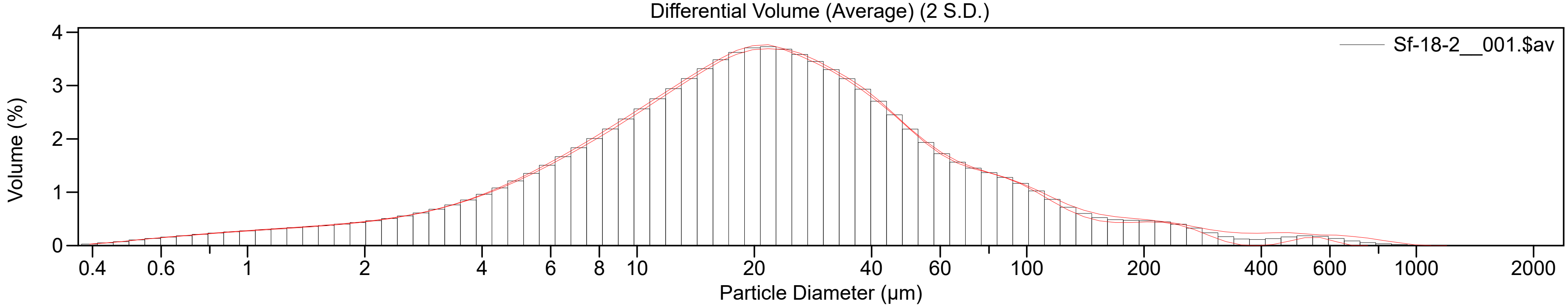
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-18-2__001.$av Sf-18-2__001.$av
File ID:	SF-18-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-18-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.78 µm	S.D.:	3.347
Median:	20.51 µm	Variance:	11.20
Mean/Median ratio:	0.964	Skewness:	-0.153 Left skewed
Mode:	21.70 µm	Kurtosis:	0.535 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.377 µm	9.867 µm	20.51 µm	40.93 µm	86.58 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

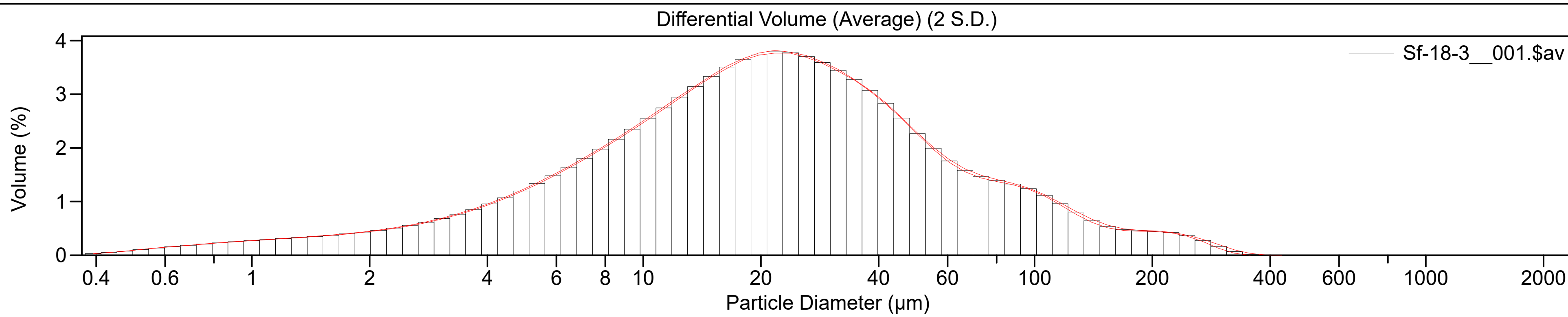
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-18-3__001.$av Sf-18-3__001.$av
File ID:	SF-18-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-18-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.21 µm	S.D.:	3.152
Median:	20.60 µm	Variance:	9.932
Mean/Median ratio:	0.932	Skewness:	-0.398 Left skewed
Mode:	21.70 µm	Kurtosis:	0.386 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.403 µm	9.971 µm	20.60 µm	39.98 µm	80.15 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

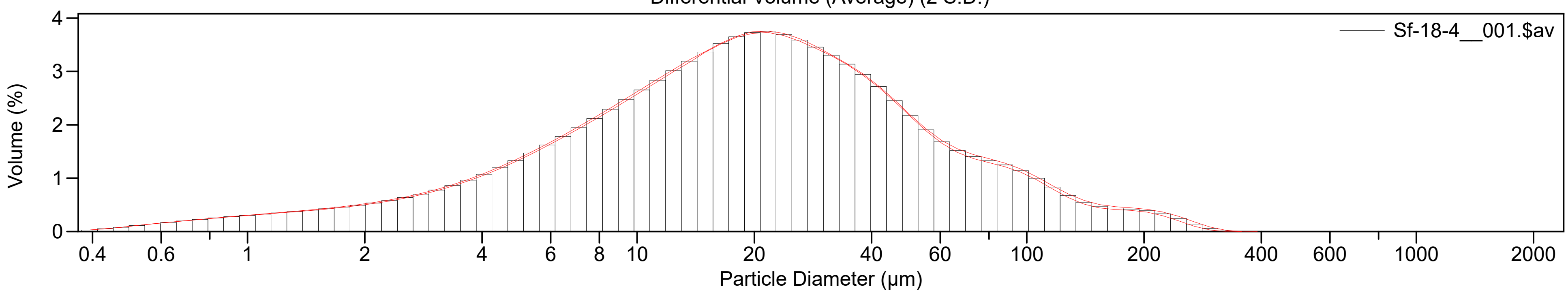
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-18-4__001.$av
	Sf-18-4__001.$av
File ID:	SF-18-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-18-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	17.70 µm	S.D.:	3.150
Median:	19.22 µm	Variance:	9.920
Mean/Median ratio:	0.921	Skewness:	-0.409 Left skewed
Mode:	21.70 µm	Kurtosis:	0.281 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.952 µm	9.095 µm	19.22 µm	37.54 µm	72.97 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

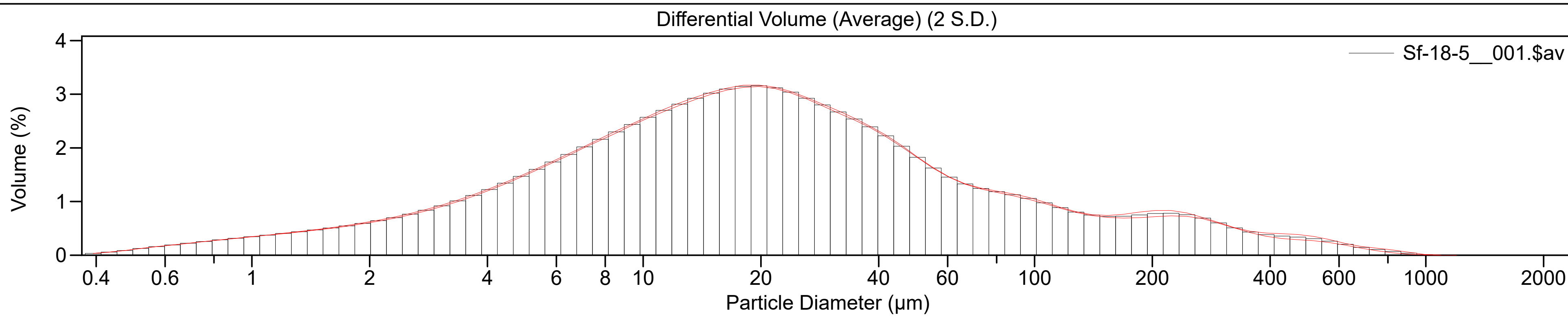
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-18-5__001.$av
	Sf-18-5__001.$av
File ID:	SF-18-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-18-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.56 µm	S.D.:	4.004
Median:	18.95 µm	Variance:	16.03
Mean/Median ratio:	1.033	Skewness:	0.083 Right skewed
Mode:	19.76 µm	Kurtosis:	0.010 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.426 µm	8.200 µm	18.95 µm	44.24 µm	129.7 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

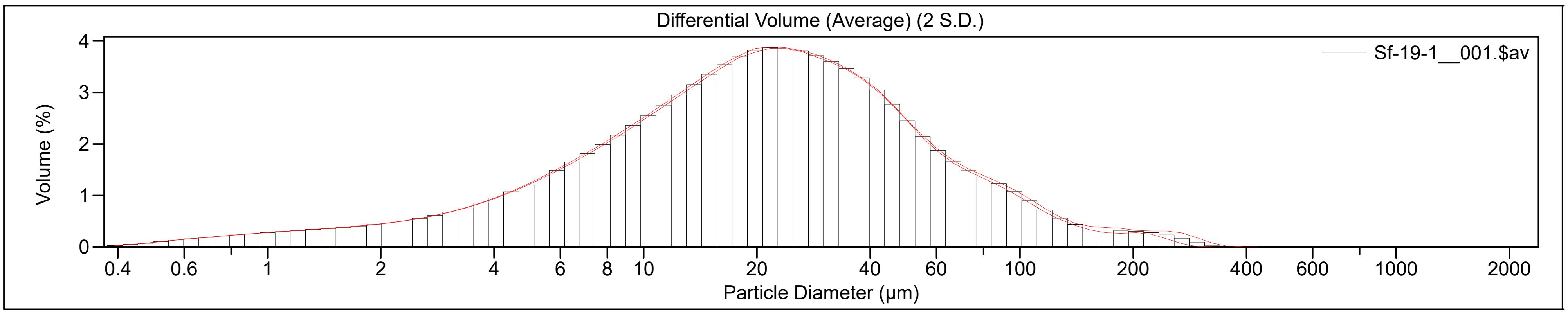
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-19-1__001.$av
	Sf-19-1__001.$av
File ID:	SF-19-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-19-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.52 µm	S.D.:	3.038
Median:	20.43 µm	Variance:	9.228
Mean/Median ratio:	0.906	Skewness:	-0.506 Left skewed
Mode:	21.70 µm	Kurtosis:	0.498 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.372 µm	9.915 µm	20.43 µm	38.53 µm	69.24 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

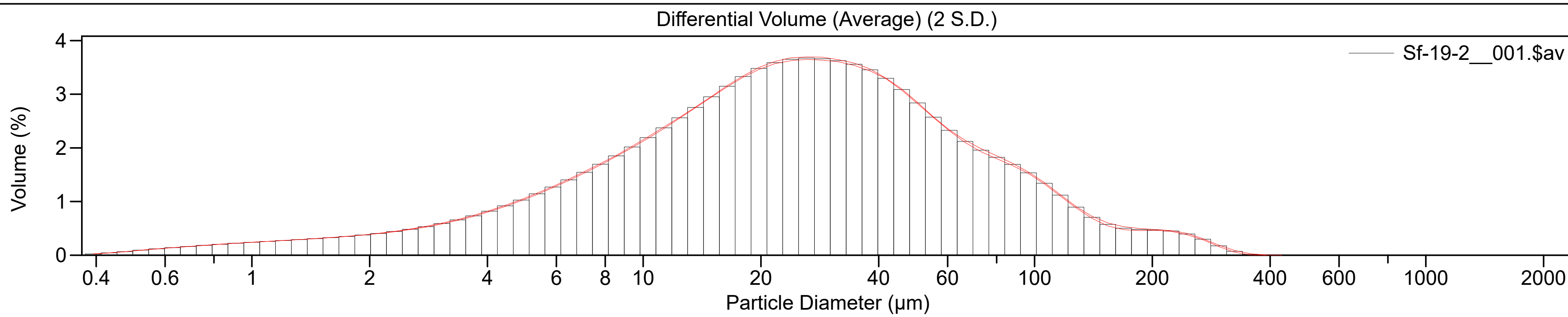
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-19-2__001.$av
	Sf-19-2__001.$av
File ID:	SF-19-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-19-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	21.97 µm	S.D.:	3.138
Median:	24.19 µm	Variance:	9.847
Mean/Median ratio:	0.909	Skewness:	-0.524 Left skewed
Mode:	26.15 µm	Kurtosis:	0.458 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.976 µm	11.48 µm	24.19 µm	47.08 µm	87.45 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-19-3__001.$av
	Sf-19-3__001.$av
File ID:	SF-19-3
Optical model:	Fraunhofer.rf780z

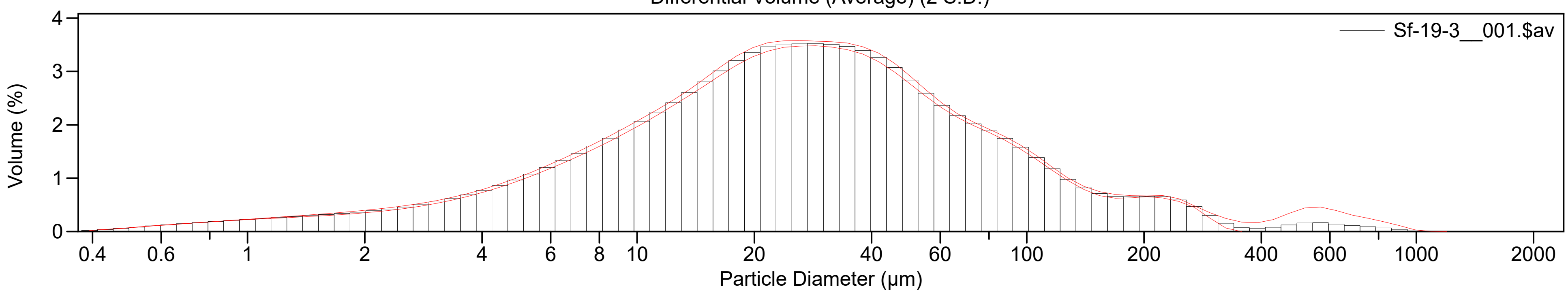
Volume Statistics (Geometric) Sf-19-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	24.31 µm	S.D.:	3.349
Median:	25.86 µm	Variance:	11.22
Mean/Median ratio:	0.940	Skewness:	-0.303 Left skewed
Mode:	26.15 µm	Kurtosis:	0.512 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.245 µm	12.15 µm	25.86 µm	52.14 µm	103.5 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

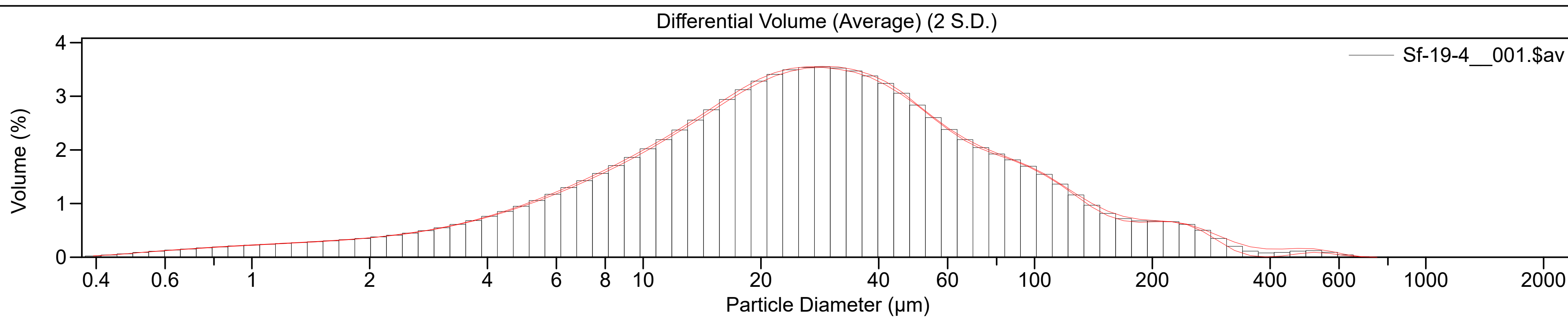
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-19-4__001.$av
	Sf-19-4__001.$av
File ID:	SF-19-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-19-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	24.64 µm	S.D.:	3.319
Median:	26.45 µm	Variance:	11.01
Mean/Median ratio:	0.931	Skewness:	-0.405 Left skewed
Mode:	28.70 µm	Kurtosis:	0.411 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.297 µm	12.37 µm	26.45 µm	53.77 µm	107.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

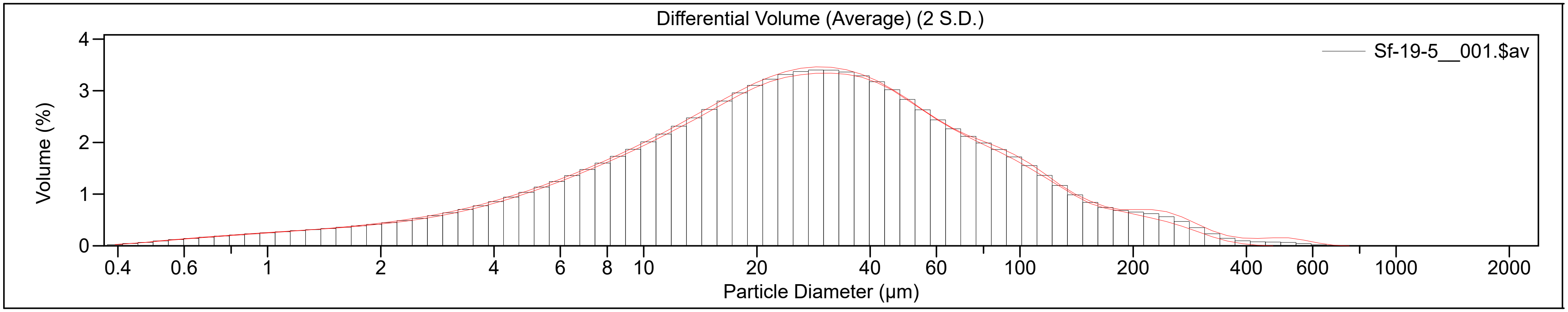
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-19-5__001.$av
	Sf-19-5__001.$av
File ID:	SF-19-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-19-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.78 µm	S.D.:	3.413
Median:	26.14 µm	Variance:	11.65
Mean/Median ratio:	0.910	Skewness:	-0.431 Left skewed
Mode:	28.70 µm	Kurtosis:	0.241 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.701 µm	11.58 µm	26.14 µm	54.17 µm	106.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

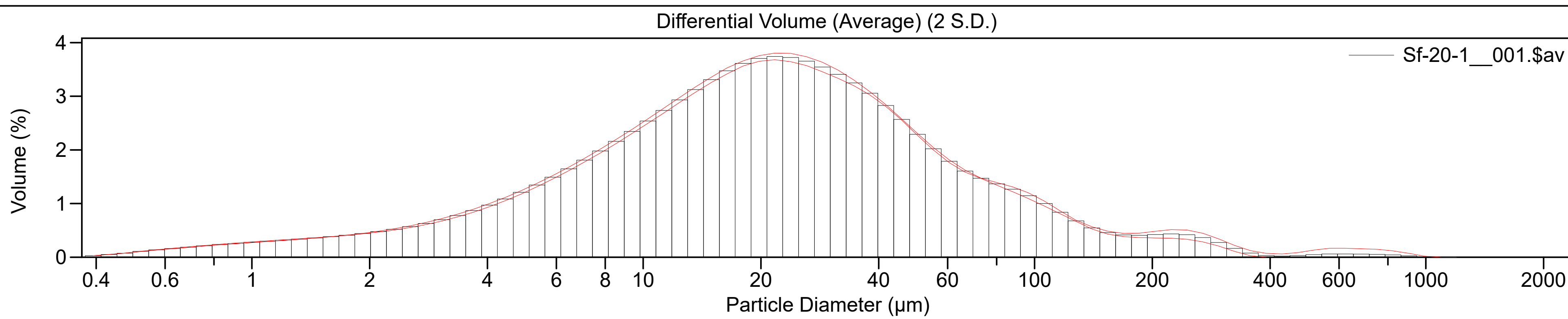
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-20-1__001.$av
	Sf-20-1__001.$av
File ID:	SF-20-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-20-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.33 µm	S.D.:	3.249
Median:	20.55 µm	Variance:	10.56
Mean/Median ratio:	0.941	Skewness:	-0.270 Left skewed
Mode:	21.70 µm	Kurtosis:	0.512 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.315 µm	9.864 µm	20.55 µm	40.21 µm	80.44 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

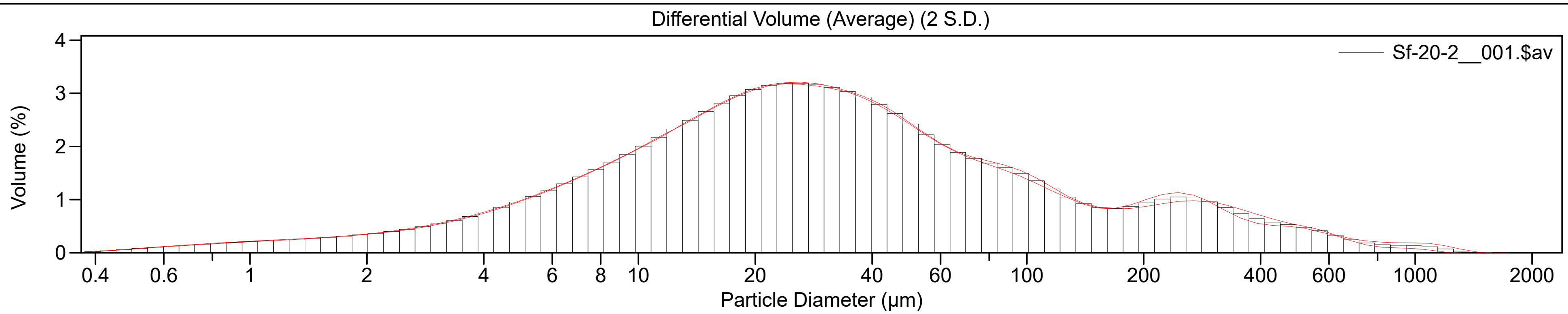
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-20-2__001.$av
	Sf-20-2__001.$av
File ID:	SF-20-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-20-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	29.19 µm	S.D.:	3.994
Median:	27.81 µm	Variance:	15.95
Mean/Median ratio:	1.050	Skewness:	0.00033 Right skewed
Mode:	26.15 µm	Kurtosis:	0.108 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.397 µm	12.50 µm	27.81 µm	67.23 µm	207.1 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-20-3__002.$av
	Sf-20-3__002.$av
File ID:	SF-20-3
Optical model:	Fraunhofer.rf780z

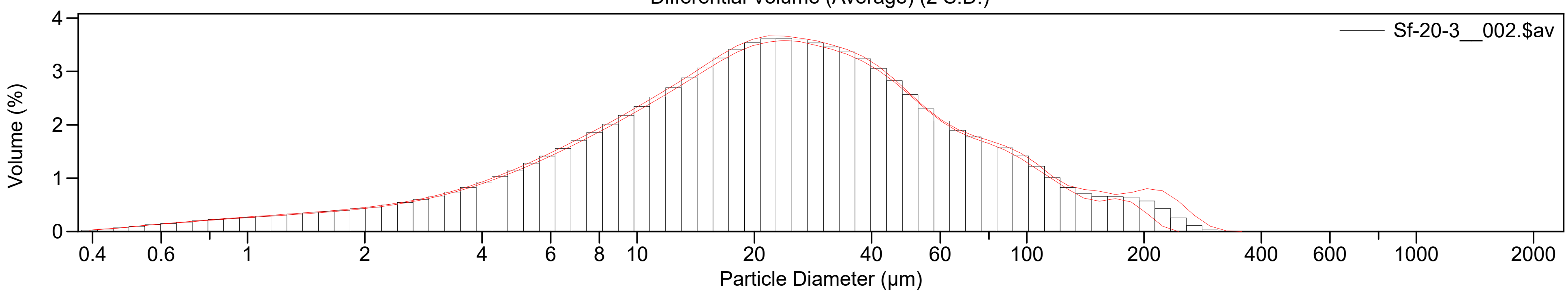
Volume Statistics (Geometric) Sf-20-3__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.34 µm	S.D.:	3.179
Median:	22.23 µm	Variance:	10.11
Mean/Median ratio:	0.915	Skewness:	-0.481 Left skewed
Mode:	23.82 µm	Kurtosis:	0.303 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.488 µm	10.41 µm	22.23 µm	44.04 µm	84.56 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

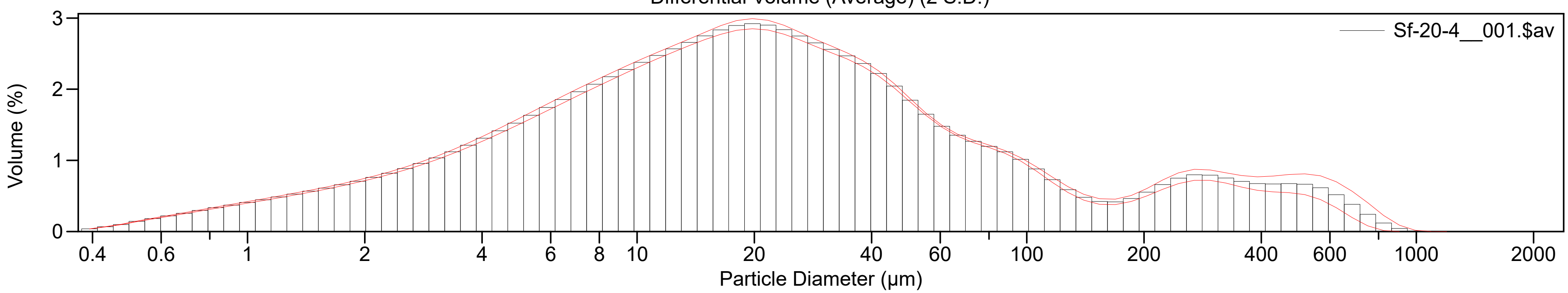
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-20-4__001.$av
	Sf-20-4__001.$av
File ID:	SF-20-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-20-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.97 µm	S.D.:	4.514
Median:	19.02 µm	Variance:	20.38
Mean/Median ratio:	1.050	Skewness:	0.188 Right skewed
Mode:	19.76 µm	Kurtosis:	-0.110 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.963 µm	7.539 µm	19.02 µm	46.97 µm	180.3 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

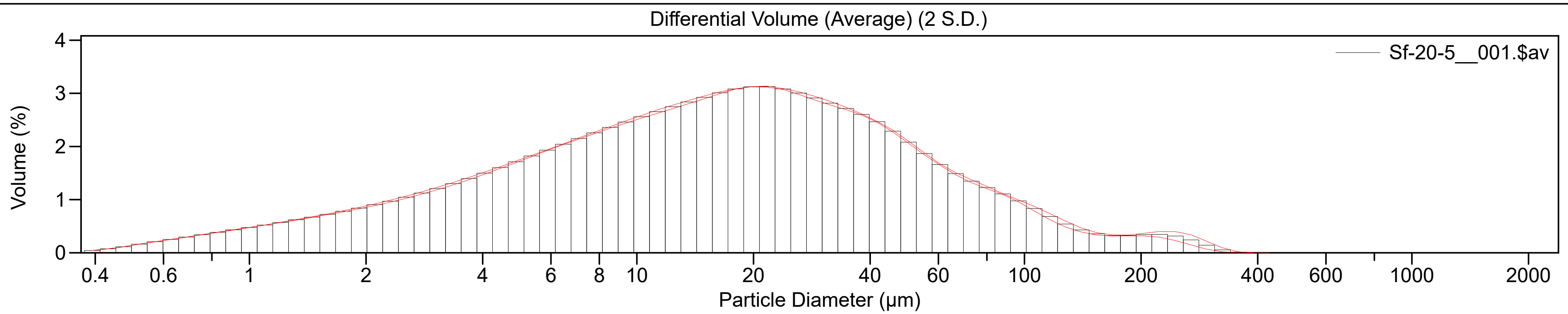
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-20-5__001.$av
	Sf-20-5__001.$av
File ID:	SF-20-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-20-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	14.54 µm	S.D.:	3.517
Median:	16.14 µm	Variance:	12.37
Mean/Median ratio:	0.901	Skewness:	-0.274 Left skewed
Mode:	21.70 µm	Kurtosis:	-0.216 Platykurtic

<10%	<25%	<50%	<75%	<90%
2.559 µm	6.438 µm	16.14 µm	35.14 µm	68.01 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

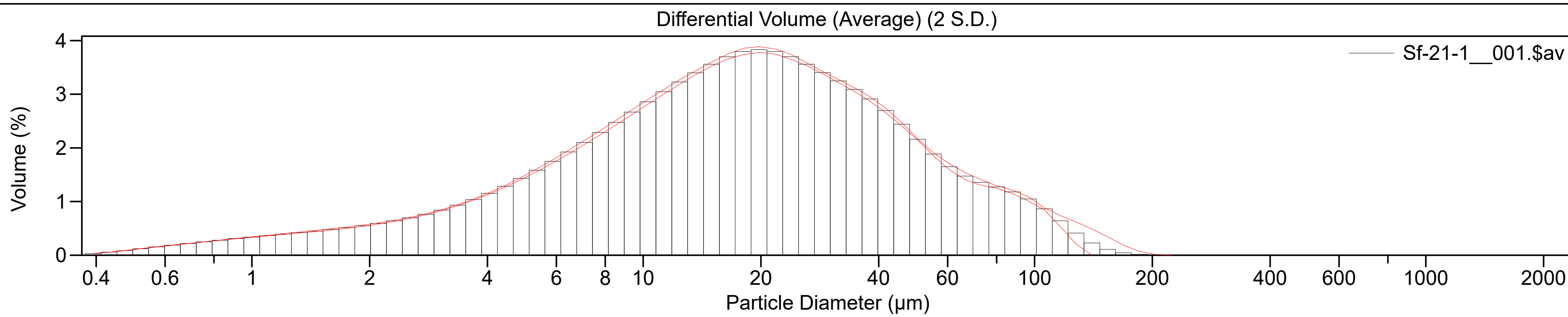
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-21-1__001.$av Sf-21-1__001.$av
File ID:	SF-21-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-21-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.69 µm	S.D.:	2.977
Median:	17.55 µm	Variance:	8.863
Mean/Median ratio:	0.894	Skewness:	-0.582 Left skewed
Mode:	19.76 µm	Kurtosis:	0.266 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.626 µm	8.395 µm	17.55 µm	33.53 µm	58.82 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-21-2__001.$av
	Sf-21-2__001.$av
File ID:	SF-21-2
Optical model:	Fraunhofer.rf780z

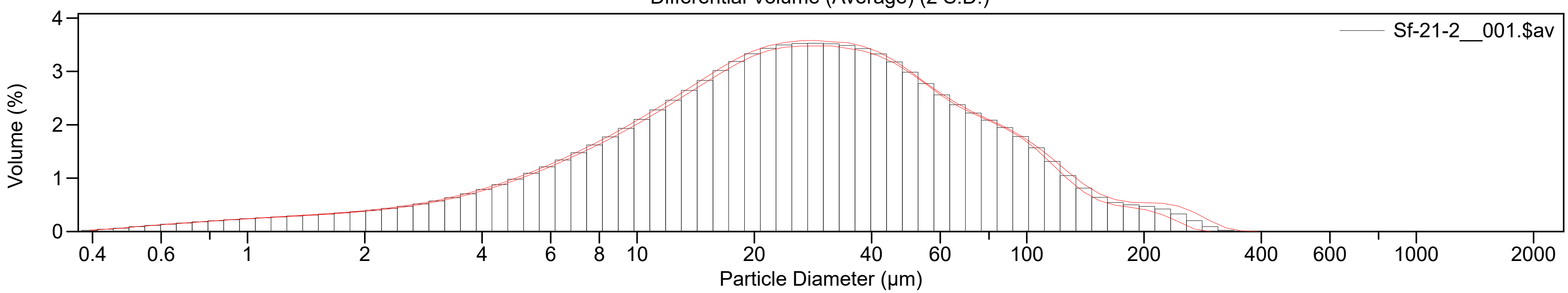
Volume Statistics (Geometric) Sf-21-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.88 µm	S.D.:	3.152
Median:	25.44 µm	Variance:	9.935
Mean/Median ratio:	0.899	Skewness:	-0.589 Left skewed
Mode:	28.70 µm	Kurtosis:	0.428 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.084 µm	11.88 µm	25.44 µm	50.62 µm	91.09 µm

Differential Volume (Average) (2 S.D.)



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

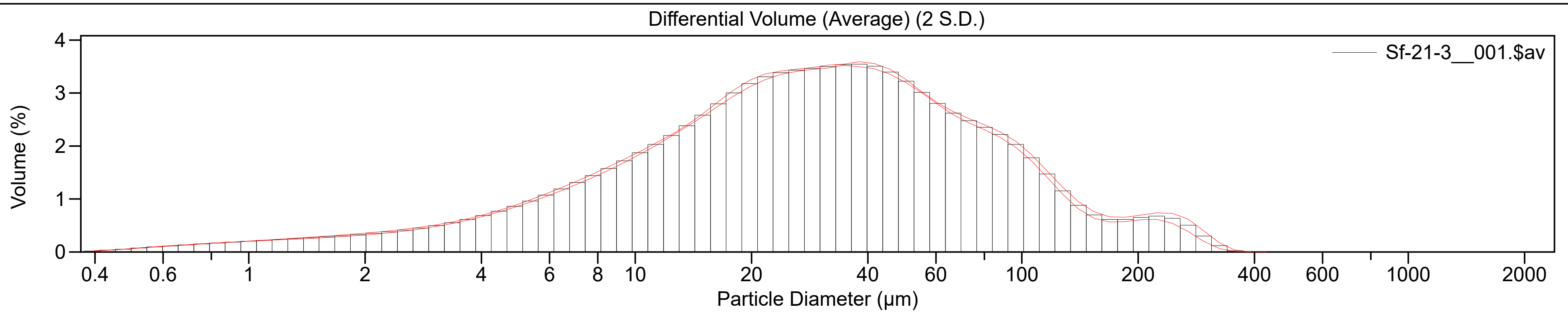
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-21-3__001.$av
	Sf-21-3__001.$av
File ID:	SF-21-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-21-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.95 µm	S.D.:	3.174
Median:	28.80 µm	Variance:	10.08
Mean/Median ratio:	0.901	Skewness:	-0.578 Left skewed
Mode:	37.97 µm	Kurtosis:	0.488 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.766 µm	13.46 µm	28.80 µm	57.16 µm	101.8 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

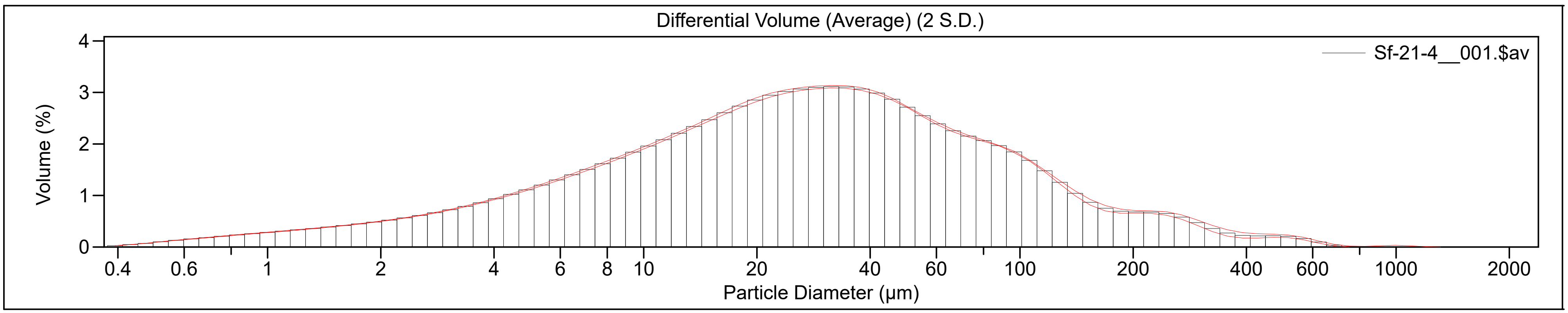
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-21-4__001.$av
	Sf-21-4__001.$av
File ID:	SF-21-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-21-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	24.17 µm	S.D.:	3.709
Median:	26.48 µm	Variance:	13.76
Mean/Median ratio:	0.913	Skewness:	-0.325 Left skewed
Mode:	31.51 µm	Kurtosis:	0.058 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.189 µm	10.87 µm	26.48 µm	58.61 µm	118.3 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

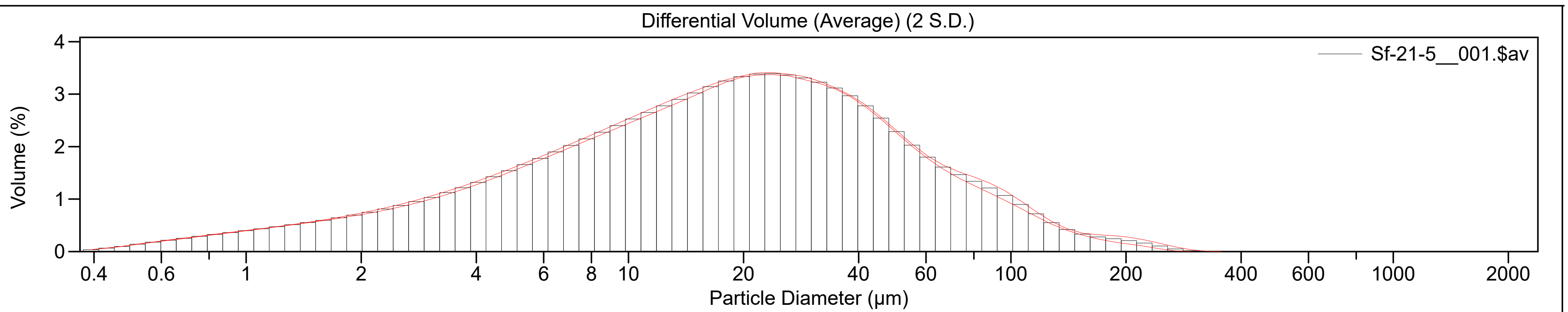
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-21-5__001.$av
	Sf-21-5__001.$av
File ID:	SF-21-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-21-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	15.70 µm	S.D.:	3.288
Median:	17.94 µm	Variance:	10.81
Mean/Median ratio:	0.875	Skewness:	-0.454 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.054 Platykurtic

<10%	<25%	<50%	<75%	<90%
3.010 µm	7.528 µm	17.94 µm	36.35 µm	66.09 µm



Swan Island Basin SEDflume Study

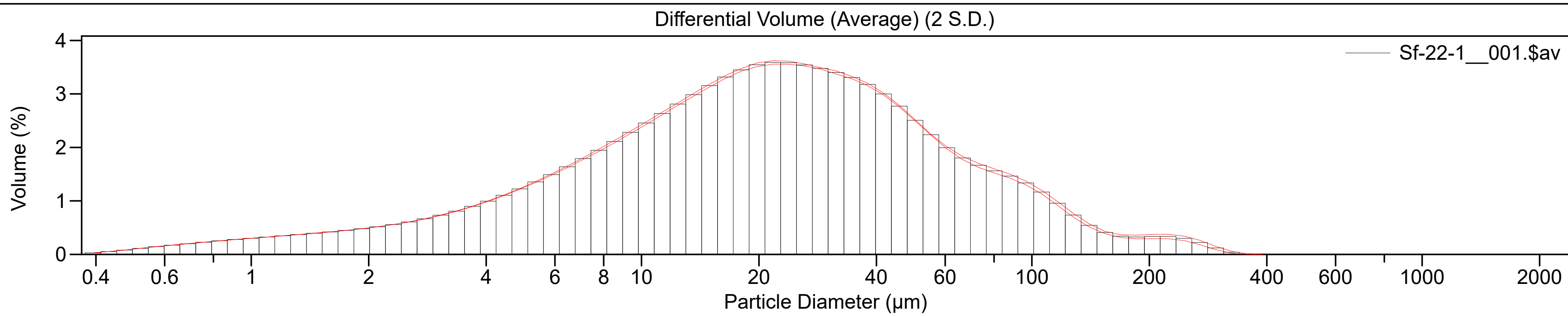
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-22-1__001.$av
	Sf-22-1__001.$av
File ID:	SF-22-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-22-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.90 µm	S.D.:	3.190
Median:	20.86 µm	Variance:	10.18
Mean/Median ratio:	0.906	Skewness:	-0.480 Left skewed
Mode:	21.70 µm	Kurtosis:	0.292 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.076 µm	9.673 µm	20.86 µm	41.32 µm	77.42 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

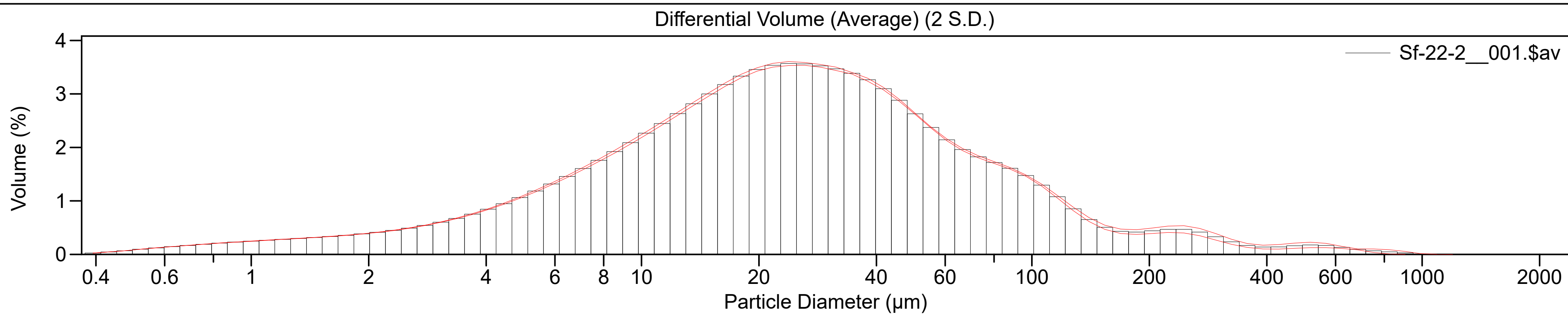
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-22-2__001.$av Sf-22-2__001.$av
File ID:	SF-22-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-22-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.34 µm	S.D.:	3.353
Median:	23.62 µm	Variance:	11.24
Mean/Median ratio:	0.946	Skewness:	-0.248 Left skewed
Mode:	23.82 µm	Kurtosis:	0.538 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.864 µm	11.13 µm	23.62 µm	47.45 µm	94.60 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

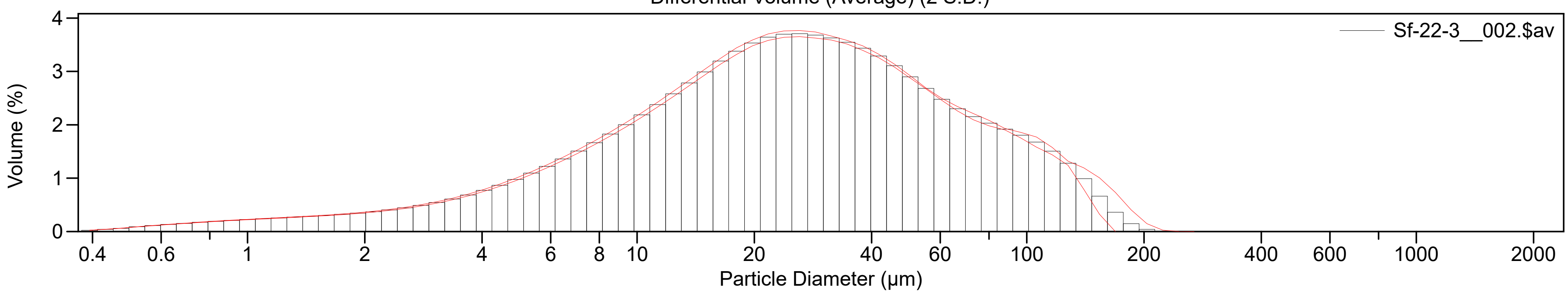
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-22-3__002.$av
	Sf-22-3__002.$av
File ID:	SF-22-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-22-3__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.12 µm	S.D.:	2.998
Median:	24.56 µm	Variance:	8.988
Mean/Median ratio:	0.901	Skewness:	-0.680 Left skewed
Mode:	26.15 µm	Kurtosis:	0.526 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.289 µm	11.90 µm	24.56 µm	47.86 µm	85.61 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

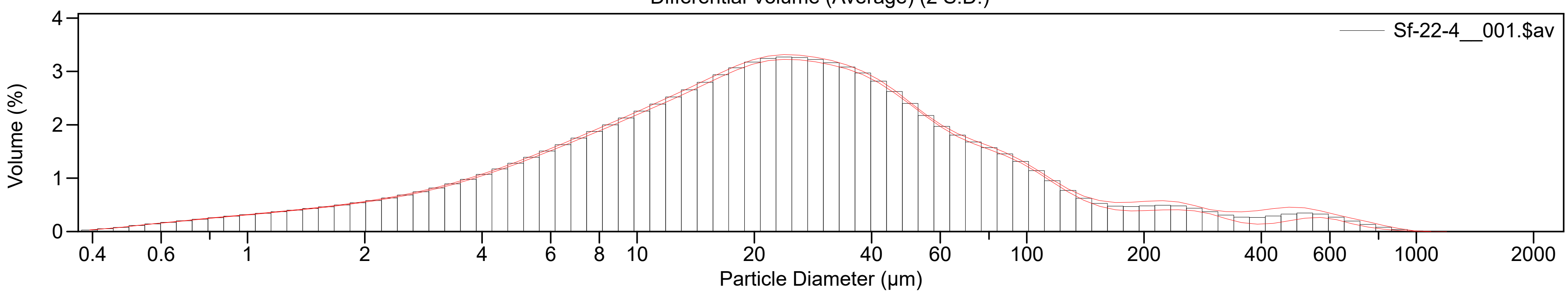
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-22-4__001.$av
	Sf-22-4__001.$av
File ID:	SF-22-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-22-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.94 µm	S.D.:	3.761
Median:	22.03 µm	Variance:	14.14
Mean/Median ratio:	0.951	Skewness:	-0.076 Left skewed
Mode:	23.82 µm	Kurtosis:	0.247 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.768 µm	9.375 µm	22.03 µm	47.06 µm	101.9 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

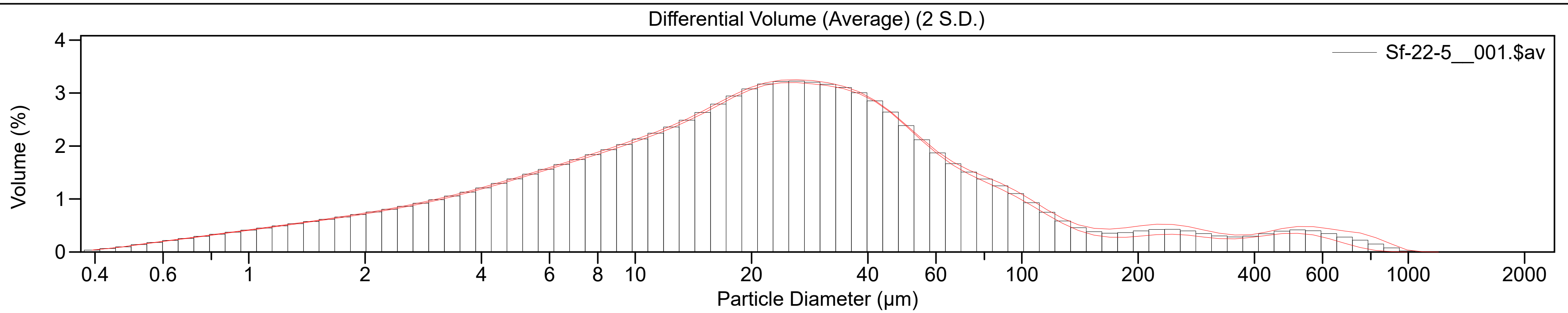
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-22-5__001.$av
	Sf-22-5__001.$av
File ID:	SF-22-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-22-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.19 µm	S.D.:	4.020
Median:	20.87 µm	Variance:	16.16
Mean/Median ratio:	0.920	Skewness:	-0.015 Left skewed
Mode:	26.15 µm	Kurtosis:	0.183 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.977 µm	8.099 µm	20.87 µm	44.15 µm	95.98 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

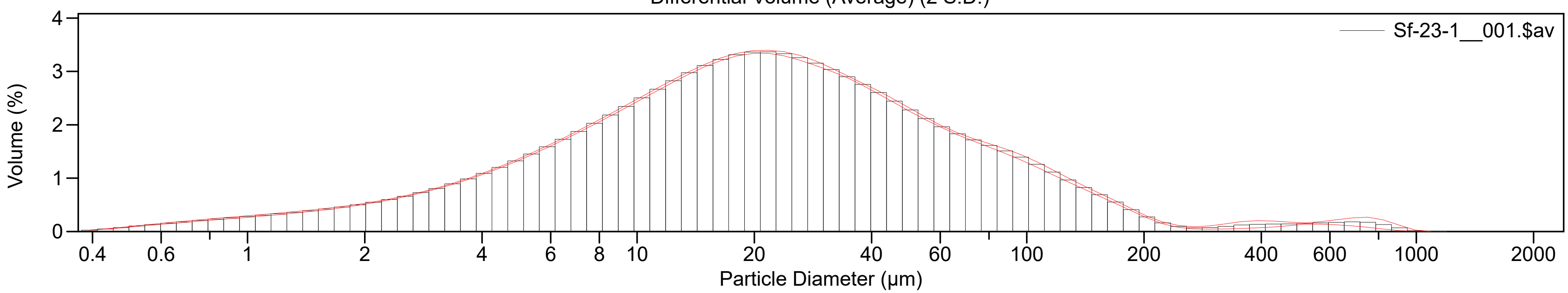
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-23-1__001.$av
	Sf-23-1__001.$av
File ID:	SF-23-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-23-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.61 µm	S.D.:	3.470
Median:	20.43 µm	Variance:	12.04
Mean/Median ratio:	0.960	Skewness:	-0.127 Left skewed
Mode:	21.70 µm	Kurtosis:	0.374 Leptokurtic

<10%	<25%	<50%	<75%	<90%
3.967 µm	9.250 µm	20.43 µm	43.80 µm	89.94 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

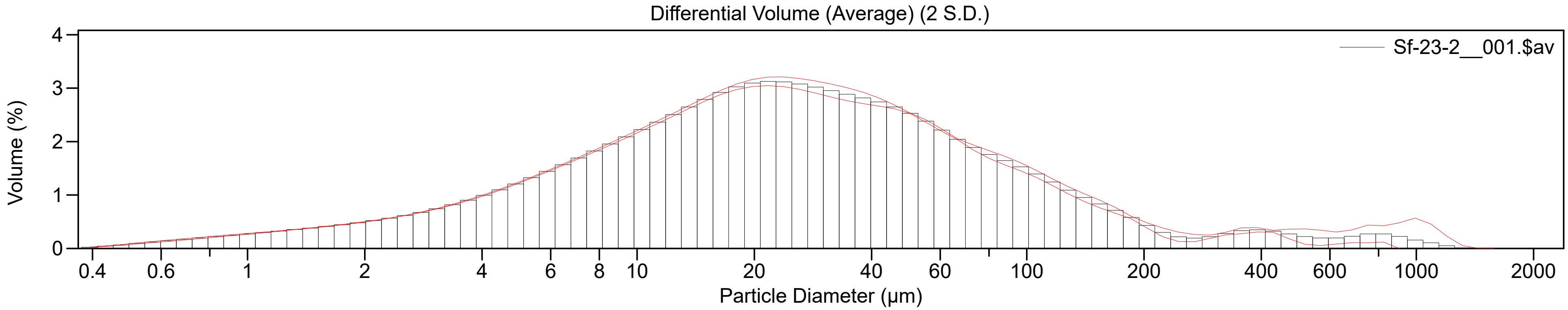
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-23-2__001.$av
	Sf-23-2__001.$av
File ID:	SF-23-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-23-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.90 µm	S.D.:	3.807
Median:	23.40 µm	Variance:	14.49
Mean/Median ratio:	0.978	Skewness:	-0.015 Left skewed
Mode:	21.70 µm	Kurtosis:	0.330 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.184 µm	10.10 µm	23.40 µm	52.94 µm	113.5 µm



Swan Island Basin SEDflume Study

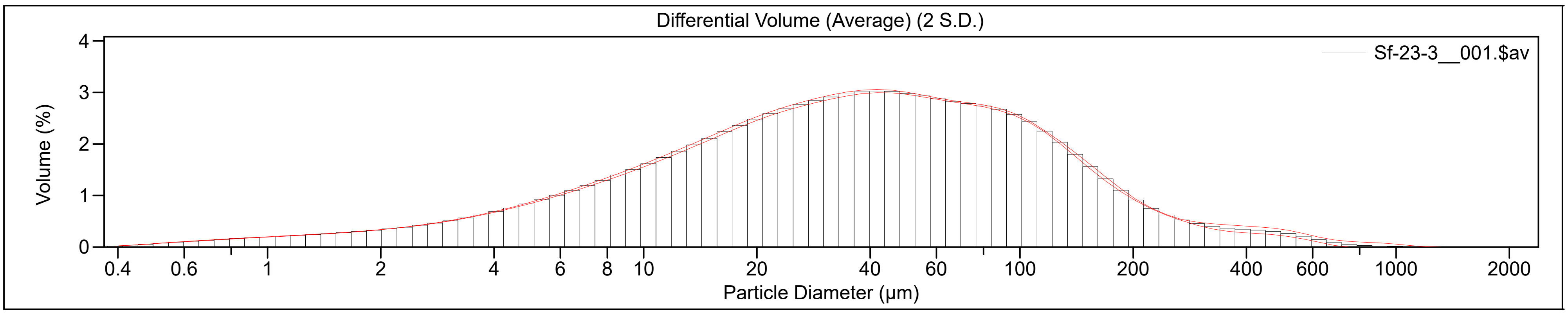
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-23-3__001.$av
	Sf-23-3__001.$av
File ID:	SF-23-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-23-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.12 µm	S.D.:	3.615
Median:	36.00 µm	Variance:	13.07
Mean/Median ratio:	0.892	Skewness:	-0.465 Left skewed
Mode:	41.68 µm	Kurtosis:	0.224 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.839 µm	14.75 µm	36.00 µm	80.03 µm	145.5 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

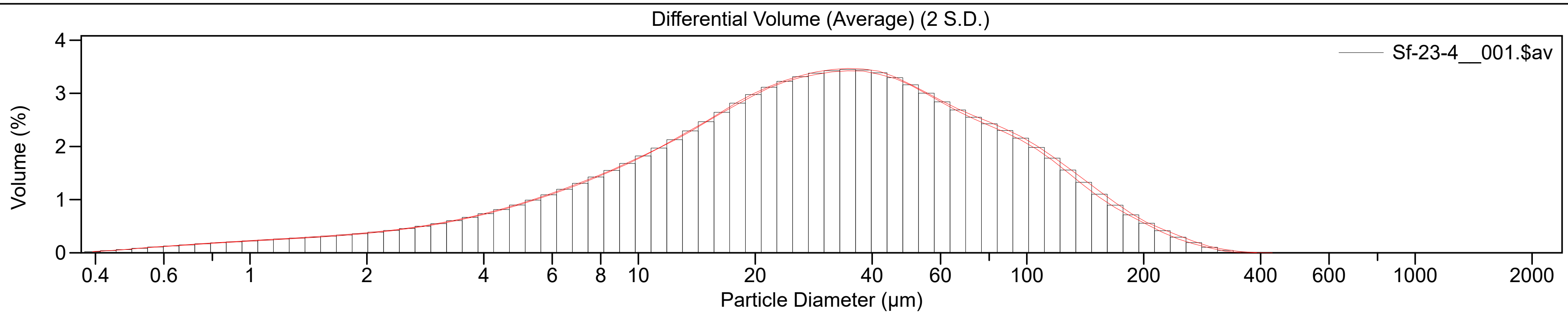
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-23-4__001.$av
	Sf-23-4__001.$av
File ID:	SF-23-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-23-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.81 µm	S.D.:	3.239
Median:	29.36 µm	Variance:	10.49
Mean/Median ratio:	0.879	Skewness:	-0.655 Left skewed
Mode:	34.59 µm	Kurtosis:	0.387 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.361 µm	13.17 µm	29.36 µm	59.65 µm	106.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

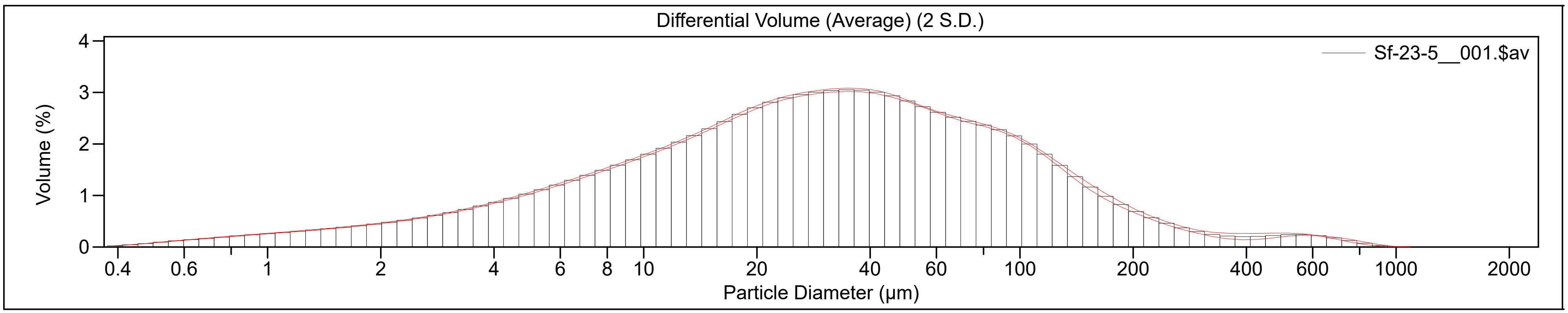
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-23-5__001.$av
	Sf-23-5__001.$av
File ID:	SF-23-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-23-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.53 µm	S.D.:	3.726
Median:	29.47 µm	Variance:	13.89
Mean/Median ratio:	0.900	Skewness:	-0.362 Left skewed
Mode:	34.59 µm	Kurtosis:	0.135 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.537 µm	11.95 µm	29.47 µm	66.09 µm	125.8 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-24-1__001.$av
	Sf-24-1__001.$av
File ID:	SF-24-1
Optical model:	Fraunhofer.rf780z

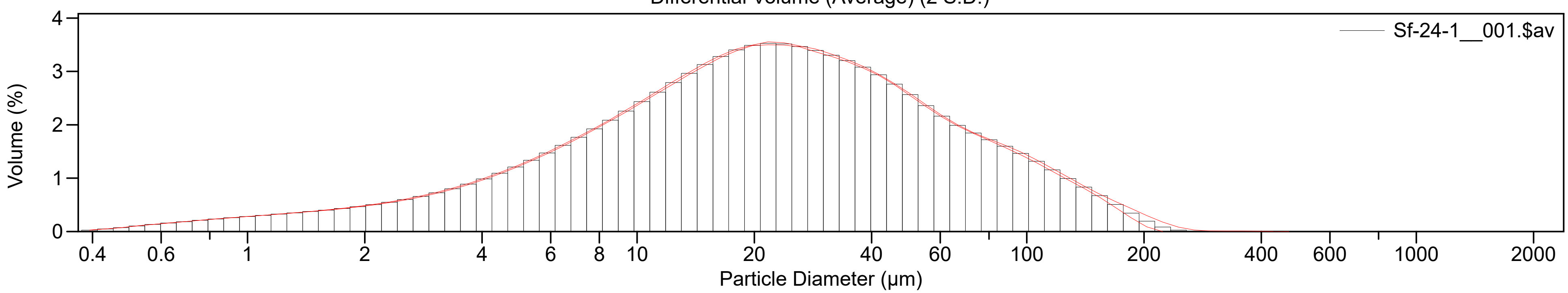
Volume Statistics (Geometric) Sf-24-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.34 µm	S.D.:	3.154
Median:	21.31 µm	Variance:	9.945
Mean/Median ratio:	0.908	Skewness:	-0.534 Left skewed
Mode:	21.70 µm	Kurtosis:	0.212 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.206 µm	9.876 µm	21.31 µm	43.16 µm	80.46 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

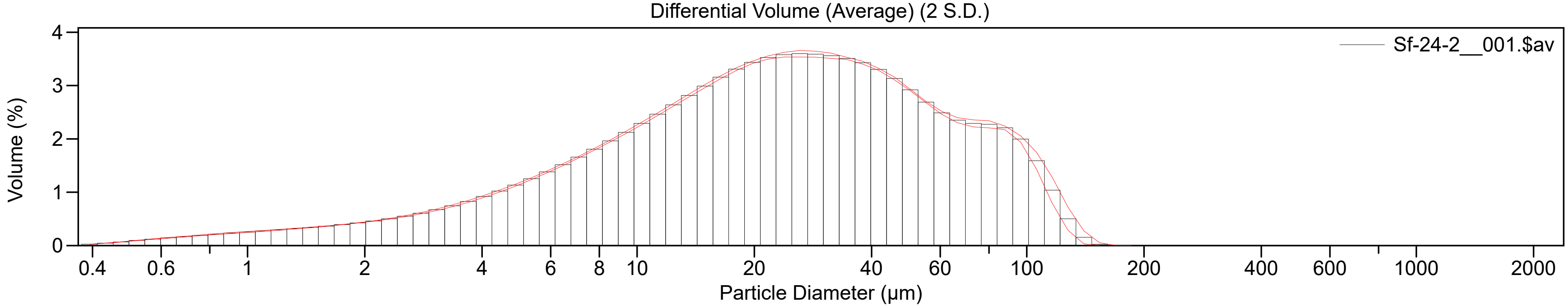
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-24-2__001.$av
	Sf-24-2__001.$av
File ID:	SF-24-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-24-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.95 µm	S.D.:	2.994
Median:	22.88 µm	Variance:	8.966
Mean/Median ratio:	0.872	Skewness:	-0.730 Left skewed
Mode:	26.15 µm	Kurtosis:	0.376 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.535 µm	10.60 µm	22.88 µm	44.58 µm	75.81 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

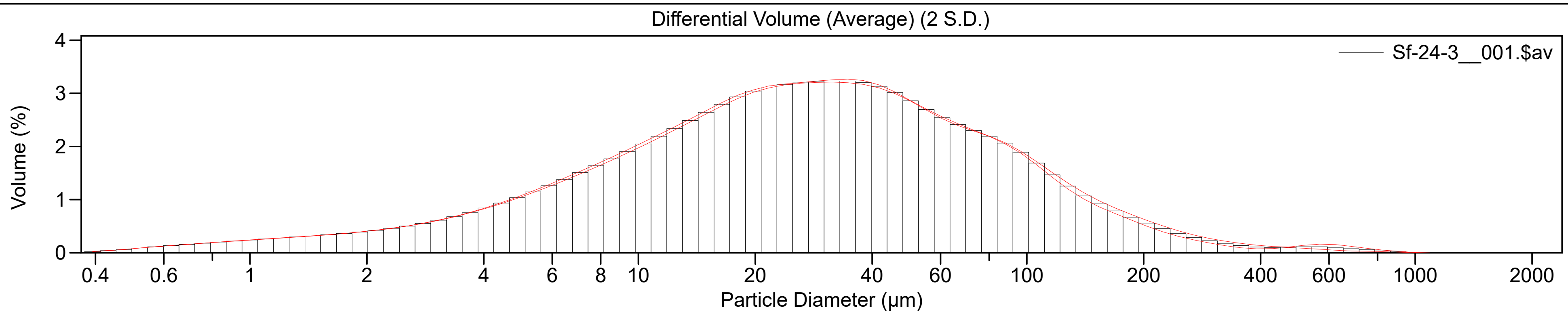
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-24-3__001.$av
	Sf-24-3__001.$av
File ID:	SF-24-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-24-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	24.32 µm	S.D.:	3.420
Median:	26.55 µm	Variance:	11.70
Mean/Median ratio:	0.916	Skewness:	-0.390 Left skewed
Mode:	34.59 µm	Kurtosis:	0.286 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.882 µm	11.65 µm	26.55 µm	56.46 µm	106.4 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

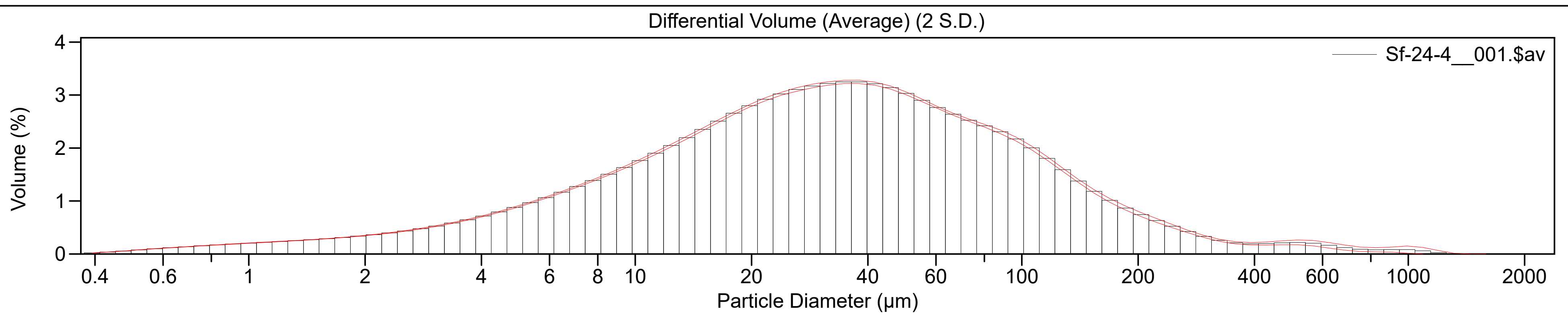
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-24-4__001.$av
	Sf-24-4__001.$av
File ID:	SF-24-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-24-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.91 µm	S.D.:	3.530
Median:	31.48 µm	Variance:	12.46
Mean/Median ratio:	0.918	Skewness:	-0.356 Left skewed
Mode:	37.97 µm	Kurtosis:	0.391 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.621 µm	13.72 µm	31.48 µm	67.59 µm	128.6 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

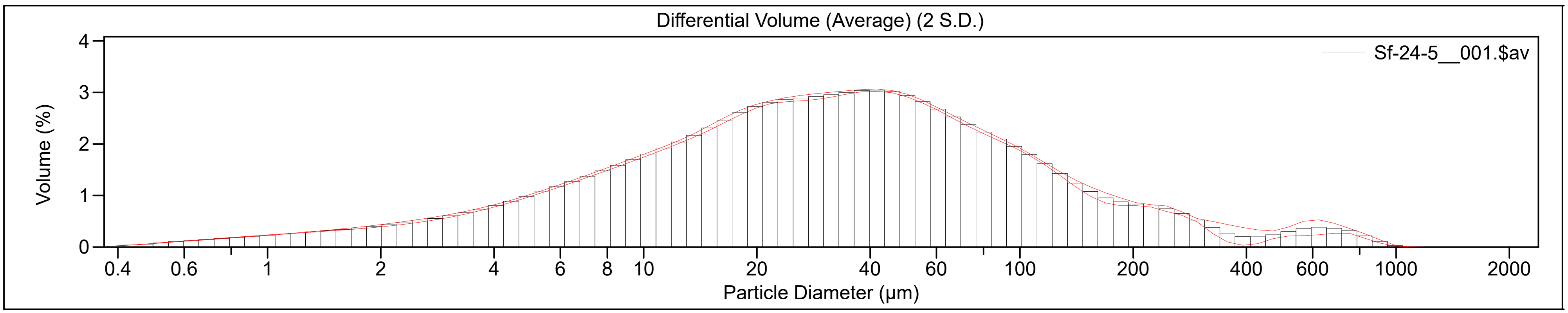
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-24-5__001.$av
	Sf-24-5__001.$av
File ID:	SF-24-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-24-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.60 µm	S.D.:	3.824
Median:	30.65 µm	Variance:	14.62
Mean/Median ratio:	0.933	Skewness:	-0.223 Left skewed
Mode:	41.68 µm	Kurtosis:	0.173 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.991 µm	12.61 µm	30.65 µm	68.56 µm	145.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

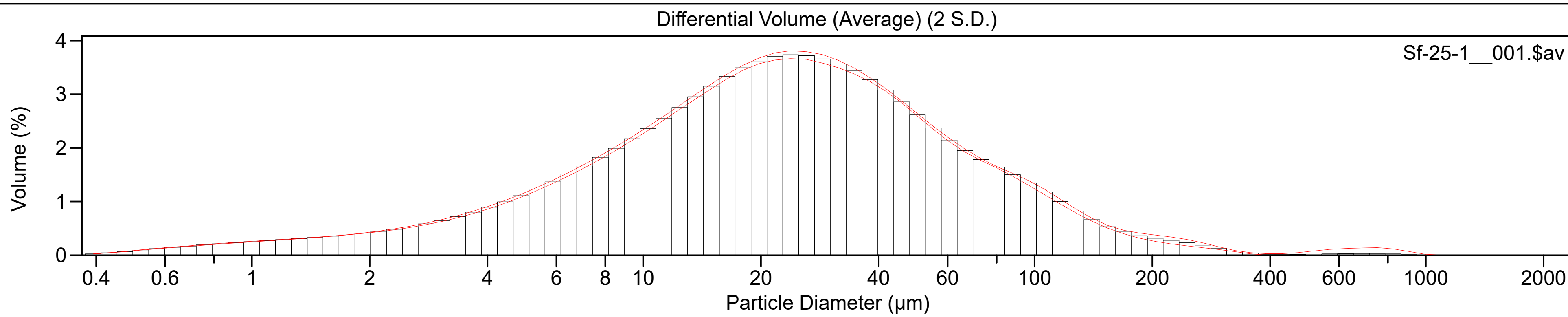
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-25-1__001.$av
	Sf-25-1__001.$av
File ID:	SF-25-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-25-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	20.41 µm	S.D.:	3.134
Median:	22.28 µm	Variance:	9.820
Mean/Median ratio:	0.916	Skewness:	-0.449 Left skewed
Mode:	23.82 µm	Kurtosis:	0.500 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.644 µm	10.67 µm	22.28 µm	43.30 µm	80.91 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

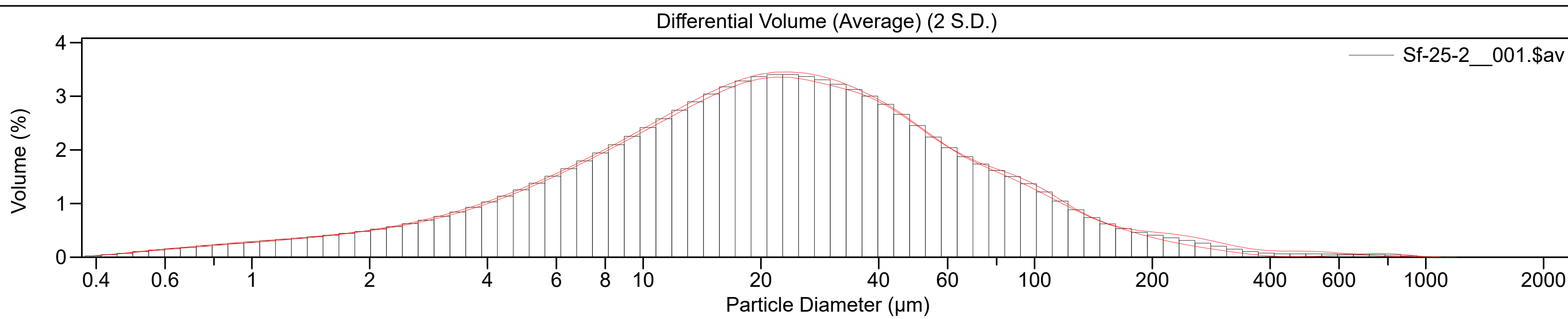
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-25-2__001.$av
	Sf-25-2__001.$av
File ID:	SF-25-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-25-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.91 µm	S.D.:	3.367
Median:	21.34 µm	Variance:	11.33
Mean/Median ratio:	0.933	Skewness:	-0.291 Left skewed
Mode:	21.70 µm	Kurtosis:	0.269 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.089 µm	9.648 µm	21.34 µm	44.28 µm	87.99 µm



Swan Island Basin SEDflume Study

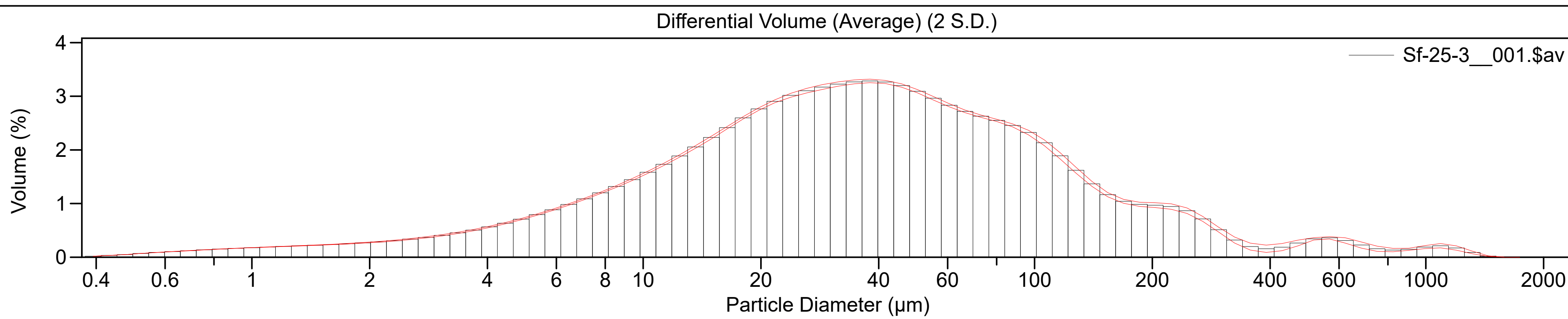
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-25-3__001.$av
	Sf-25-3__001.$av
File ID:	SF-25-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-25-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	33.69 µm	S.D.:	3.614
Median:	35.29 µm	Variance:	13.06
Mean/Median ratio:	0.955	Skewness:	-0.240 Left skewed
Mode:	37.97 µm	Kurtosis:	0.585 Leptokurtic

<10%	<25%	<50%	<75%	<90%
6.793 µm	15.98 µm	35.29 µm	76.58 µm	155.5 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

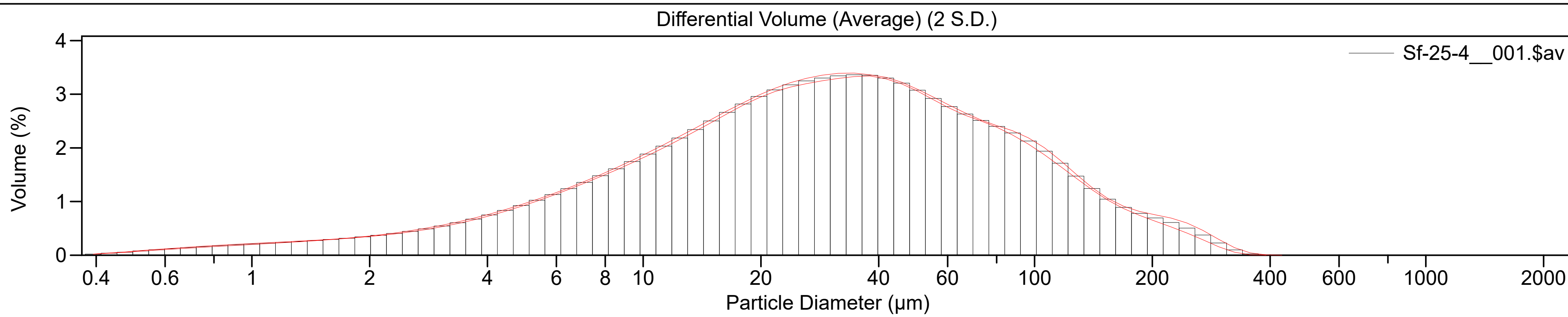
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-25-4__001.$av
	Sf-25-4__001.$av
File ID:	SF-25-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-25-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.12 µm	S.D.:	3.269
Median:	29.19 µm	Variance:	10.69
Mean/Median ratio:	0.895	Skewness:	-0.574 Left skewed
Mode:	34.59 µm	Kurtosis:	0.309 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.452 µm	12.99 µm	29.19 µm	60.52 µm	109.4 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

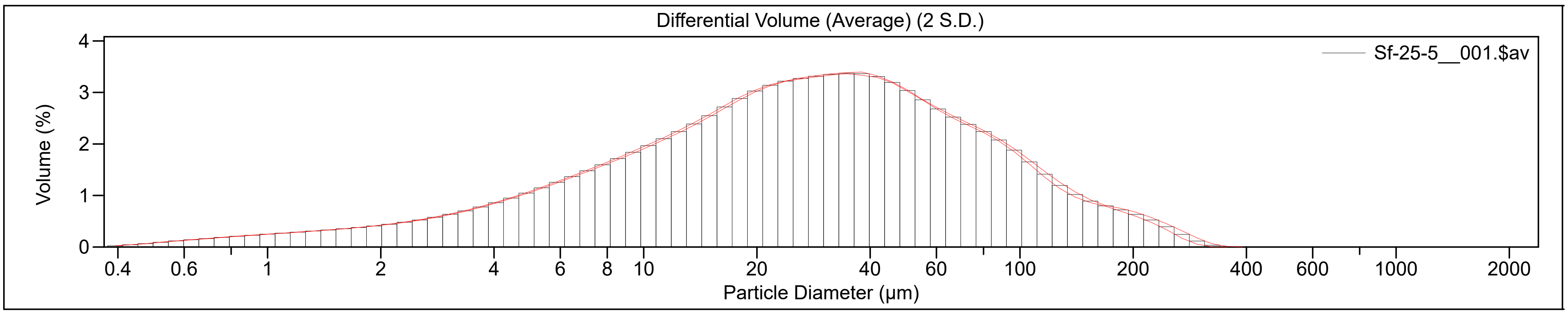
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-25-5__001.$av
	Sf-25-5__001.$av
File ID:	SF-25-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-25-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.64 µm	S.D.:	3.308
Median:	26.82 µm	Variance:	10.94
Mean/Median ratio:	0.882	Skewness:	-0.569 Left skewed
Mode:	34.59 µm	Kurtosis:	0.226 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.733 µm	11.66 µm	26.82 µm	54.94 µm	99.41 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

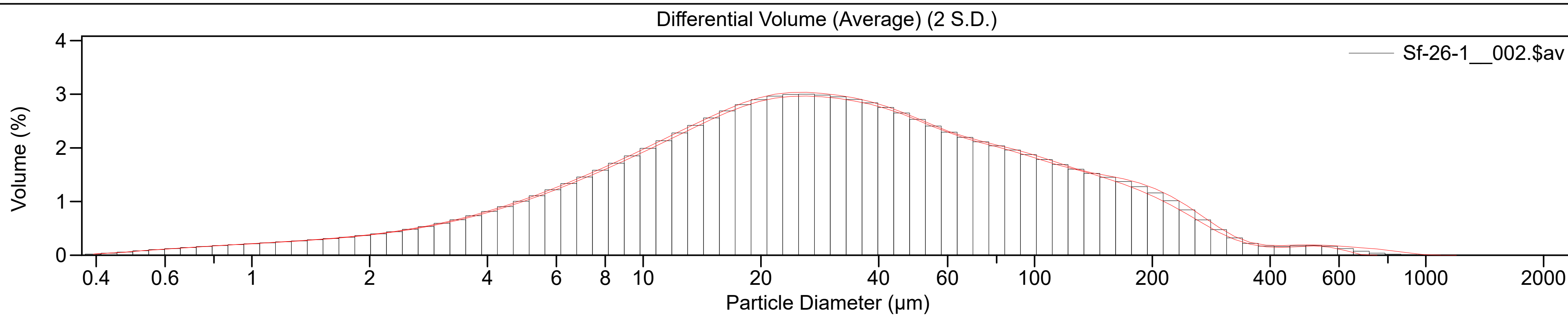
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-26-1__002.$av
	Sf-26-1__002.$av
File ID:	SF-26-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-26-1__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	27.36 µm	S.D.:	3.659
Median:	28.33 µm	Variance:	13.39
Mean/Median ratio:	0.966	Skewness:	-0.296 Left skewed
Mode:	26.15 µm	Kurtosis:	0.0047 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.134 µm	12.16 µm	28.33 µm	68.27 µm	146.2 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

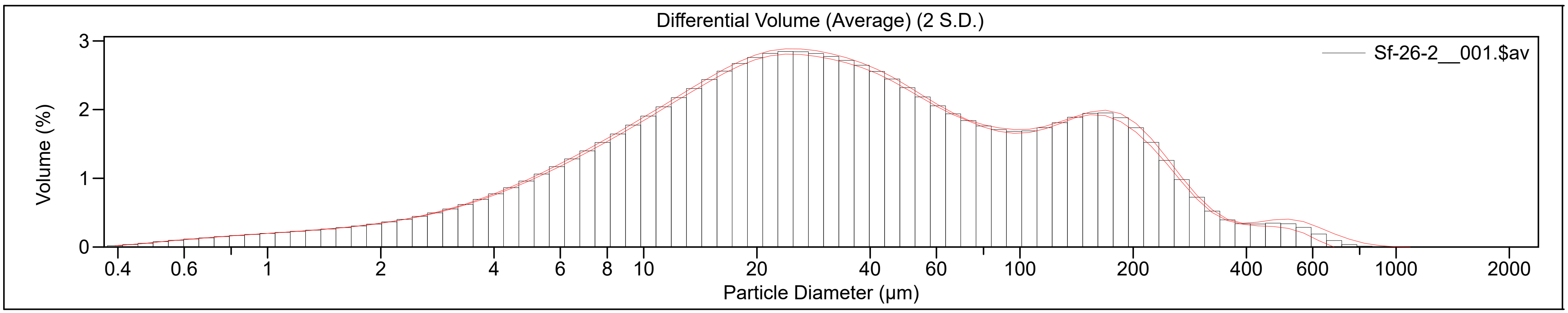
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-26-2__001.$av
	Sf-26-2__001.$av
File ID:	SF-26-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-26-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	30.99 µm	S.D.:	3.901
Median:	30.78 µm	Variance:	15.22
Mean/Median ratio:	1.007	Skewness:	-0.250 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.186 Platykurtic

<10%	<25%	<50%	<75%	<90%
5.445 µm	12.85 µm	30.78 µm	85.96 µm	186.2 µm



Swan Island Basin SEDflume Study

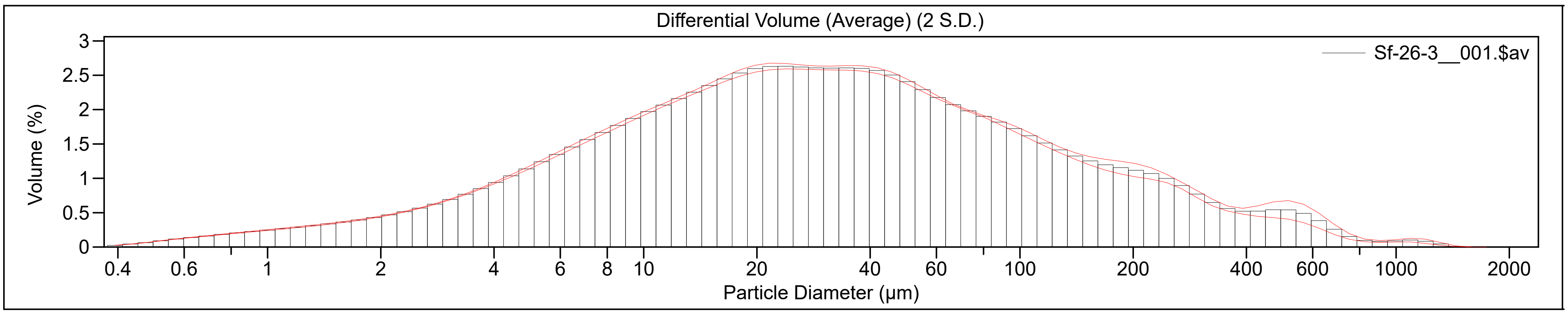
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-26-3__001.$av
	Sf-26-3__001.$av
File ID:	SF-26-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-26-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.66 µm	S.D.:	4.237
Median:	28.76 µm	Variance:	17.96
Mean/Median ratio:	0.997	Skewness:	-0.091 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.174 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.513 µm	11.09 µm	28.76 µm	76.10 µm	194.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-26-4__001.$av Sf-26-4__001.$av
File ID:	SF-26-4
Optical model:	Fraunhofer.rf780z

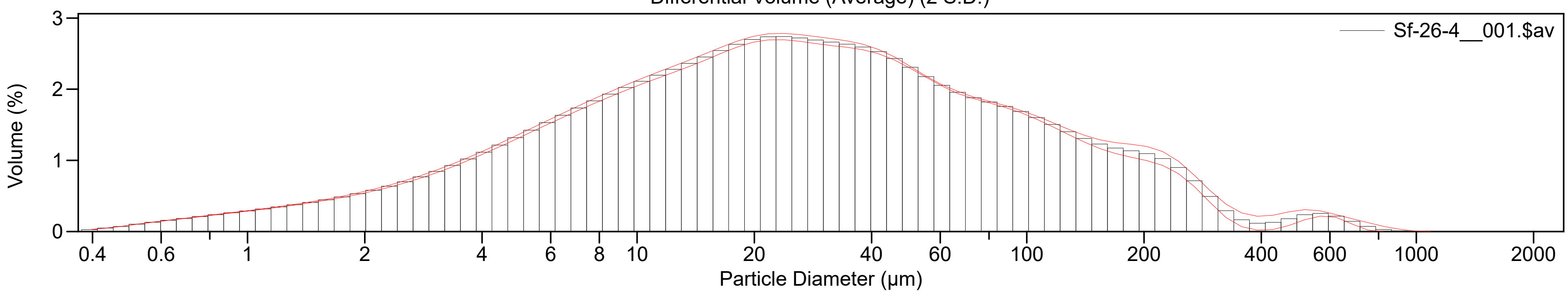
Volume Statistics (Geometric) Sf-26-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.53 µm	S.D.:	3.982
Median:	24.42 µm	Variance:	15.86
Mean/Median ratio:	0.964	Skewness:	-0.180 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.240 Platykurtic

<10%	<25%	<50%	<75%	<90%
3.821 µm	9.431 µm	24.42 µm	62.16 µm	143.0 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

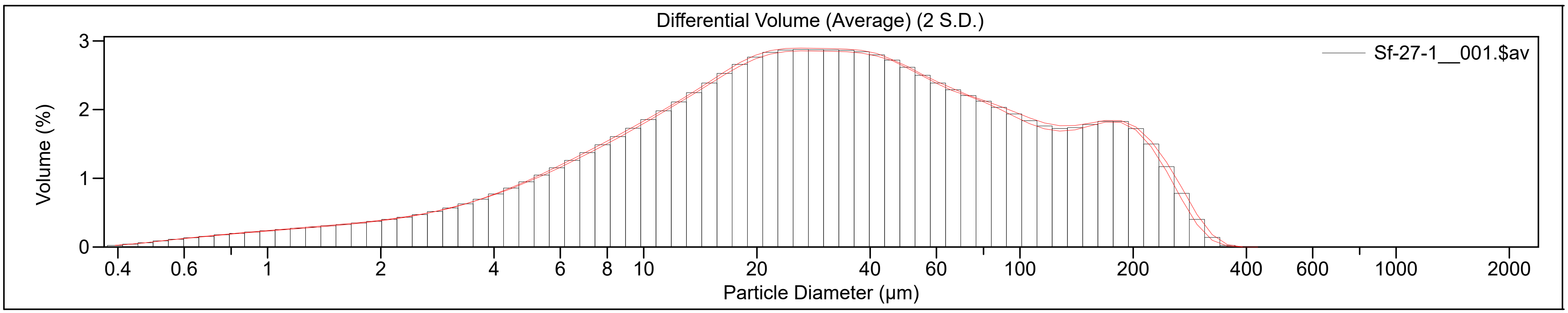
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-27-1__001.$av
	Sf-27-1__001.$av
File ID:	SF-27-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-27-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.44 µm	S.D.:	3.662
Median:	30.51 µm	Variance:	13.41
Mean/Median ratio:	0.932	Skewness:	-0.463 Left skewed
Mode:	26.15 µm	Kurtosis:	-0.058 Platykurtic

<10%	<25%	<50%	<75%	<90%
5.145 µm	12.69 µm	30.51 µm	74.39 µm	156.3 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

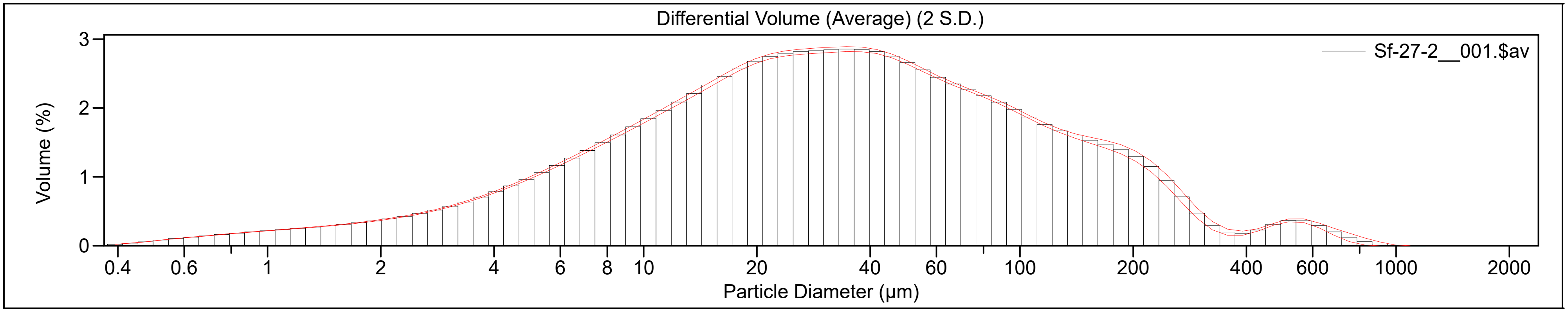
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-27-2__001.$av
	Sf-27-2__001.$av
File ID:	SF-27-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-27-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	29.70 µm	S.D.:	3.818
Median:	31.30 µm	Variance:	14.58
Mean/Median ratio:	0.949	Skewness:	-0.288 Left skewed
Mode:	34.59 µm	Kurtosis:	0.014 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.230 µm	12.79 µm	31.30 µm	75.81 µm	162.6 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

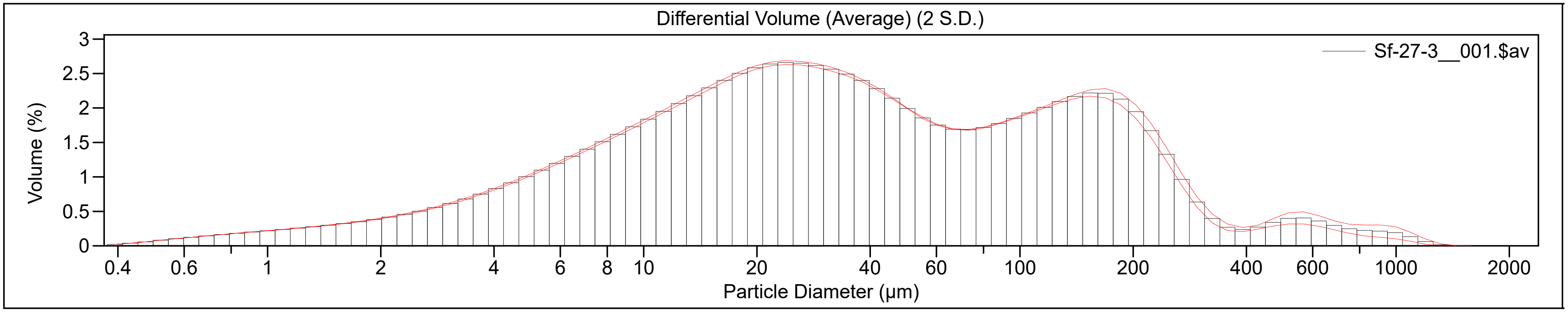
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-27-3__001.$av
	Sf-27-3__001.$av
File ID:	SF-27-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-27-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.60 µm	S.D.:	4.263
Median:	31.88 µm	Variance:	18.17
Mean/Median ratio:	1.023	Skewness:	-0.185 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.263 Platykurtic

<10%	<25%	<50%	<75%	<90%
5.025 µm	12.49 µm	31.88 µm	103.0 µm	200.2 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

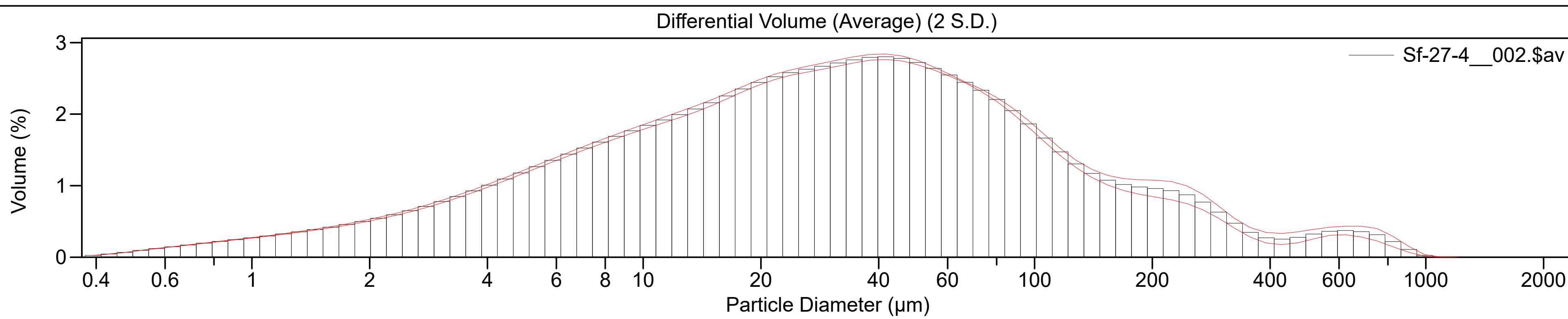
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-27-4__002.$av
	Sf-27-4__002.$av
File ID:	SF-27-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-27-4__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.97 µm	S.D.:	4.125
Median:	29.30 µm	Variance:	17.02
Mean/Median ratio:	0.921	Skewness:	-0.183 Left skewed
Mode:	41.68 µm	Kurtosis:	-0.114 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.088 µm	10.68 µm	29.30 µm	69.69 µm	159.6 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

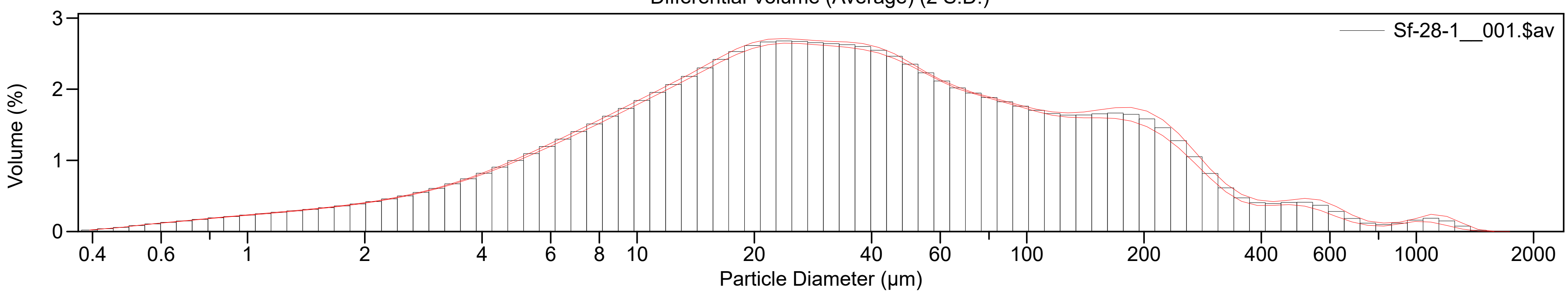
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-28-1__001.$av
	Sf-28-1__001.$av
File ID:	SF-28-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-28-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.44 µm	S.D.:	4.200
Median:	31.49 µm	Variance:	17.64
Mean/Median ratio:	0.998	Skewness:	-0.163 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.148 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.981 µm	12.42 µm	31.49 µm	87.74 µm	202.2 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

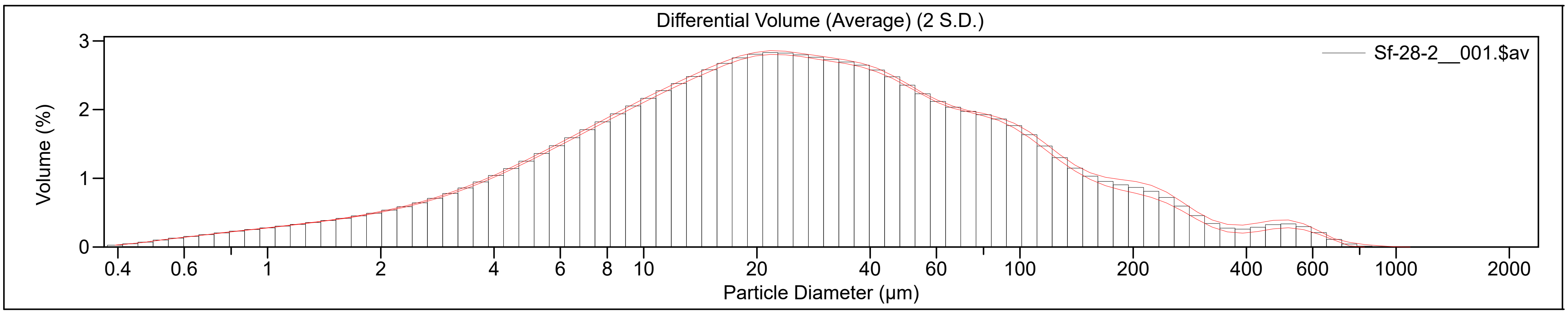
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-28-2__001.$av
	Sf-28-2__001.$av
File ID:	SF-28-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-28-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.76 µm	S.D.:	3.899
Median:	24.45 µm	Variance:	15.21
Mean/Median ratio:	0.971	Skewness:	-0.167 Left skewed
Mode:	21.70 µm	Kurtosis:	-0.117 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.050 µm	9.878 µm	24.45 µm	60.69 µm	133.8 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

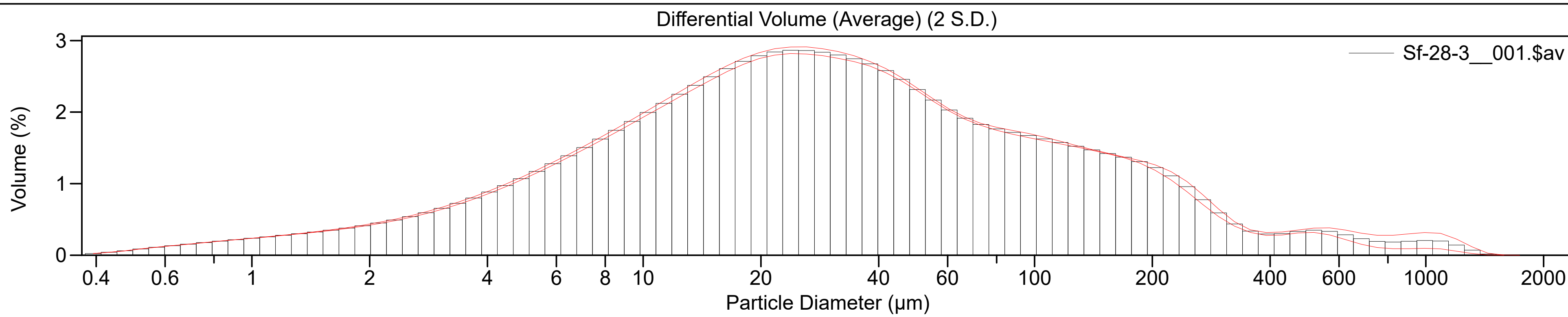
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-28-3__001.$av
	Sf-28-3__001.$av
File ID:	SF-28-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-28-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.35 µm	S.D.:	4.116
Median:	27.94 µm	Variance:	16.94
Mean/Median ratio:	1.015	Skewness:	-0.066 Left skewed
Mode:	23.82 µm	Kurtosis:	-0.019 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.717 µm	11.52 µm	27.94 µm	73.54 µm	178.0 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

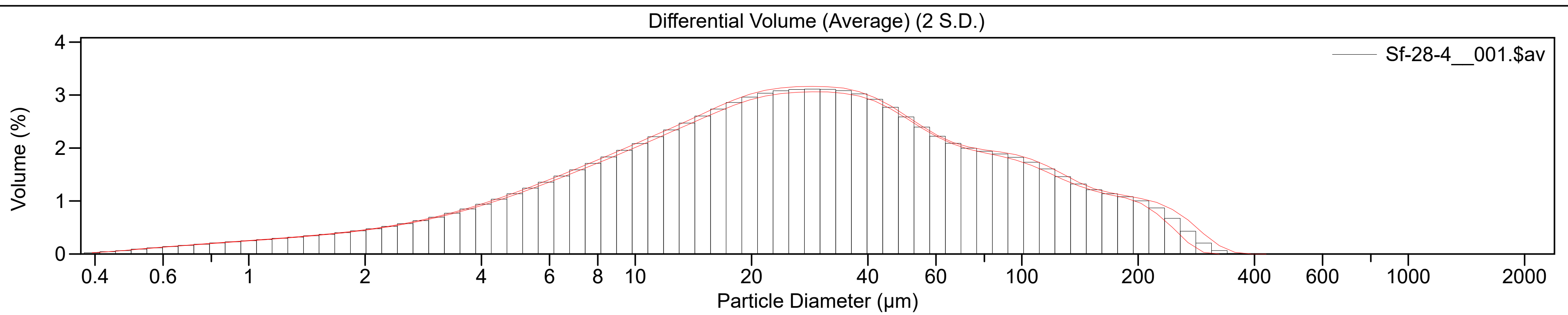
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-28-4__001.$av
	Sf-28-4__001.$av
File ID:	SF-28-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-28-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.67 µm	S.D.:	3.506
Median:	25.64 µm	Variance:	12.29
Mean/Median ratio:	0.923	Skewness:	-0.412 Left skewed
Mode:	28.70 µm	Kurtosis:	-0.043 Platykurtic

<10%	<25%	<50%	<75%	<90%
4.476 µm	10.86 µm	25.64 µm	57.27 µm	118.3 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-29-1__001.$av
	Sf-29-1__001.$av
File ID:	SF-29-1
Optical model:	Fraunhofer.rf780z

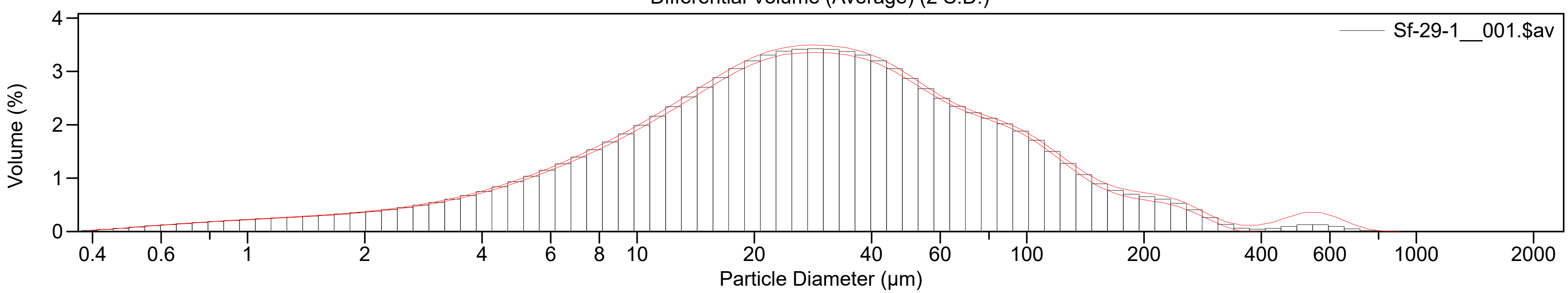
Volume Statistics (Geometric) Sf-29-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.14 µm	S.D.:	3.327
Median:	27.12 µm	Variance:	11.07
Mean/Median ratio:	0.927	Skewness:	-0.430 Left skewed
Mode:	28.70 µm	Kurtosis:	0.396 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.339 µm	12.53 µm	27.12 µm	56.43 µm	108.1 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

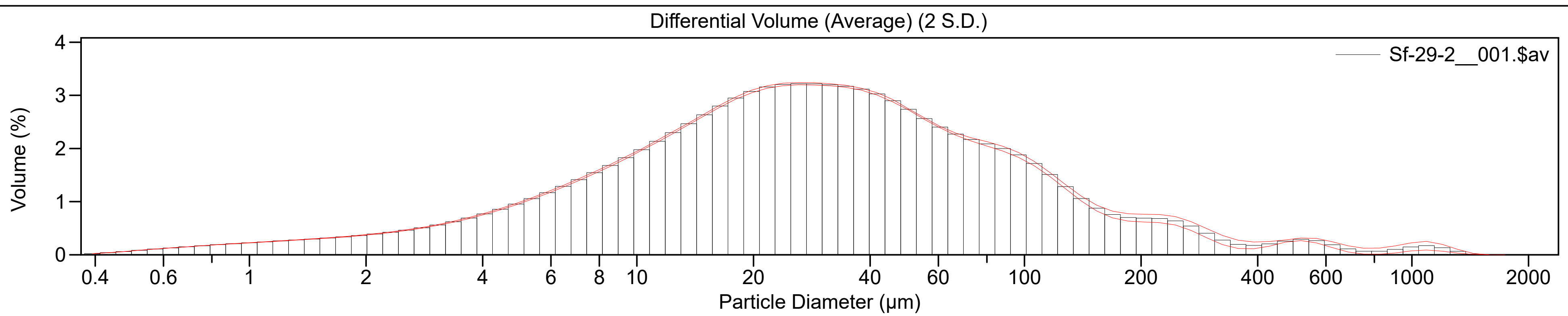
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-29-2__001.$av
	Sf-29-2__001.$av
File ID:	SF-29-2
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric)   Sf-29-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.73 µm	S.D.:	3.650
Median:	27.69 µm	Variance:	13.32
Mean/Median ratio:	0.965	Skewness:	-0.161 Left skewed
Mode:	26.15 µm	Kurtosis:	0.437 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.233 µm	12.42 µm	27.69 µm	61.14 µm	125.5 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

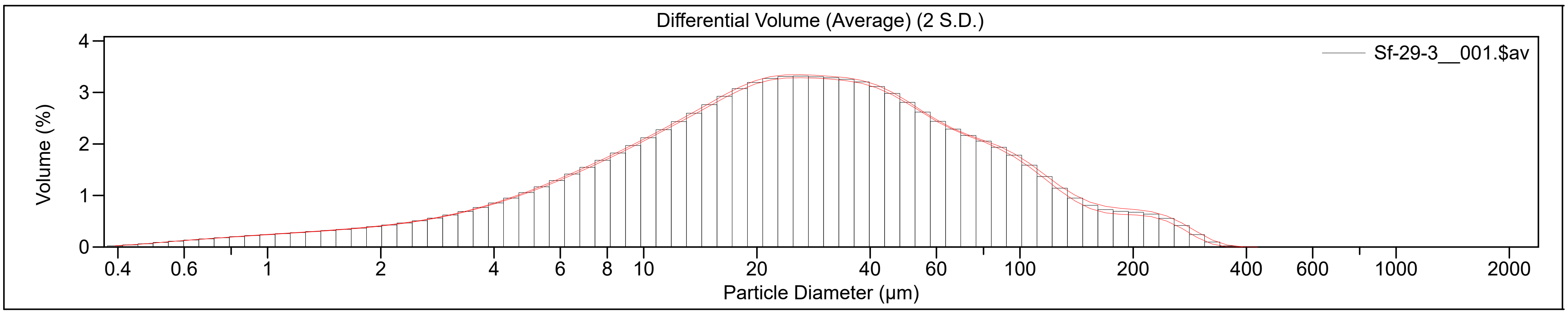
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-29-3__001.$av Sf-29-3__001.$av
File ID:	SF-29-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-29-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	23.21 µm	S.D.:	3.310
Median:	25.31 µm	Variance:	10.95
Mean/Median ratio:	0.917	Skewness:	-0.470 Left skewed
Mode:	26.15 µm	Kurtosis:	0.209 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.831 µm	11.40 µm	25.31 µm	53.05 µm	100.7 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

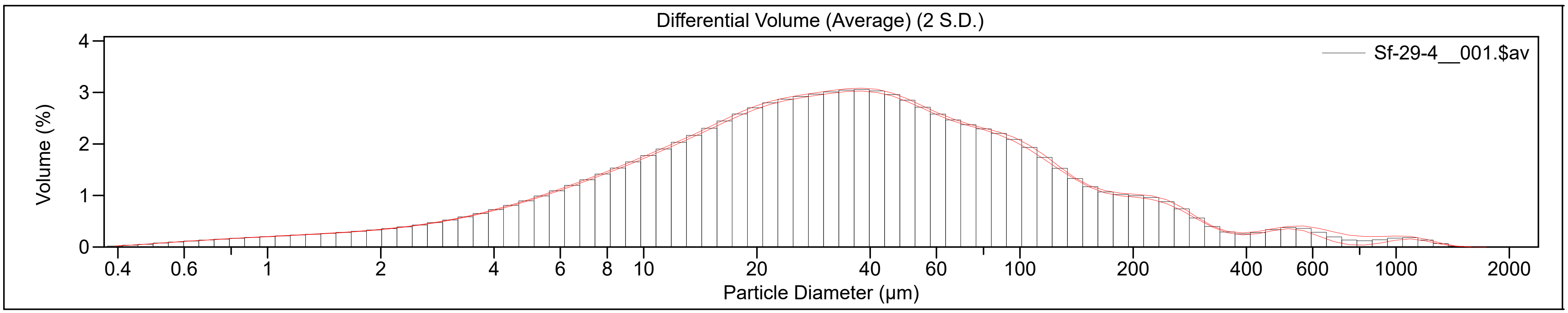
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-29-4__001.$av
	Sf-29-4__001.$av
File ID:	SF-29-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-29-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	30.95 µm	S.D.:	3.817
Median:	32.38 µm	Variance:	14.57
Mean/Median ratio:	0.956	Skewness:	-0.187 Left skewed
Mode:	37.97 µm	Kurtosis:	0.259 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.625 µm	13.65 µm	32.38 µm	74.37 µm	161.1 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-29-5__001.$av
	Sf-29-5__001.$av
File ID:	SF-29-5
Optical model:	Fraunhofer.rf780z

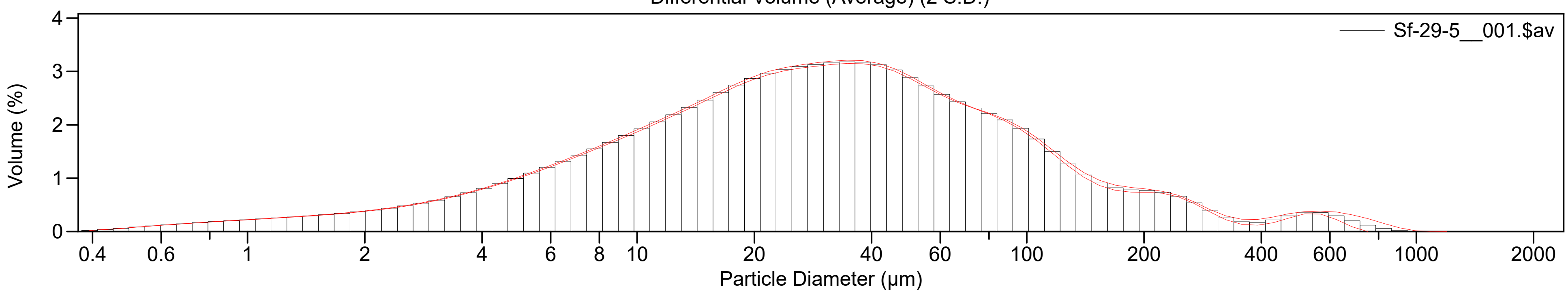
Volume Statistics (Geometric)   Sf-29-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.95 µm	S.D.:	3.624
Median:	28.83 µm	Variance:	13.13
Mean/Median ratio:	0.935	Skewness:	-0.259 Left skewed
Mode:	34.59 µm	Kurtosis:	0.257 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.122 µm	12.35 µm	28.83 µm	62.75 µm	126.3 µm

Differential Volume (Average) (2 S.D.)



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

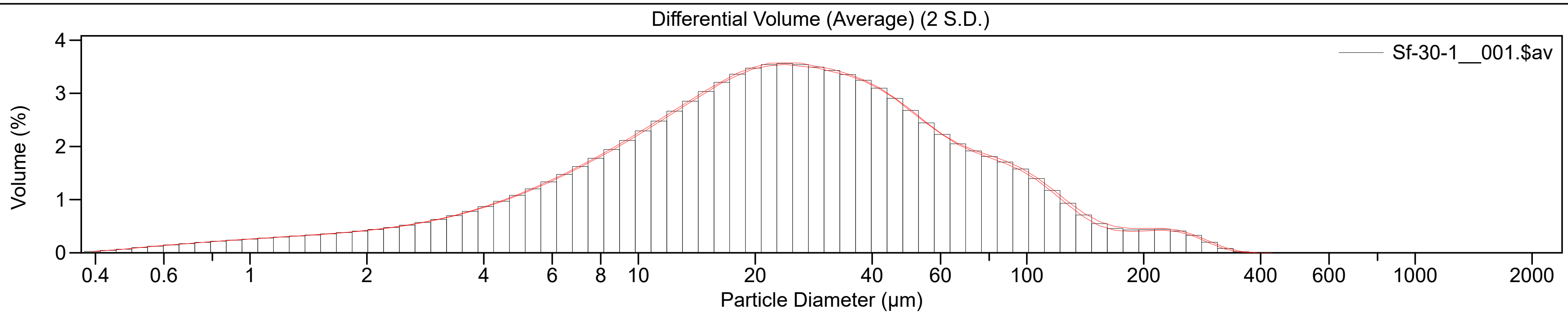
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-30-1__001.$av Sf-30-1__001.$av
File ID:	SF-30-1
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-30-1__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	21.23 µm	S.D.:	3.196
Median:	23.12 µm	Variance:	10.21
Mean/Median ratio:	0.918	Skewness:	-0.483 Left skewed
Mode:	23.82 µm	Kurtosis:	0.351 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.687 µm	10.88 µm	23.12 µm	46.45 µm	88.00 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-30-2__001.$av
	Sf-30-2__001.$av
File ID:	SF-30-2
Optical model:	Fraunhofer.rf780z

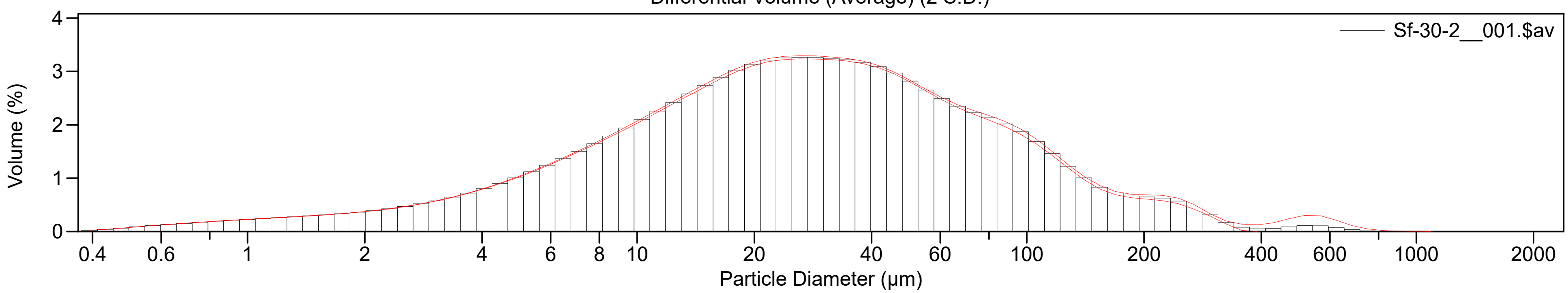
Volume Statistics (Geometric) Sf-30-2__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	24.47 µm	S.D.:	3.366
Median:	26.30 µm	Variance:	11.33
Mean/Median ratio:	0.930	Skewness:	-0.397 Left skewed
Mode:	26.15 µm	Kurtosis:	0.291 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.121 µm	11.86 µm	26.30 µm	56.06 µm	107.1 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

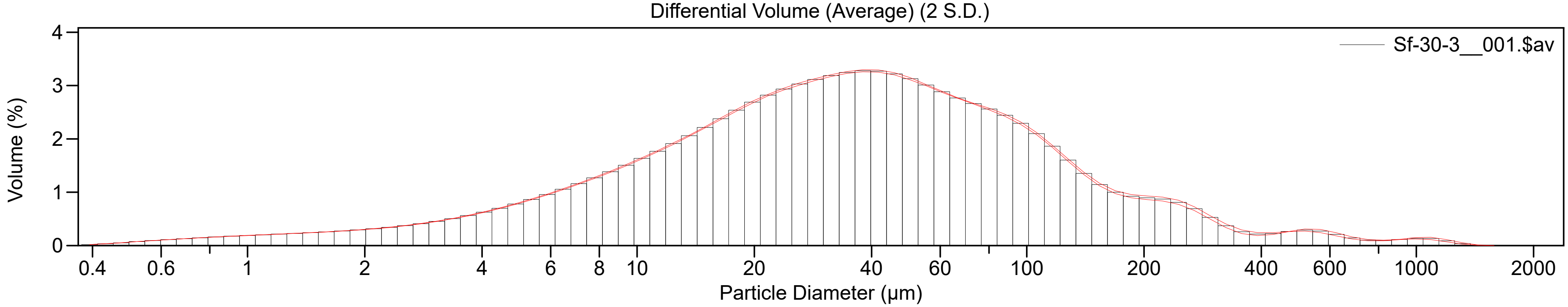
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-30-3__001.$av Sf-30-3__001.$av
File ID:	SF-30-3
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-30-3__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.07 µm	S.D.:	3.591
Median:	34.54 µm	Variance:	12.89
Mean/Median ratio:	0.929	Skewness:	-0.318 Left skewed
Mode:	37.97 µm	Kurtosis:	0.480 Leptokurtic

<10%	<25%	<50%	<75%	<90%
6.273 µm	15.17 µm	34.54 µm	74.05 µm	145.4 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

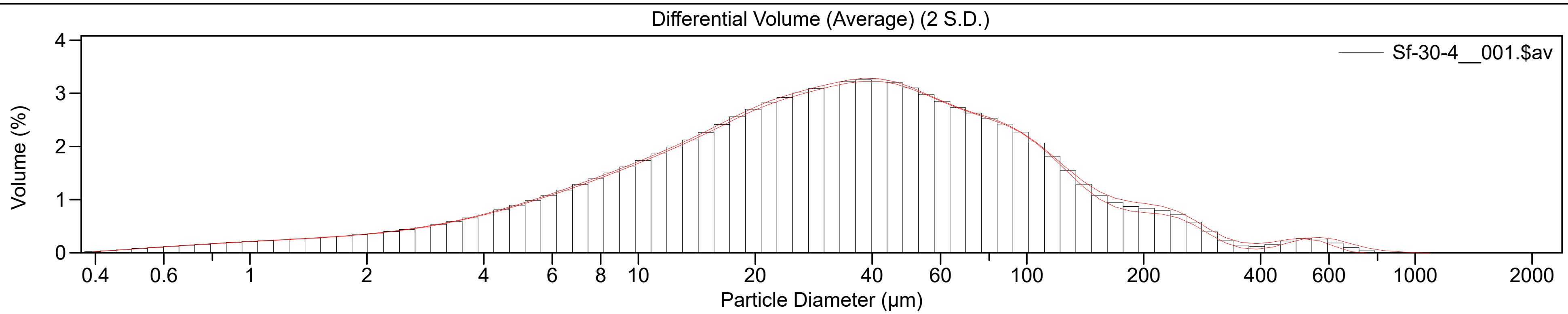
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-30-4__001.$av Sf-30-4__001.$av
File ID:	SF-30-4
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-30-4__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.94 µm	S.D.:	3.521
Median:	32.19 µm	Variance:	12.40
Mean/Median ratio:	0.899	Skewness:	-0.437 Left skewed
Mode:	37.97 µm	Kurtosis:	0.305 Leptokurtic

<10%	<25%	<50%	<75%	<90%
5.524 µm	13.70 µm	32.19 µm	68.56 µm	128.0 µm



Beckman Coulter LS Particle Size Analyzer

31 Mar 2022

Swan Island Basin SEDflume Study

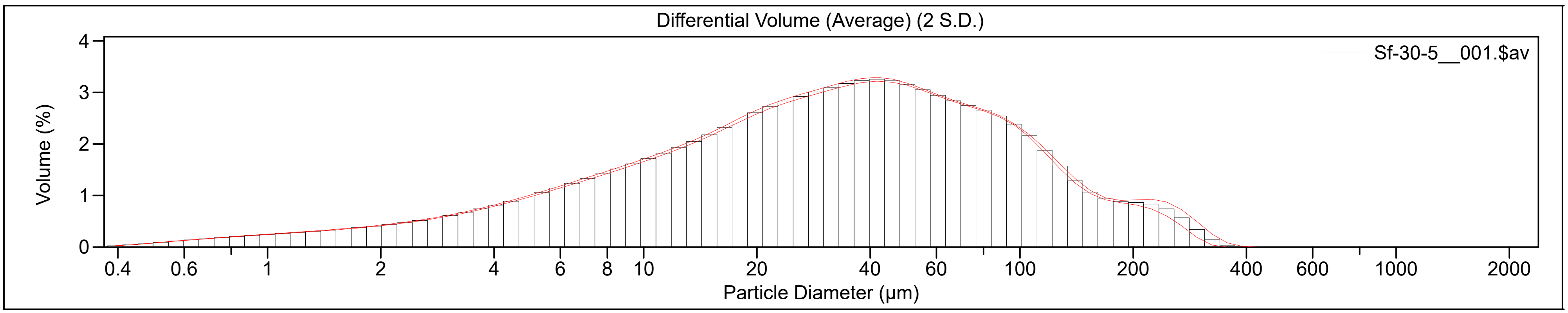
File name:	C:\Users\smcwilliams74\Desktop\CF3284_PSD Data\PSD Data\Sf-30-5__001.$av
	Sf-30-5__001.$av
File ID:	SF-30-5
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) Sf-30-5__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	27.01 µm	S.D.:	3.487
Median:	31.60 µm	Variance:	12.16
Mean/Median ratio:	0.855	Skewness:	-0.607 Left skewed
Mode:	41.68 µm	Kurtosis:	0.163 Leptokurtic

<10%	<25%	<50%	<75%	<90%
4.875 µm	12.82 µm	31.60 µm	66.63 µm	117.6 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

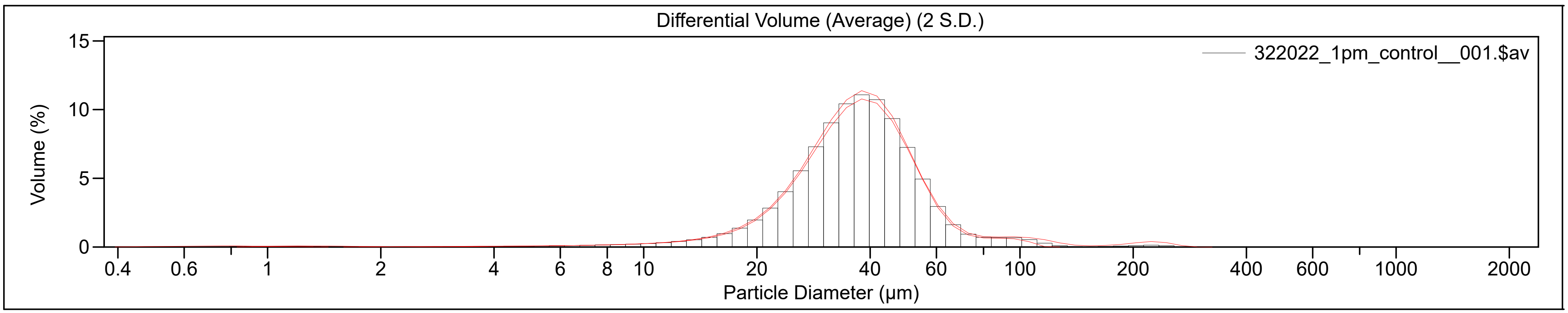
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 322022_1pm_control__001.$av
File ID:	322022_1pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 322022_1pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.44 µm	S.D.:	1.675
Median:	37.01 µm	Variance:	2.807
Mean/Median ratio:	0.958	Skewness:	-2.011 Left skewed
Mode:	37.97 µm	Kurtosis:	12.99 Leptokurtic

<10%	<25%	<50%	<75%	<90%
21.84 µm	28.92 µm	37.01 µm	46.23 µm	56.79 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

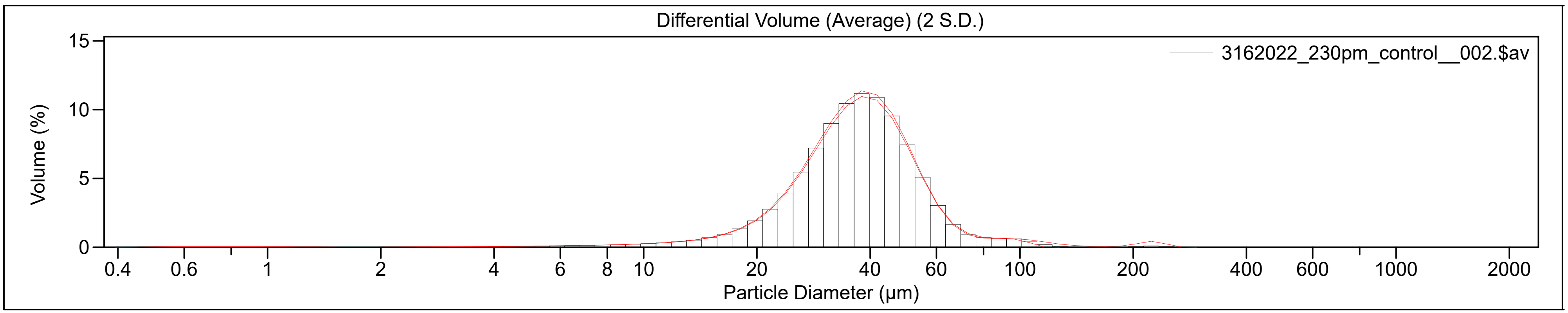
File name:	**C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\3162022_23** **3162022_230pm_control__002.$av**
File ID:	**3162022_230pm_control**
Optical model:	**Fraunhofer.rf780z**

Volume Statistics (Geometric) 3162022_230pm_control__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.13 µm	S.D.:	1.688
Median:	37.10 µm	Variance:	2.851
Mean/Median ratio:	0.947	Skewness:	-2.567 Left skewed
Mode:	37.97 µm	Kurtosis:	16.07 Leptokurtic

<10%	<25%	<50%	<75%	<90%
21.84 µm	29.01 µm	37.10 µm	46.21 µm	56.35 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

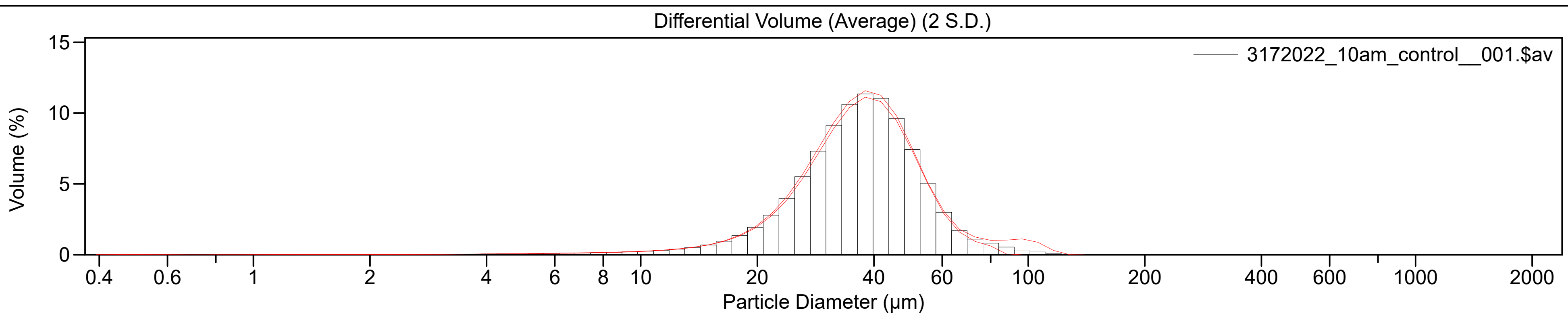
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\31
	3172022_10am_control__001.$av
File ID:	3172022_10am_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3172022_10am_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	34.76 µm	S.D.:	1.653
Median:	36.93 µm	Variance:	2.732
Mean/Median ratio:	0.941	Skewness:	-2.898 Left skewed
Mode:	37.97 µm	Kurtosis:	17.56 Leptokurtic

<10%	<25%	<50%	<75%	<90%
21.84 µm	28.96 µm	36.93 µm	45.82 µm	55.50 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

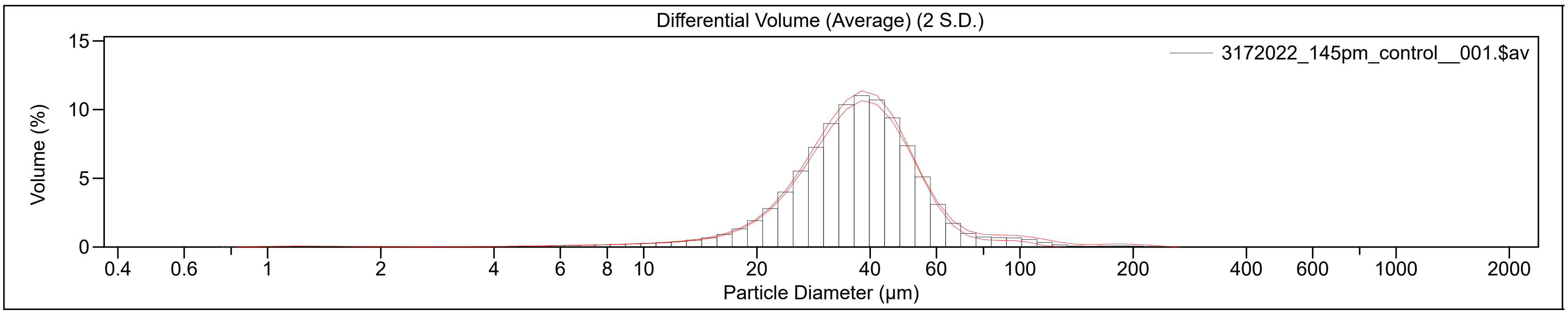
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\31 3172022_145pm_control__001.$av
File ID:	3172022_145pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3172022_145pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.68 µm	S.D.:	1.641
Median:	37.18 µm	Variance:	2.693
Mean/Median ratio:	0.960	Skewness:	-1.811 Left skewed
Mode:	37.97 µm	Kurtosis:	10.59 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.05 µm	29.06 µm	37.18 µm	46.49 µm	57.10 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

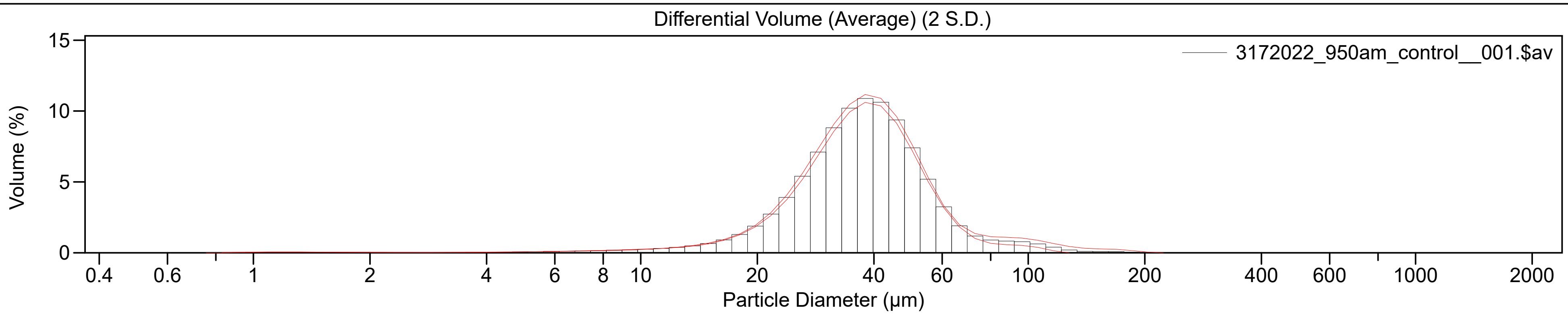
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\31 3172022_950am_control__001.$av
File ID:	3172022_950am_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3172022_950am_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	36.14 µm	S.D.:	1.640
Median:	37.51 µm	Variance:	2.689
Mean/Median ratio:	0.964	Skewness:	-1.771 Left skewed
Mode:	37.97 µm	Kurtosis:	10.15 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.25 µm	29.29 µm	37.51 µm	47.03 µm	58.50 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

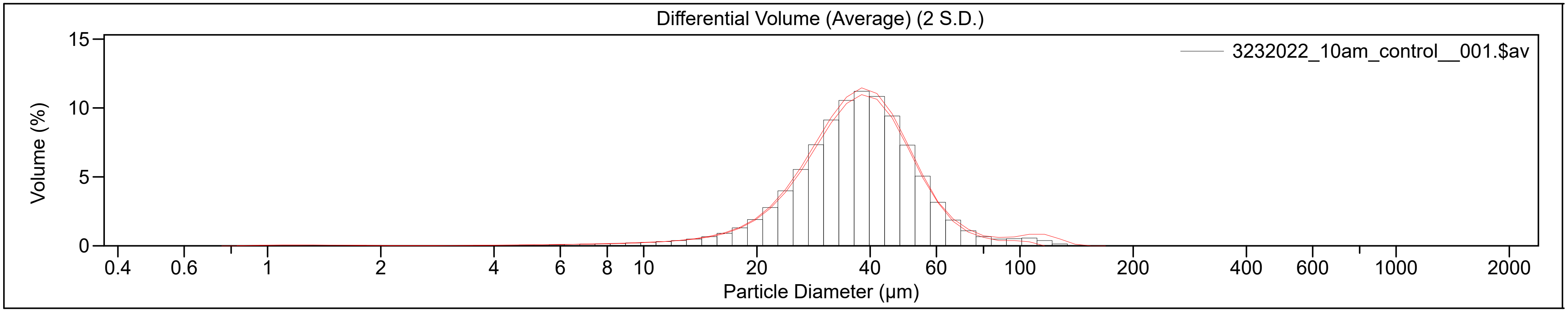
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 3232022_10am_control__001.$av
File ID:	3232022_10am_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3232022_10am_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.54 µm	S.D.:	1.611
Median:	37.11 µm	Variance:	2.594
Mean/Median ratio:	0.958	Skewness:	-2.031 Left skewed
Mode:	37.97 µm	Kurtosis:	11.43 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.23 µm	29.14 µm	37.11 µm	46.26 µm	56.69 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

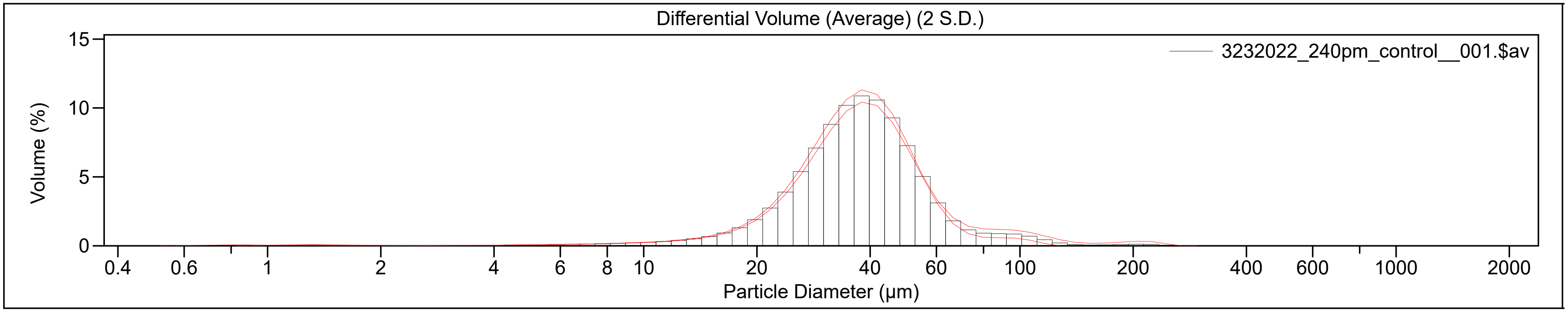
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 3232022_240pm_control__001.$av
File ID:	3232022_240pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3232022_240pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	36.18 µm	S.D.:	1.675
Median:	37.46 µm	Variance:	2.807
Mean/Median ratio:	0.966	Skewness:	-1.713 Left skewed
Mode:	37.97 µm	Kurtosis:	10.65 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.10 µm	29.23 µm	37.46 µm	47.02 µm	59.04 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

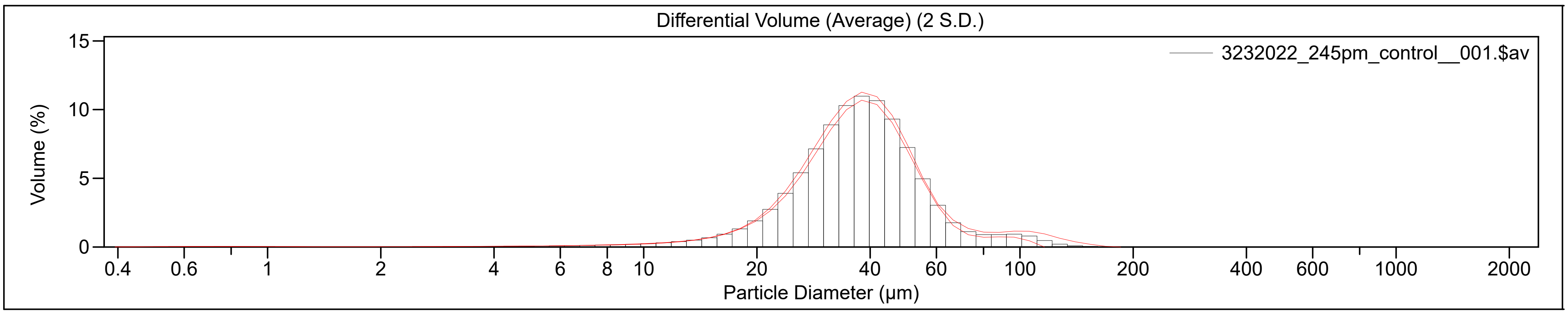
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 3232022_245pm_control__001.$av
File ID:	3232022_245pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3232022_245pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.80 µm	S.D.:	1.689
Median:	37.36 µm	Variance:	2.853
Mean/Median ratio:	0.958	Skewness:	-2.375 Left skewed
Mode:	37.97 µm	Kurtosis:	14.75 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.07 µm	29.19 µm	37.36 µm	46.81 µm	58.36 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

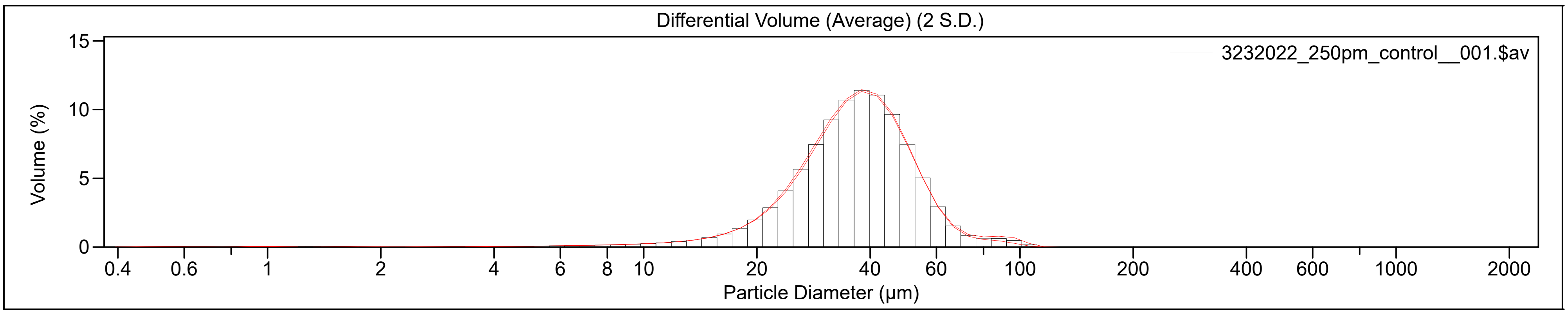
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 3232022_250pm_control__001.$av
File ID:	3232022_250pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3232022_250pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	34.88 µm	S.D.:	1.606
Median:	36.82 µm	Variance:	2.579
Mean/Median ratio:	0.947	Skewness:	-2.662 Left skewed
Mode:	37.97 µm	Kurtosis:	16.45 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.04 µm	28.93 µm	36.82 µm	45.62 µm	54.96 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

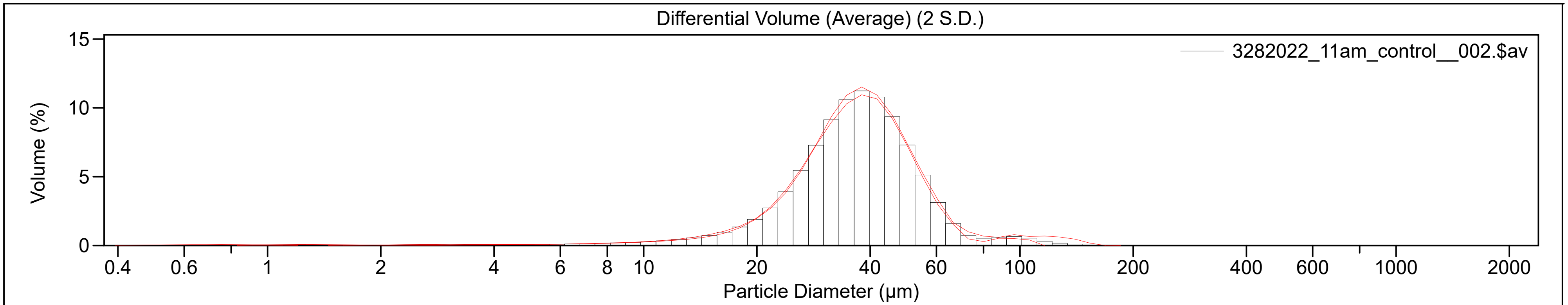
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\32 3282022_11am_control__002.$av
File ID:	3282022_11am_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3282022_11am_control__002.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	34.95 µm	S.D.:	1.671
Median:	36.92 µm	Variance:	2.792
Mean/Median ratio:	0.947	Skewness:	-2.403 Left skewed
Mode:	37.97 µm	Kurtosis:	13.64 Leptokurtic

<10%	<25%	<50%	<75%	<90%
21.68 µm	28.94 µm	36.92 µm	46.02 µm	56.13 µm



integral consulting inc.

Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\33 3302022_1pm_control__001.$av
File ID:	3302022_1pm_control
Optical model:	Fraunhofer.rf780z

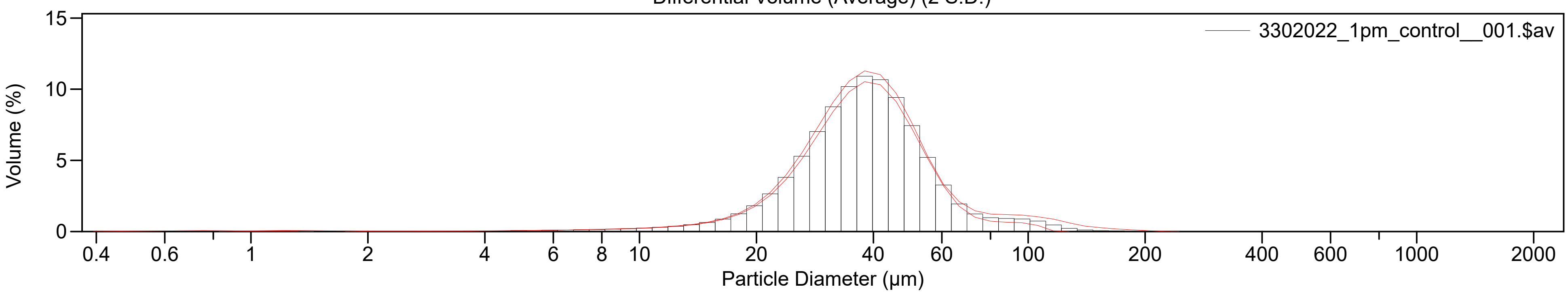
Volume Statistics (Geometric) 3302022_1pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	36.39 µm	S.D.:	1.656
Median:	37.73 µm	Variance:	2.744
Mean/Median ratio:	0.964	Skewness:	-2.025 Left skewed
Mode:	37.97 µm	Kurtosis:	12.52 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.48 µm	29.51 µm	37.73 µm	47.30 µm	59.38 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

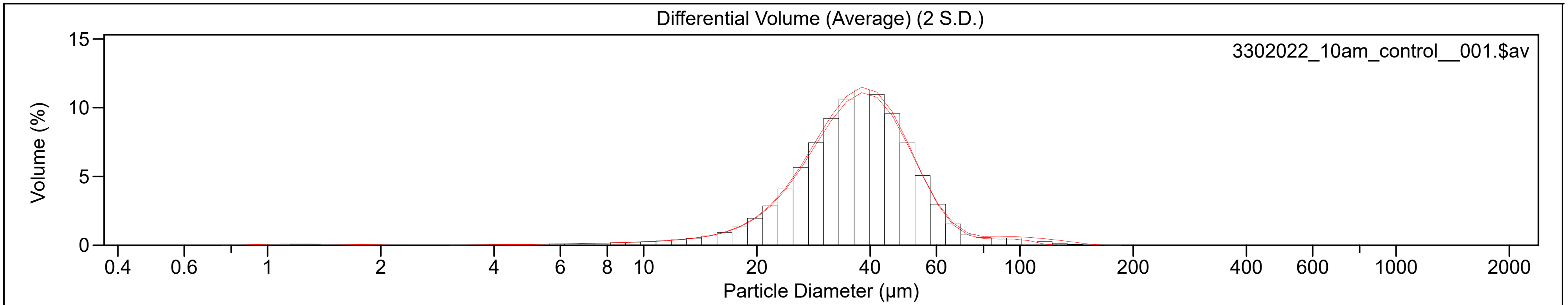
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\33 3302022_10am_control__001.$av
File ID:	3302022_10am_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3302022_10am_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.46 µm	S.D.:	1.563
Median:	36.93 µm	Variance:	2.442
Mean/Median ratio:	0.960	Skewness:	-1.667 Left skewed
Mode:	37.97 µm	Kurtosis:	9.472 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.22 µm	29.01 µm	36.93 µm	45.87 µm	55.61 µm



Beckman Coulter LS Particle Size Analyzer

3 Jun 2022

Beckman Coulter 35 Micron Control

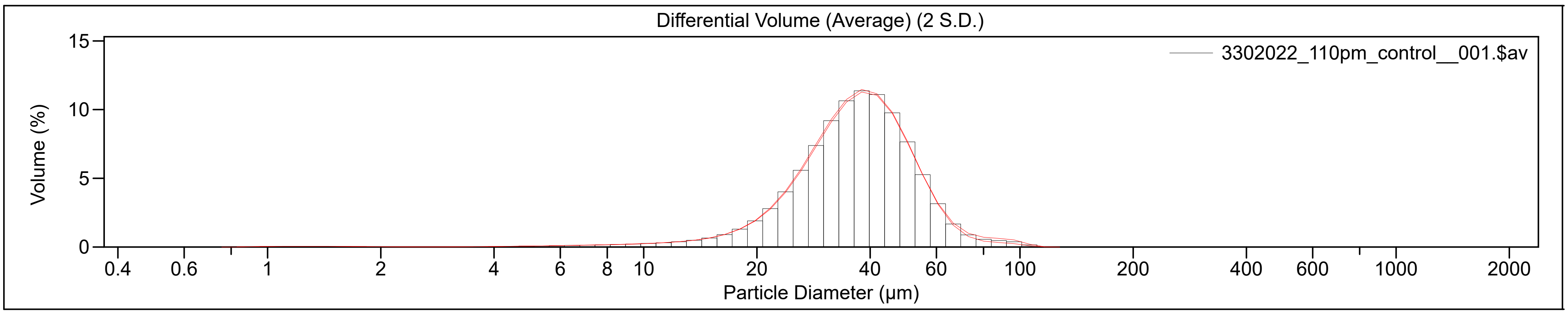
File name:	C:\Users\smcwilliams74\Documents\projects\CF3284_Swan_Island_SEDFlume\SWID_SEDflume_Data\SIB_PSD_data\SWan_Island_PSD_data\PSD Data\33 3302022_110pm_control__001.$av
File ID:	3302022_110pm_control
Optical model:	Fraunhofer.rf780z

Volume Statistics (Geometric) 3302022_110pm_control__001.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.09 µm	S.D.:	1.580
Median:	37.01 µm	Variance:	2.496
Mean/Median ratio:	0.948	Skewness:	-2.335 Left skewed
Mode:	37.97 µm	Kurtosis:	12.83 Leptokurtic

<10%	<25%	<50%	<75%	<90%
22.22 µm	29.09 µm	37.01 µm	45.85 µm	55.13 µm

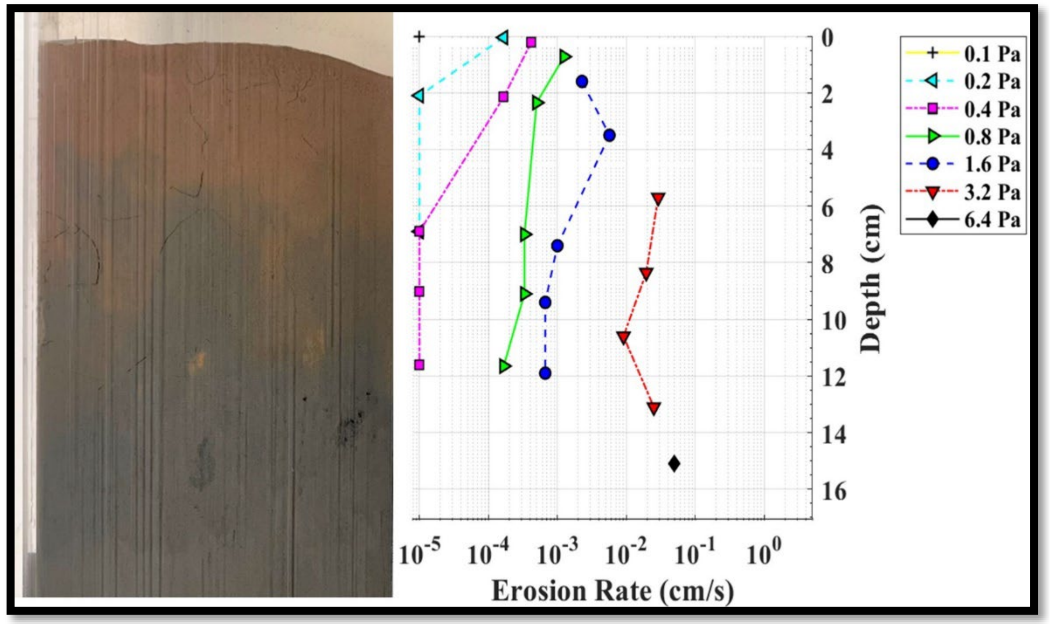


APPENDIX B

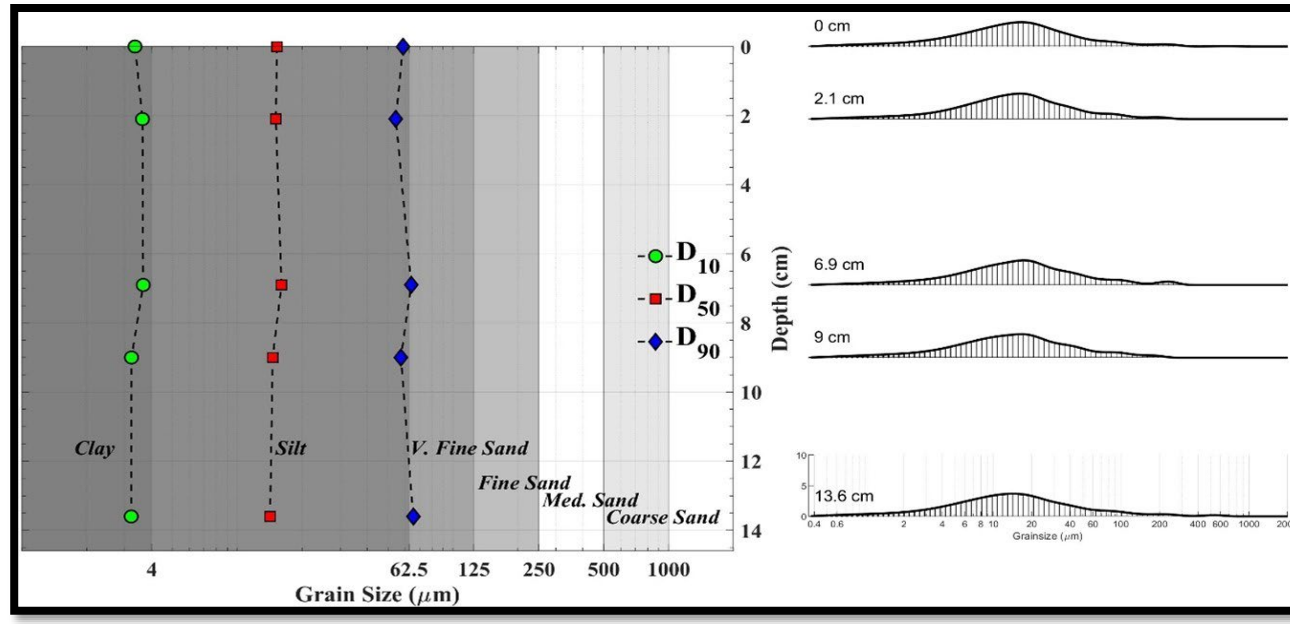
SEDFLUME CORE RESULTS

This page was intentionally left blank.

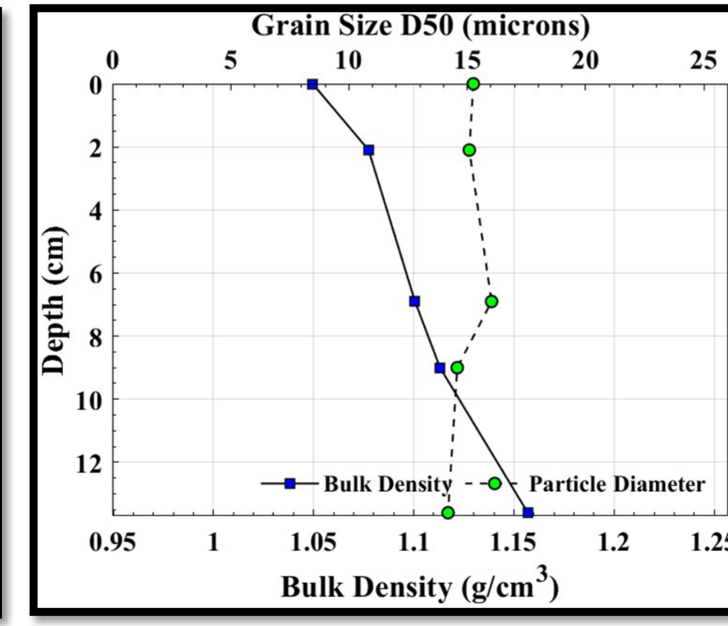
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	15.26	1.05	0.2	11.8	0.1	0.2	0.16	0.14	0.14
2.1	15.09	1.08	0.25	11.6	0.2	0.4	0.32	0.34	0.34
6.9	16.03	1.1	0.29	11.7	0.4	0.8	0.52	0.55	0.55
9	14.58	1.11	0.31	11.4	0.4	0.8	0.52	0.53	0.53
13.6	14.19	1.16	0.37	10.3	0.4	0.8	0.64	0.67	0.67
Mean	15.03	1.10	0.28	11.4	0.3	0.6	0.43	0.45	0.45

(5) Power Law Best-Fit Coefficients per Interval

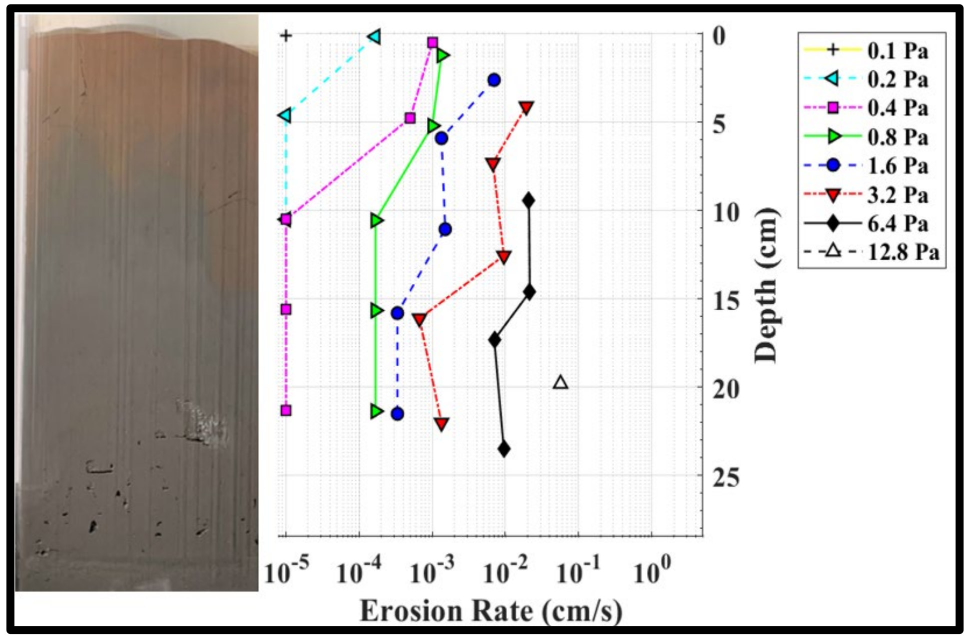
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.1	6.06E-05	1.36	0.99
2	2.1	6.9	4.66E-06	2.5	0.99
3	6.9	9	9.06E-07	2.77	0.96
4	9	11.6	2.06E-06	2.32	0.94
5	11.6	16.1	3.86E-07	2.93	0.95

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

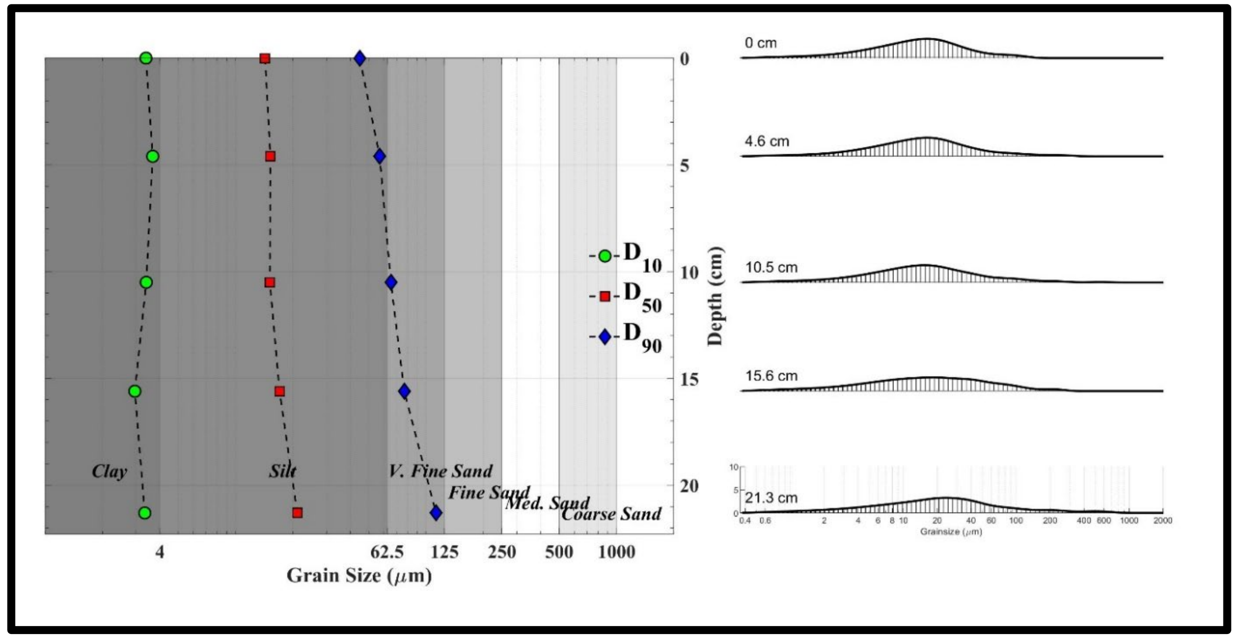
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-1
Core SF01

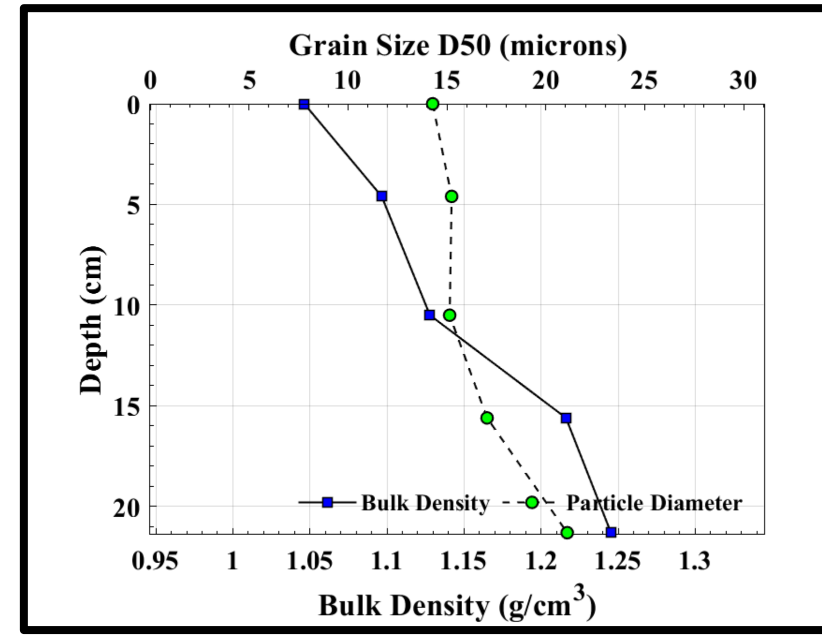
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.28	1.05	0.21	12.6	0.1	0.2	0.16	0.14	0.14
4.6	15.24	1.10	0.28	11.3	0.2	0.4	0.24	0.19	0.20
10.5	15.14	1.13	0.34	11.6	0.4	0.8	0.64	0.6	0.60
15.6	17.03	1.22	0.47	10.0	0.4	0.8	0.64	0.75	0.75
21.3	21.08	1.25	0.52	10.0	0.4	0.8	0.64	0.69	0.69
Mean	16.55	1.15	0.36	11.1	0.3	0.6	0.46	0.48	0.48

(5) Power Law Best-Fit Coefficients per Interval

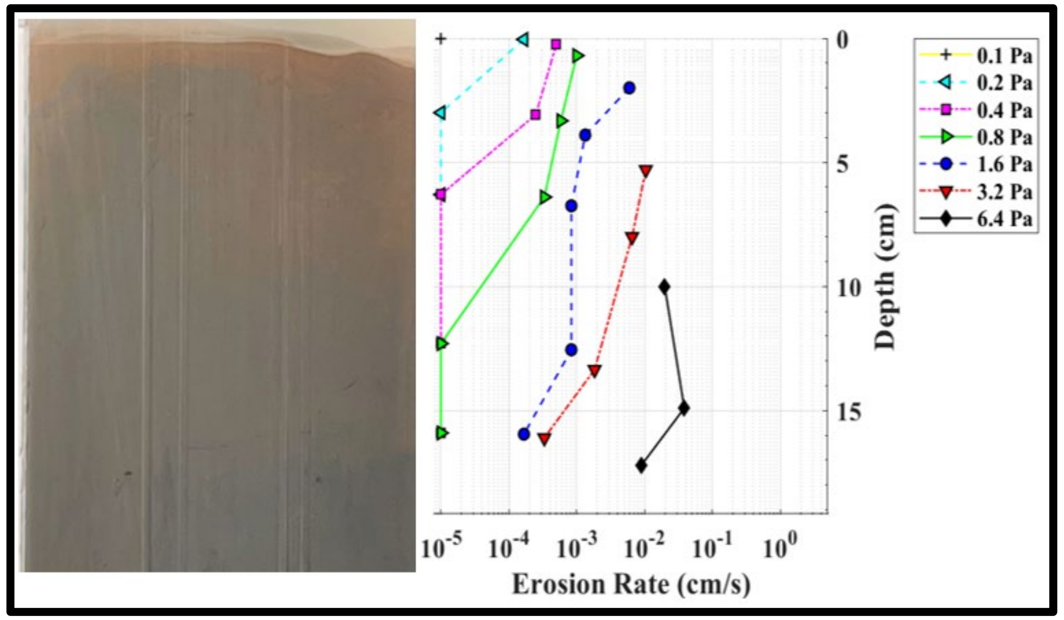
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	4.5	5.39E-05	1.71	0.98
2	4.5	10.4	3.8E-05	1.48	0.96
3	10.4	15.5	1.23E-06	2.45	0.98
4	15.5	21.2	1.72E-06	2.01	0.94
5	21.2	24.5	2.67E-06	1.88	0.97

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

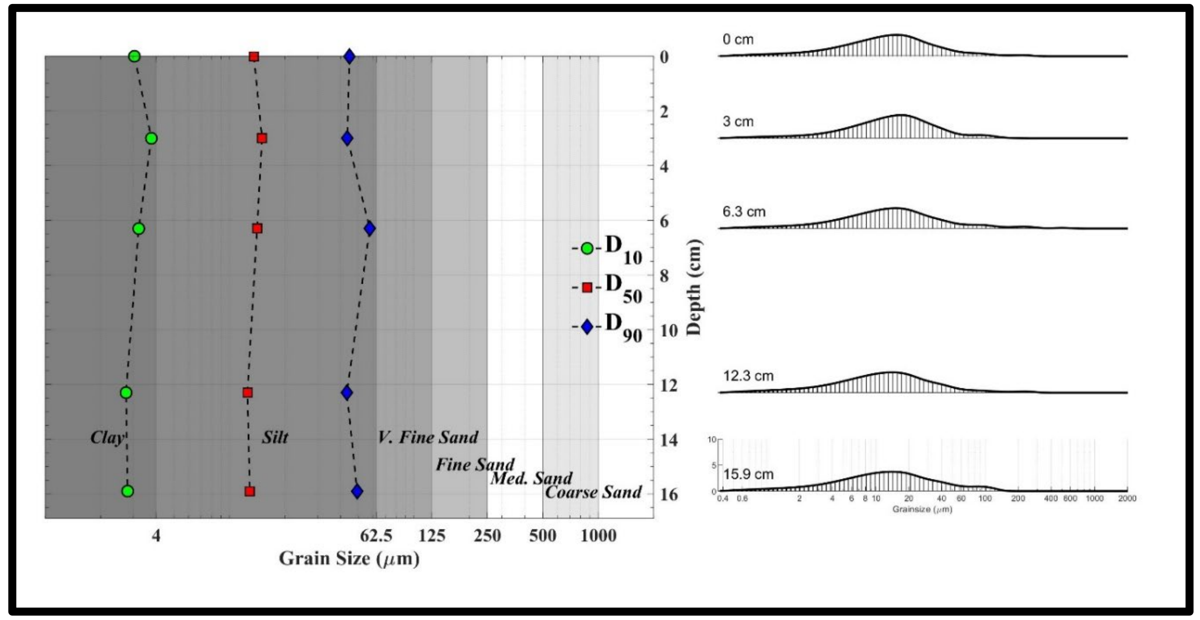
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-2
Core SF02

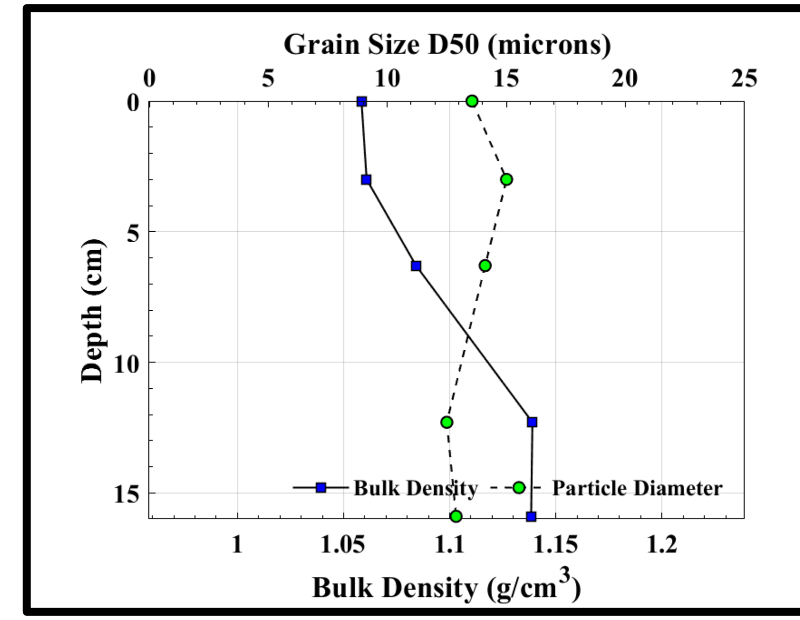
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	13.56	1.06	0.23	13.1	0.1	0.2	0.16	0.16	0.16
3	15.01	1.06	0.24	13.7	0.2	0.4	0.28	0.28	0.28
6.3	14.11	1.08	0.27	12.4	0.4	0.8	0.52	0.5	0.50
12.3	12.50	1.14	0.35	11.1	0.8	1.6	0.9	0.88	0.88
15.9	12.89	1.14	0.36	12.2	0.8	1.6	1.28	1.41	1.41
Mean	13.61	1.10	0.29	12.5	0.5	0.9	0.63	0.65	0.65

(5) Power Law Best-Fit Coefficients per Interval

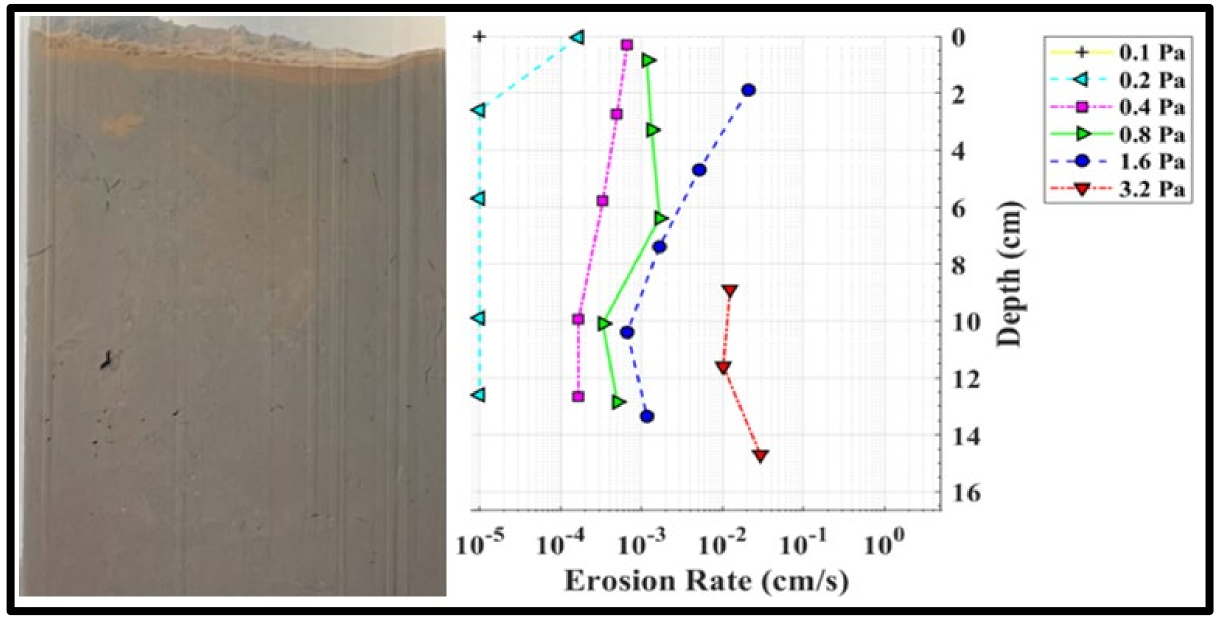
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	3	4.69E-05	1.66	0.98
2	3	6.3	1.7E-05	1.75	0.96
3	6.3	11	3.32E-06	2.11	0.99
4	12.3	15.9	2.09E-07	2.83	0.95
5	15.9	18.2	9.46E-08	2.63	0.90

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

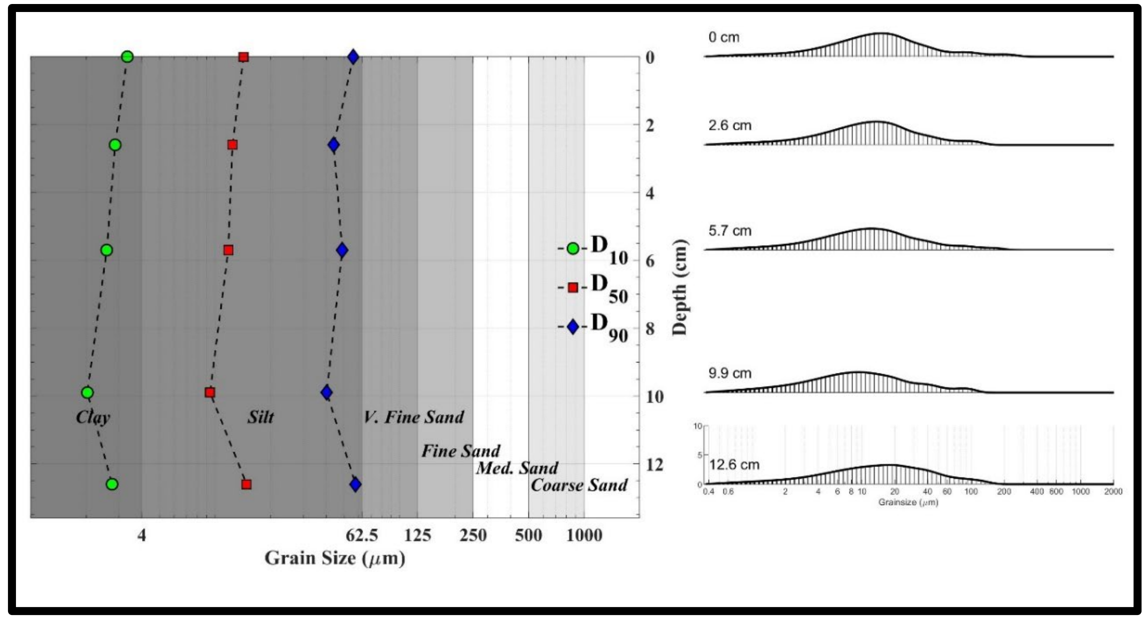
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm^3 = grams per cubic centimeter
Pa = Pascal

Figure B-3
Core SF03

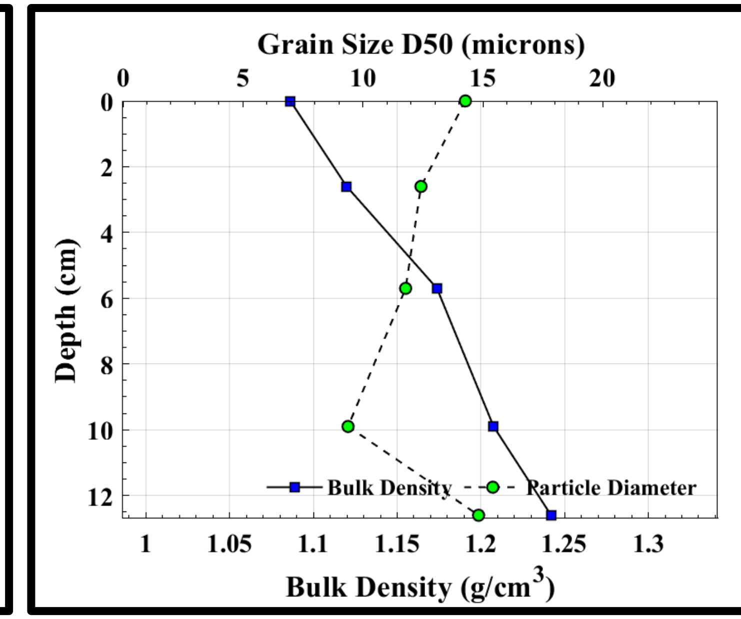
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.27	1.09	0.27	12.2	0.1	0.2	0.16	0.17	0.17
2.6	12.42	1.12	0.32	11.0	0.2	0.4	0.24	0.21	0.21
5.7	11.78	1.17	0.4	10.6	0.2	0.4	0.26	0.22	0.22
9.9	9.38	1.21	0.45	9.9	0.2	0.4	0.32	0.35	0.35
12.6	14.82	1.24	0.52	10.5	0.2	0.4	0.32	0.35	0.35
Mean	12.53	1.17	0.39	10.8	0.2	0.4	0.26	0.26	0.26

(5) Power Law Best-Fit Coefficients per Interval

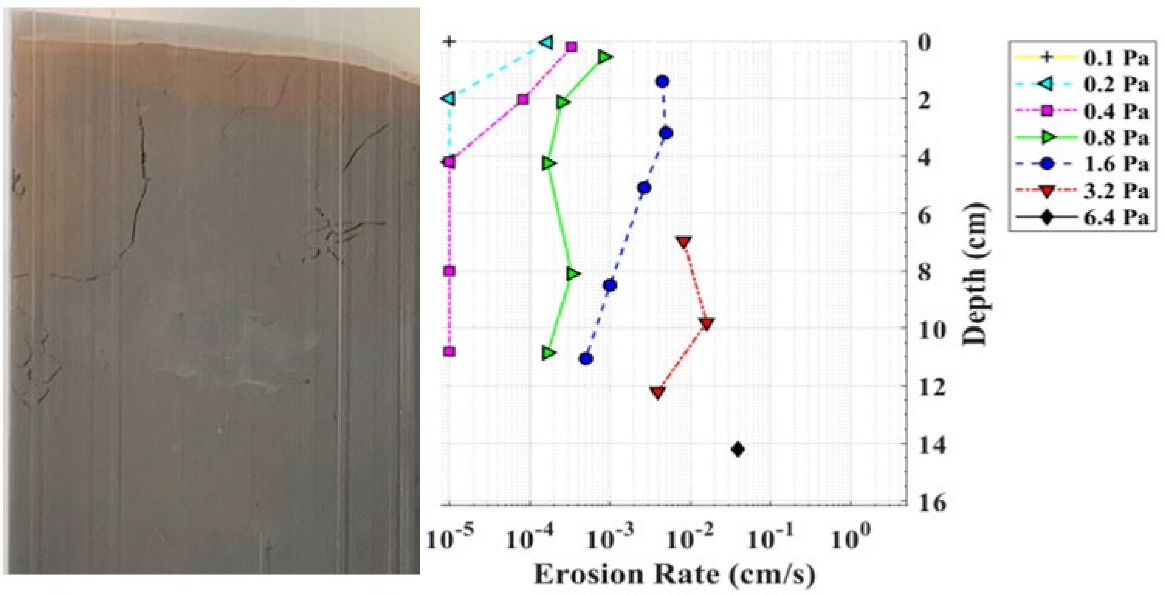
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.6	3.34E-05	2.12	0.94
2	2.6	5.7	2.23E-05	1.99	0.98
3	5.7	9.9	2.53E-05	1.74	0.94
4	9.9	12.6	1.05E-05	1.79	0.9
5	12.6	15.7	5.9E-06	2.25	0.92

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

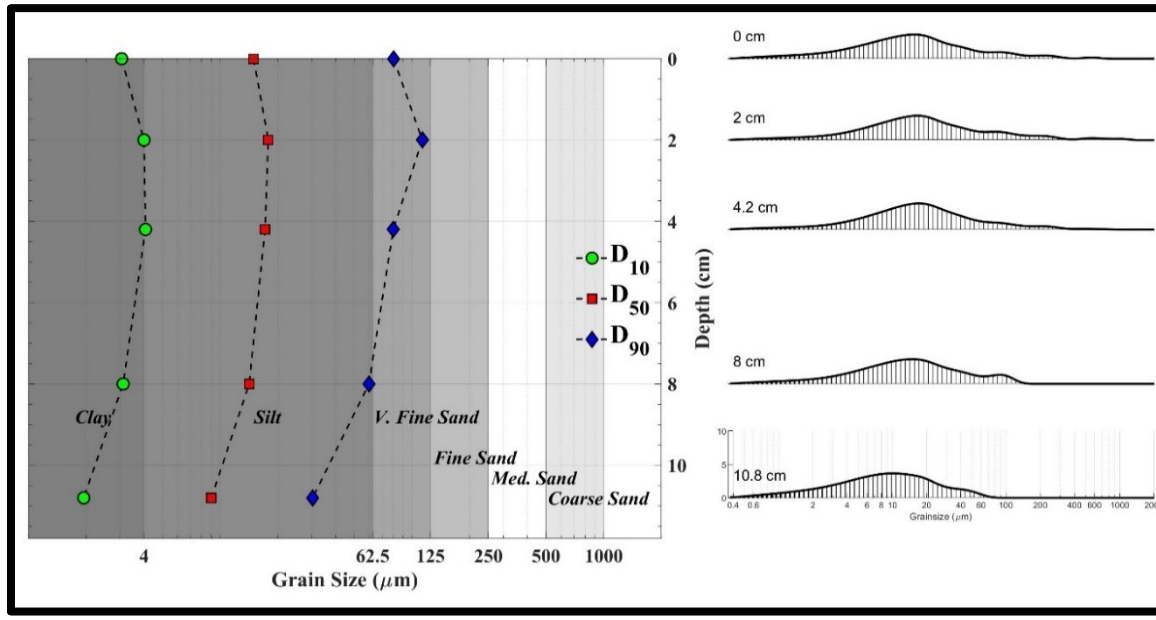
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-4
Core SF04

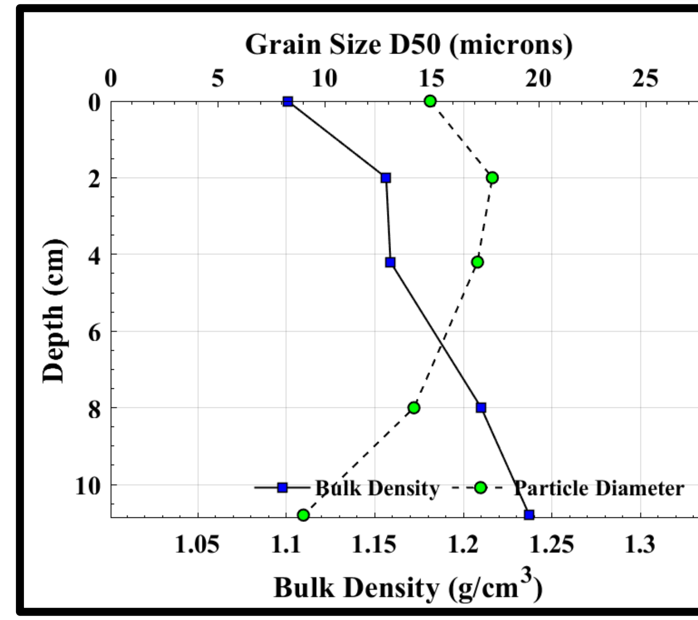
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.93	1.1	0.29	12.0	0.1	0.2	0.16	0.16	0.16
2	17.83	1.16	0.38	11.1	0.2	0.4	0.4	0.47	0.40
4.2	17.14	1.16	0.38	10.9	0.4	0.8	0.64	0.62	0.62
8	14.17	1.21	0.46	10.4	0.4	0.8	0.52	0.54	0.54
10.8	9.01	1.24	0.5	9.7	0.4	0.8	0.64	0.70	0.70
Mean	14.62	1.17	0.40	10.8	0.3	0.6	0.47	0.50	0.48

(5) Power Law Best-Fit Coefficients per Interval

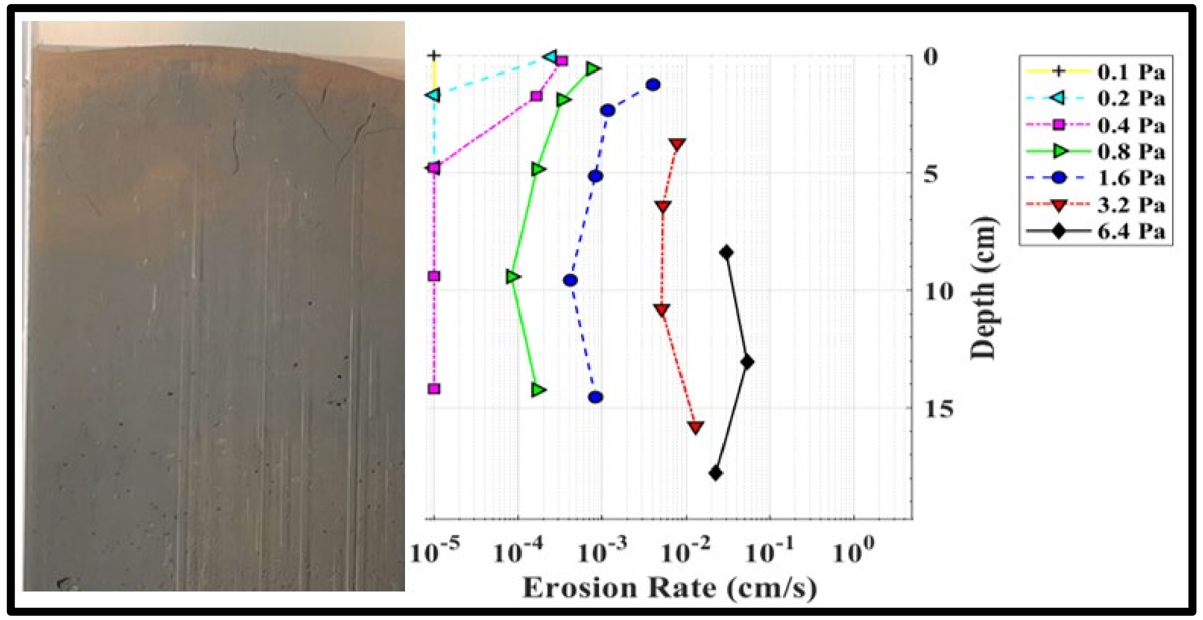
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2	4.71E-05	1.54	0.97
2	2	4.2	1.02E-06	2.95	0.93
3	4.2	8	5.11E-07	2.88	0.97
4	8	10.8	1.1E-06	2.67	0.96
5	10.8	15.2	7.12E-07	2.55	0.98

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

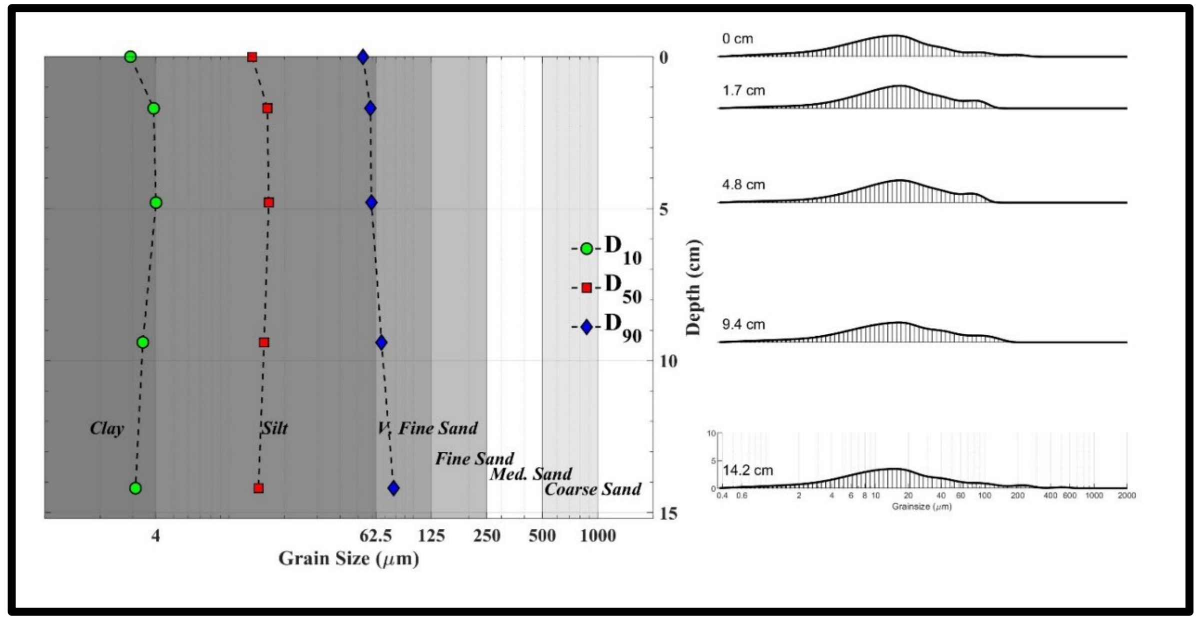
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-5
Core SF05

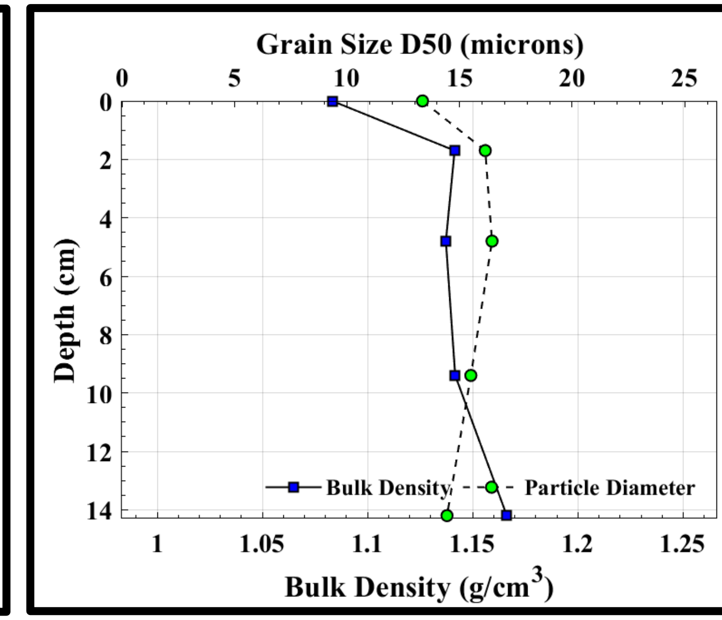
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	13.35	1.08	0.27	12.8	0.1	0.2	0.14	0.13	0.13
1.7	16.14	1.14	0.36	11.6	0.2	0.4	0.32	0.34	0.34
4.8	16.44	1.14	0.36	12.2	0.4	0.8	0.64	0.65	0.65
9.4	15.5	1.14	0.38	12.9	0.4	0.8	0.8	0.91	0.80
14.2	14.44	1.17	0.4	11.8	0.4	0.8	0.64	0.63	0.63
Mean	15.17	1.13	0.35	12.3	0.3	0.6	0.51	0.54	0.51

(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.7	6.7E-05	1.35	0.94
2	1.7	4.8	1.12E-05	1.79	0.97
3	4.8	9.4	9.42E-07	2.49	1
4	9.4	14.2	9.21E-08	3.16	0.99
5	14.2	18.8	9.24E-07	2.54	0.97

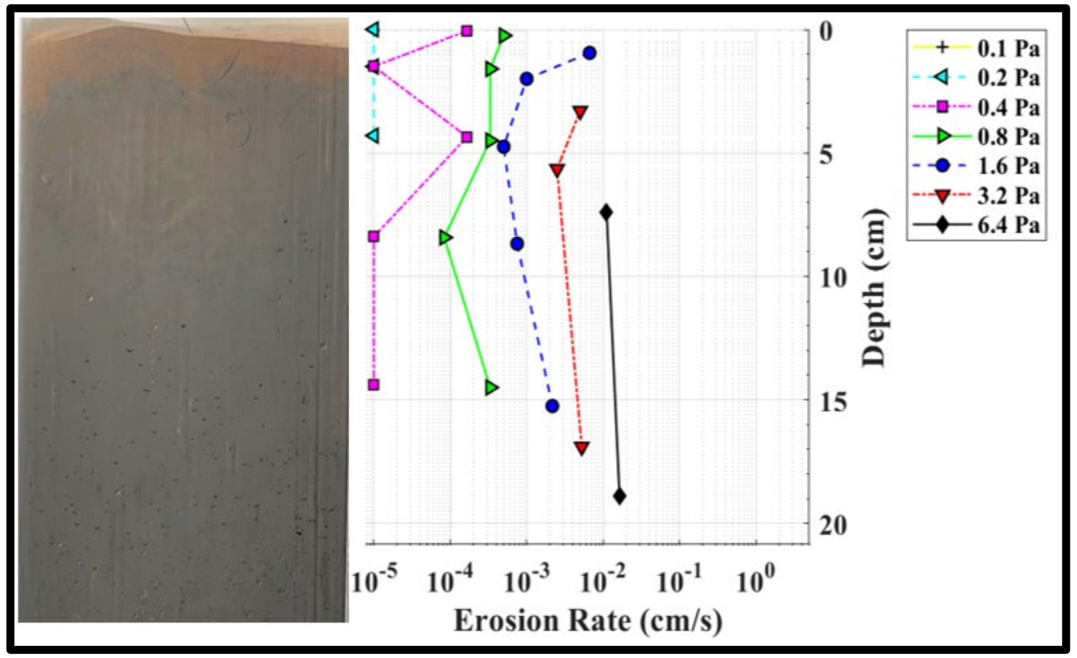
Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

PACIFIC groundwater GROUP, HGL HydroGeoLogic, Inc, MOTT MACDONALD, BRIDGEWATER GROUP, integral consulting inc.

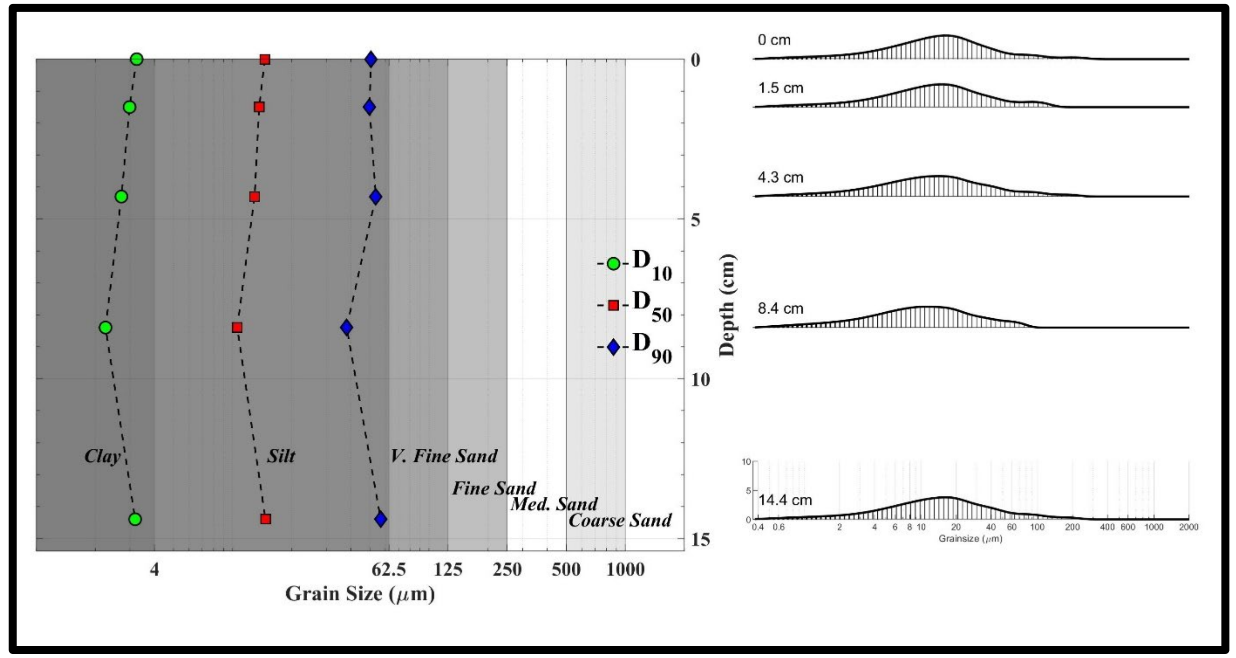
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-6
Core SF06

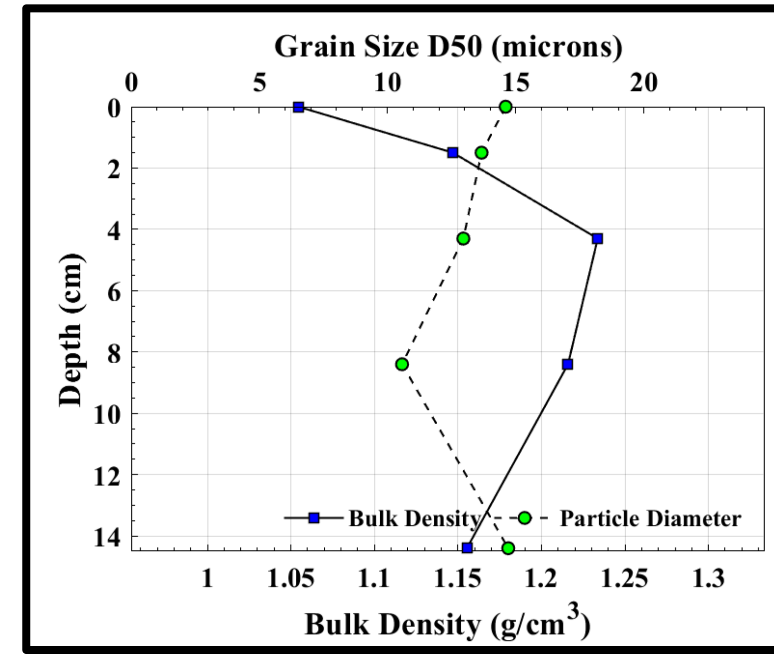
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.6	1.05	0.19	9.7	0.2	0.4	0.32	0.34	0.34
1.5	13.66	1.15	0.33	8.2	0.4	0.8	0.52	0.49	0.49
4.3	12.95	1.23	0.47	7.7	0.2	0.4	0.32	0.34	0.34
8.4	10.56	1.22	0.44	8.0	0.4	0.8	0.8	0.85	0.80
14.4	14.7	1.16	0.35	8.9	0.4	0.8	0.52	0.45	0.45
Mean	13.29	1.16	0.36	8.5	0.3	0.6	0.50	0.49	0.48

(5) Power Law Best-Fit Coefficients per Interval

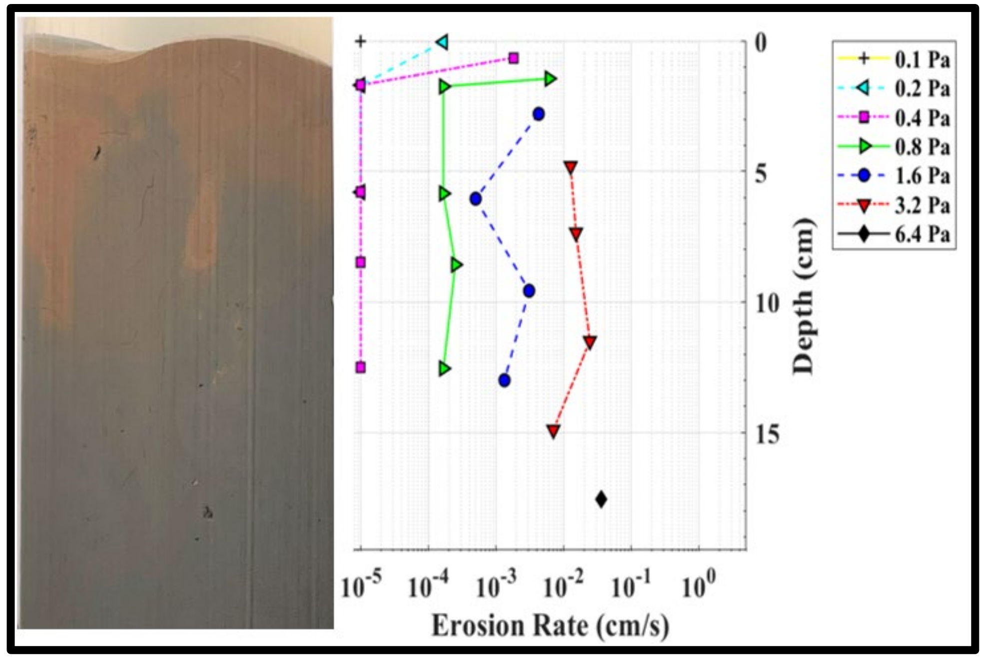
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.5	4.6E-06	2.52	0.96
2	1.5	4.3	3.61E-06	2.08	0.99
3	4.3	8.4	1.64E-05	1.47	0.96
4	8.4	8.9	1.14E-07	3.17	1
5	14.4	19.9	5.01E-06	2	0.98

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

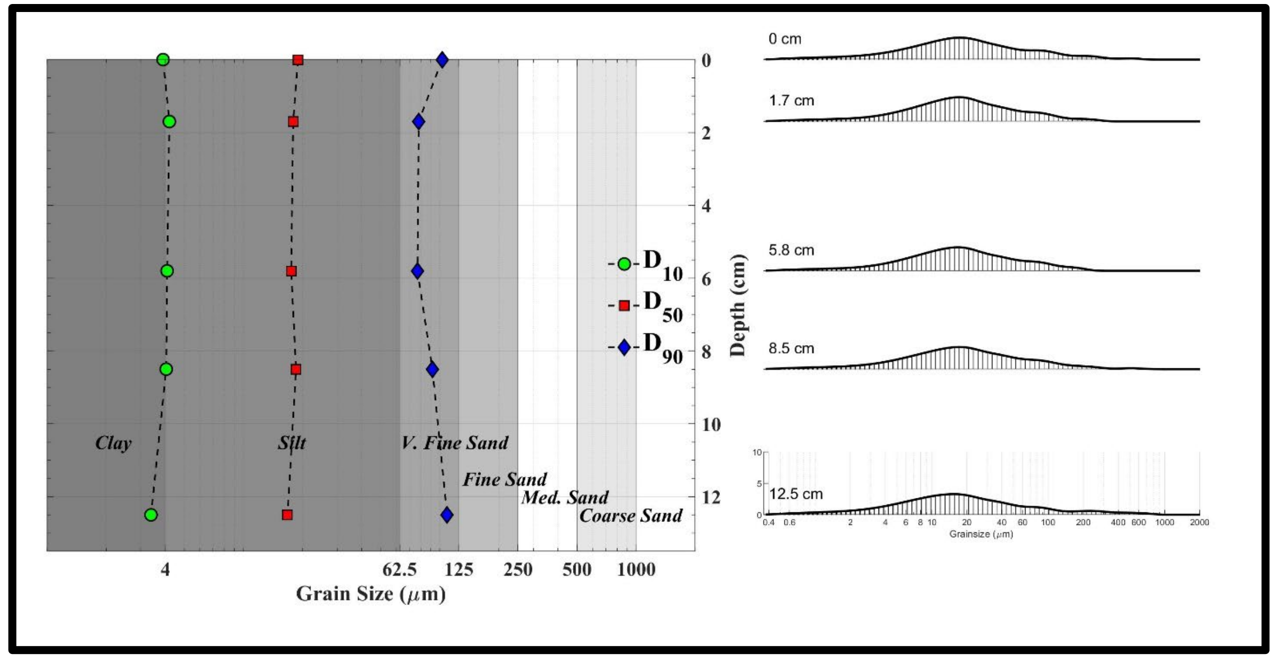
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-7
Core SF07

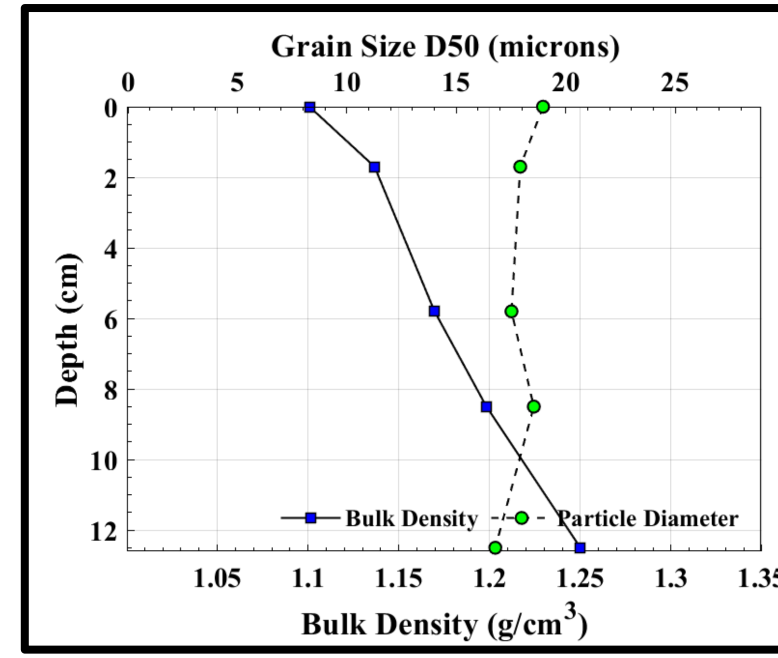
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	18.96	1.10	0.26	8.8	0.1	0.2	0.16	0.16	0.16
1.7	17.92	1.14	0.31	7.9	0.4	0.8	0.64	0.62	0.62
5.8	17.52	1.17	0.37	8.0	0.4	0.8	0.64	0.70	0.70
8.5	18.54	1.20	0.41	8.0	0.4	0.8	0.56	0.57	0.57
12.5	16.78	1.25	0.48	6.6	0.4	0.8	0.64	0.63	0.63
Mean	17.94	1.17	0.37	7.9	0.3	0.7	0.53	0.54	0.54

(5) Power Law Best-Fit Coefficients per Interval

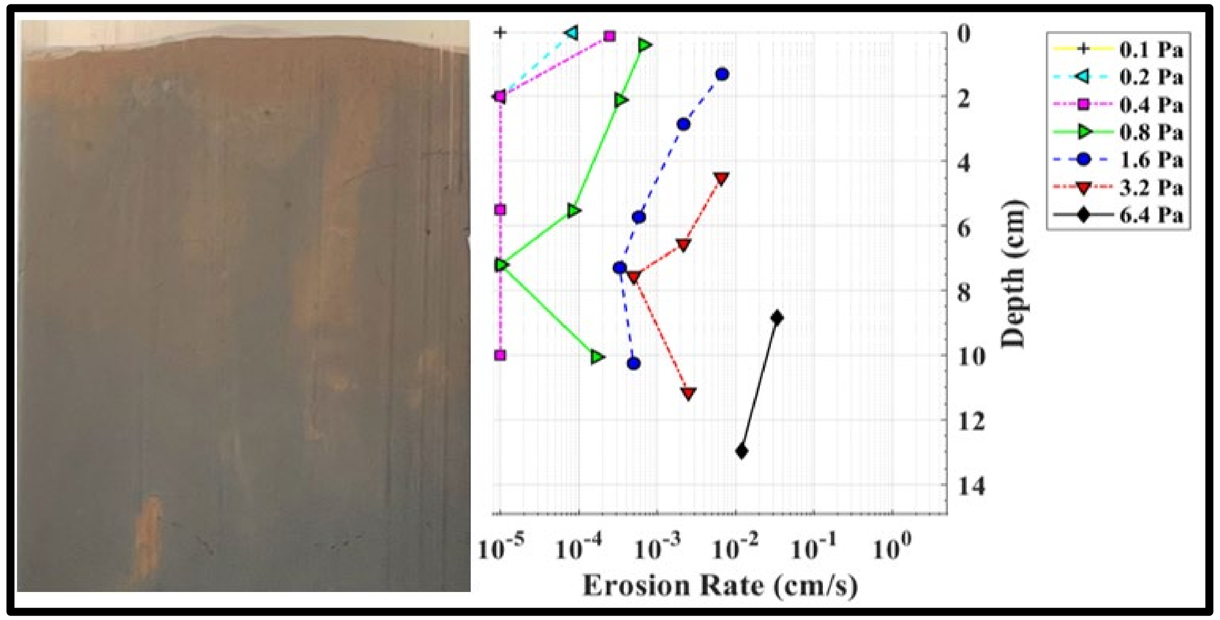
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.7	3.05E-05	2.65	0.98
2	1.7	5.8	2.85E-07	3.2	0.95
3	5.8	8.5	2.92E-07	3	0.93
4	8.5	12.5	3.61E-07	3.22	1
5	12.5	18.7	8.55E-07	2.58	1

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

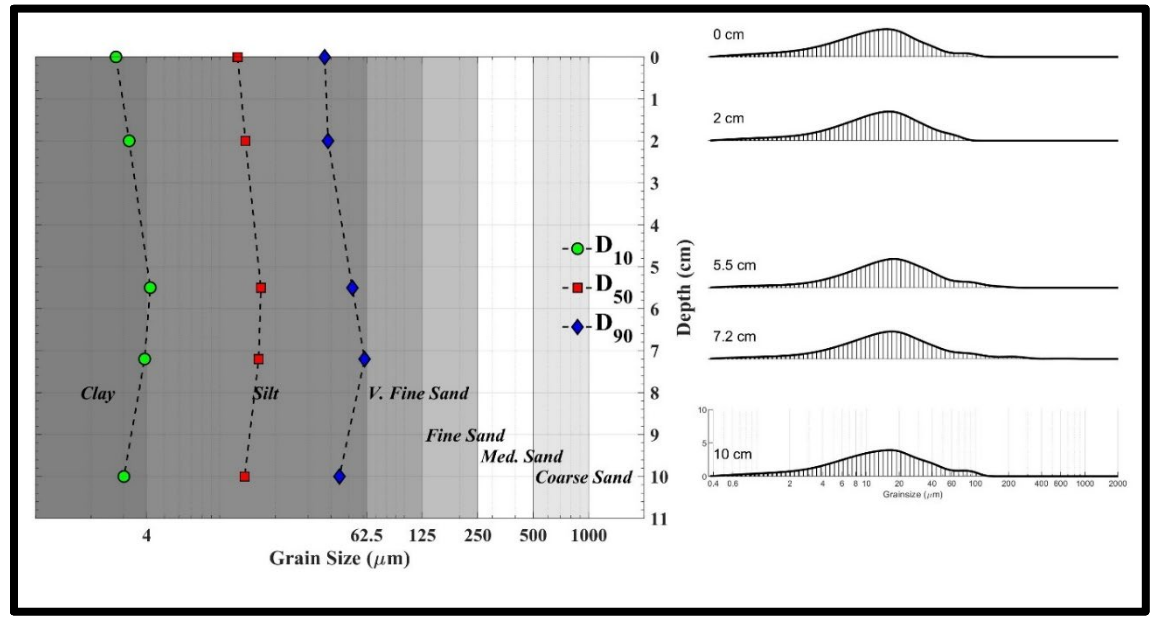
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-8
Core SF08

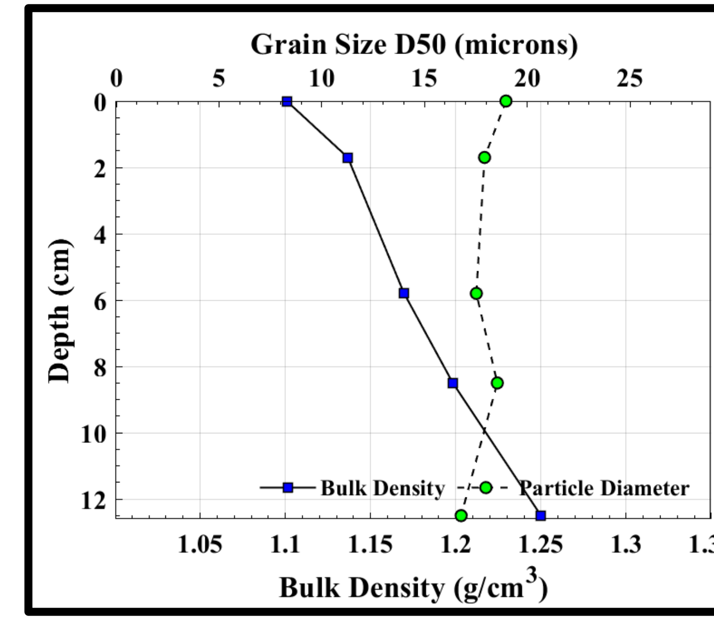
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	12.48	1.06	0.22	11.2	0.1	0.2	0.20	0.24	0.20
2	13.75	1.09	0.26	10.6	0.4	0.8	0.52	0.49	0.49
5.5	16.69	1.11	0.29	10.2	0.4	0.8	0.80	0.83	0.80
7.2	16.24	1.12	0.30	10.1	0.8	1.6	1.04	1.16	1.16
10	13.63	1.16	0.36	9.4	0.4	0.8	0.64	0.66	0.66
Mean	14.56	1.11	0.29	10.3	0.4	0.8	0.64	0.68	0.66

(5) Power Law Best-Fit Coefficients per Interval

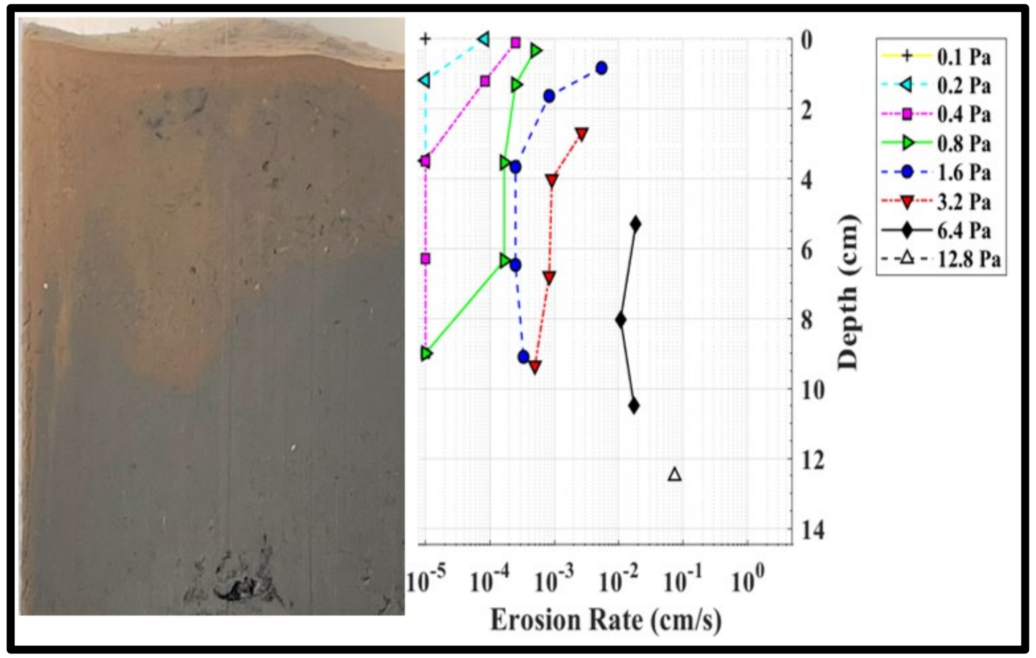
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2	1.61E-05	2.04	0.95
2	2	5.5	2.5E-06	2.33	0.98
3	5.5	7.2	6.99E-07	2.35	0.99
4	7.2	10	7.21E-08	2.95	0.86
5	10	14	2.11E-06	2.05	1

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

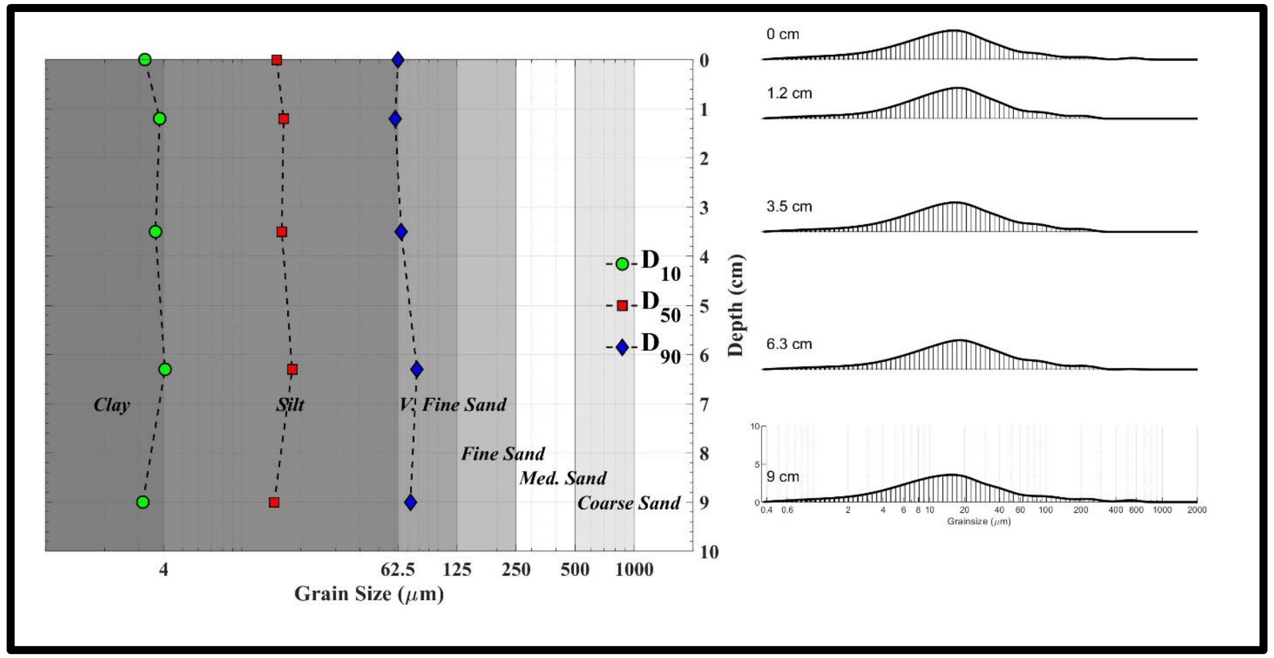
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-9
Core SF09

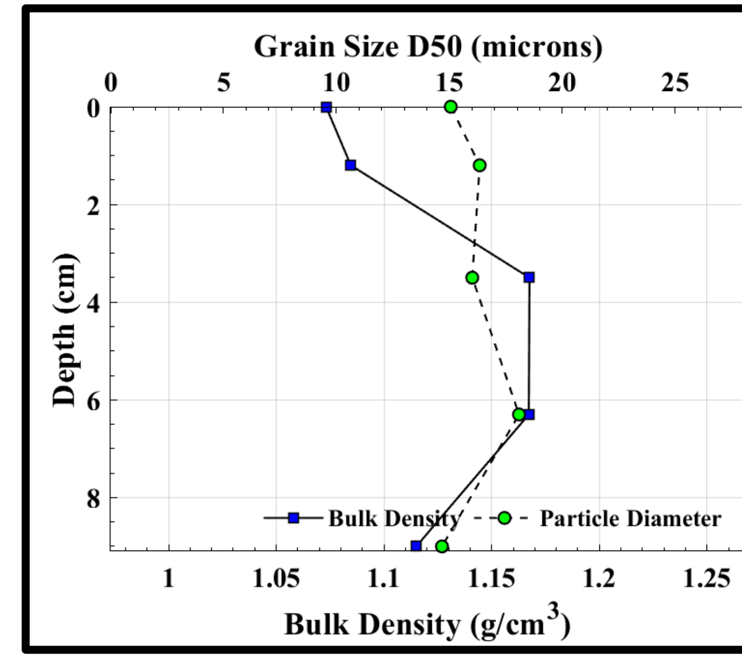
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	15.06	1.07	0.24	11.7	0.1	0.2	0.20	0.25	0.20
1.2	16.34	1.08	0.24	9.2	0.2	0.4	0.40	0.45	0.40
3.5	16.01	1.17	0.39	10.2	0.4	0.8	0.64	0.74	0.74
6.3	18.08	1.17	0.38	10.0	0.4	0.8	0.64	0.72	0.72
9	14.67	1.11	0.30	10.6	0.8	1.6	1.04	1.14	1.14
Mean	16.03	1.12	0.31	10.3	0.4	0.8	0.58	0.66	0.64

(5) Power Law Best-Fit Coefficients per Interval

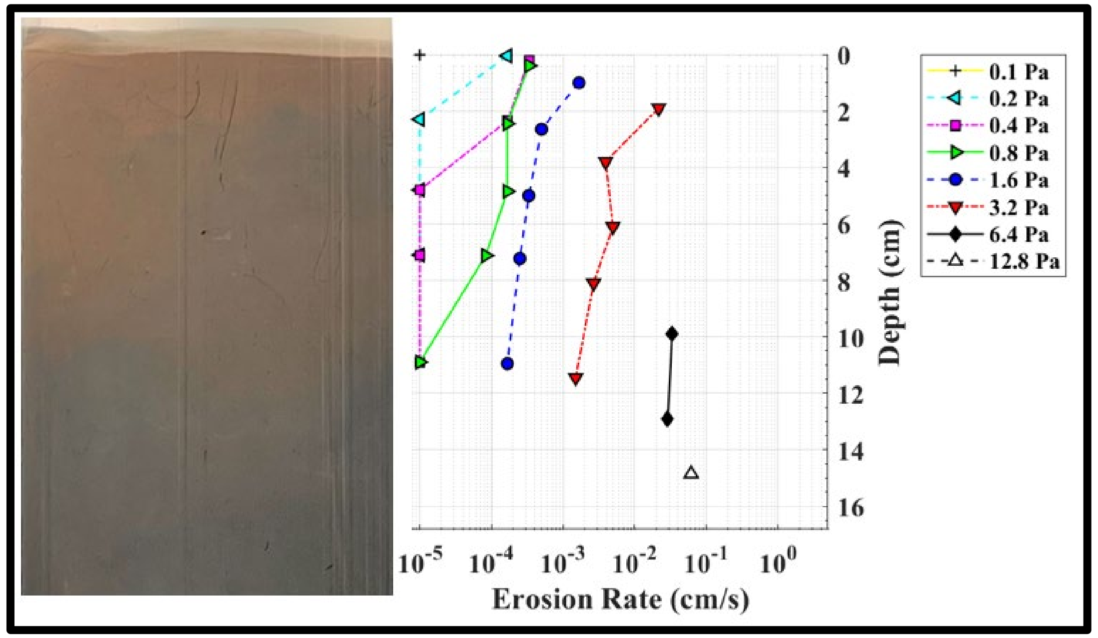
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.2	1.79E-05	1.91	0.93
2	1.2	3.5	8E-06	1.67	1
3	3.5	6.3	1.59E-06	2.06	0.89
4	6.3	9	2.54E-06	1.85	0.91
5	9	13.5	1.41E-07	2.7	0.94

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

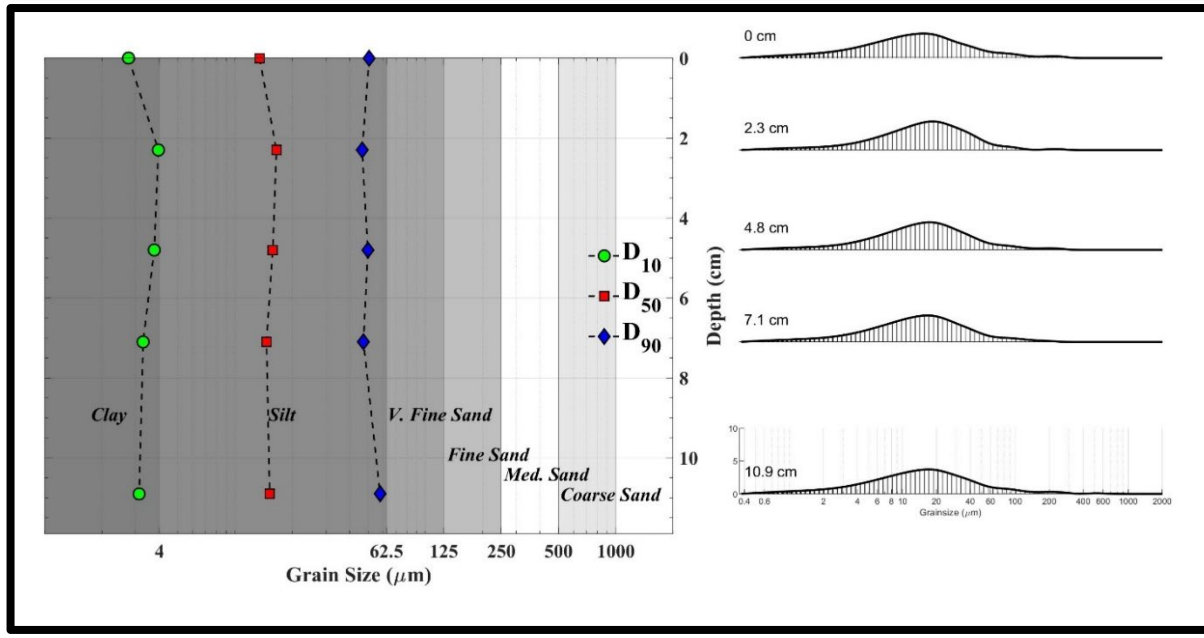
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-10
Core SF10

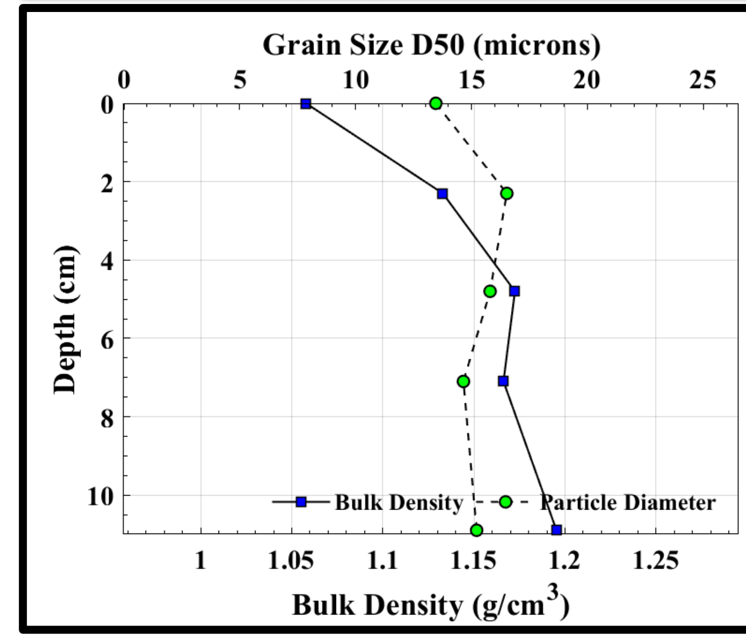
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	13.46	1.06	0.22	11.6	0.1	0.2	0.16	0.19	0.19
2.3	16.52	1.13	0.32	9.0	0.2	0.4	0.32	0.36	0.36
4.8	15.80	1.17	0.36	7.3	0.4	0.8	0.64	0.69	0.69
7.1	14.65	1.17	0.37	9.2	0.4	0.8	0.80	0.98	0.80
10.9	15.22	1.20	0.43	9.5	0.8	1.6	1.28	1.27	1.27
Mean	15.13	1.15	0.34	9.3	0.4	0.8	0.64	0.70	0.66

(5) Power Law Best-Fit Coefficients per Interval

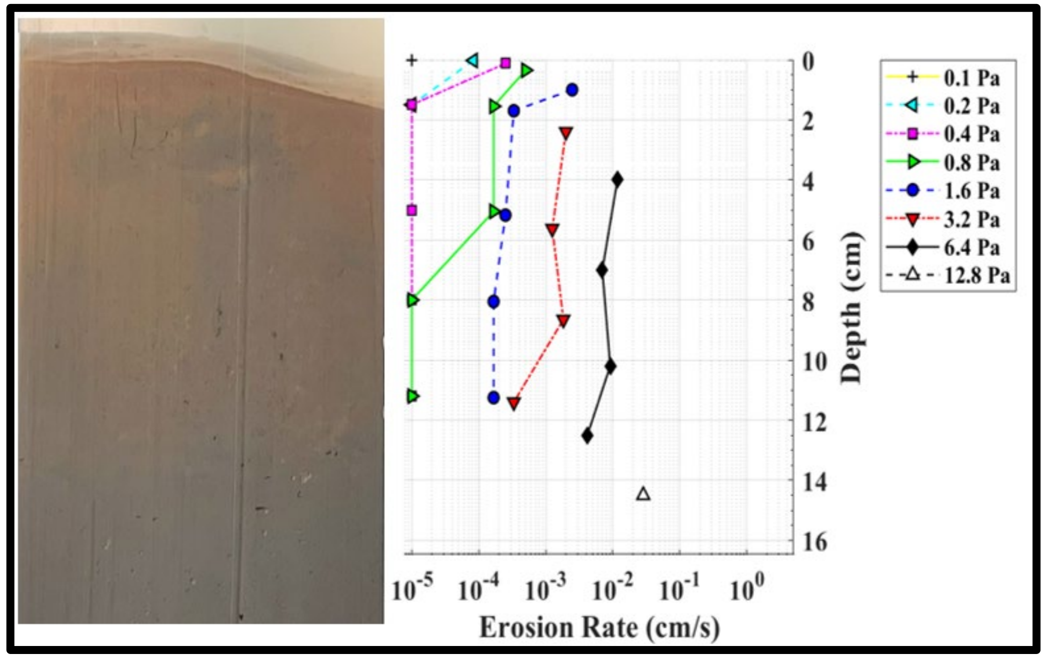
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.3	3.8E-05	1.56	0.87
2	2.3	4.8	1.58E-05	1.43	0.87
3	4.8	7.1	1.21E-06	2.29	0.92
4	7.1	10.9	1.23E-07	2.93	0.97
5	10.9	15.8	4.92E-08	3	0.97

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

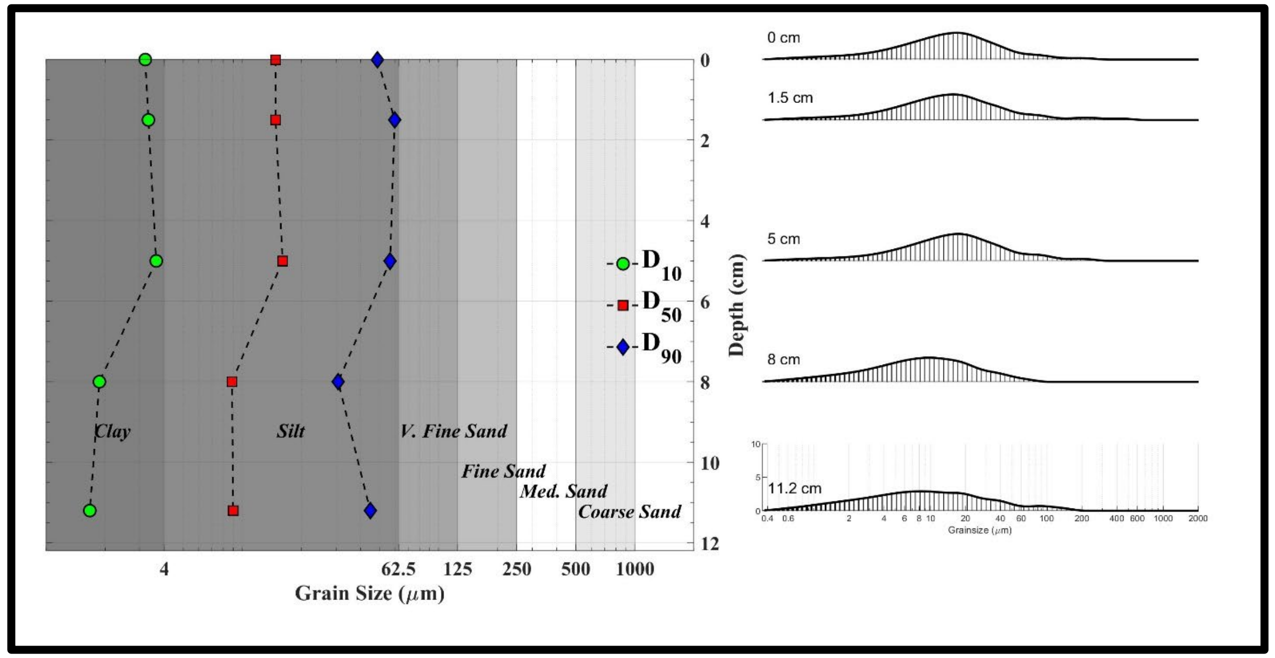
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-11
Core SF11

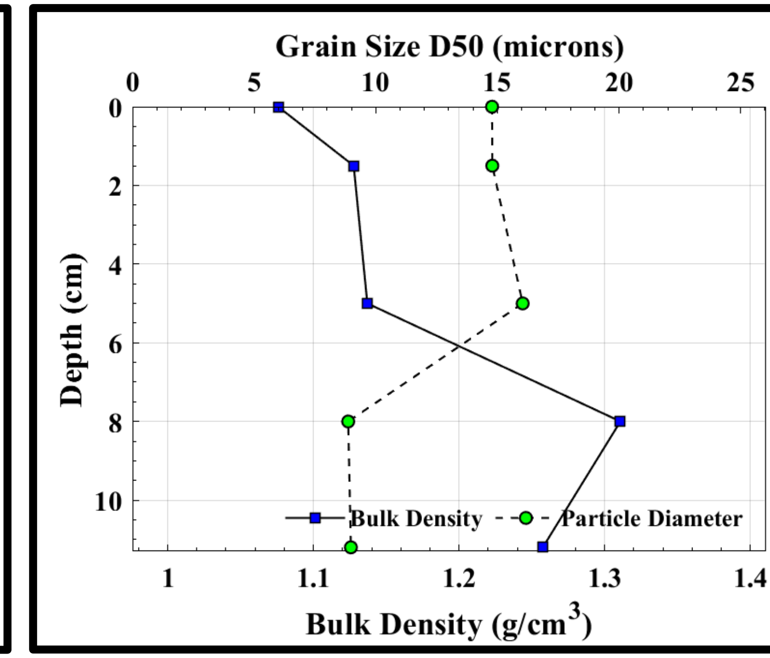
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.78	1.08	0.24	10.9	0.1	0.2	0.20	0.23	0.20
1.5	14.79	1.13	0.32	10.0	0.4	0.8	0.64	0.69	0.69
5	16.04	1.14	0.33	9.3	0.4	0.8	0.64	0.70	0.70
8	8.87	1.31	0.58	6.3	0.8	1.6	1.28	1.28	1.28
11.2	8.98	1.26	0.48	5.4	0.8	1.6	1.28	1.42	1.42
Mean	12.69	1.18	0.39	8.4	0.5	1.0	0.81	0.86	0.86

(5) Power Law Best-Fit Coefficients per Interval

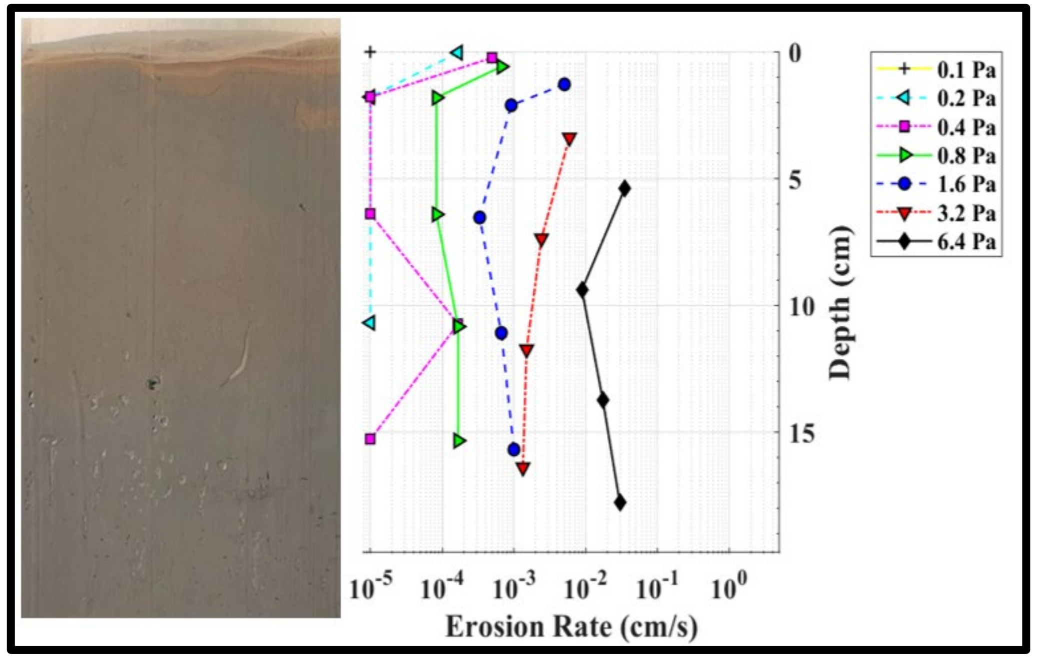
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.5	2.64E-05	1.57	0.98
2	1.5	5	2.02E-06	2.02	0.97
3	5	8	3.22E-06	1.77	0.96
4	8	11.2	6.3E-08	2.89	0.99
5	11.2	15.5	1.48E-07	2.46	0.96

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

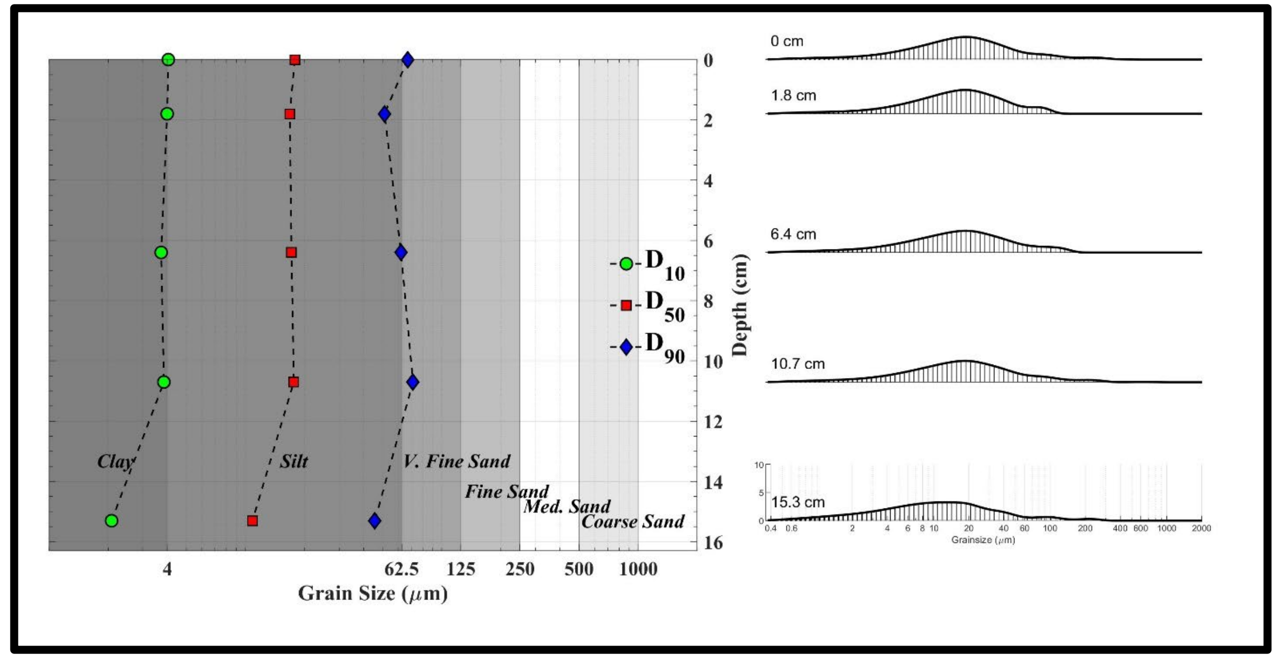
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-12
Core SF12

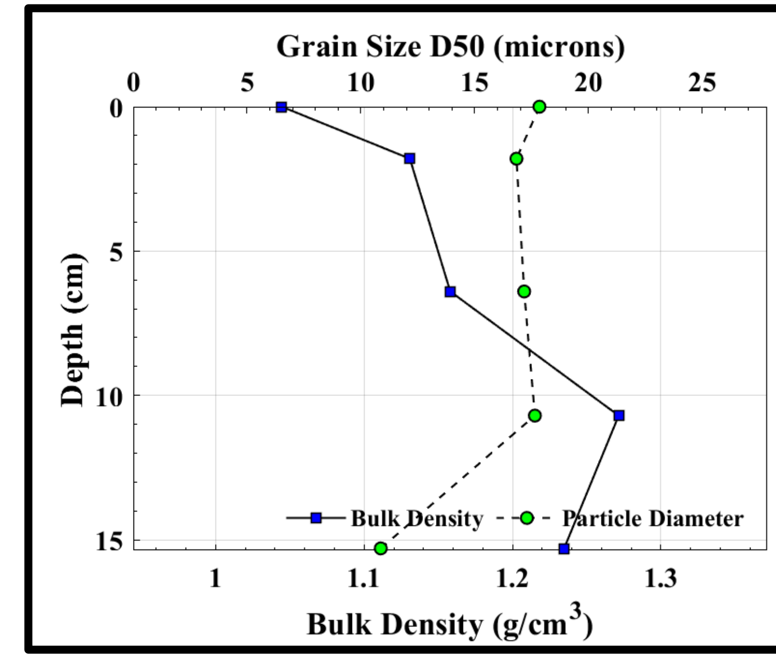
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.84	1.04	0.20	12.5	0.1	0.2	0.16	0.16	0.16
1.8	16.83	1.13	0.33	10.5	0.4	0.8	0.80	0.80	0.80
6.4	17.17	1.16	0.37	9.9	0.4	0.8	0.80	0.88	0.80
10.7	17.64	1.27	0.54	8.4	0.2	0.4	0.32	0.39	0.39
15.3	10.87	1.23	0.47	7.7	0.4	0.8	0.64	0.66	0.66
Mean	16.07	1.17	0.38	9.8	0.3	0.6	0.54	0.58	0.56

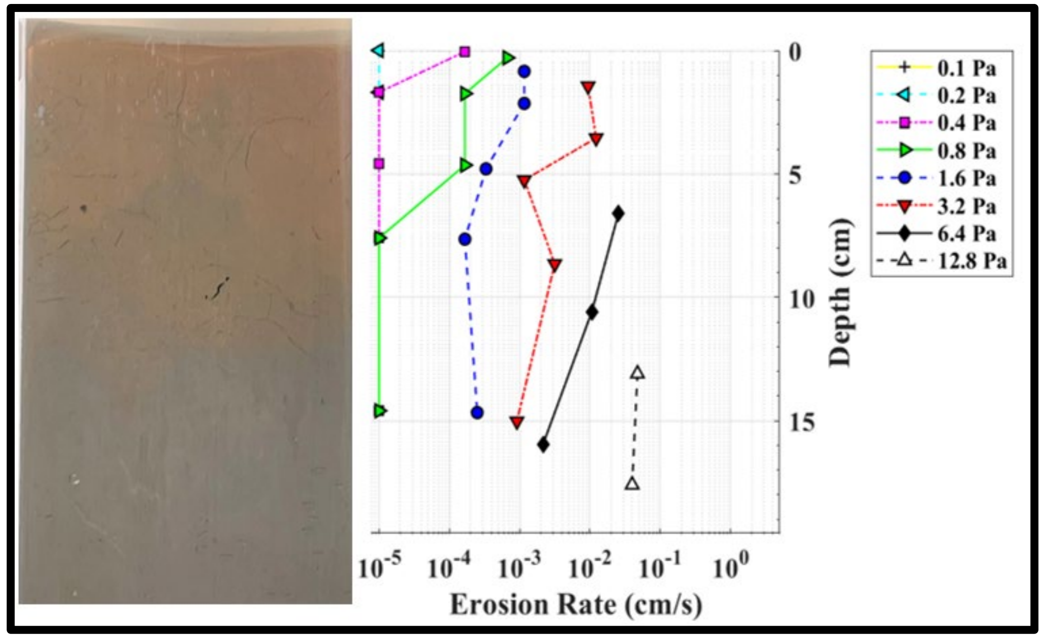
(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.8	5.03E-05	1.54	0.94
2	1.8	6.4	2.47E-07	2.88	0.99
3	6.4	10.7	6.63E-07	2.3	0.99
4	10.7	15.3	1.22E-05	1.56	0.91
5	15.3	18.8	1.43E-06	2.26	0.93

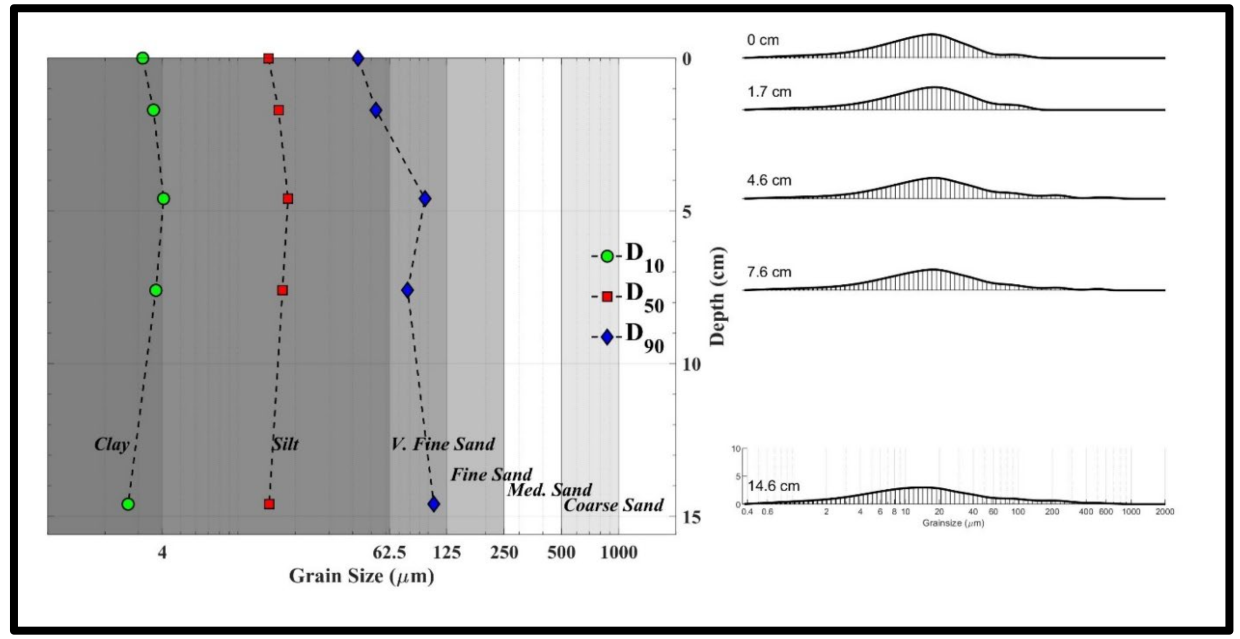
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-13
Core SF13

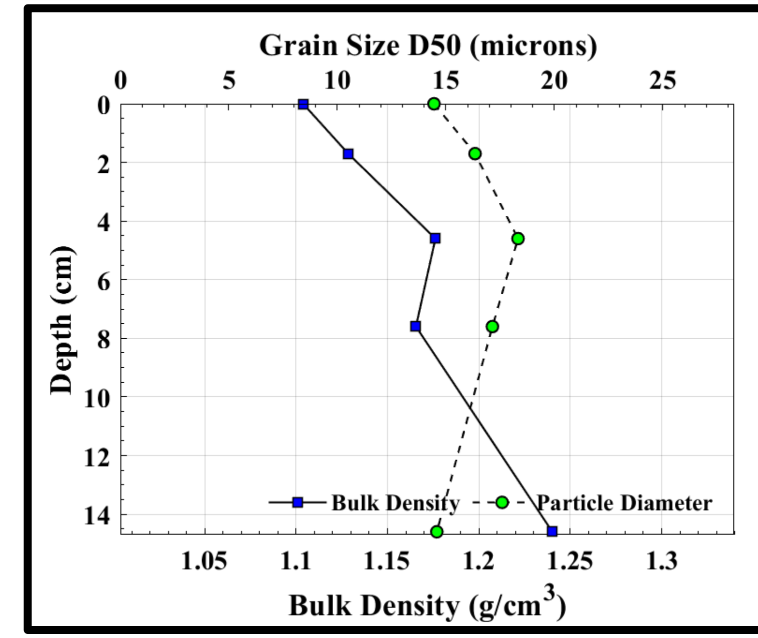
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	14.45	1.1	0.25	7.3	0.2	0.4	0.32	0.32	0.32
1.7	16.34	1.13	0.29	7.4	0.4	0.8	0.64	0.66	0.66
4.6	18.32	1.18	0.37	7.2	0.4	0.8	0.64	0.73	0.73
7.6	17.14	1.17	0.35	7.4	0.8	1.6	1.28	1.19	1.19
14.6	14.58	1.24	0.47	6.8	0.8	1.6	1.12	1.17	1.17
Mean	16.17	1.16	0.35	7.2	0.5	1.0	0.80	0.81	0.81

(5) Power Law Best-Fit Coefficients per Interval

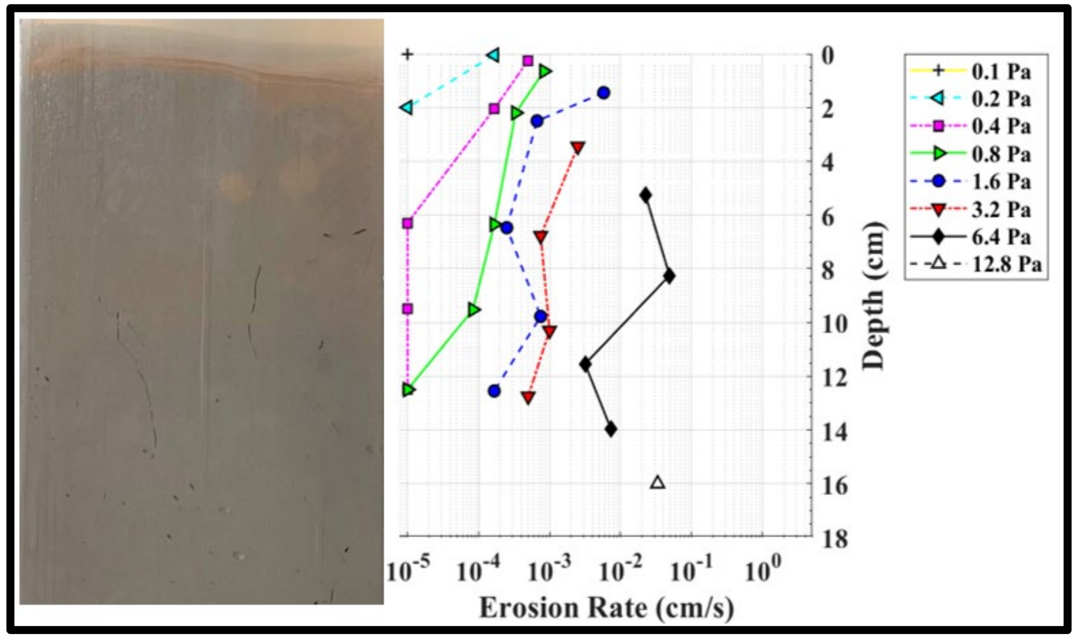
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.7	1.2E-05	1.84	0.97
2	1.7	4.6	3.45E-07	2.99	1
3	4.6	7.6	1.24E-06	2.21	0.91
4	7.6	14.6	1.17E-07	2.73	0.97
5	14.6	18.6	3.81E-07	2.27	0.95

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

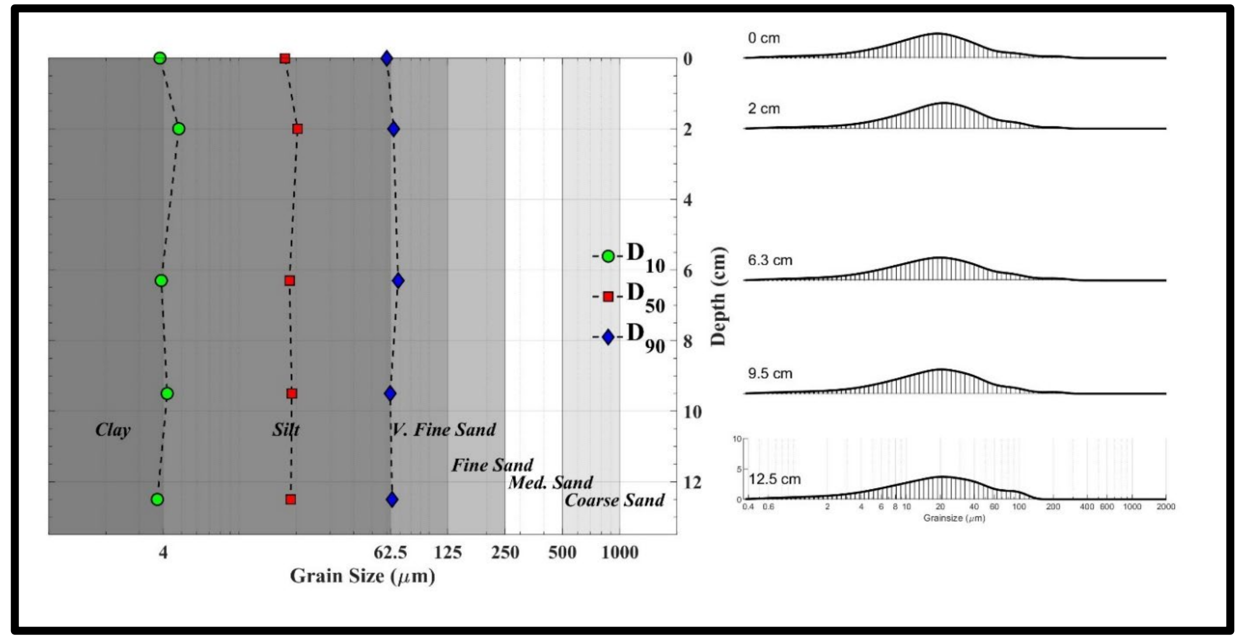
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-14
Core SF14

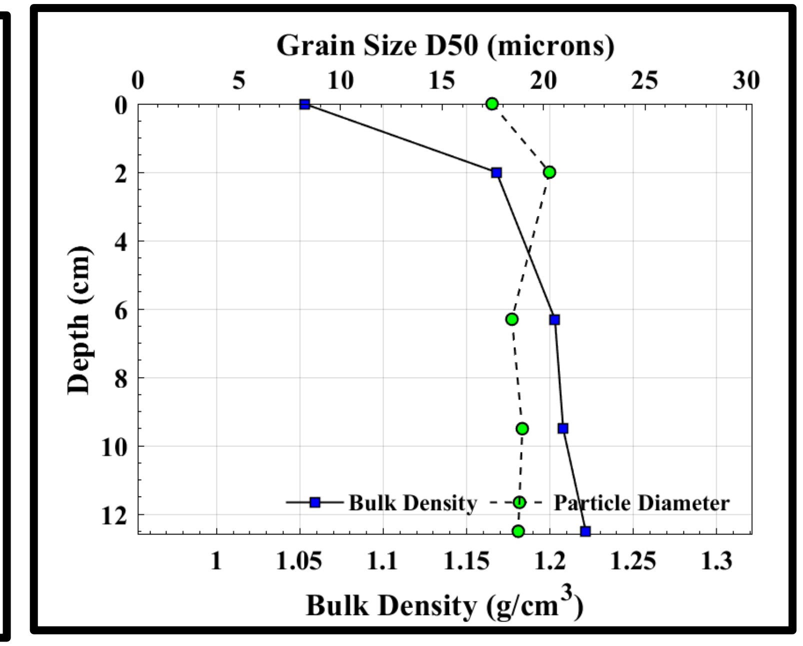
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.46	1.05	0.17	7.9	0.1	0.2	0.16	0.16	0.16
2	20.29	1.17	0.36	7.5	0.2	0.4	0.32	0.35	0.35
6.3	18.44	1.20	0.42	7.7	0.4	0.8	0.64	0.78	0.78
9.5	18.95	1.21	0.43	7.6	0.4	0.8	0.80	0.70	0.70
12.5	18.75	1.22	0.44	7.2	0.8	1.6	1.28	1.37	1.37
Mean	18.78	1.17	0.36	7.6	0.4	0.76	0.64	0.67	0.67

(5) Power Law Best-Fit Coefficients per Interval

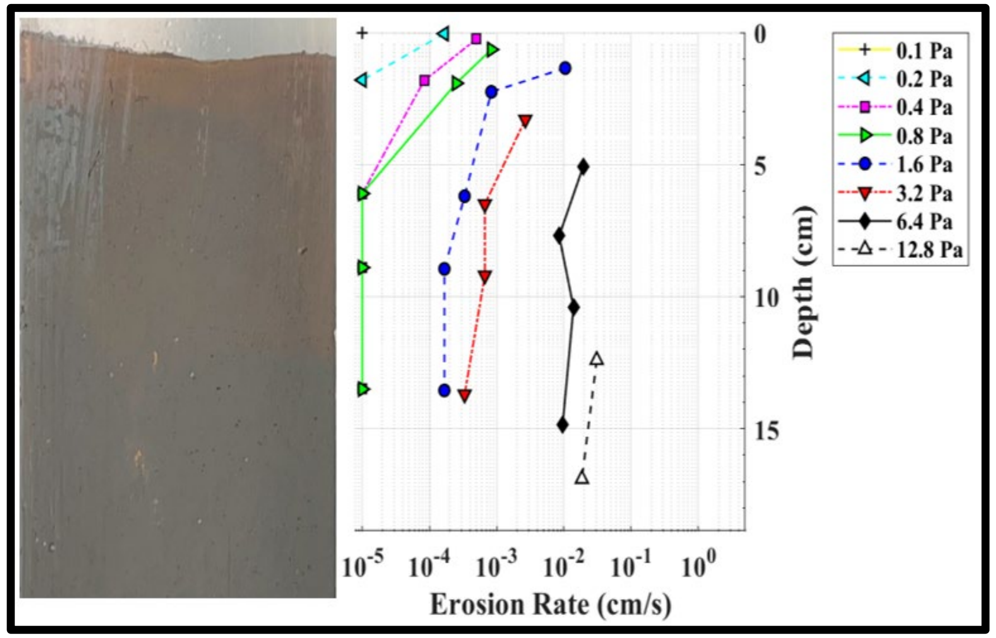
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2	4.77E-05	1.62	0.96
2	2	6.3	1.24E-05	1.65	0.95
3	6.3	9.5	7.66E-07	2.37	0.83
4	9.5	12.5	4.32E-06	1.62	0.91
5	12.5	17	1.14E-07	2.59	0.98

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

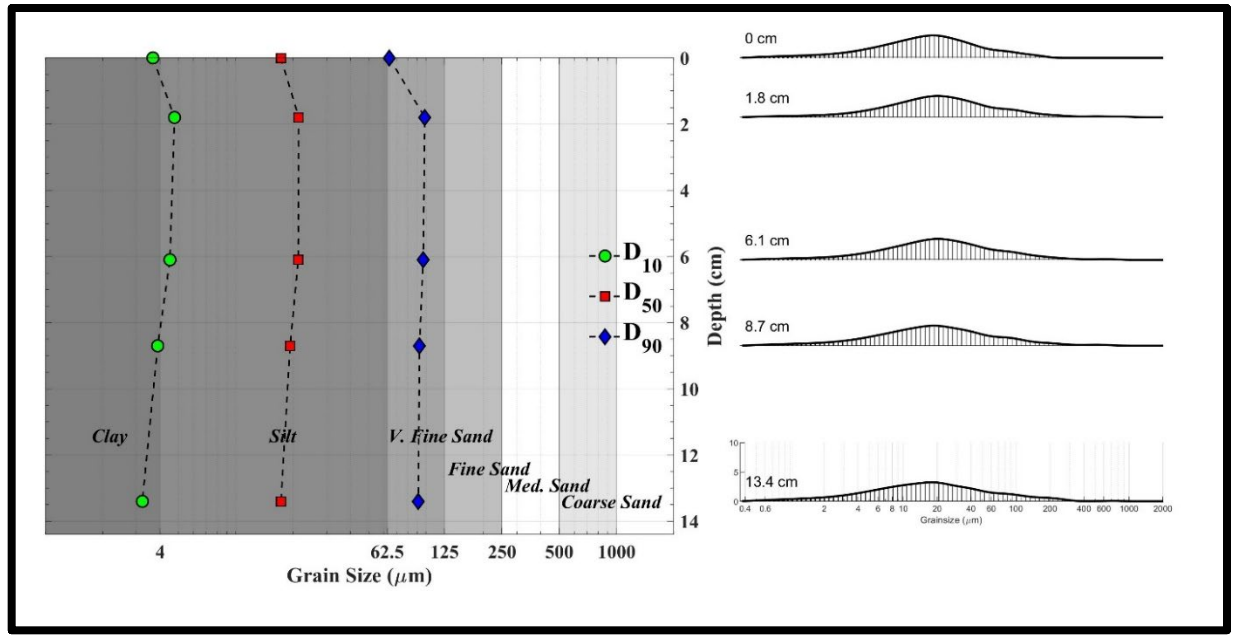
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-15
Core SF15

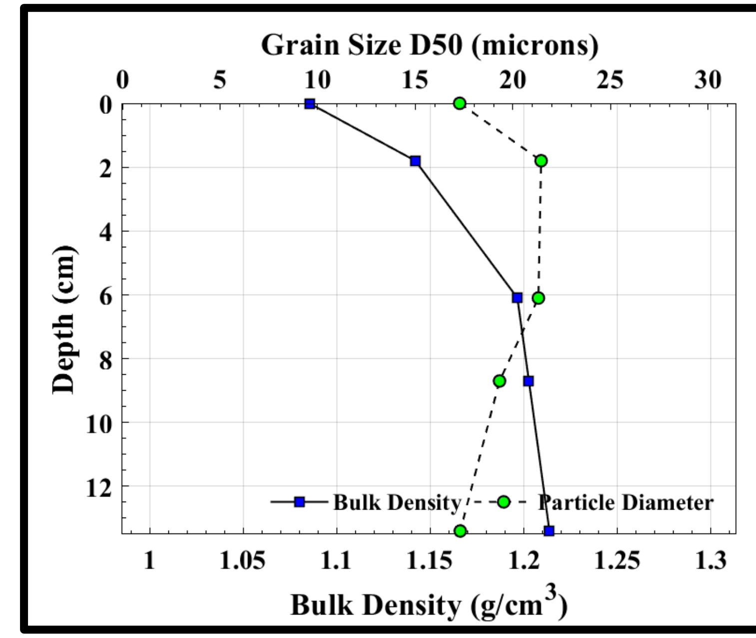
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.27	1.09	0.23	8.2	0.1	0.2	0.16	0.17	0.17
1.8	21.44	1.14	0.32	7.6	0.2	0.4	0.40	0.49	0.40
6.1	21.30	1.20	0.41	7.6	0.8	1.6	1.04	1.06	1.06
8.7	19.31	1.20	0.41	7.4	0.8	1.6	1.28	1.32	1.32
13.4	17.30	1.21	0.43	7.4	0.8	1.6	1.28	1.37	1.37
Mean	19.32	1.17	0.36	7.6	0.5	1.1	0.83	0.88	0.86

(5) Power Law Best-Fit Coefficients per Interval

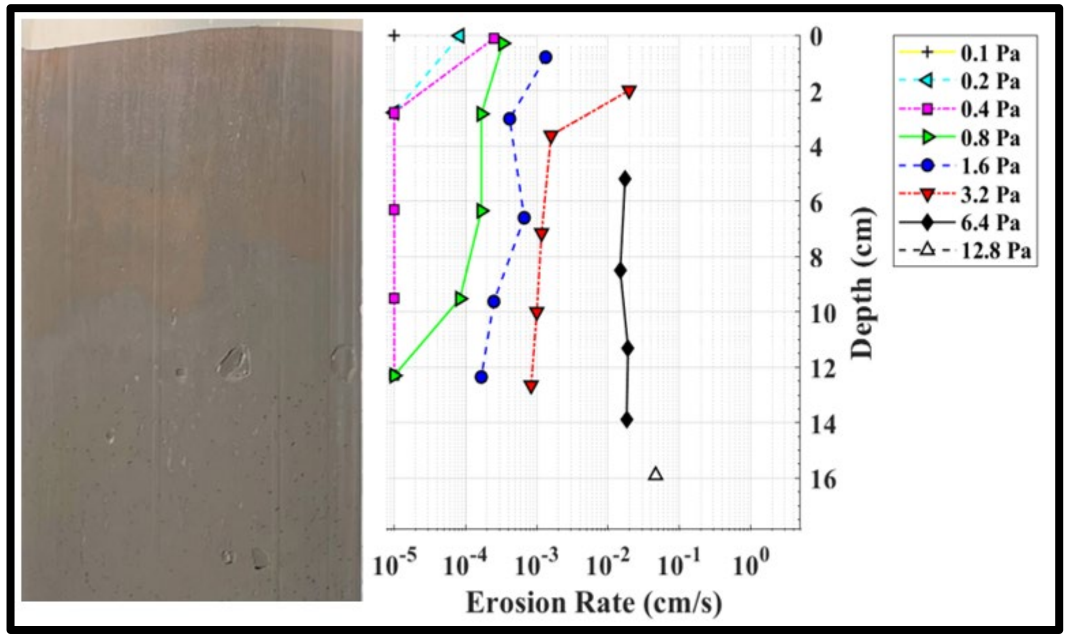
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.8	3.95E-05	1.83	0.93
2	1.8	6.1	4.88E-06	1.91	0.98
3	6.1	8.7	4.52E-07	2.29	0.95
4	8.9	13.4	1.06E-07	2.66	0.97
5	13.5	17.9	1.7E-07	2.44	0.94

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

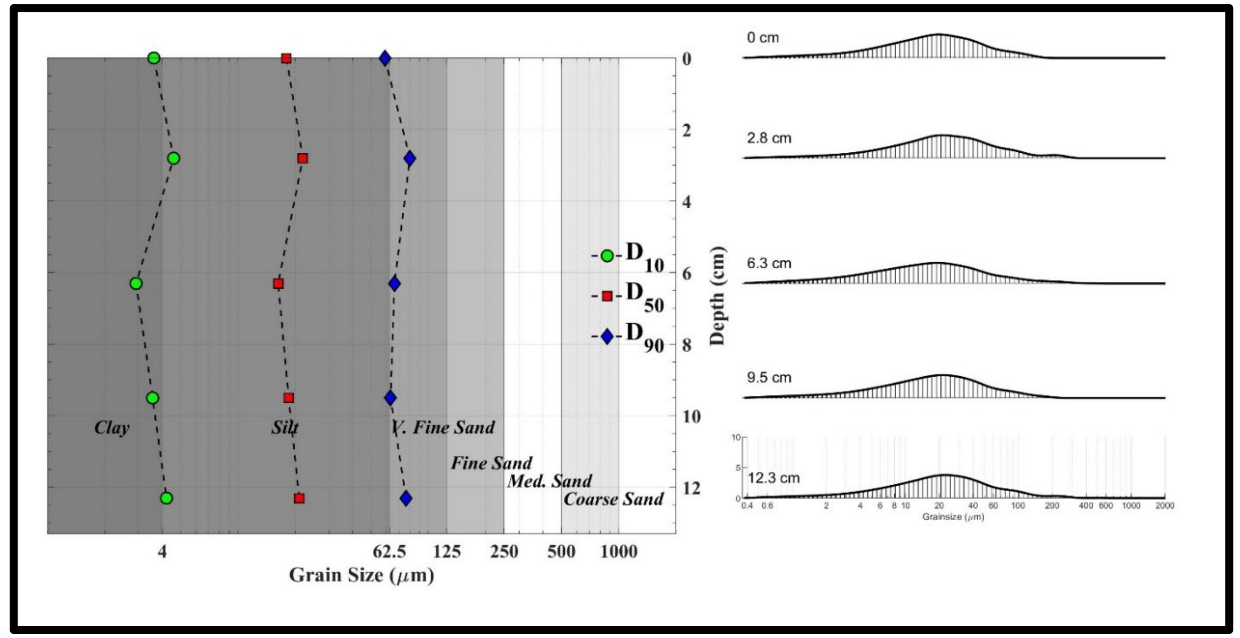
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-16
Core SF16

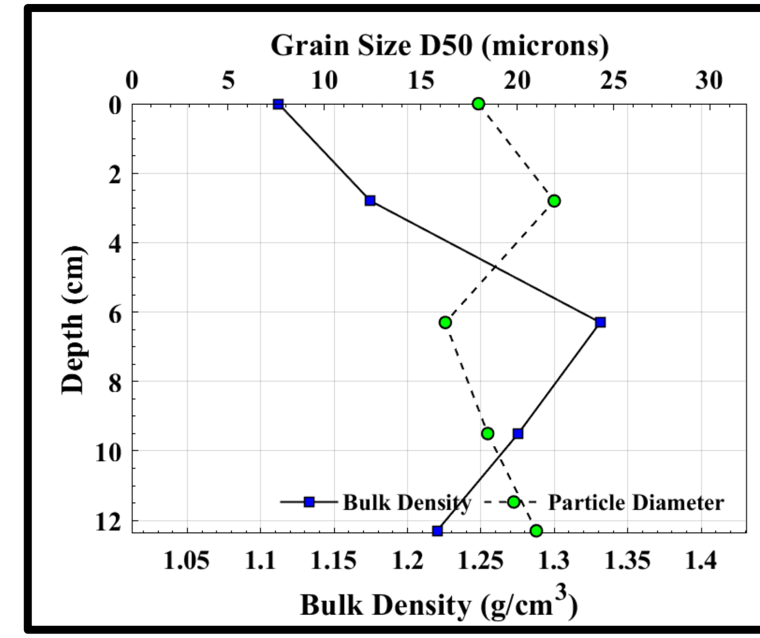
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.99	1.11	0.27	8.5	0.1	0.2	0.2	0.27	0.20
2.8	21.92	1.17	0.37	7.5	0.4	0.8	0.64	0.69	0.69
6.3	16.27	1.33	0.62	6.8	0.4	0.8	0.64	0.66	0.66
9.5	18.47	1.28	0.53	6.7	0.4	0.8	0.8	1.00	0.80
12.3	20.99	1.22	0.45	7.5	0.8	1.6	1.28	1.31	1.31
Mean	19.13	1.22	0.45	7.4	0.4	0.84	0.71	0.79	0.73

(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.8	1.62E-05	1.82	0.9
2	2.8	6.3	1.67E-06	2.12	0.96
3	6.3	9.5	2.34E-06	2	0.95
4	9.5	12.3	2.78E-07	2.55	0.94
5	12.3	16.9	6.61E-08	2.84	0.97

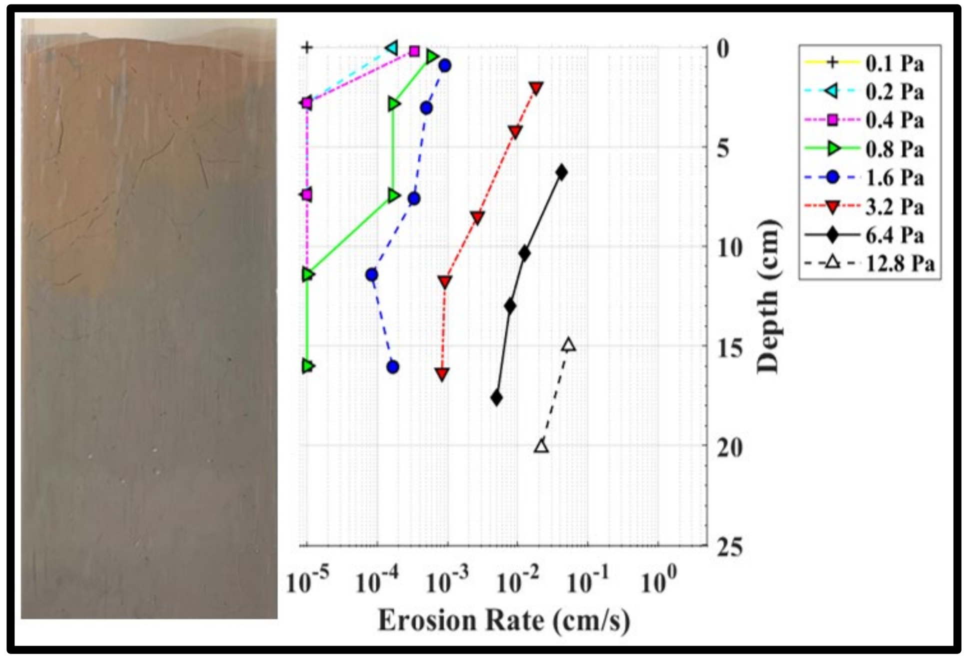
Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

PACIFIC groundwater GROUP HGL HydroGeoLogic, Inc MOTT MACDONALD BRIDGEWATER GROUP integral consulting inc.

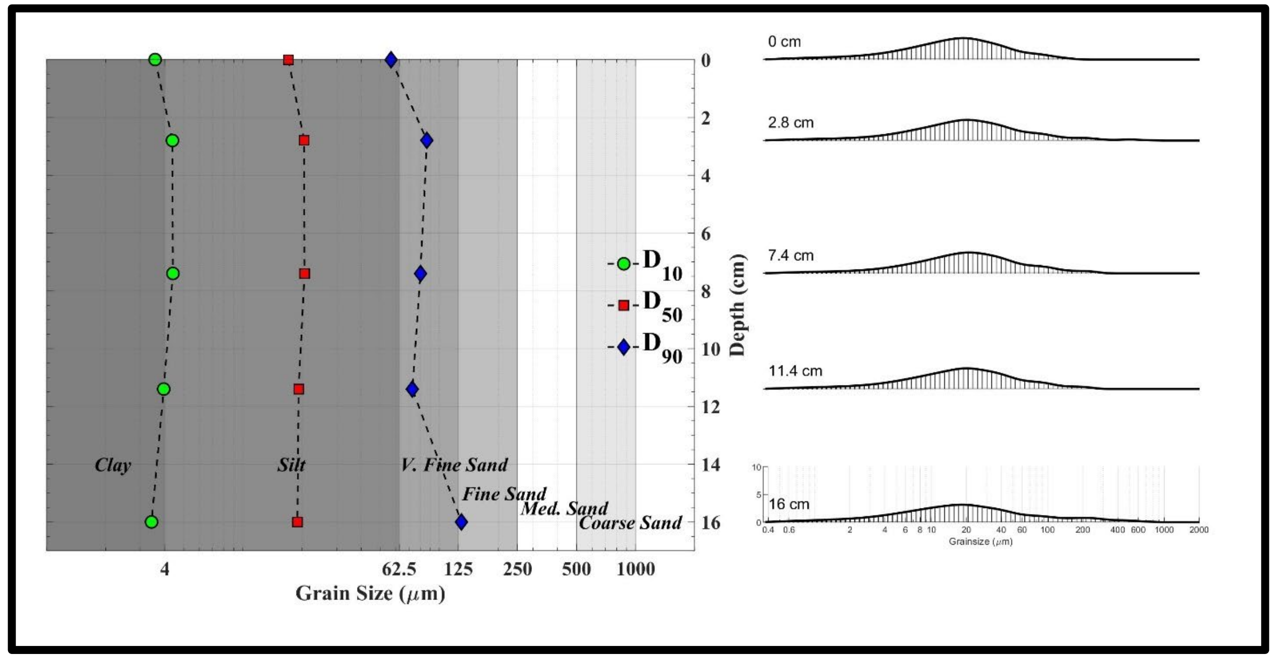
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-17
Core SF17

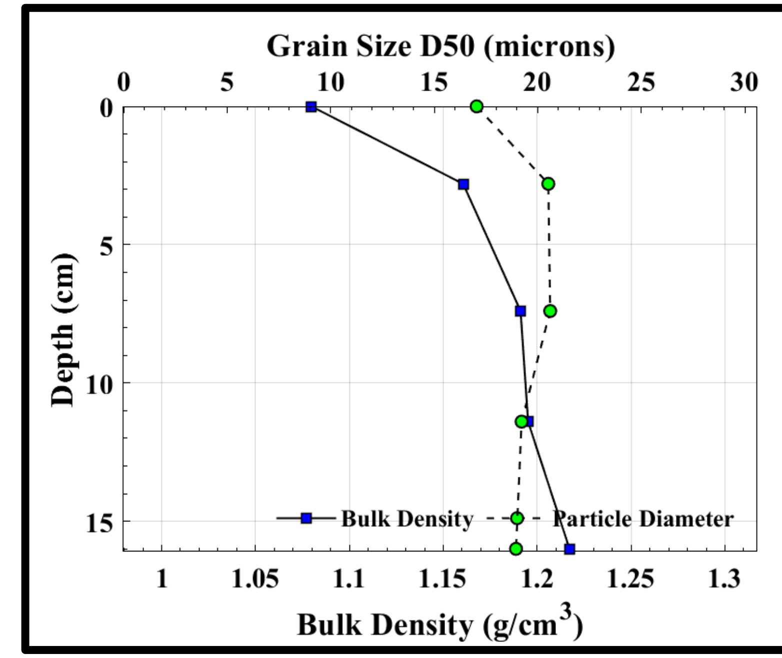
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.05	1.08	0.23	9.5	0.1	0.2	0.16	0.18	0.18
2.8	20.51	1.16	0.35	8.1	0.4	0.8	0.64	0.69	0.69
7.4	20.60	1.19	0.40	7.9	0.4	0.8	0.64	0.69	0.69
11.4	19.22	1.20	0.42	8.5	0.8	1.6	1.60	1.63	1.60
16	18.95	1.22	0.44	7.6	0.8	1.6	1.28	1.28	1.28
Mean	19.27	1.17	0.37	8.3	0.5	1.0	0.86	0.89	0.89

(5) Power Law Best-Fit Coefficients per Interval

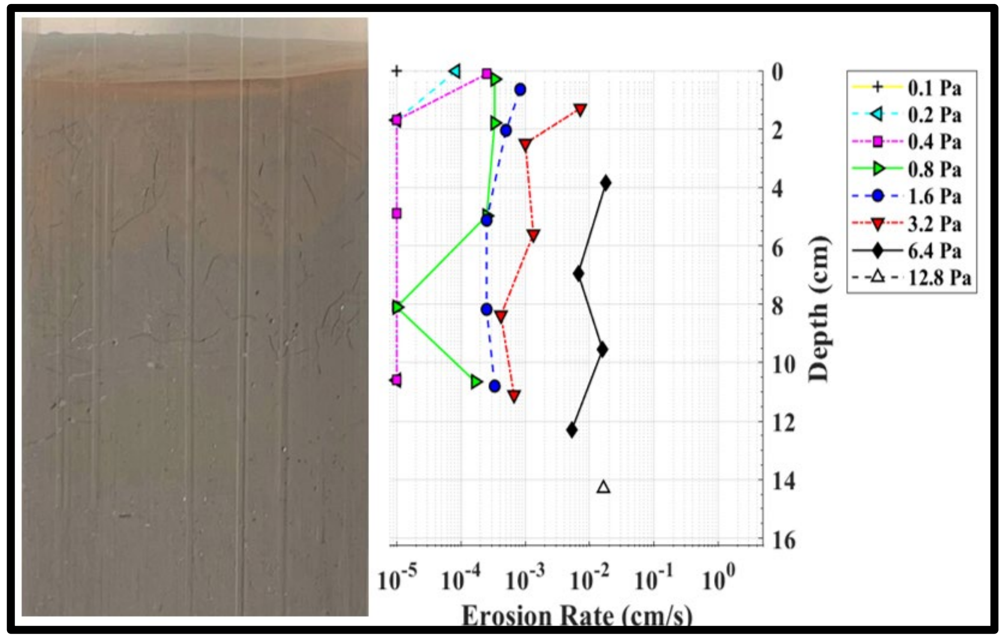
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.8	4.41E-05	1.45	0.87
2	2.8	7.4	5.42E-07	2.7	0.98
3	7.4	11.4	1.77E-06	2.09	0.98
4	11.4	16	1.75E-08	3.1	1
5	16	21.6	2.41E-07	2.36	1

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

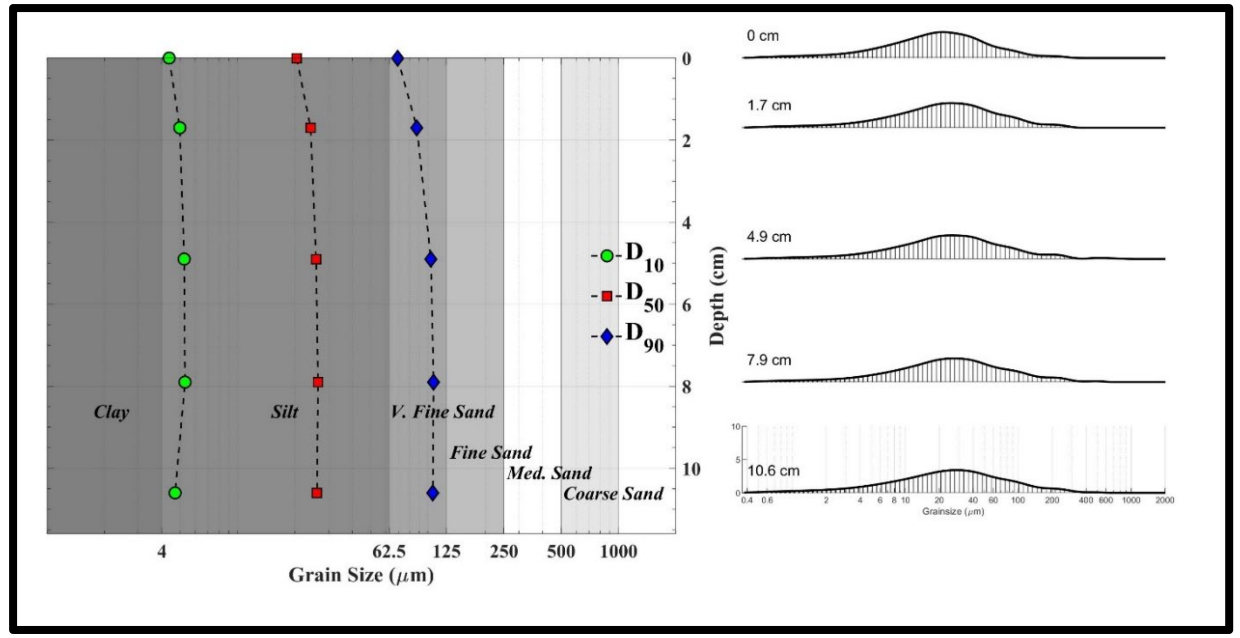
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-18
Core SF18

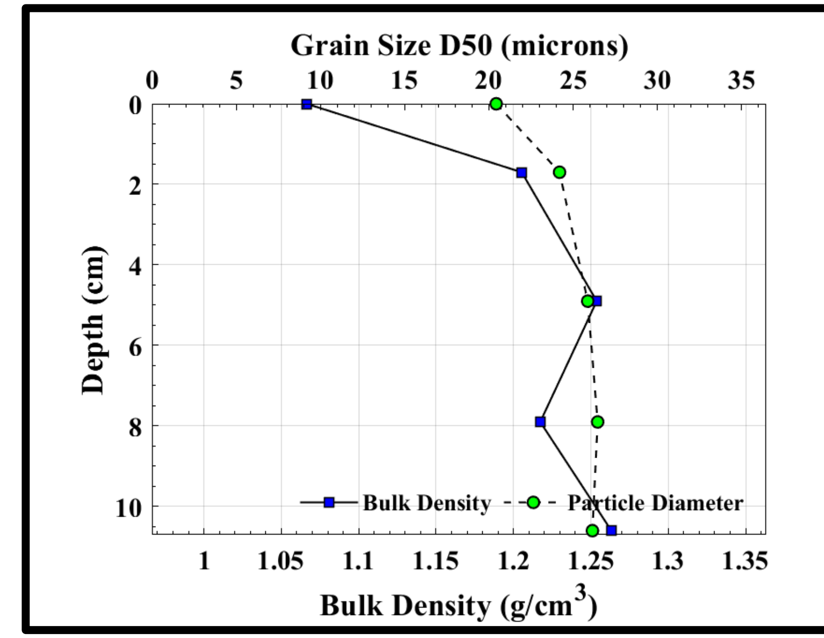
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	20.43	1.07	0.21	9.9	0.1	0.2	0.20	0.26	0.20
1.7	24.19	1.21	0.42	7.9	0.4	0.8	0.52	0.53	0.53
4.9	25.86	1.25	0.50	7.4	0.4	0.8	0.56	0.59	0.59
7.9	26.45	1.22	0.44	7.6	0.8	1.6	1.12	1.24	1.24
10.6	26.14	1.26	0.52	7.6	0.4	0.8	0.64	0.69	0.69
Mean	24.61	1.20	0.42	8.1	0.4	0.8	0.61	0.66	0.65

(5) Power Law Best-Fit Coefficients per Interval

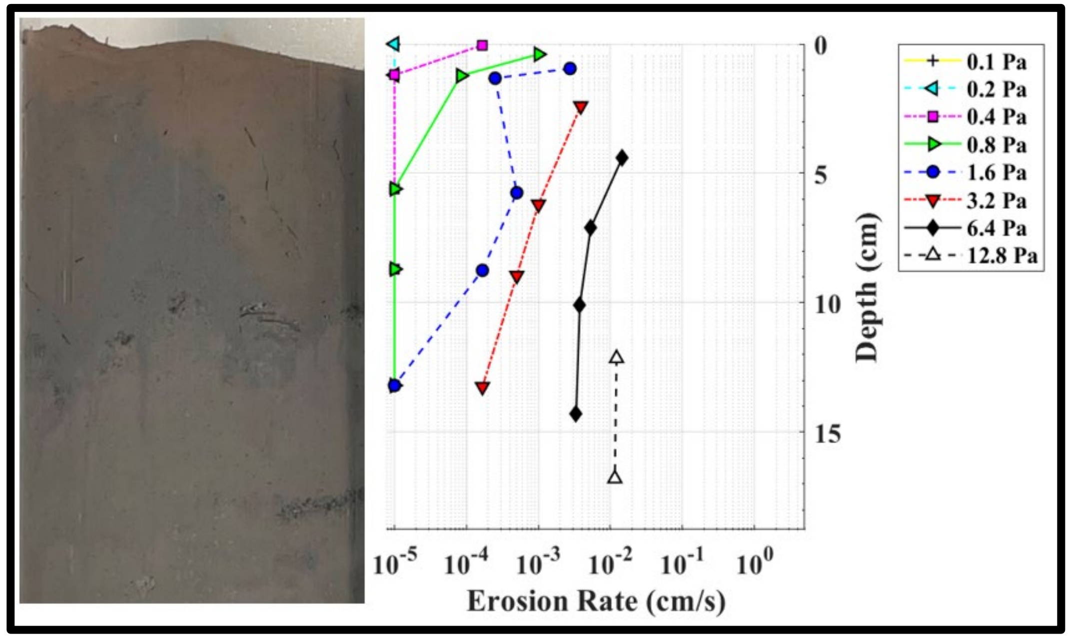
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.7	2.55E-05	1.46	0.91
2	1.7	4.9	4.94E-06	1.79	0.89
3	4.9	7.9	5.73E-06	1.61	0.93
4	8.1	10.6	1.12E-07	2.7	0.88
5	10.6	15.3	3.88E-06	1.68	0.97

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

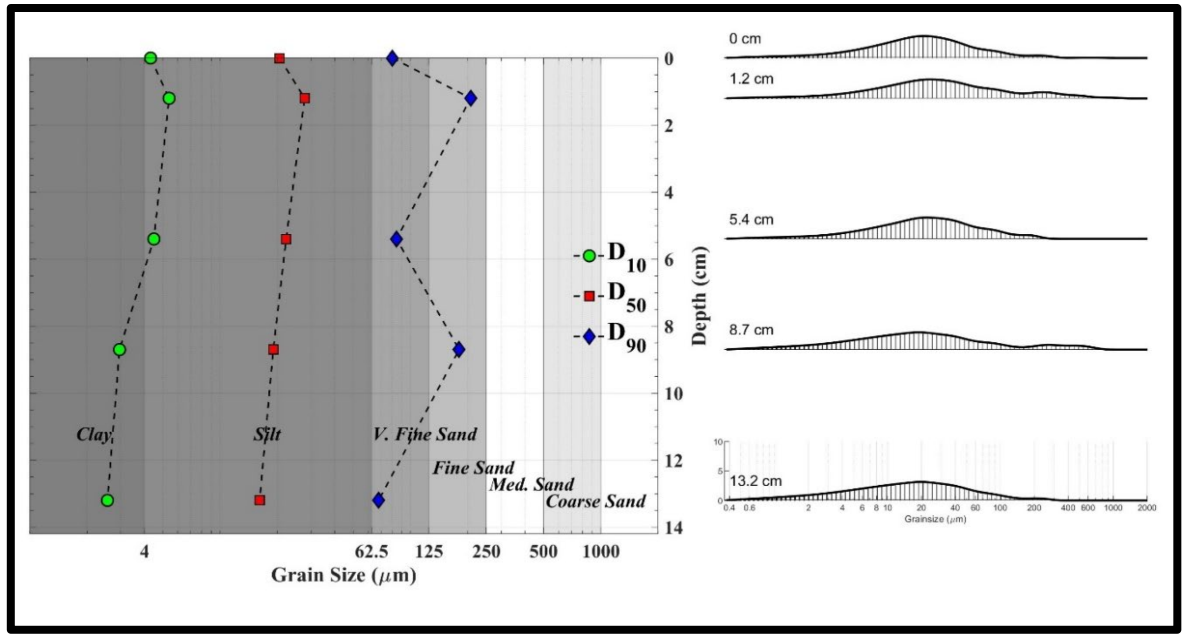
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-19
Core SF19

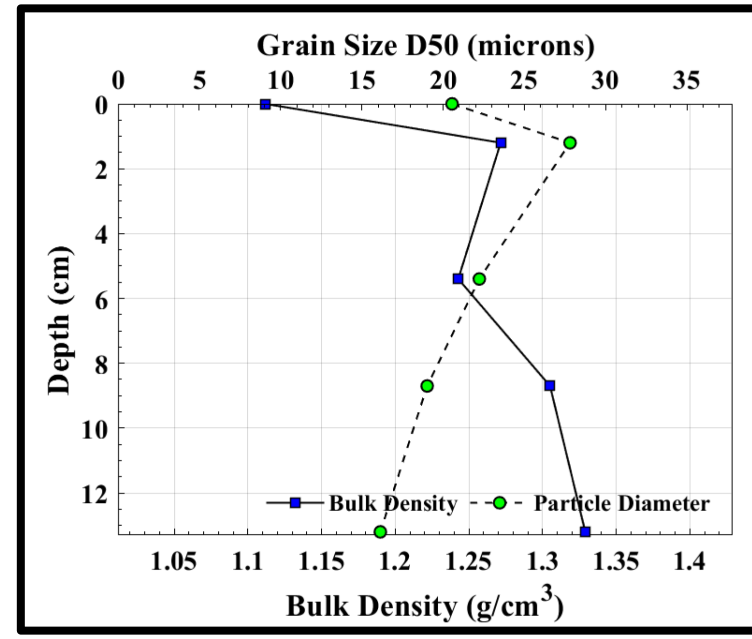
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	20.55	1.11	0.29	9.7	0.2	0.4	0.32	0.31	0.31
1.2	27.81	1.27	0.52	6.5	0.4	0.8	0.8	0.93	0.80
5.4	22.23	1.24	0.48	7.3	0.8	1.6	0.96	0.87	0.87
8.7	19.02	1.31	0.56	5.6	0.8	1.6	1.28	1.30	1.30
13.2	16.14	1.33	0.61	6.2	1.6	3.2	2.56	2.51	2.51
Mean	21.15	1.25	0.49	7.1	0.8	1.5	1.18	1.18	1.16

(5) Power Law Best-Fit Coefficients per Interval

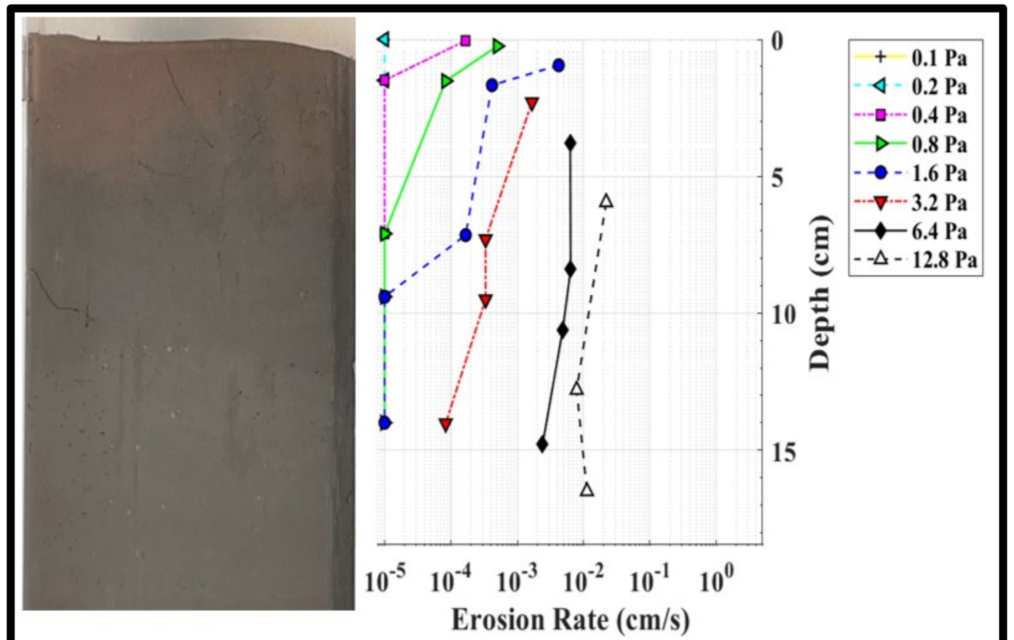
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.2	9.44E-06	2.1	0.98
2	1.2	5.4	2.84E-07	2.63	0.97
3	5.6	7.7	1.45E-06	1.96	0.97
4	8.7	13.2	4.25E-07	2.13	0.99
5	13.2	18.3	4.45E-09	3.11	0.97

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

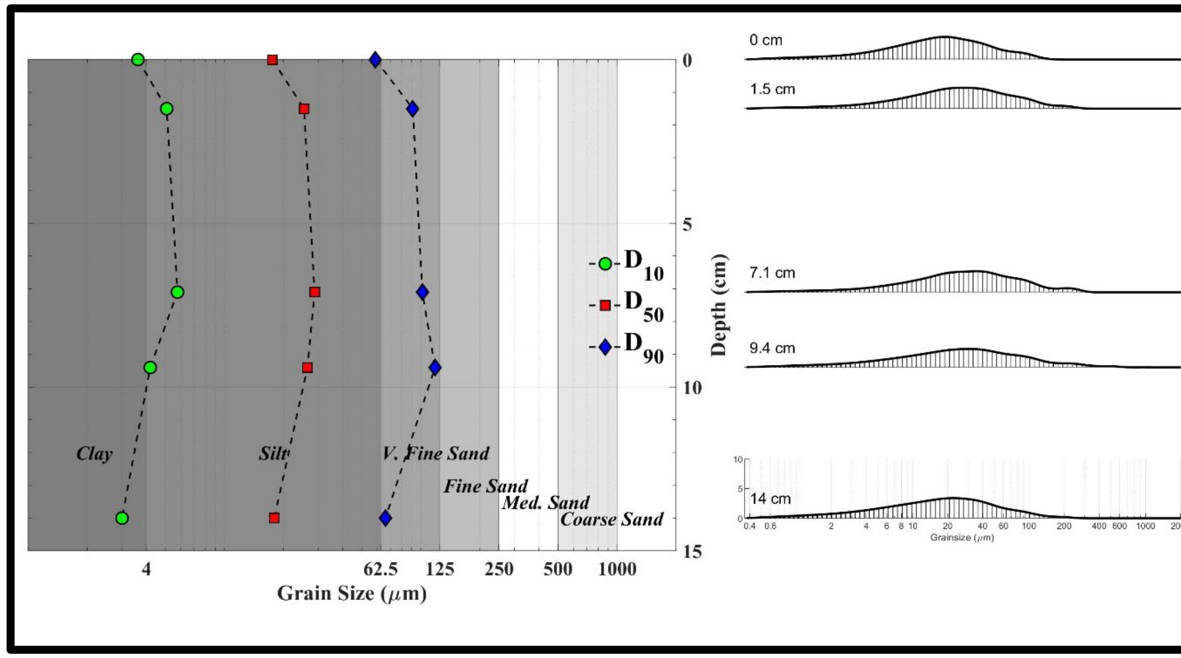
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-20
Core SF20

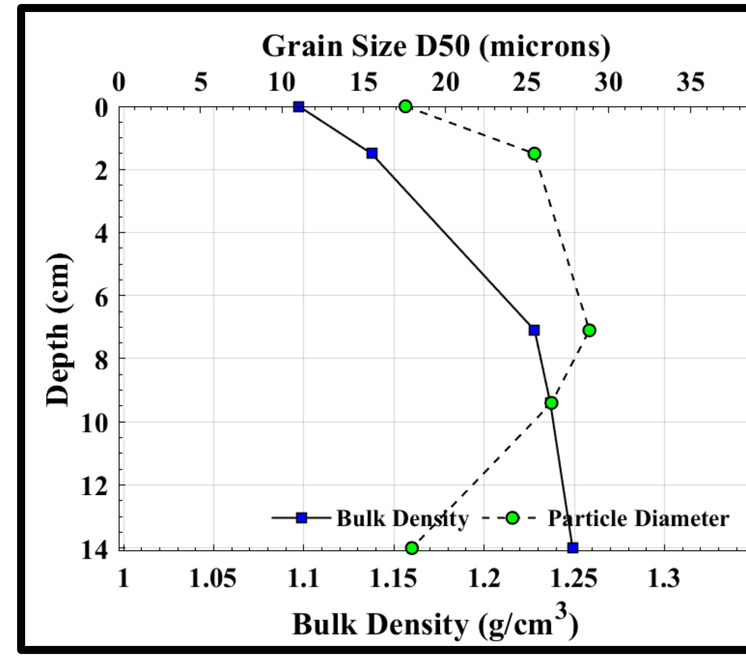
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	17.55	1.10	0.28	10.9	0.2	0.4	0.32	0.33	0.33
1.5	25.44	1.14	0.33	10.0	0.4	0.8	0.80	0.82	0.80
7.1	28.80	1.23	0.48	8.9	0.8	1.6	1.28	1.39	1.39
9.4	26.48	1.24	0.49	8.7	1.6	3.2	2.08	1.91	1.91
14	17.94	1.25	0.51	8.5	1.6	3.2	3.20	3.09	3.09
Mean	23.24	1.19	0.42	9.4	0.92	1.8	1.54	1.51	1.50

(5) Power Law Best-Fit Coefficients per Interval

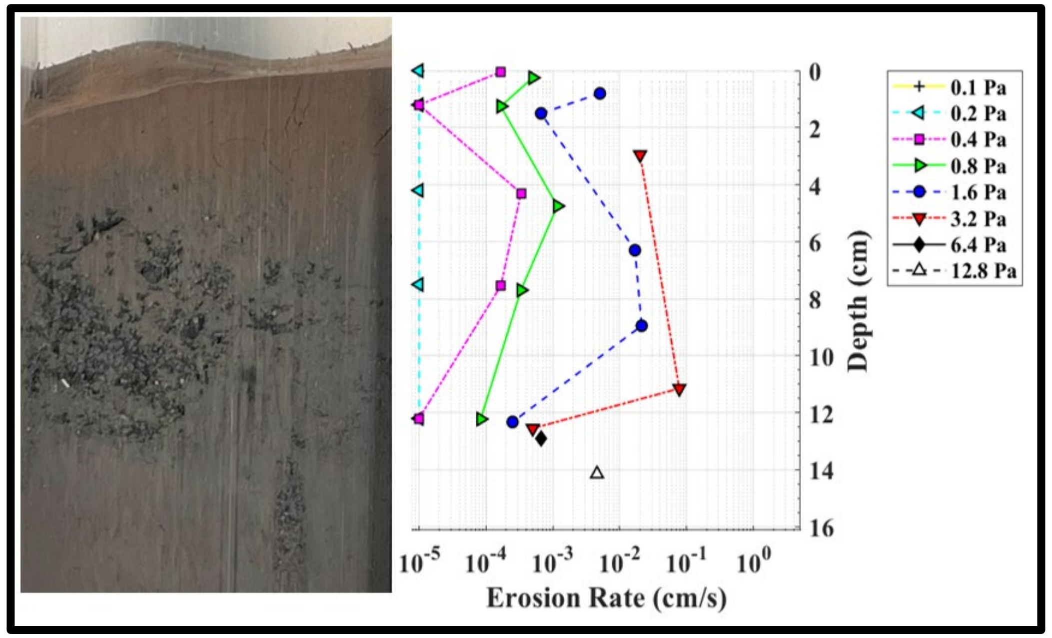
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.5	6.71E-06	2.25	0.98
2	1.5	7.1	1.48E-06	2	1
3	7.1	9.4	1.64E-07	2.43	0.91
4	9.4	14	5.6E-08	2.54	0.93
5	14	17.5	5.36E-10	3.54	0.96

Prepared on 6/13/2022
SEDFlume Sampling Summary
Swan Island Basin

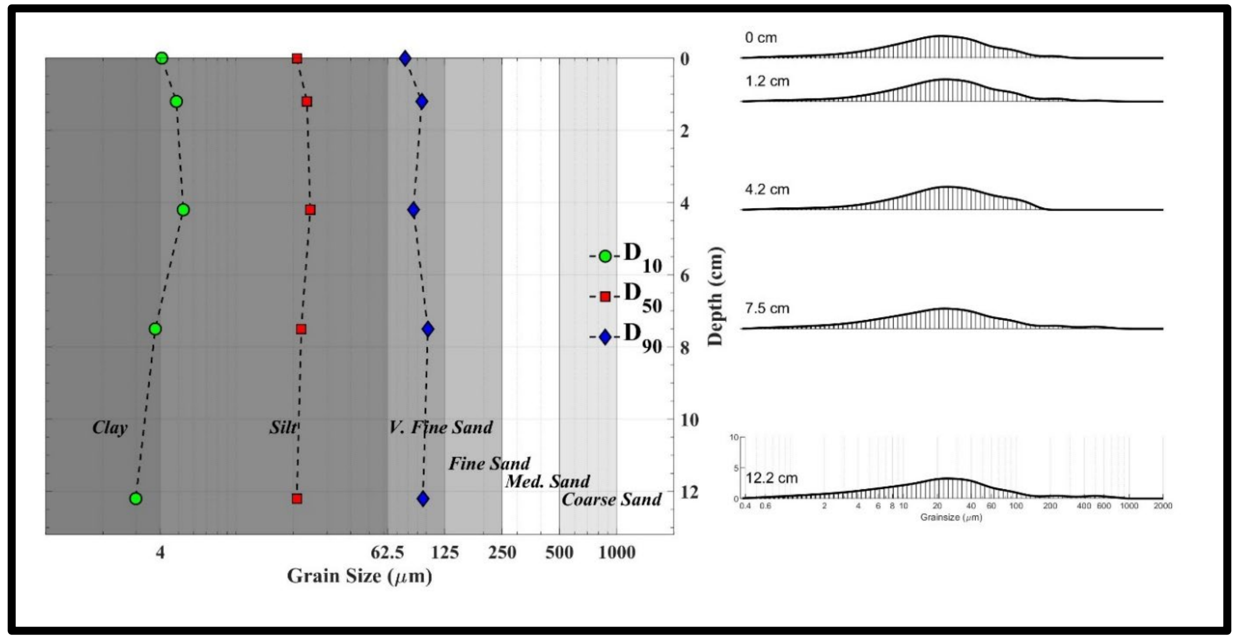
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-21
Core SF21

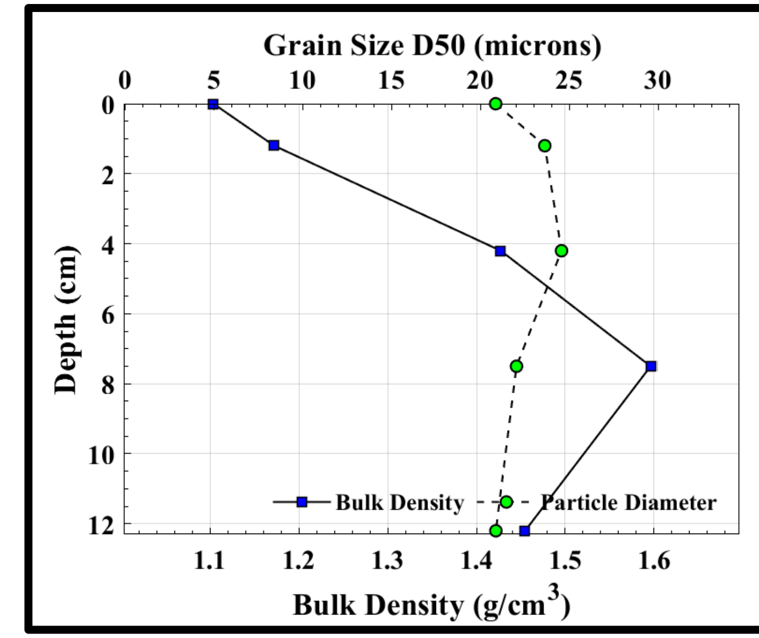
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	20.86	1.10	0.28	10.4	0.2	0.4	0.32	0.34	0.34
1.2	23.62	1.17	0.85	49.0	0.4	0.8	0.64	0.70	0.70
4.2	24.56	1.43	0.75	4.7	0.2	0.4	0.26	0.27	0.27
7.5	22.03	1.60	1.02	3.6	0.2	0.4	0.32	0.36	0.36
12.2	20.87	1.45	0.81	5.5	0.4	0.8	0.80	0.92	0.80
Mean	22.39	1.35	0.74	14.6	0.3	0.6	0.47	0.52	0.49

(5) Power Law Best-Fit Coefficients per Interval

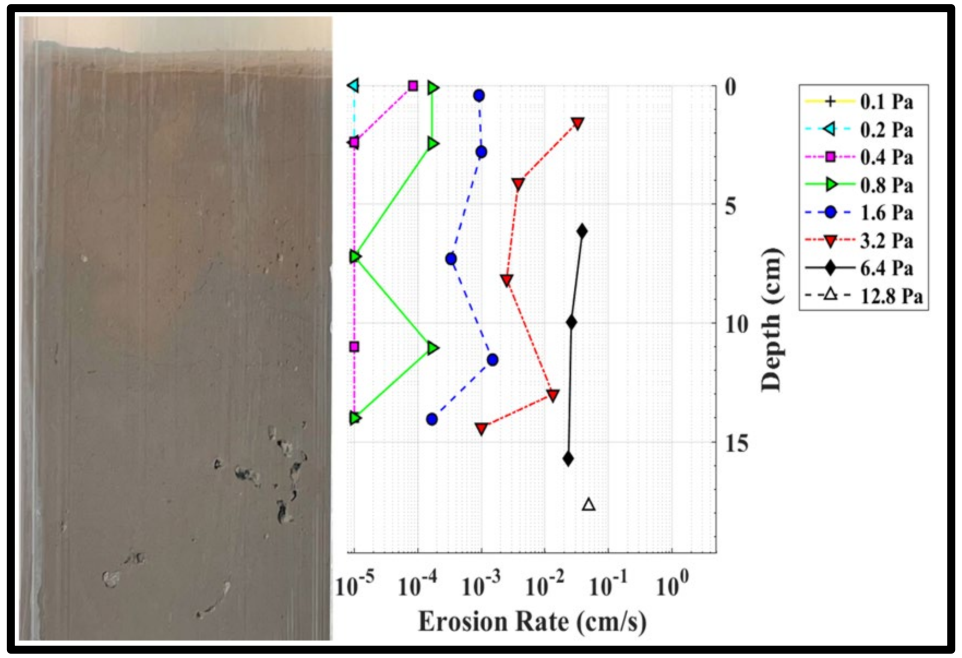
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.2	5.77E-06	2.36	0.97
2	1.2	4.2	2E-07	3.2	0.95
3	4.2	7.5	6.76E-06	2.72	0.98
4	7.5	12.2	1.96E-06	3.07	0.94
5	12.2	15.2	5.59E-06	1.3	0.93

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

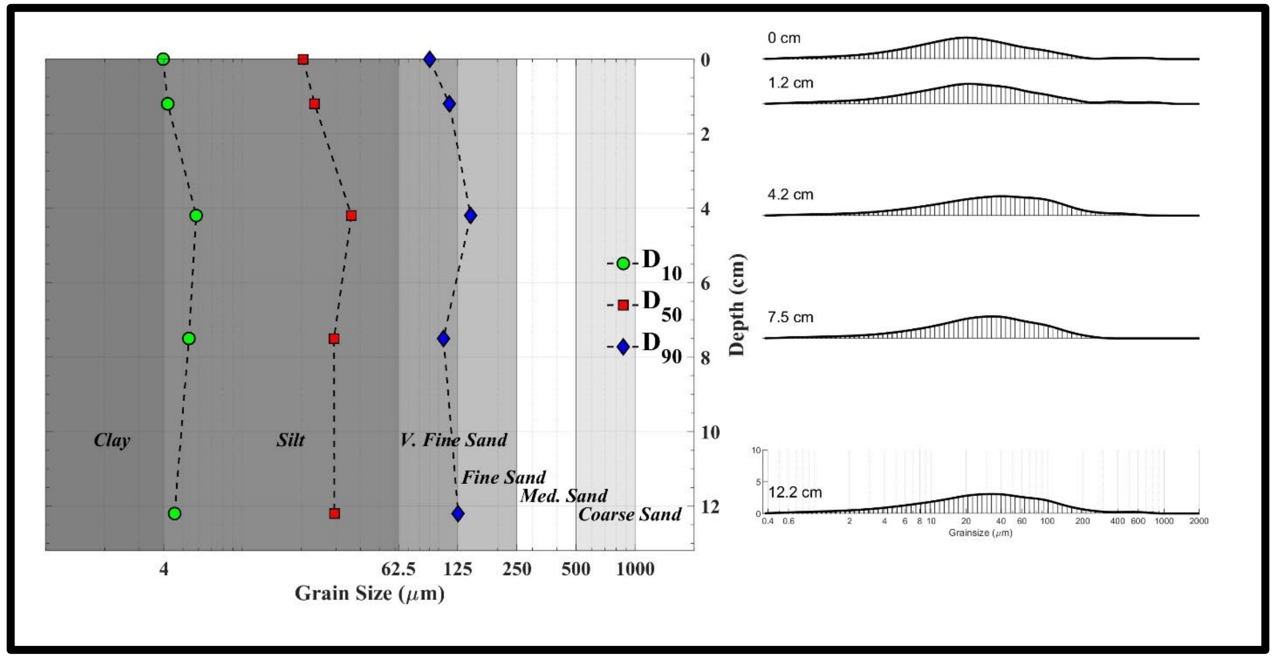
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-22
Core SF22

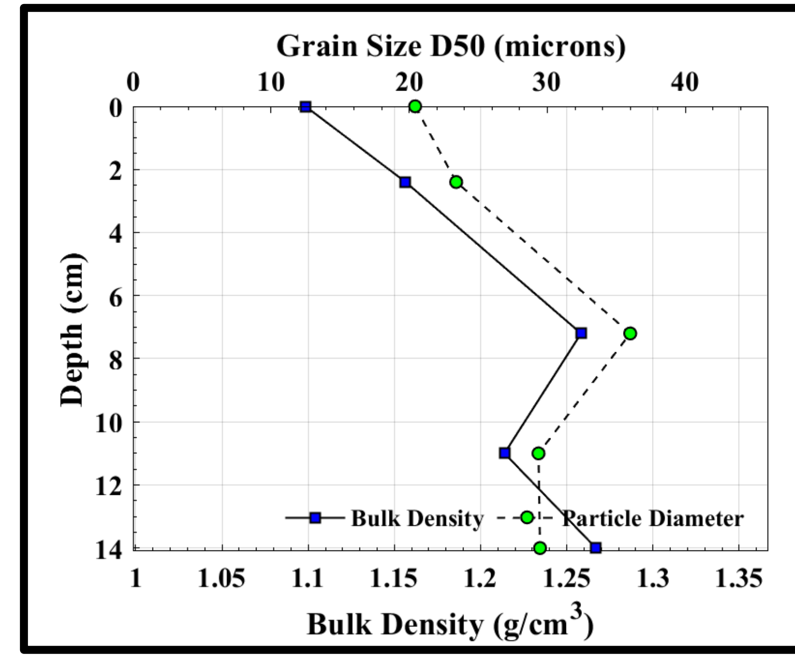
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	20.43	1.10	0.28	11.5	0.2	0.4	0.40	0.54	0.40
2.4	23.4	1.16	0.37	10.4	0.4	0.8	0.64	0.66	0.66
7.2	36.00	1.26	0.53	8.8	0.8	1.6	1.04	1.07	1.07
11	29.36	1.21	0.46	9.4	0.4	0.8	0.64	0.66	0.66
14	29.47	1.27	0.54	8.6	0.8	1.6	1.28	1.29	1.29
Mean	27.73	1.20	0.44	9.7	0.5	1.0	0.80	0.84	0.82

(5) Power Law Best-Fit Coefficients per Interval

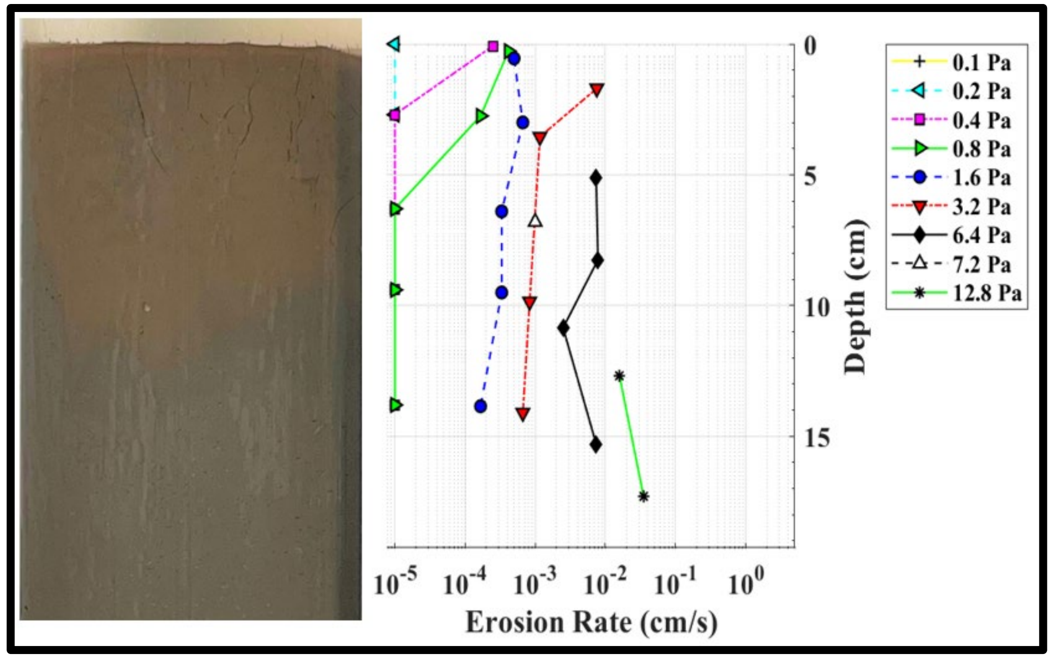
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.4	8.36E-07	2.83	0.9
2	2.4	7.2	8.74E-07	2.52	0.99
3	7.2	11	7.31E-08	3.05	1
4	11	14	3.03E-07	3.08	1
5	14	18.7	6.01E-08	2.9	0.97

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

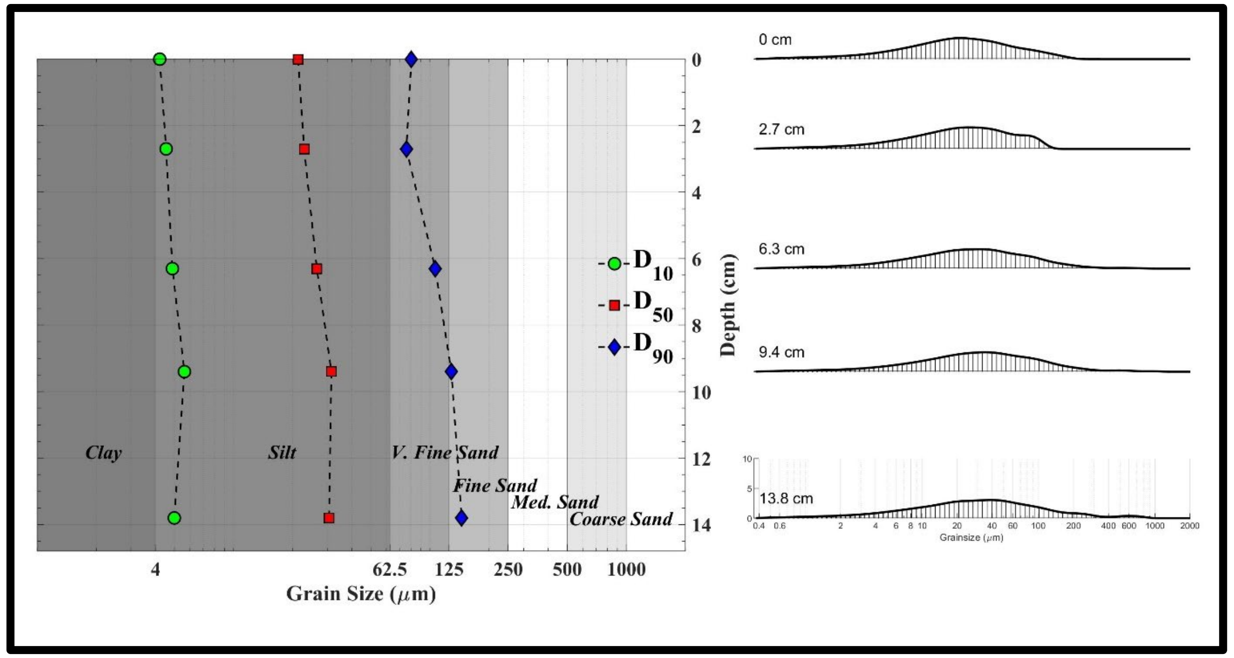
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-23
Core SF23

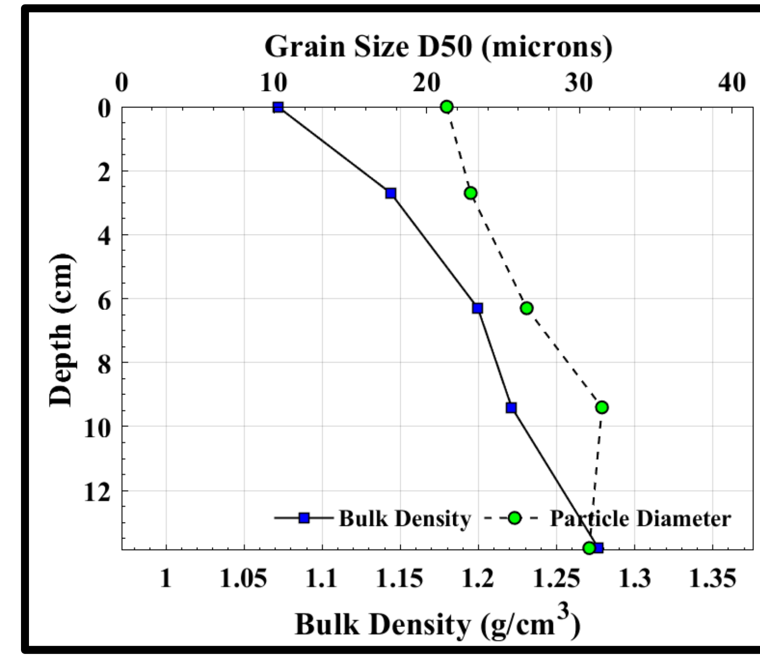
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	21.31	1.07	0.24	11.9	0.2	0.4	0.28	0.28	0.28
2.7	22.88	1.14	0.35	10.6	0.4	0.8	0.64	0.62	0.62
6.3	26.55	1.20	0.43	9.3	0.8	1.6	1.04	1.03	1.03
9.4	31.48	1.22	0.47	9.2	0.8	1.6	1.04	0.99	0.99
13.8	30.65	1.28	0.55	8.6	0.8	1.6	1.28	1.34	1.34
Mean	26.57	1.18	0.41	9.9	0.6	1.2	0.86	0.85	0.85

(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.7	2.12E-05	1.49	0.84
2	2.7	6.3	4.1E-06	1.75	0.98
3	6.3	9.4	4.62E-07	2.31	0.98
4	9.4	13.8	1.31E-06	1.89	0.98
5	13.8	18.3	1.17E-07	2.6	0.99

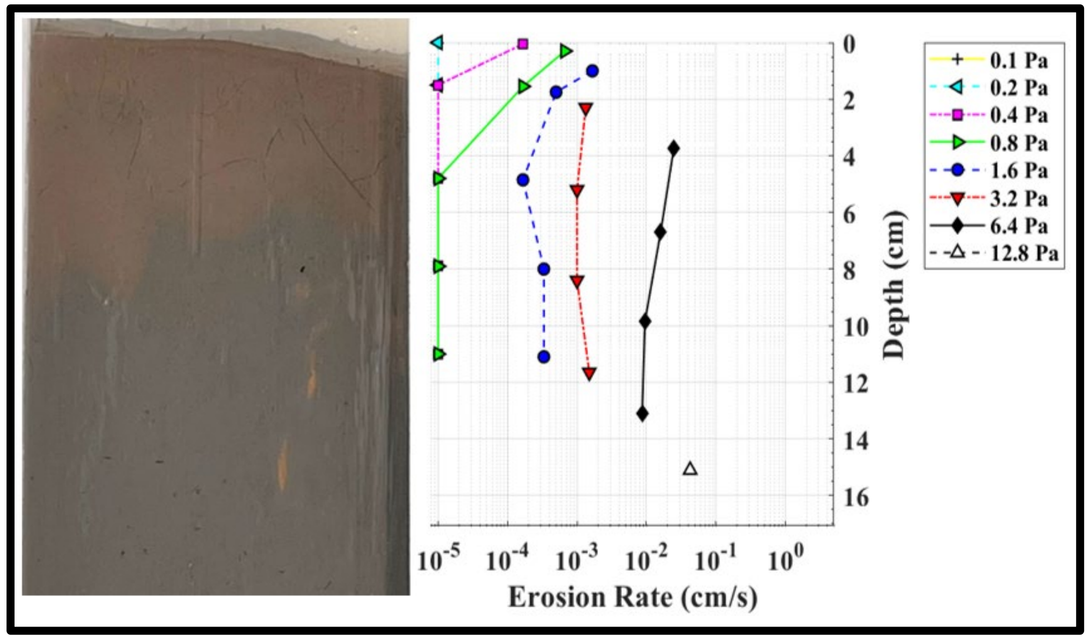
Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

PACIFIC groundwater GROUP HGL HydroGeoLogic, Inc MOTT MACDONALD BRIDGEWATER GROUP integral consulting inc.

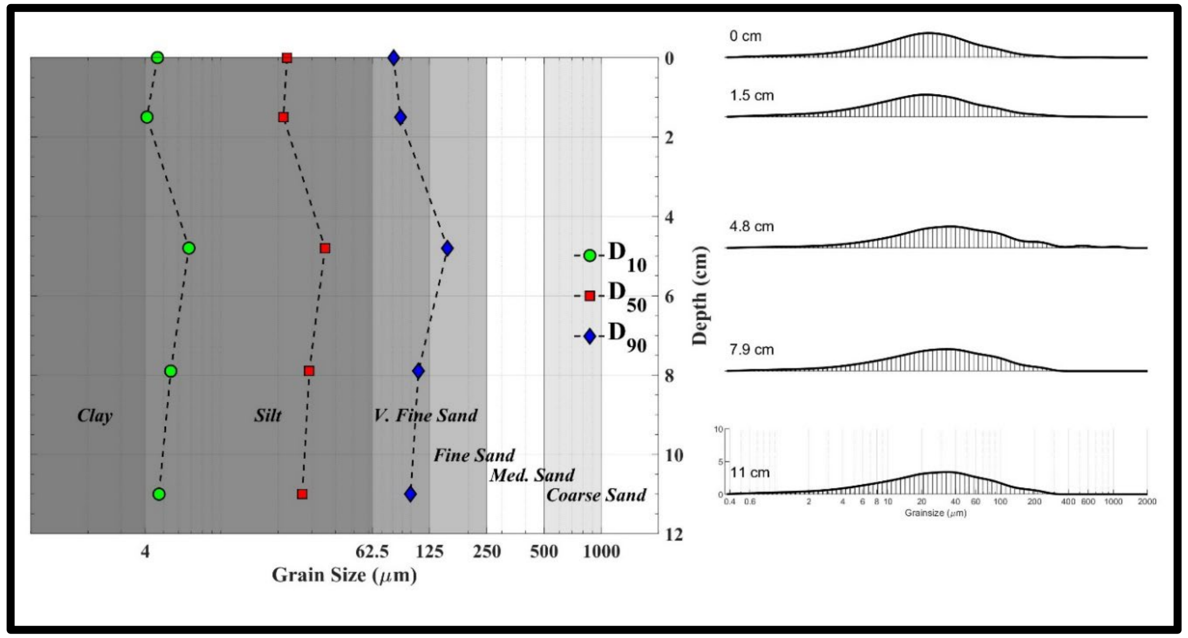
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-24
Core SF24

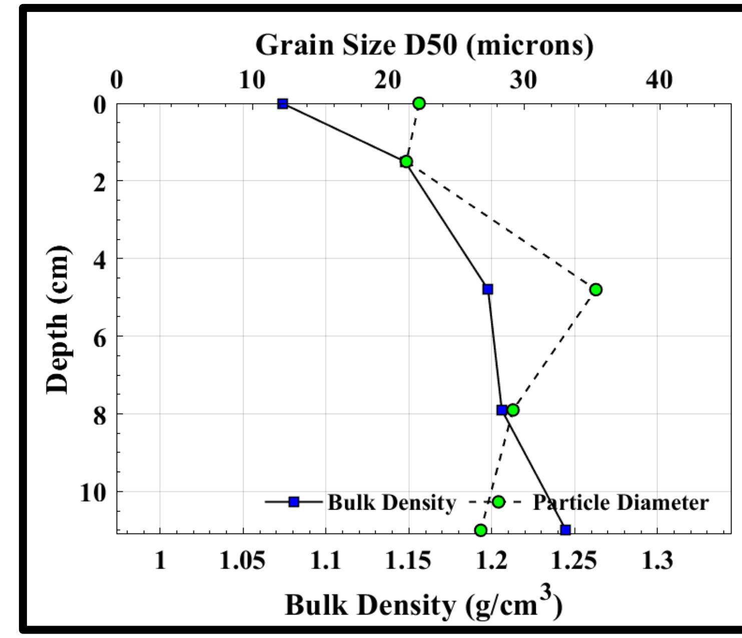
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	22.28	1.07	0.24	11.7	0.2	0.4	0.32	0.30	0.30
1.5	21.34	1.15	0.36	10.6	0.4	0.8	0.64	0.70	0.70
4.8	35.29	1.20	0.43	9.7	0.8	1.6	1.28	1.35	1.35
7.9	29.19	1.21	0.46	10.4	0.8	1.6	1.04	1.04	1.04
11	26.82	1.24	0.51	9.1	0.8	1.6	1.04	1.01	1.01
Mean	26.98	1.17	0.40	10.3	0.6	1.2	0.86	0.88	0.88

(5) Power Law Best-Fit Coefficients per Interval

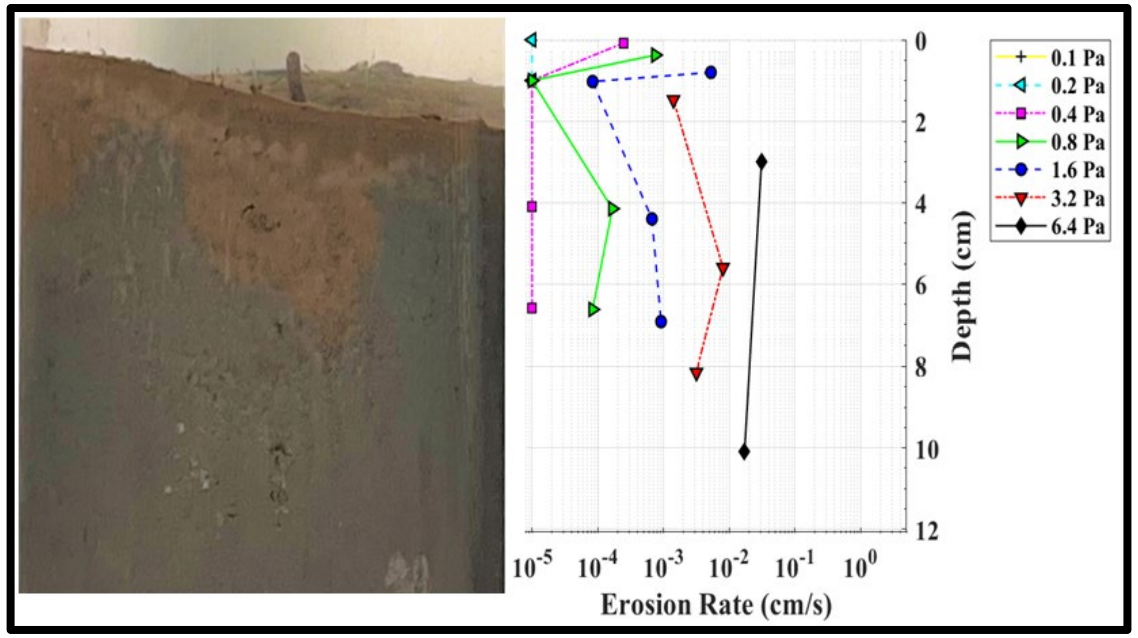
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.5	1.43E-05	1.76	0.99
2	1.5	4.8	1.38E-06	2.21	0.94
3	4.8	7.9	2.91E-08	3.13	0.99
4	7.9	11	3.55E-07	2.4	0.98
5	11	16.1	3.94E-07	2.39	1

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

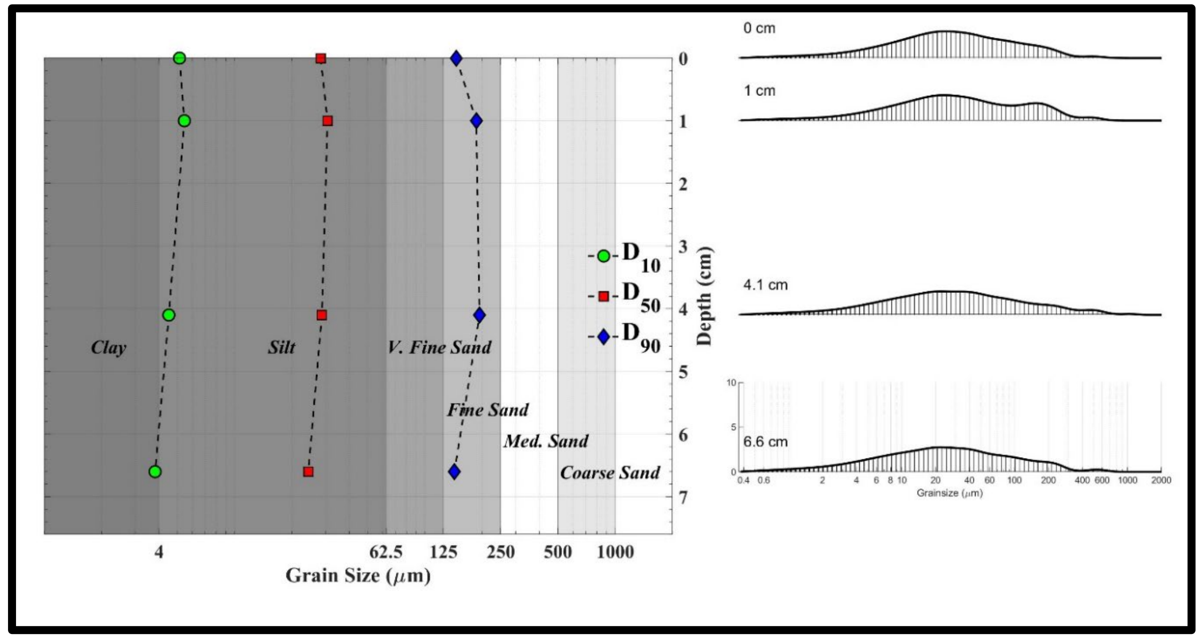
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-25
Core SF25

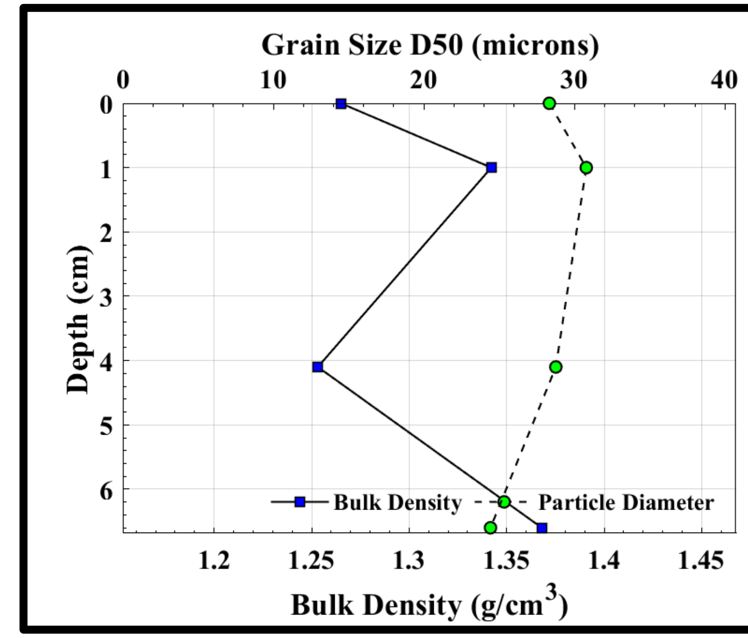
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	28.33	1.27	0.53	8.1	0.2	0.4	0.28	0.28	0.28
1	30.78	1.34	0.67	9.0	0.8	1.6	1.60	1.69	1.60
4.1	28.76	1.25	0.53	9.6	0.4	0.8	0.64	0.67	0.67
6.6	24.42	1.37	0.69	7.3	0.4	0.8	0.80	0.78	0.78
Mean	28.07	1.31	0.60	8.5	0.5	0.9	0.83	0.85	0.83

(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1	1.04E-05	2.19	0.99
2	1	4.1	5.78E-10	4.27	1
3	4.1	6.6	6.19E-07	2.67	0.98
4	6.6	11.1	6.17E-07	2.48	0.98

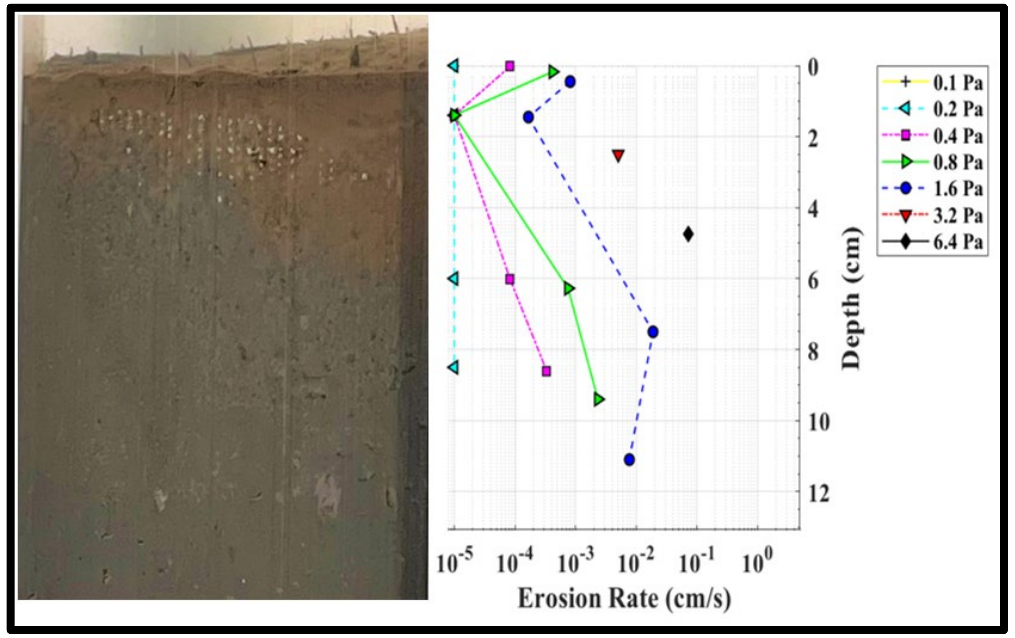
Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

PACIFIC groundwater GROUP HGL MOTT MACDONALD BRIDGEWATER GROUP integral consulting inc.

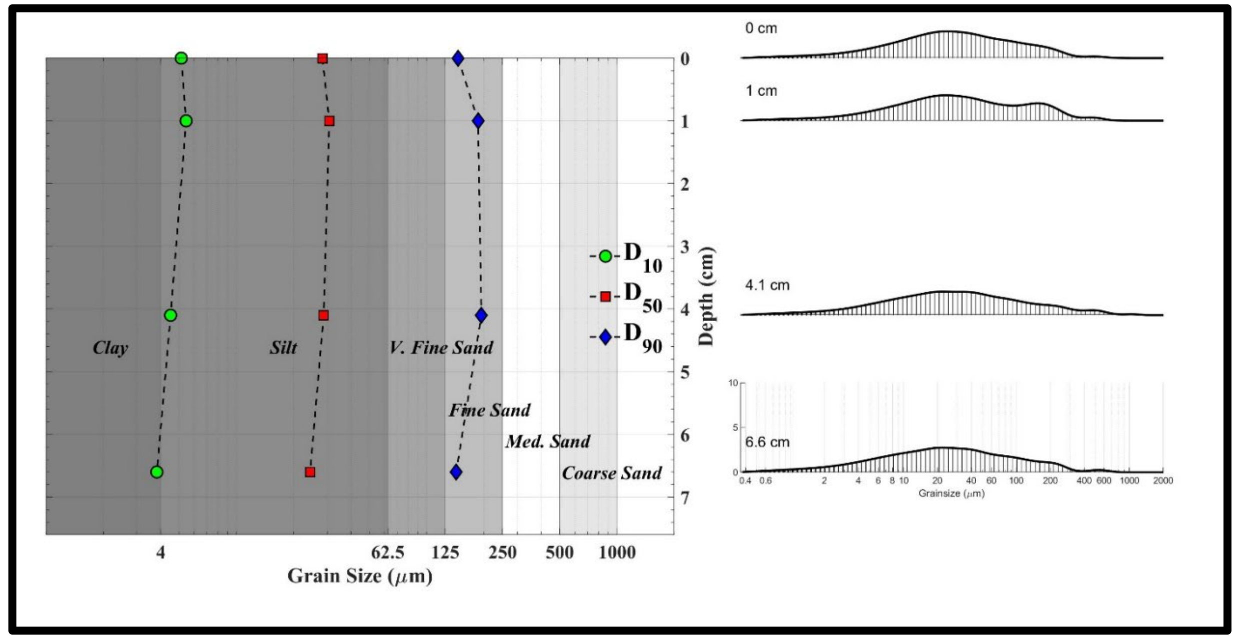
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-26
Core SF26

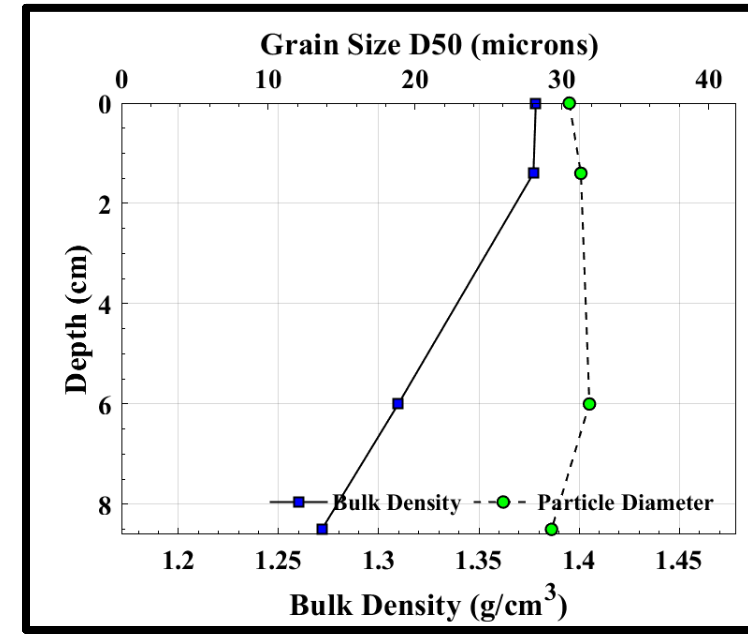
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	30.51	1.38	0.69	6.3	0.2	0.4	0.40	0.41	0.40
1.4	31.30	1.38	0.72	8.4	0.8	1.6	1.28	1.33	1.33
6	31.88	1.31	0.62	9.6	0.2	0.4	0.40	0.44	0.40
8.5	29.30	1.27	0.57	10.9	0.2	0.4	0.26	0.25	0.25
Mean	30.75	1.33	0.65	8.8	0.4	0.7	0.585	0.60	0.60

(5) Power Law Best-Fit Coefficients per Interval

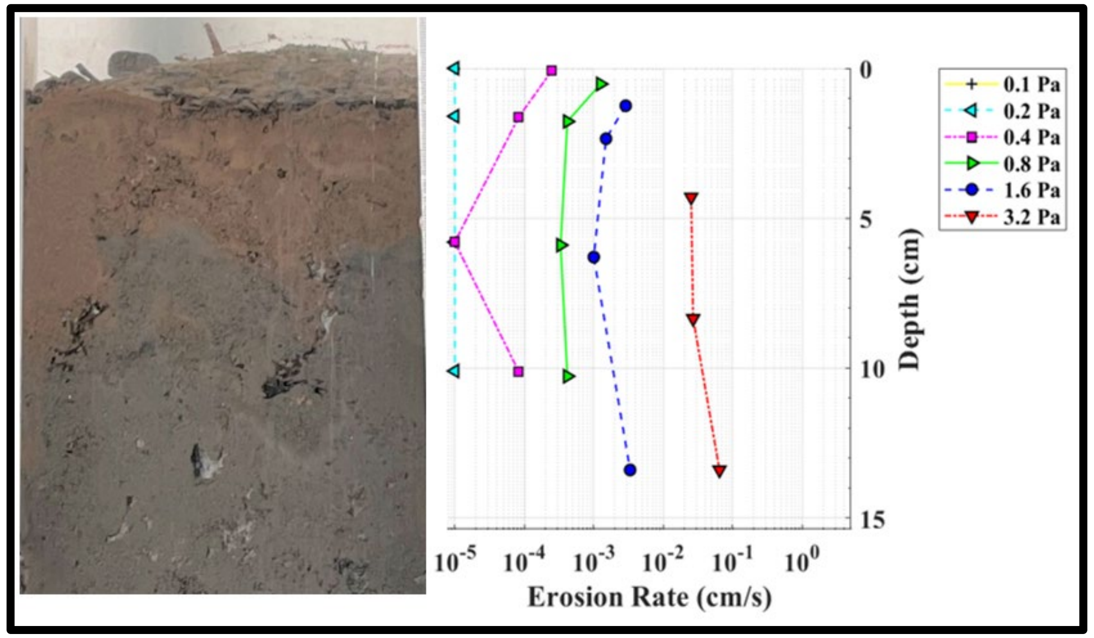
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	0.6	9.99E-06	1.64	0.95
2	1.4	6	1.8E-09	4.23	0.99
3	6	8.5	3.1E-07	3.91	0.99
4	8.5	12.1	1.13E-05	2.42	0.99

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

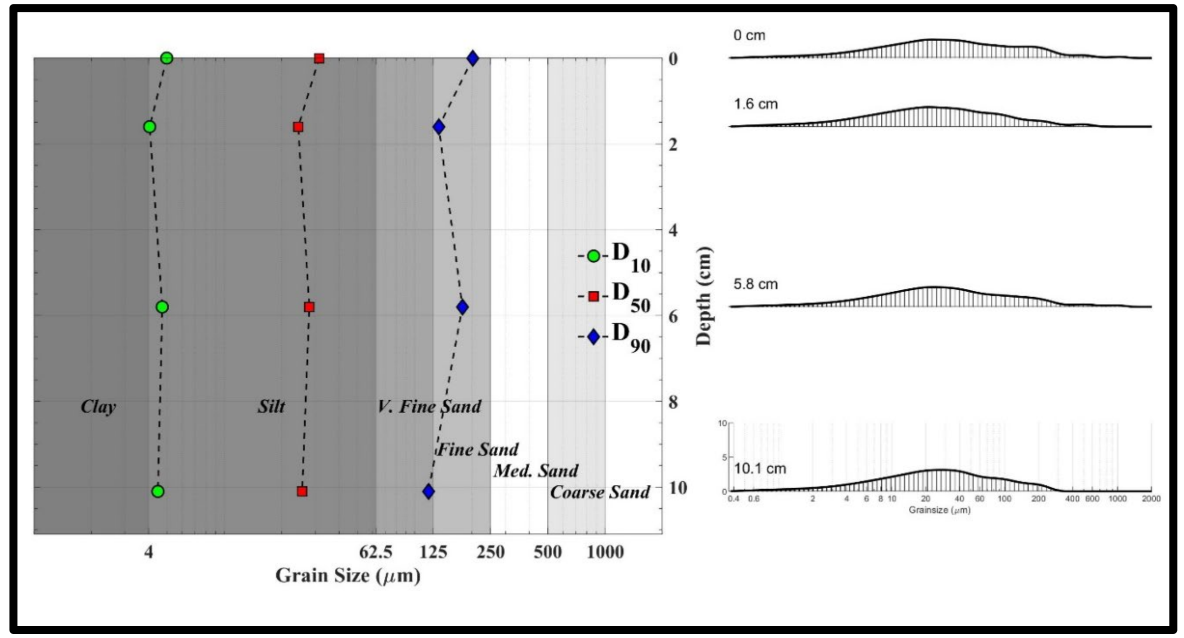
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm^3 = grams per cubic centimeter
Pa = Pascal

Figure B-27
Core SF27

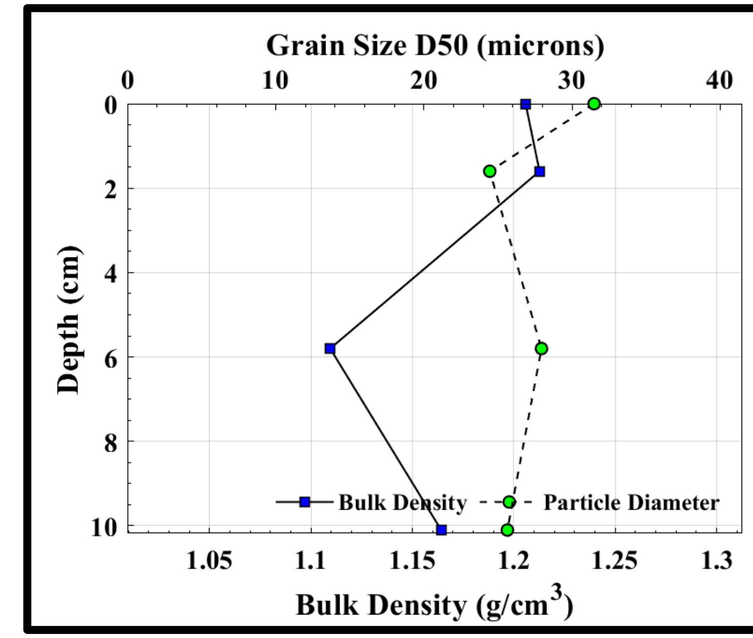
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	31.49	1.21	0.5	13.7	0.2	0.4	0.28	0.26	0.26
1.6	24.45	1.21	0.48	11.6	0.2	0.4	0.40	0.46	0.40
5.8	27.94	1.11	0.38	18.5	0.4	0.8	0.52	0.56	0.56
10.1	25.64	1.16	0.42	13.8	0.2	0.4	0.40	0.47	0.40
Mean	27.38	1.17	0.45	14.4	0.3	0.5	0.40	0.44	0.41

(5) Power Law Best-Fit Coefficients per Interval

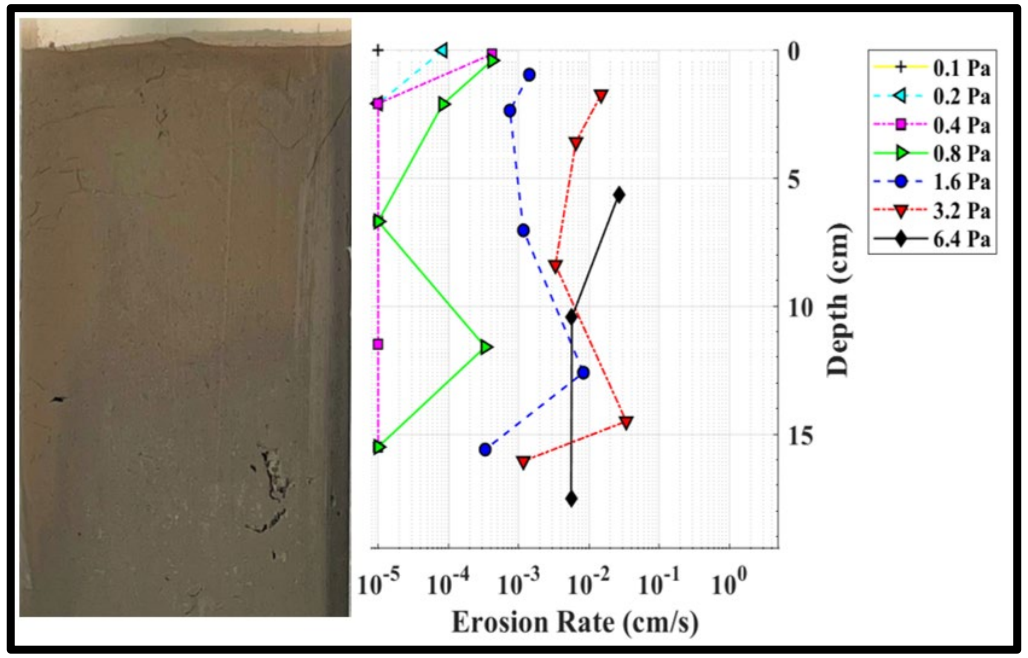
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	1.6	1.59E-05	1.95	0.98
2	1.6	5.8	1.7E-06	2.66	0.97
3	5.8	10.1	6.49E-07	2.94	0.95
4	10.1	14.4	7.4E-07	3.18	0.98

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

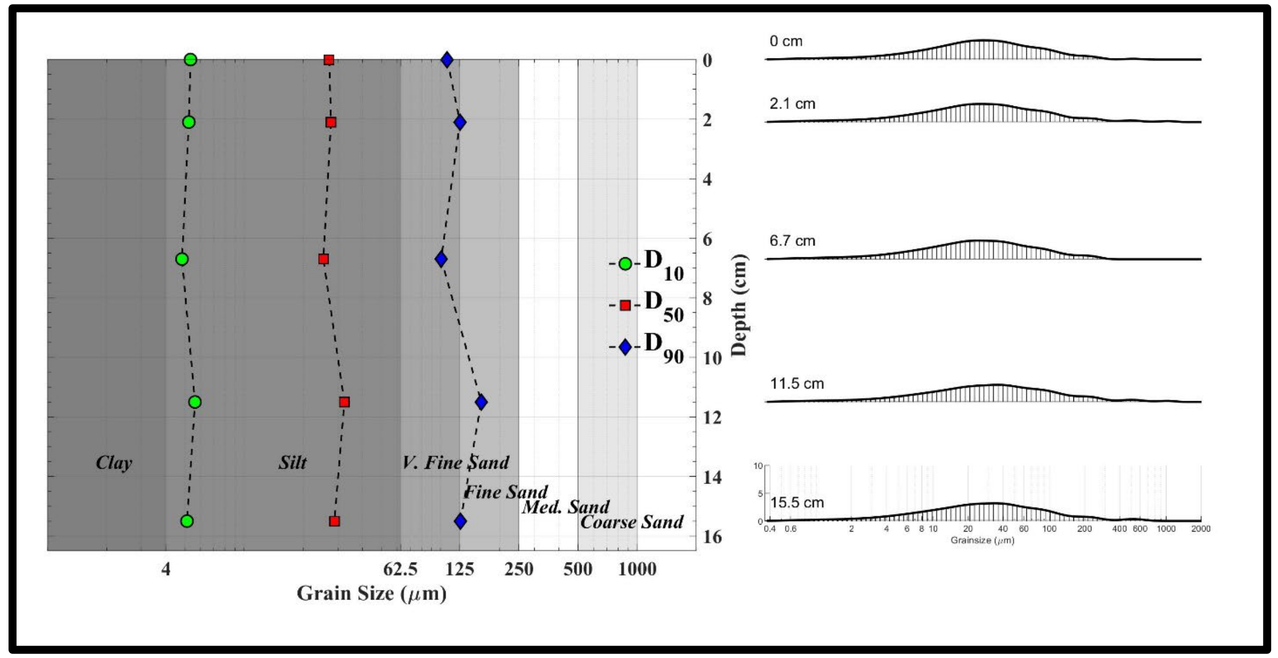
Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-28
Core SF28

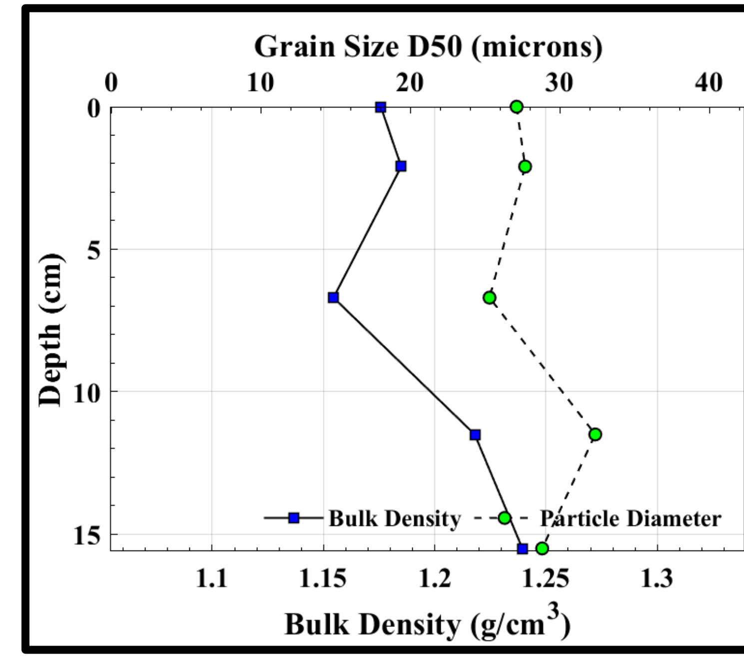
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (μm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	27.12	1.18	0.40	10.2	0.1	0.2	0.20	0.23	0.20
2.1	27.69	1.18	0.43	11.5	0.4	0.8	0.80	0.81	0.80
6.7	25.31	1.15	0.39	12.3	0.8	1.6	0.87	0.64	0.80
11.5	32.38	1.22	0.48	10.9	0.4	0.8	0.52	0.52	0.52
15.5	28.83	1.24	0.51	10.1	0.8	1.6	1.04	0.99	0.99
Mean	28.27	1.19	0.44	11.0	0.5	1.0	0.69	0.64	0.66

(5) Power Law Best-Fit Coefficients per Interval

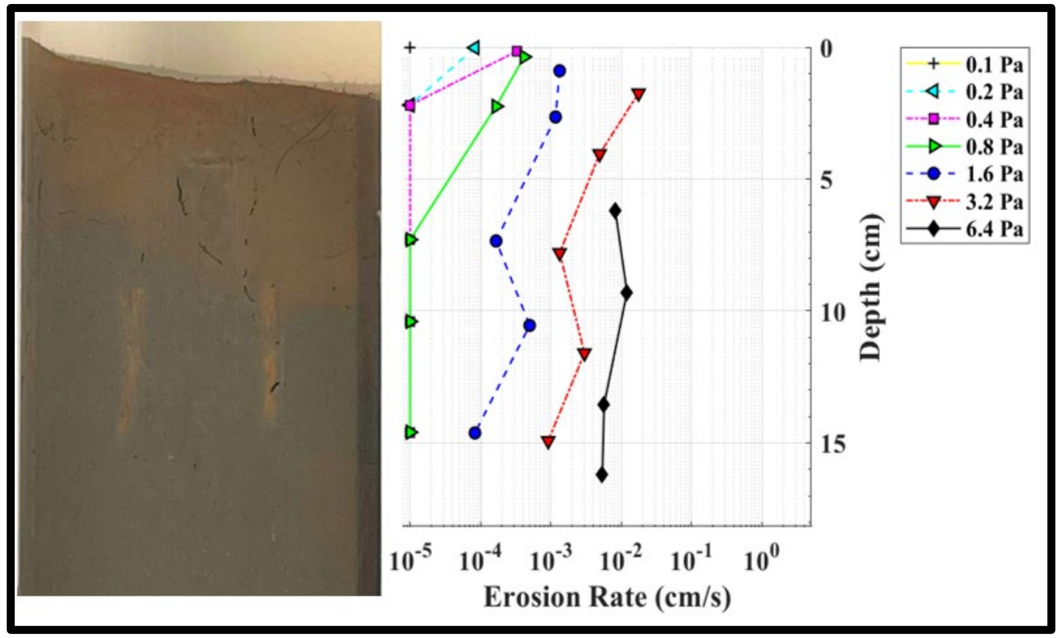
Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.1	2.43E-05	1.67	0.91
2	2.1	6.7	2.86E-07	2.81	0.99
3	6.7	11.5	2.66E-06	1.95	0.88
4	11.5	15.5	4E-07	3.37	0.98
5	15.5	18.6	7.16E-07	2.15	0.99

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

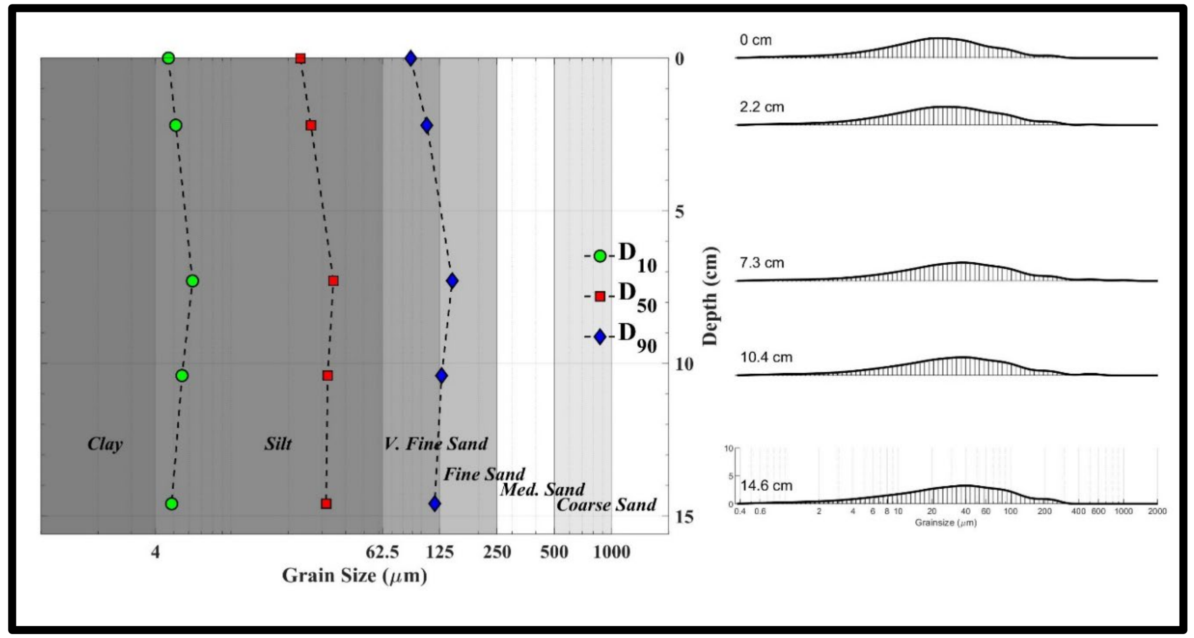
Units:
μm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-29
Core SF29

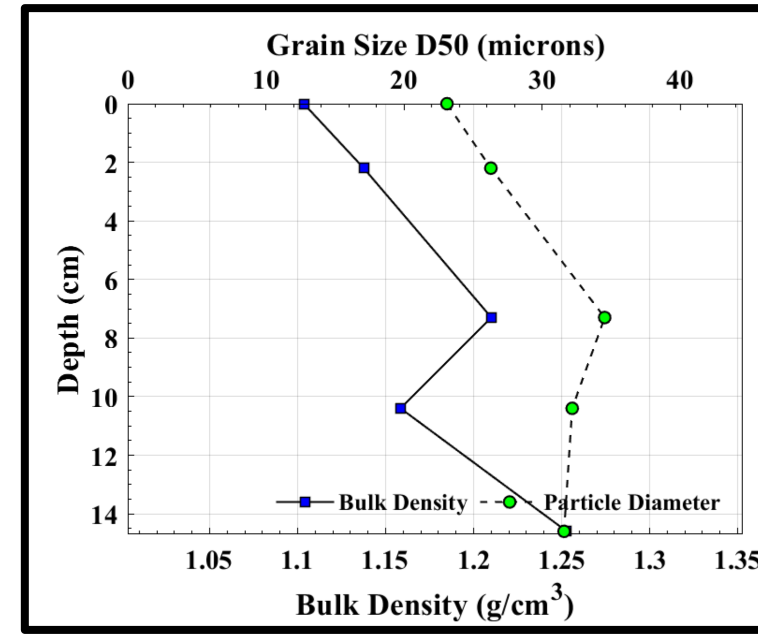
(1) Vertical alignment of core with applied shear stress and corresponding erosion rate



(3) Particle size distribution with depth



(4) Wet bulk density and median particle size (D50) with depth



(2) Median Particle Size, Bulk Density, and Critical Shear Stress with Depth

Sample Depth (cm)	Median Grain Size (µm)	Wet Bulk Density (g/cm³)	Dry Bulk Density (g/cm³)	Loss on Ignition (%)	τ_{no} (Pa)	τ_{first} (Pa)	τ_{cr} Linear (Pa)	τ_{cr} Power (Pa)	Recommended τ_{cr} (Pa)
0	23.12	1.1	0.29	11.0	0.1	0.2	0.20	0.25	0.20
2.2	26.3	1.14	0.36	12.2	0.4	0.8	0.64	0.57	0.57
7.3	34.54	1.21	0.48	11.4	0.8	1.6	1.28	1.32	1.32
10.4	32.19	1.16	0.39	11.3	0.8	1.6	0.96	0.83	0.83
14.6	31.6	1.25	0.54	11.0	0.8	1.6	1.60	1.64	1.60
Mean	29.55	1.17	0.41	11.4	0.6	1.2	0.936	0.922	0.90

(5) Power Law Best-Fit Coefficients per Interval

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0	2.2	2.05E-05	1.75	0.91
2	2.2	7.3	2.98E-06	2.01	0.96
3	7.3	10.4	4.31E-08	3	1
4	10.4	14.6	1.05E-06	2.15	0.95
5	14.6	17.2	2.21E-08	3.01	0.99

Prepared on 6/13/2022
SEDflume Sampling Summary
Swan Island Basin

Units:
µm = micrometers
cm = centimeters
cm/s = centimeters per second
g/cm³ = grams per cubic centimeter
Pa = Pascal

Figure B-30
Core SF30