F00613

NOAA Form 76-35A

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: F00613

LOCALITY

State: Washington

General Locality: Elliott Bay

Sub-locality: Elliott Bay

2012

CHIEF OF PARTY
CDR James M. Crocker, NOAA

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**F00613**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State:	**Washington**
General Locality:	**Elliott Bay**
Sub-Locality:	**Elliott Bay**
Scale:	**5000**
Dates of Survey:	**05/31/2012 to 05/31/2013**
Instructions Dated:	**05/29/2012**
Project Number:	**S-N923-FA-12**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR James M. Crocker, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**
H-Cell Compilation Units:	***meters at Mean Lower Low Water***

Remarks:

An addendum for the 2013 data collection has been submitted. Title Sheet survey dates have been adjusted to include 2013 data collection. The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold, red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

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Descriptive Report to Accompany Survey F00613

Project: S-N923-FA-12

Locality: Elliott Bay

Sublocality: Elliott Bay

Scale: 1:5000

May 2012 - May 2013

NOAA Ship *Fairweather*

Chief of Party: CDR James M. Crocker, NOAA

A. Area Surveyed

The survey area is located in Elliot Bay, WA, within the sub-locality of Elliot Bay and Duwamish Waterways.

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
47.6345416667 N 122.404944444 W	47.5370972222 N 122.323755556 W

Table 1: Survey Limits

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. Due to changes in vessel traffic and subsequent changes to channels and waterways, both the Duwamish Waterway and near shore Seattle waterfront have been classified as "Resurvey Areas" as defined in the NOAA Hydrographic Survey Priorities (NHSP). This project will fulfill the requirement that periodic surveys of these areas be conducted every 5-7 years. Additionally, this survey will address requests from the Port of Seattle, the United States Coast Guard (USCG), the United States Army Corps of Engineers (USACE) and the Puget Sound Pilots for updated information in the vicinity of several of the Port's berth areas, terminals, and piers.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

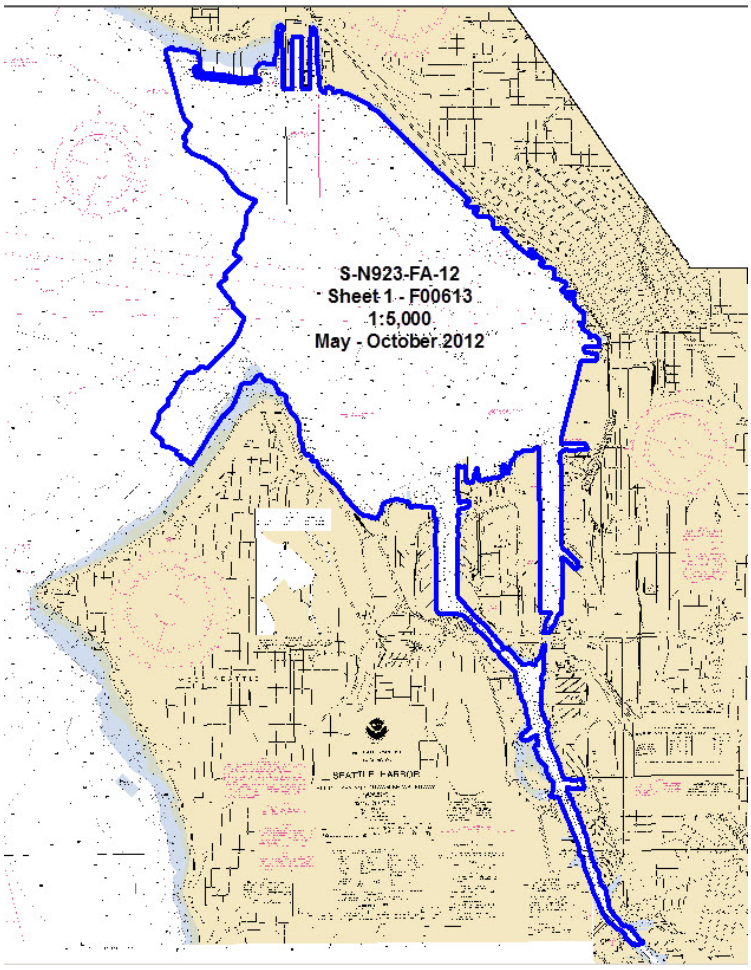


Figure 1: F00613 Survey outline

Survey Coverage was in accordance with the requirements in the Project Instructions and the HSSD.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*2808*	*2805*	*Total*
LNM	**SBES Mainscheme**	0.00	0.00	0.00
	MBES Mainscheme	103.07	13.73	116.80
	Lidar Mainscheme	0.00	0.00	0.00
	SSS Mainscheme	0.00	0.00	0.00
	SBES/MBES Combo Mainscheme	0.000	0.00	0.00
	SBES/SSS Combo Mainscheme	0.00	0.00	0.00
	MBES/SSS Combo Mainscheme	0.000	0.00	0.00
	SBES/MBES Combo Crosslines	9.36	0.00	9.36
	Lidar Crosslines	0.00	0.00	0.00
Number of Bottom Samples				0
Number of DPs				0
Number of Items Items Investigated by Dive Ops				0
Total Number of SNM				4.63

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates
05/31/2012
06/01/2012
06/04/2012
10/03/2012
10/04/2012
10/10/2012
10/17/2012

Table 3: Dates of Hydrography

See attached addendum that addresses the 2013 survey data.

A.6 Shoreline

There is no Shoreline Verification requirement for this project.

Although shoreline verification was not required, the field addressed features that fell within the limits of the survey.

A.7 Bottom Samples

There is no Bottom Sample requirement for this project.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*2805*	*2808*
LOA	8.64 meters	8.64 meters
Draft	1.12 meters	1.12 meters

Table 4: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Reson	7125	MBES
Reson	SVP71	Sound Speed System
Sea Bird	SBE 19 plus	Conductivity, Temperature and Depth Sensor
Applanix	Pos MV V4	Positioning and Attitude System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed and compared in accordance with section 5.2.4.3 of the HSSD. All crosslines were filtered to 45 degrees on both sides and surface differencing in CARIS HIPS and SIPS was used to assess crossline agreement with mainscheme lines. The difference surface is submitted digitally in the Separates II folder. Percentage of crosslines collected to mainscheme lines is 8.01%. The differences in crosslines to mainscheme were generally less than 1.5 meters and areas of larger differences are believed to be caused by changes in slope. See Figure 2 for an example of surface difference along highly sloped areas between 10 and 50 meters. Figure 3 is a statistical representation of crossline differences.

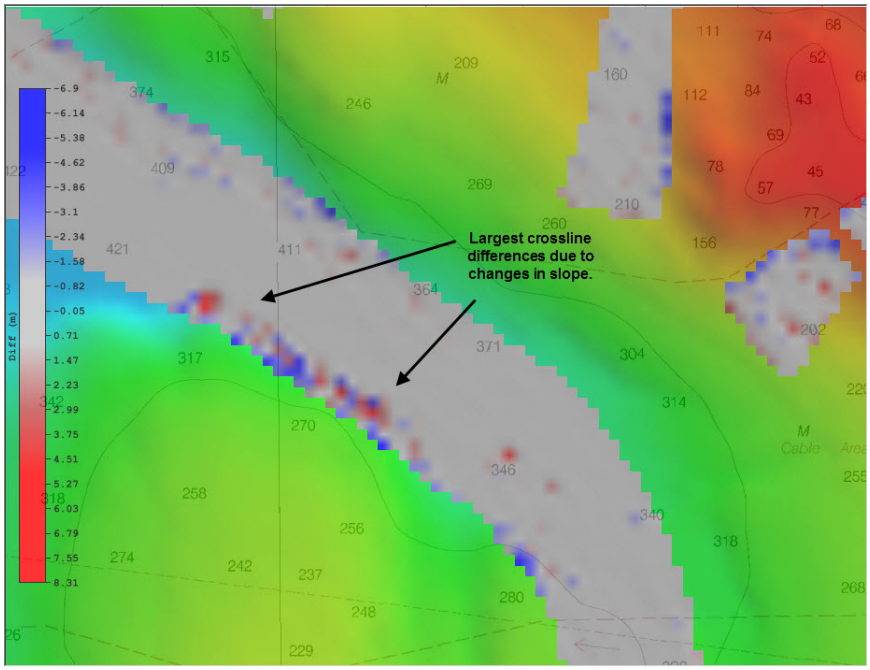


Figure 2: Graphical representation of differences between crossline and mainscheme surfaces. white indicates agreement, cool colors indicate crosslines shoaler than main-scheme and warm colors indicate crosslines are deeper.

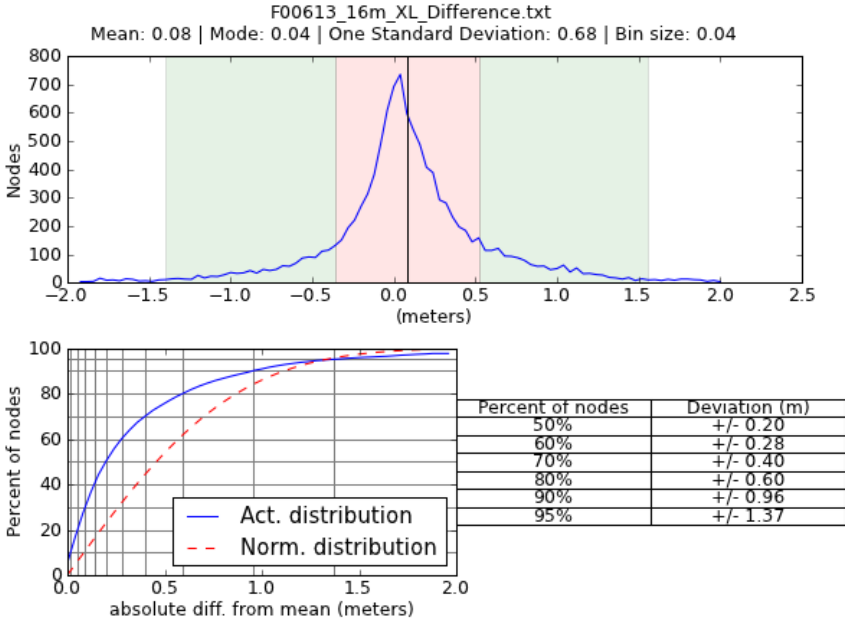


Figure 3: Statistcal representation of differences between crosslines and mainscheme surfaces.

Larger differences are expected in areas of steep topography. The data is adequate for charting.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.01meters	0.10meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2805	2meters/second		0.5meters/second
2808	2meters/second		0.5meters/second

Table 7: Survey Specific Sound Speed TPU Values

Tide TPU values were not provided by CO-OPS and is likely understating the actual uncertainty of the water levels. Despite this ambiguity in the uncertainty calculation for water levels, the data is adequate for charting.

B.2.3 Junctions

The areas of overlap between the sheets were reviewed in CARIS Subset Editor for sounding consistency and by surface differencing 16 meter combined surfaces to assess surface agreement. See Figure 4 for area of overlap.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H11605	1:5000	2007	Navigation Response Team 3	NW
H12025	1:10000	2009	NOAA Ship RAINIER	W

Table 8: Junctioning Surveys

H11605

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between F00613_8m_Combined surface and H11605_4m_MLLW_5of6 surface. The H11605_4m_MLLW_5of6 surface was used in lieu of a H11605 combined surface. Differences were generally less than 1 meter and areas of larger differences are believed to be caused by rapid changes in slope. See Figure 5 for a graphical representation and Figure 6 for statistical information of the surface differencing.

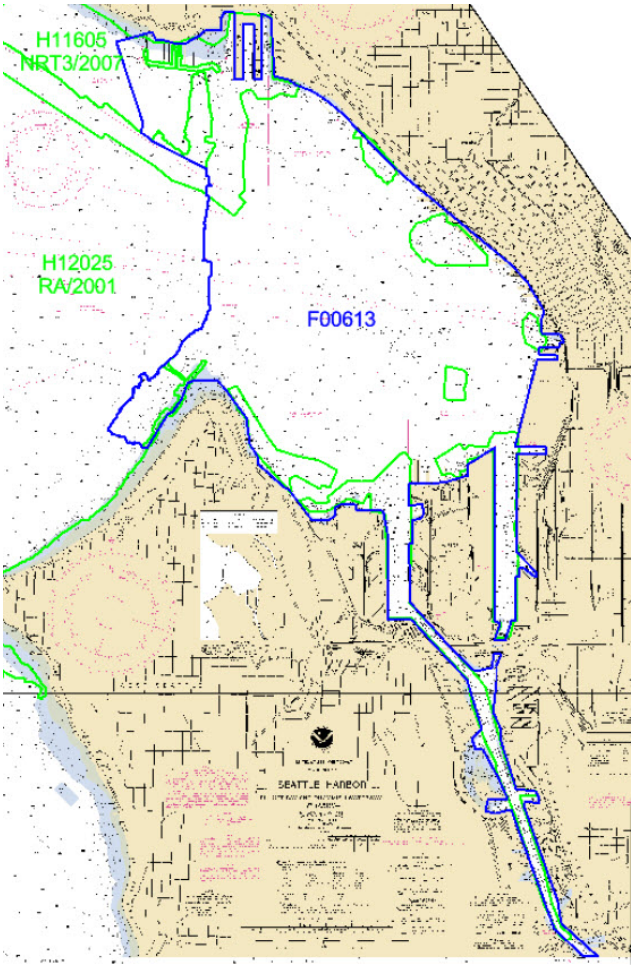


Figure 4: Junctions between F00613, H11605, and H12025

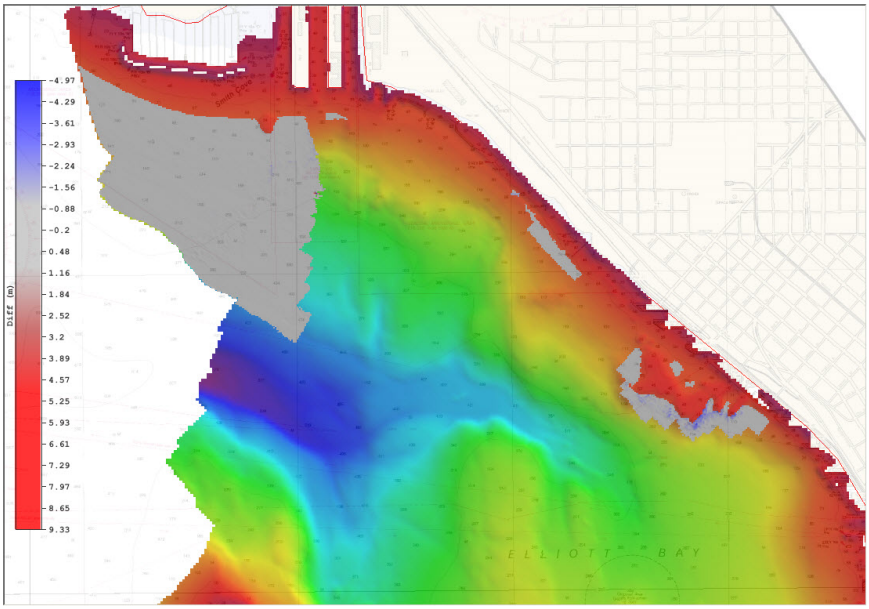


Figure 5: Graphical representation of junction comparison between F00613 and H11605

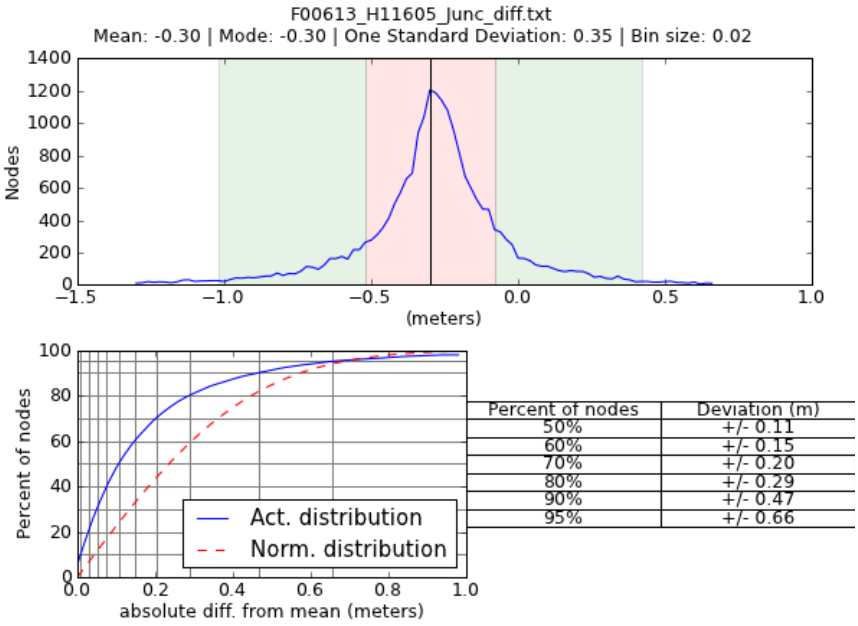


Figure 6: Statistical representation of junction comparison between F00613 and H11605

Larger depth differences between surveys are expected in deep areas and areas with steep topography. The data is adequate for charting.

H12025

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between F00613_16m_Combined surface and H12025_MBVB_8m_MLLW_Combined surface. The data were found to show differences generally less than 1.5 meters and areas of larger differences are believed to be caused by the nodal position differences between the 16 and 8 meter surface. See Figure 7 for a graphical representation and Figure 8 for statistical information of the surface differencing.

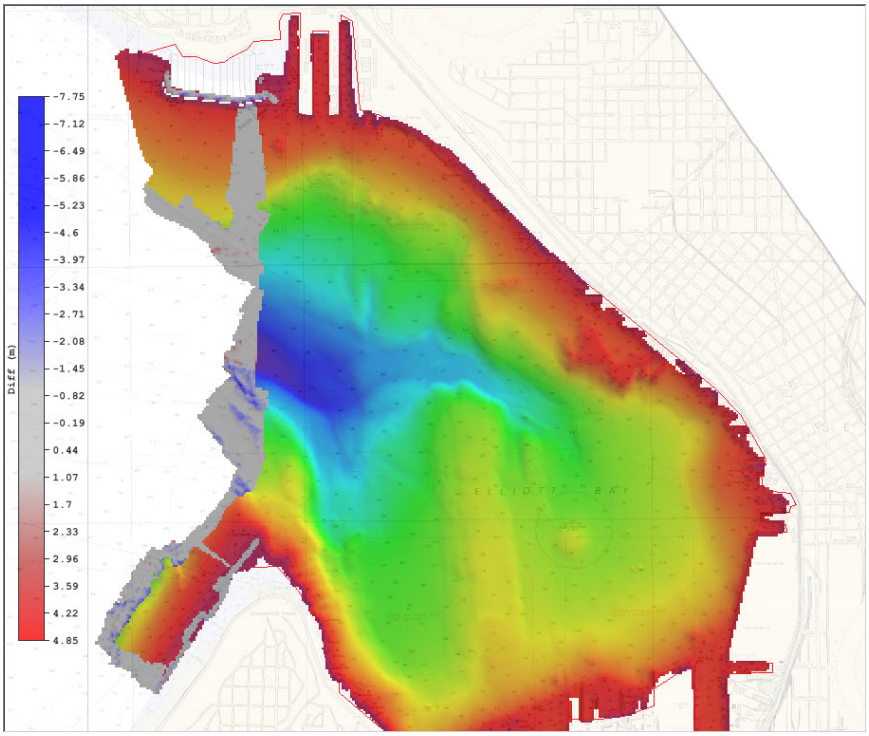


Figure 7: Graphical representation of junction comparison between F00613 and H12025

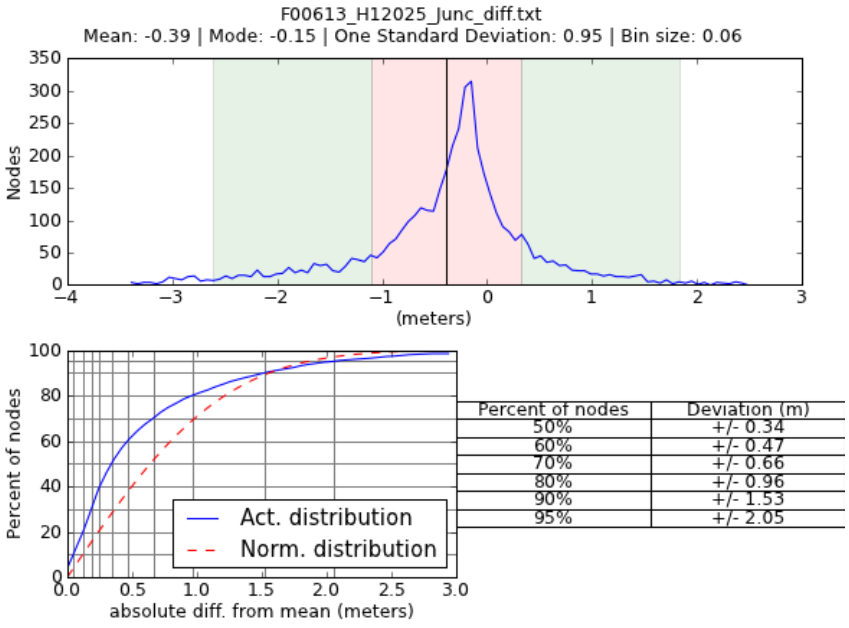


Figure 8: Statistical representation of junction comparision between F00613 and H12025

Larger depth differences between surveys are expected in deep areas and areas with steep topography. The data is adequate for charting.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

B.2.5.1None Exist

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

B.2.6.1 Influence of Vegetation

Variable bottom, likely due to marine vegetation, is noticeable in the vicinity of Duwamish Head. The vegetation data was not removed and all soundings should supersede the chart. See Figure 9 for an overview of the affected area and Figure 10 for a profile view of the same area.

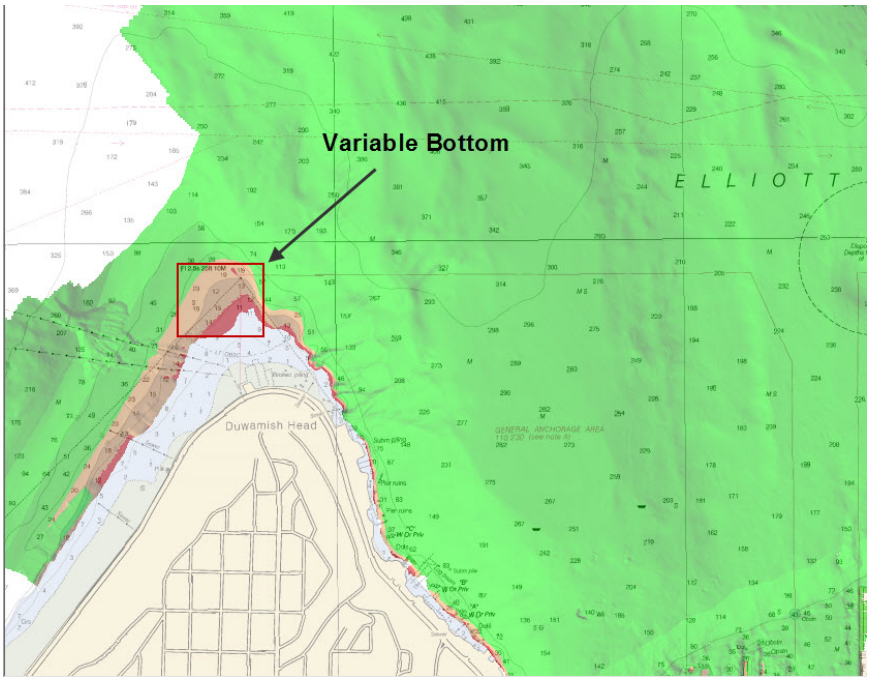


Figure 9: Variable bottom due to vegetation.

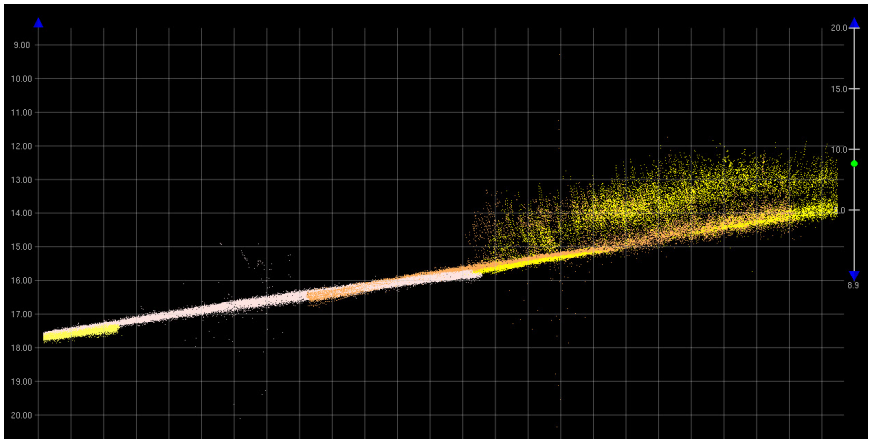


Figure 10: Variable bottom due to vegetation, profile view.

B.2.6.1 Nadir Punch-Though

Several areas in the West Waterway, and other locations of soft sediment, show 'punch-though' of sonar nadir beams. (Figure 11 and 12). In general, data is within spec and has been retained, rather than rejected, to avoid creating holidays. Data outside of IHO specifications for the depth range has been rejected and small holidays occur in these locations. Least depths are not effected by rejection or retention of data as shoaler soundings exist in local areas.

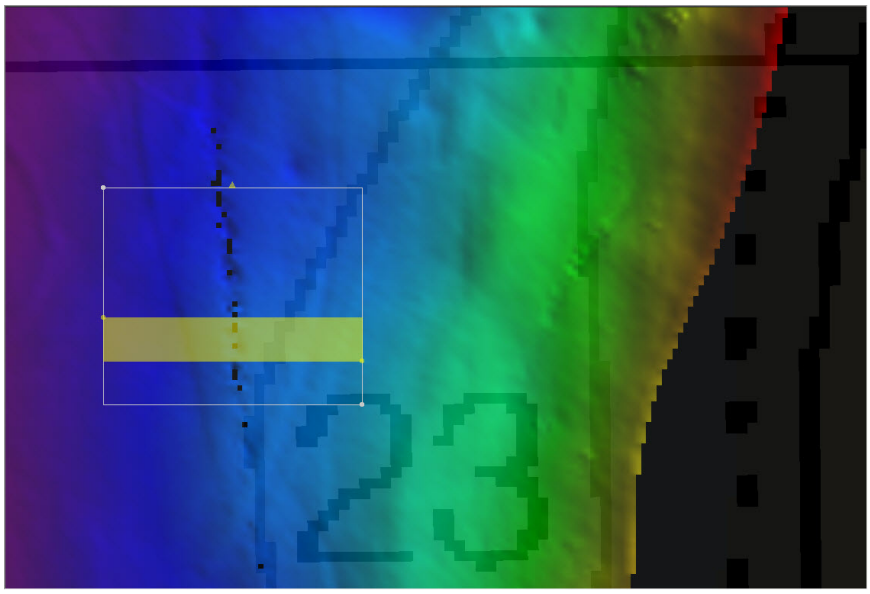


Figure 11: Holidays caused by rejection of nadir punch-though in West Waterway

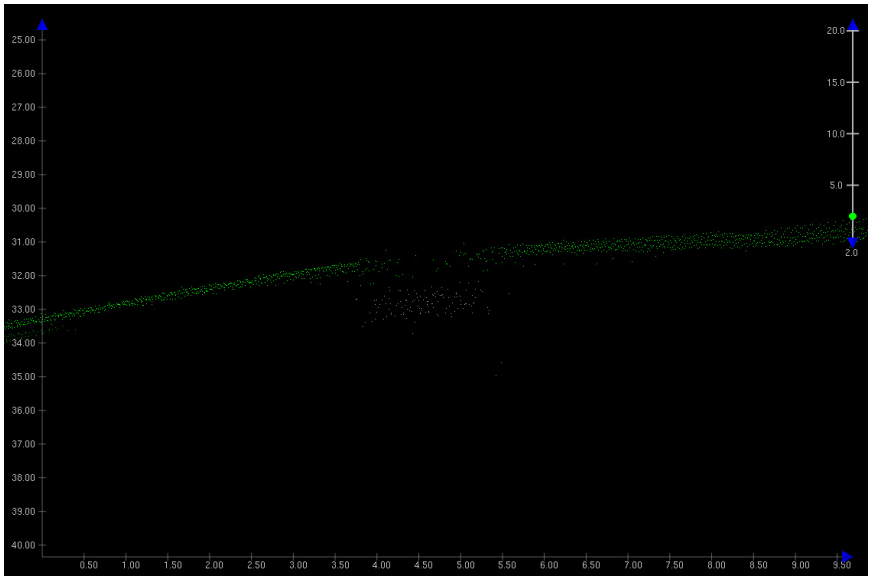


Figure 12: Subset view of nadir punch-though in West Waterway

The data is adequate for charting despite the punch-through of the nadir beams.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed measurements were conducted and applied as discussed in the Corrections to Echo Soundings section of the DAPR.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 IHO Uncertainty

All data meet the data accuracy specifications as stated in the NOS Hydrographic Surveys Specifications and Deliverables (HSSD) dated April 2012. To assess vertical accuracy standards, a child layer titled "IHO_1" was created for each of the 0.5 meter, 1 meter, 2 meter, 4 meter, and 8 meter finalized surfaces up to depths of 100 meters using the equation as stated in section C. 2.1 of the DAPR. A child layer titled "IHO_2" was created for the 8 meter and 16 meter finalized surfaces for depths over 100 meters using the equation as stated in section C. 2.1 of the DAPR. The resulting analysis is presented in Standards Compliance Review in Appendix V.

See attached Compliance Review document.

B.2.10 Density

Density requirements for the 0.5m, 1m, 2m, 4m, 8m, and 16m finalized surfaces were achieved with at least 99.35% of finalized surface nodes containing five or more soundings. See Standards Compliance Review in Appendix V.

B.2.11 Holidays

Complete multibeam coverage was obtained within the limits of F00613. For holidays larger than three surface grid nodes, the corresponding multibeam backscatter was examined and no navigationally significant features were found. The least depths of all navigationally significant features are represented by F00613.

Figure 13 depicts the location of a holiday where no coverage exists; however, it is outside of the sheet limits and no features were found in the immediate area.

Figure 14 depicts the location of a small density holiday caused by a shadow of bottom feature. Similar holidays near shoreline construction exist to dol and pile shadows.

Figure 15 depicts the location of a holiday at the junction of the 1 and 2 meter finalized surfaces. No significant features exist in local area.

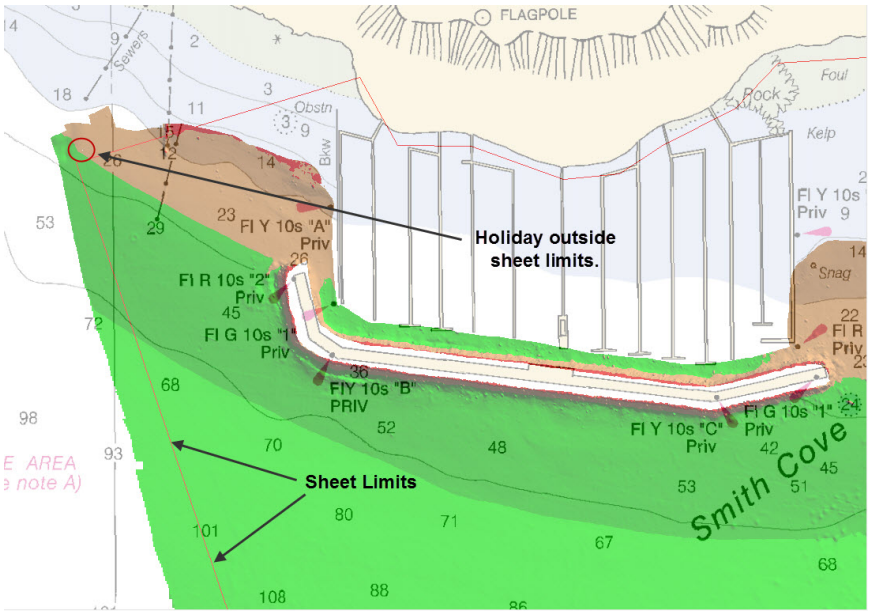


Figure 13: Holiday outside sheet limits.

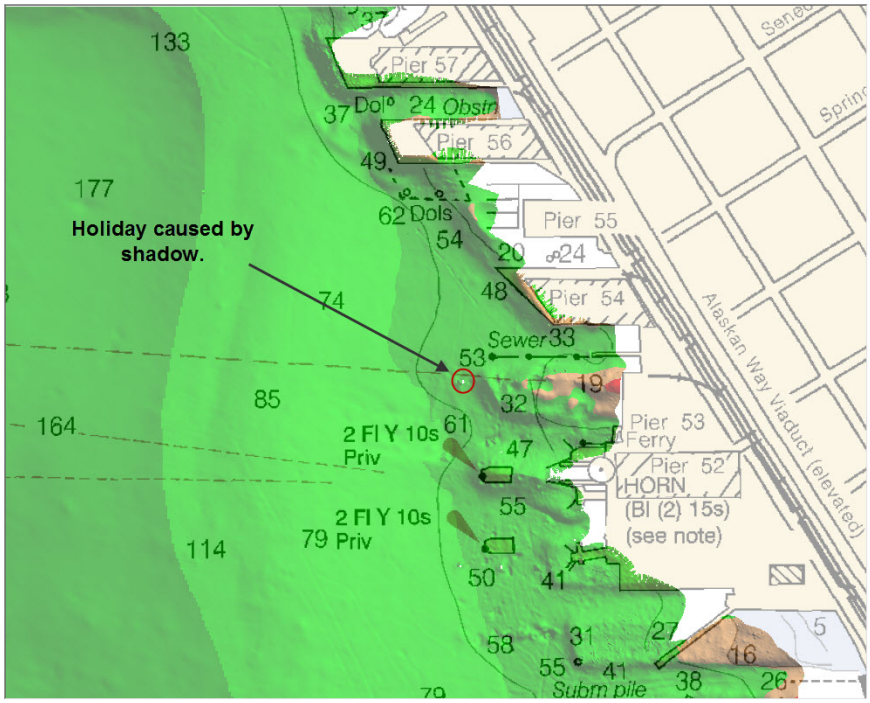


Figure 14: Holiday caused by shadow.

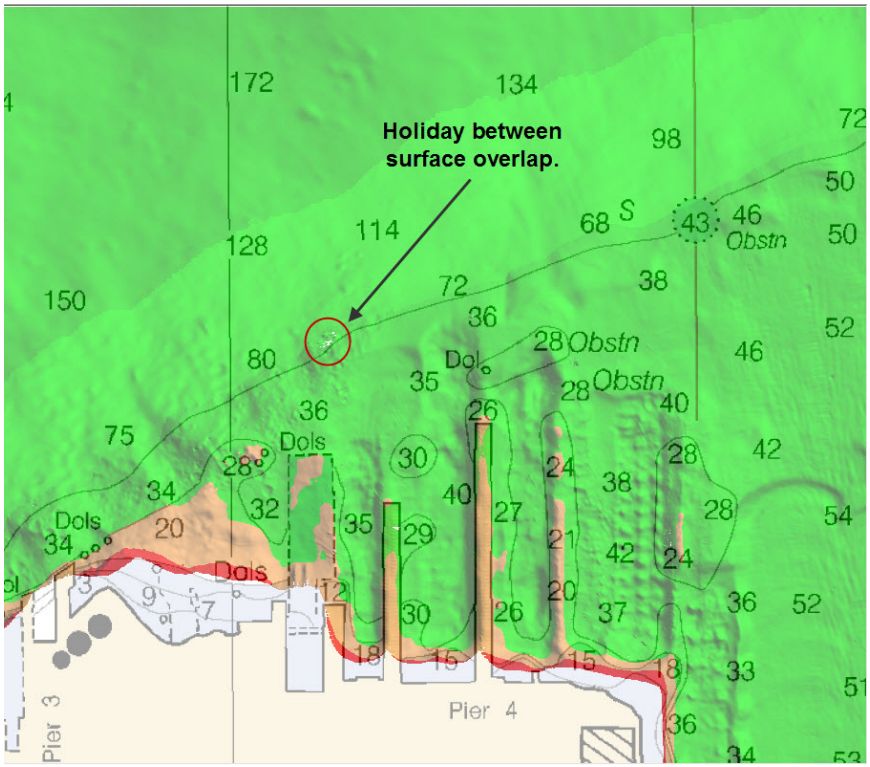


Figure 15: Holiday at surface junction.

The holiday noted in Figure 14 was examined and determined not to be due to acoustic shadowing, but instead was due to fliers pulling the surface downwards below the depth threshold of the finalized surfaces. The deep fliers were rejected and the surfaces were recomputed. After the recomputation, the holiday was no longer present. The data is adequate for charting despite the remaining small holidays identified in the data.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter was logged as 7k files and submitted directly to NGDC to be archived, as well as the Pacific Hydrographic Branch (PHB) for processing.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Extended Attribute Files V5_2

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00613_05m	CUBE	0.5 meters	-	NOAA_0.5m	Complete MBES
F00613_1m	CUBE	1 meters	-	NOAA_1m	Complete MBES
F00613_2m	CUBE	2 meters	-	NOAA_2m	Complete MBES
F00613_4m	CUBE	4 meters	-	NOAA_4m	Complete MBES
F00613_8m	CUBE	8 meters	-	NOAA_8m	Complete MBES
F00613_16m	CUBE	16 meters	-	NOAA_16m	Complete MBES
F00613_05m_Final_0to12	CUBE	0.5 meters	0 meters - 12 meters	NOAA_0.5m	Complete MBES
F00613_1m_Final_10to20	CUBE	1 meters	10 meters - 20 meters	NOAA_1m	Complete MBES
F00613_2m_Final_18to40	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
F00613_4m_Final_36to80	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
F00613_8m_Final_72to160	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES
F00613_16m_Final_144to320	CUBE	16 meters	144 meters - 320 meters	NOAA_16m	Complete MBES
F00613_16m_Combined	CUBE	16 meters	-	NOAA_16m	Complete MBES
F00613_16m_Combined_ERS	CUBE	16 meters	-	NOAA_16m	Complete MBES

Table 9: CARIS Surfaces

All field sheet extents were adjusted using the Base 16 Calculator tool to ensure coincident nodes among all bathymetric surfaces regardless of the field sheet in which they are contained given the surface resolutions of one, two, four, eight, and sixteen meters. The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey F00613.

The surfaces have been reviewed where noisy data, or 'fliers', are incorporated into the gridded solution causing the surface to be shoaler or deeper than the true seafloor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable vertical uncertainty at that depth, the noisy data have been rejected and the surface recomputed.

B.5.3 Manual Cleaning of Cultural Features

Piles, dols, and waterfront construction were manually rejected from the collected data where they were known to break the surface of the water and/or where already charted as features. See Figures 16 through 19 for examples of rejected data.

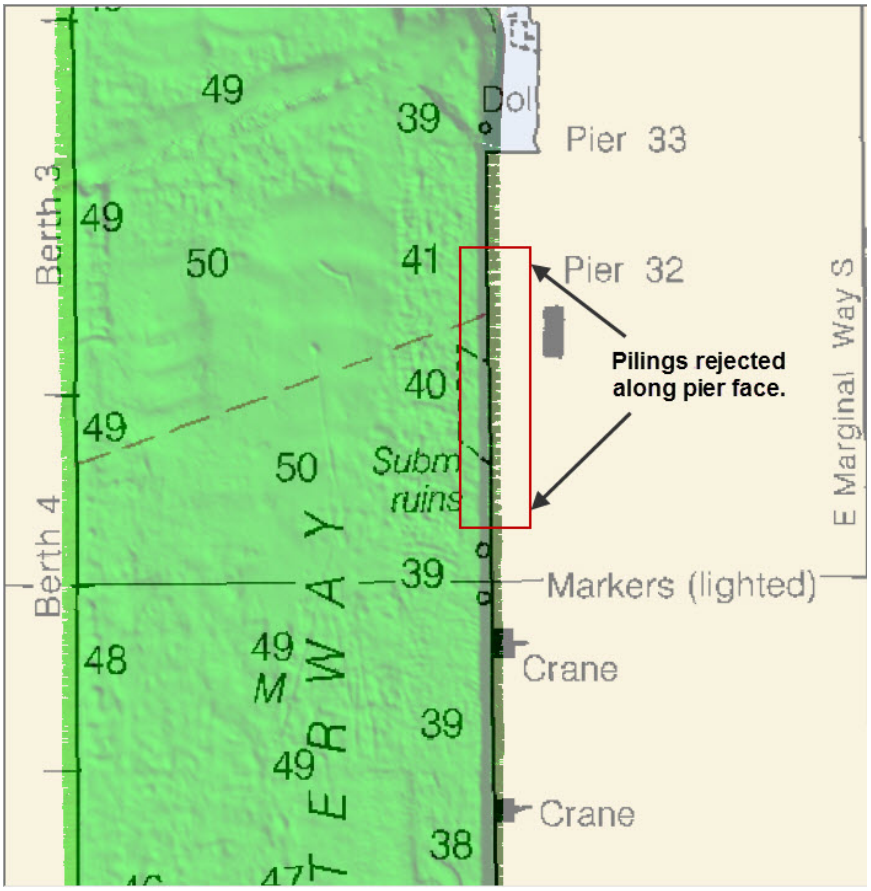


Figure 16: Rejected pilings along pier in East Waterway.

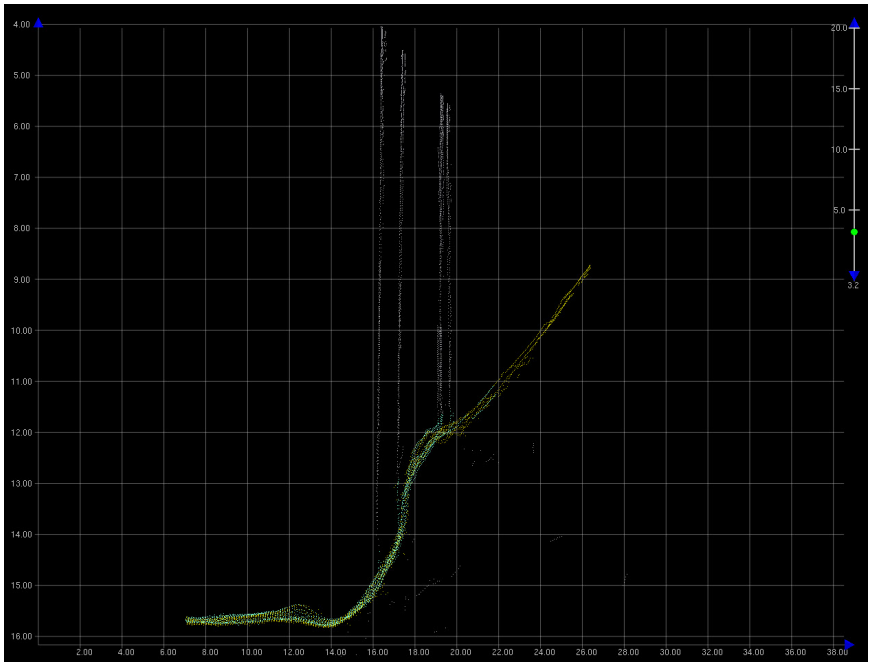


Figure 17: Rejected pilings along pier in East Waterway.

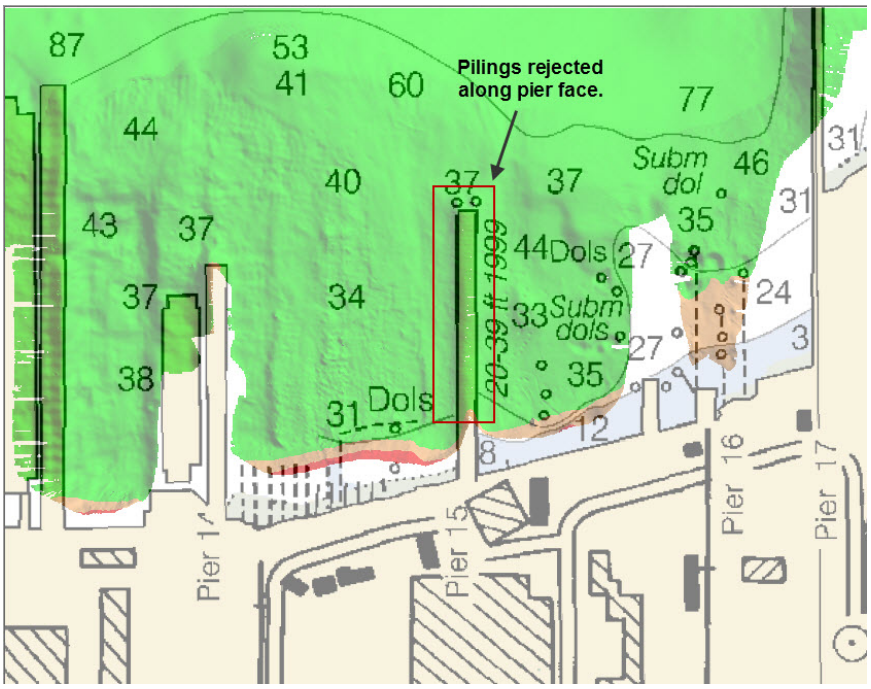


Figure 18: Rejected pilings along pier north of Harbor Island.

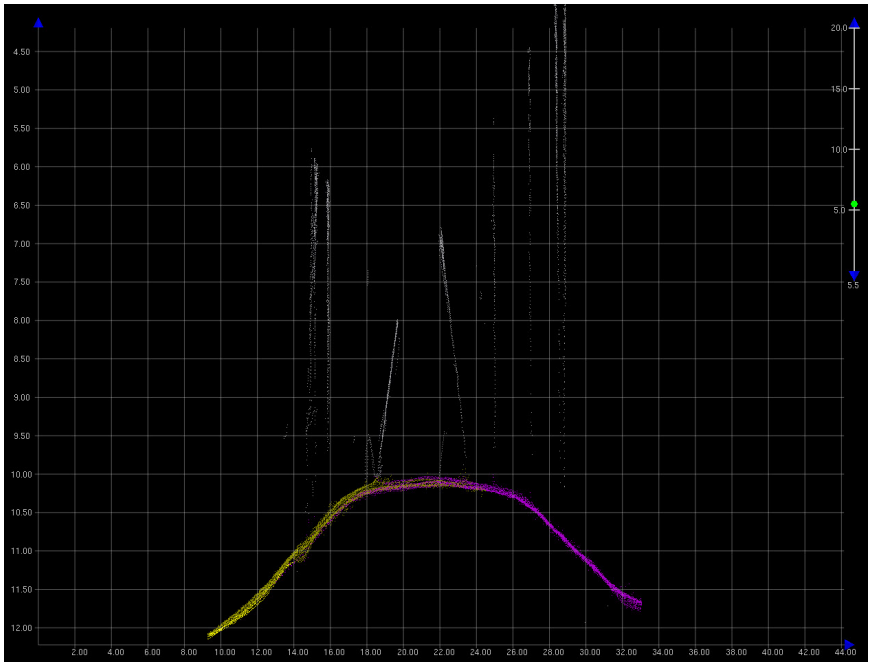


Figure 19: Rejected pilings along pier north of Harbor Island.

B.5.4 TrueHeave

To enable the application of TrueHeave some POS/MV files were "fixed" using the fixTrueHeave.exe utility from CARIS. Fixed files were assigned an additional *.fixed suffix. This was performed for the following vessels and days: Launch 2805 day 153 and Launch 2808 day 156.

The data with the fixed TrueHeave files applied are adequate for charting.

B.5.5 Data logs

Data acquisition and processing notes are included in the acquisition and processing logs and additional processing, such as sound velocity application, is noted in the F00613 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

B.5.6 Critical Soundings

Designation of soundings followed the procedures as outlined in section 5.2.1.2 of the HSSD.

Survey F00613 requires 33 designated soundings to accurately represent the bottom characteristics and features.

During office processing, 73 additional designated soundings were selected for the 2012 dataset. An additional 17 designated soundings were selected for the 2013 dataset.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Standard Vertical Control Methods Used:

Discrete Zoning

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Seattle, Puget Sound, WA	9447130

Table 10: NWLON Tide Stations

File Name	Status
9447130.tid	Final Approved

Table 11: Water Level Files (.tid)

File Name	Status
F00613_Rev_CORF.zdf	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 10/18/2012. The final tide note was received on 11/01/2012.

Final Zoning and water level files were received for survey F00613.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The following PPK methods were used for horizontal control:

Smart Base

Vessel kinematic data were post-processed using Applanix POSPac processing software and SmartBase Post Processed Kinematic methods described in the DAPR. Smooth Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in Caris HIPS.

For further details regarding the processing and quality control checks performed see the F00613 POSPac Processing Logs spreadsheet located in the SBET folder with the GNSS data.

All data from F00613 can be referenced to the ellipsoid.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
ZSE1	ZSE1
SEAT	SEAT
RPT5	RPT5
PRDY	PRDY
P426	P426
P424	P424
SEAI	SEAI
KTBW	KTBW
PUPU	PUPU

Table 13: CORS Base Stations

Differential correctors from the U.S. Coast Guard beacon at Robinson Point, WA (323kHz) and Whidbey Island, WA (302 kHz) was used during real-time acquisition.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Robinsion Point, WA - 323 kHz (200 BPS)
Whidbey Island, WA - 302 kHz (100 BPS)

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
18450	1:10000	18	02/2004	05/08/2012	04/28/2012

Table 15: Largest Scale Raster Charts

18450

Soundings from survey F00613 generally agreed within five to eight feet with charted depths on chart 18450. Notable exceptions to this general agreement are listed and shown in the figures below:

West of Duwamish Head: MBES coverage over sewer line indicates its position is approximately 70 to 110 meters from the charted position (Figure 20).

East Waterway: MBES coverage indicates depths approximately 10 to 15 feet deeper than charted (Figure 21 & 22).

Entrance to West Waterway: MBES coverage indicates no 43 foot obstruction as charted (Figure 23).

Duwamish Waterway, East of Kellogg Island: No log boom, dols, or any indications of such found next to pier as charted (Figure 24).

Channel under 1st Avenue South Bridge: Channel does not hold 30 foot depth to the 1st Avenue South Bridge as listed on chart and published in coast pilot (Figure 25).

Duwamish Waterway, Southeast of Kellogg Island: There is a 7-foot high obstruction with a least depth of 25 feet on the westerly edge of a dredged 30-foot channel (Figure 26 & 27).

Elliott Bay: Numerous designated soundings were needed close to shore in order to accurately represent bottom characteristics (Figure 28).

Elliott Bay: There appears to be an uncharted wreck in approximately 430 feet of water with a length of 300 feet (Figure 29 & 30).

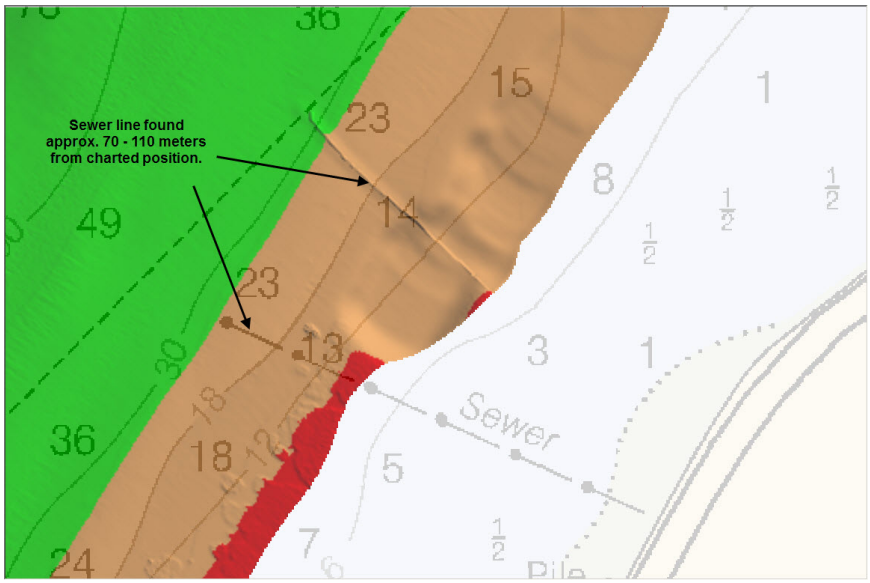


Figure 20: Sewer line approx. 70 - 110 meters from charted position.

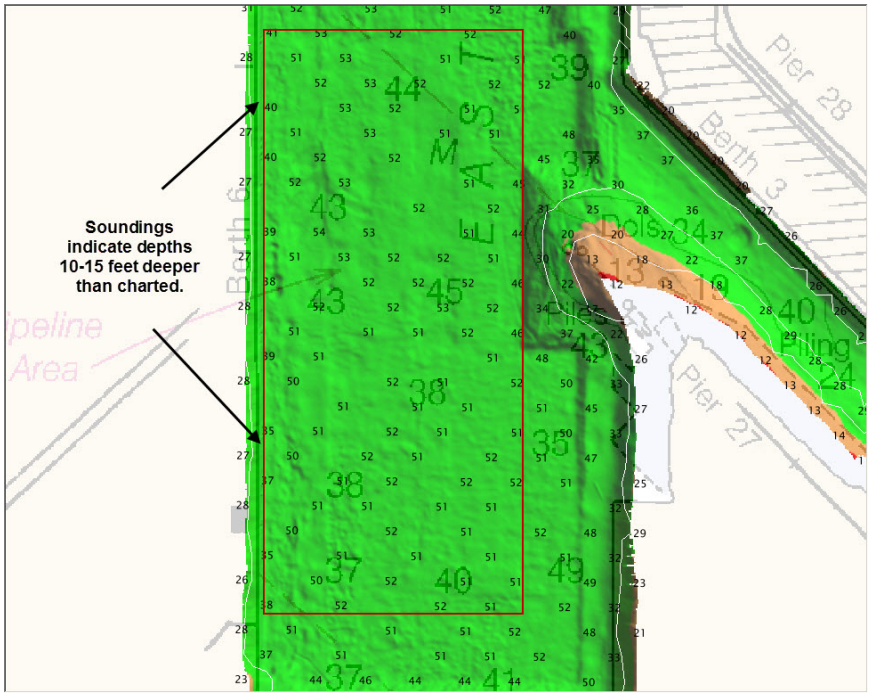


Figure 21: East Waterway depths approx. 10 - 15 feet deeper than charted.

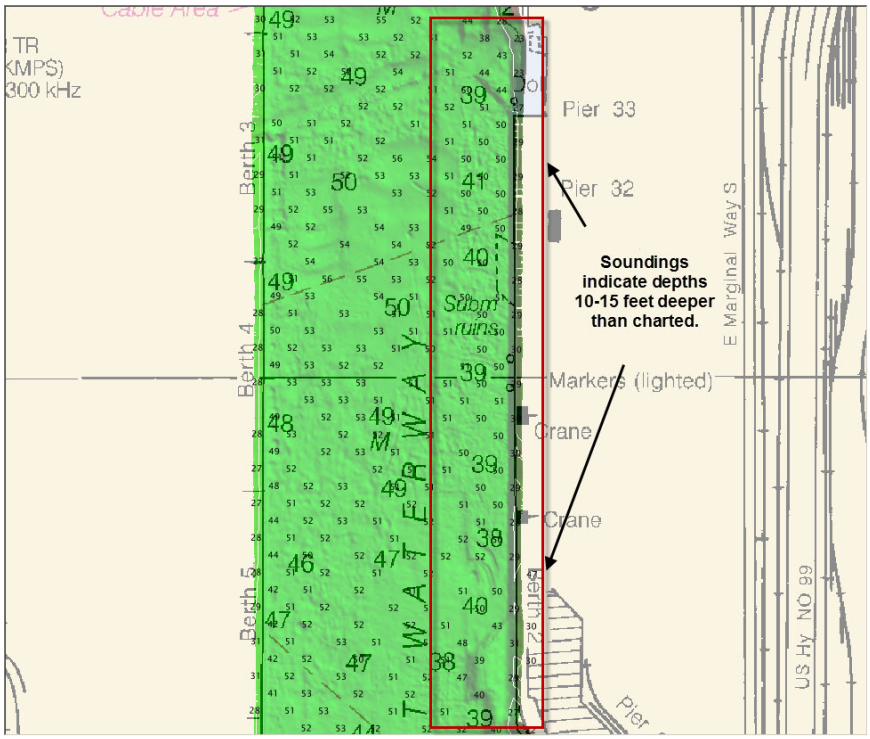


Figure 22: East Waterway depths approx. 10 - 15 feet deeper than charted.

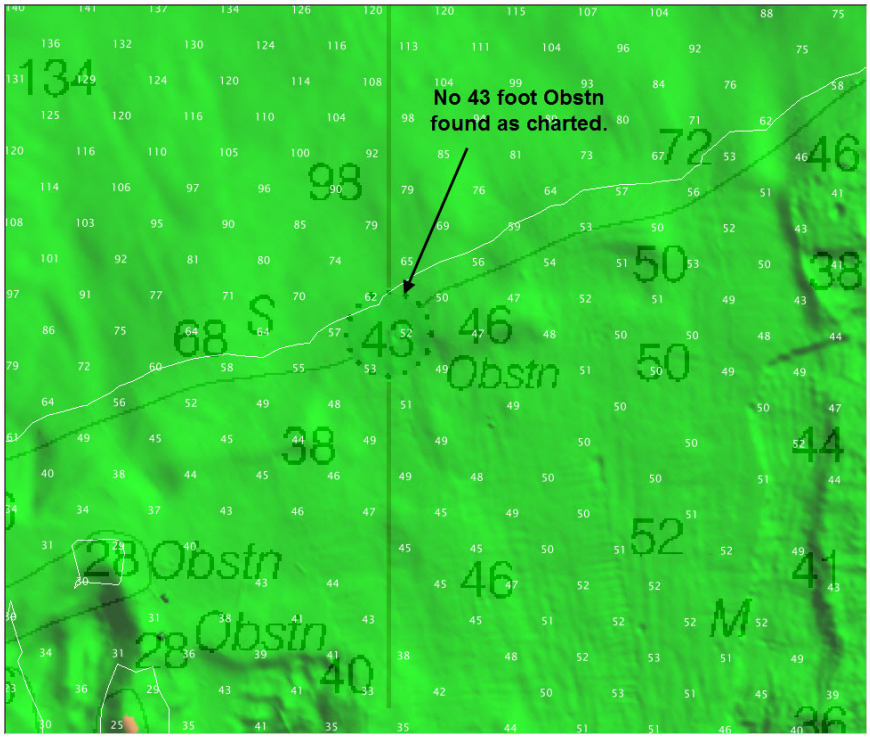


Figure 23: No 43 foot obstn found as charted.

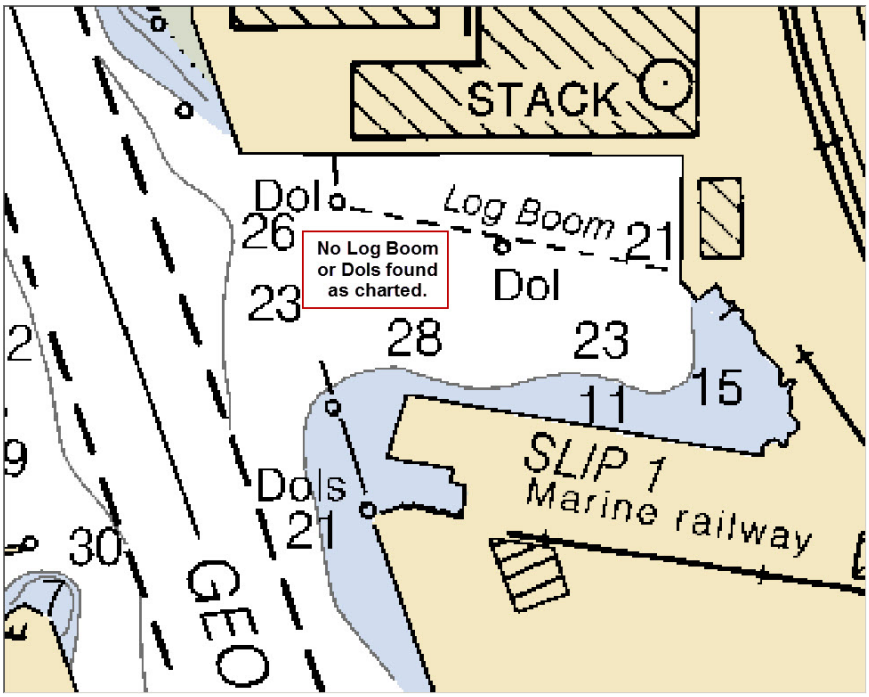


Figure 24: No Log Boom or Dols found as charted.

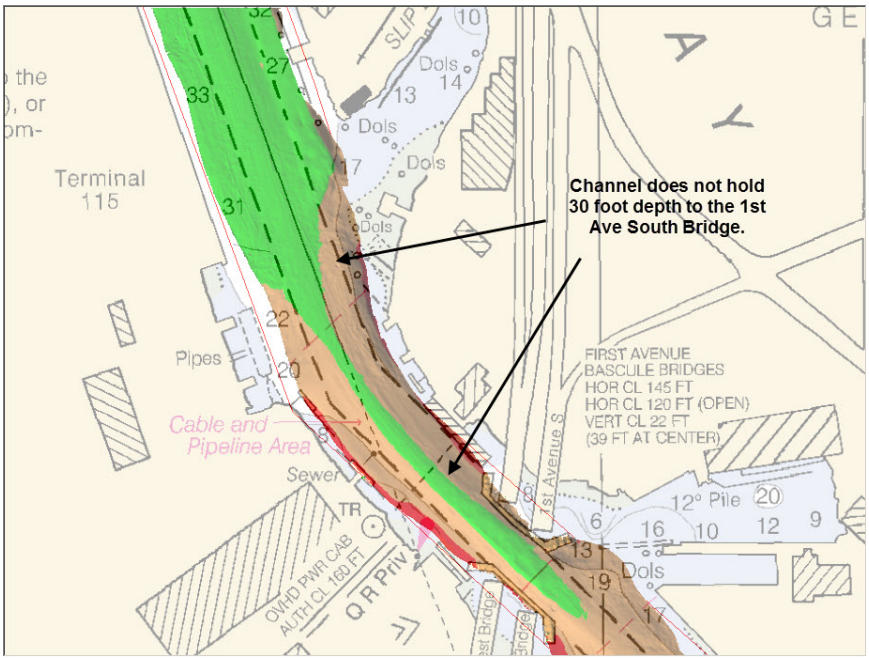


Figure 25: Shoaling approaching 1st Ave South Bridge.

Figure 26: 7-foot high obstn on westerly edge of 30-foot channel.

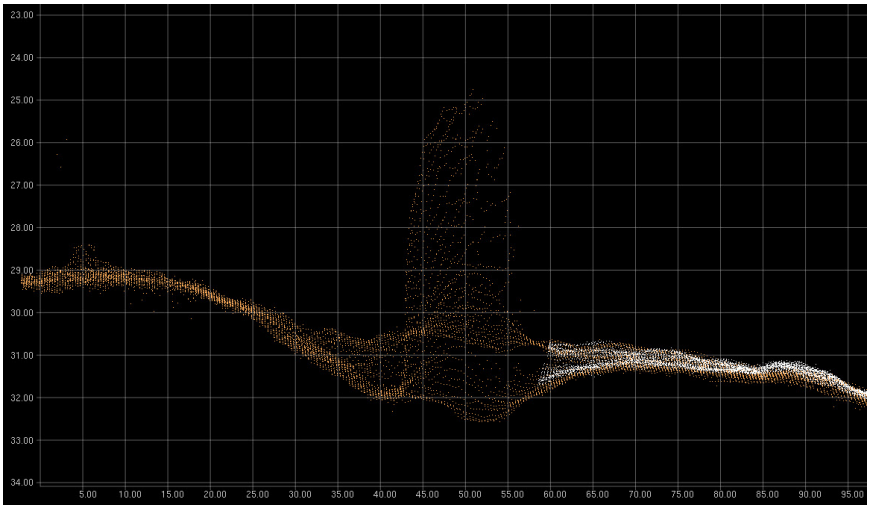


Figure 27: 7-foot high obstn on westerly edge of 30-foot channel, profile view.

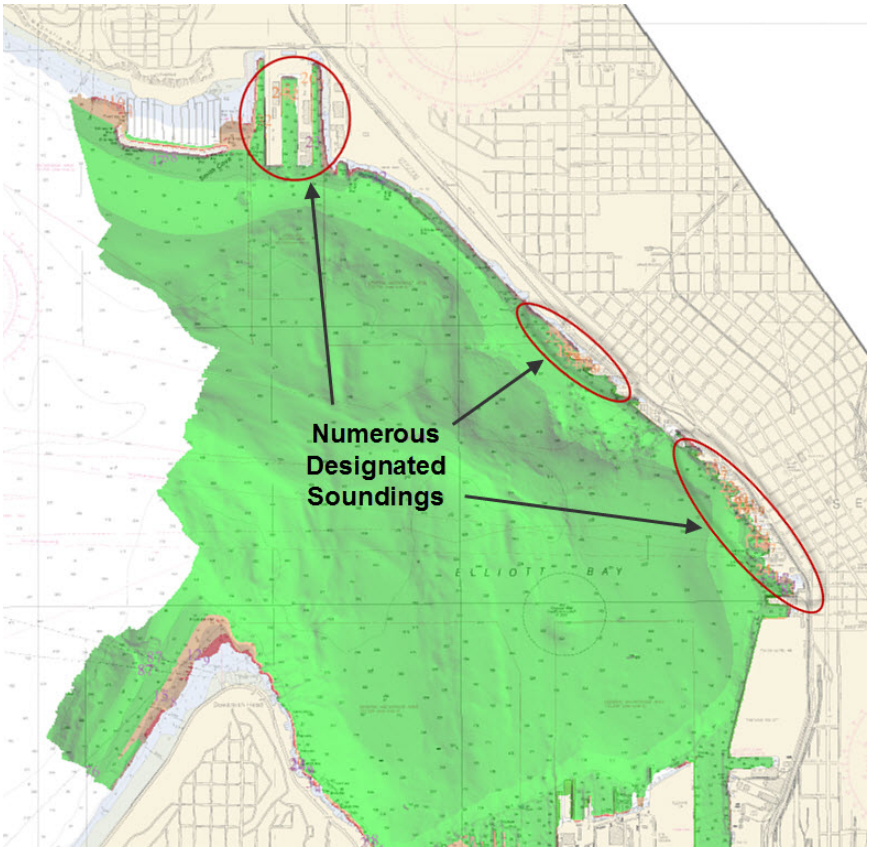


Figure 28: Overview of designated soundings.

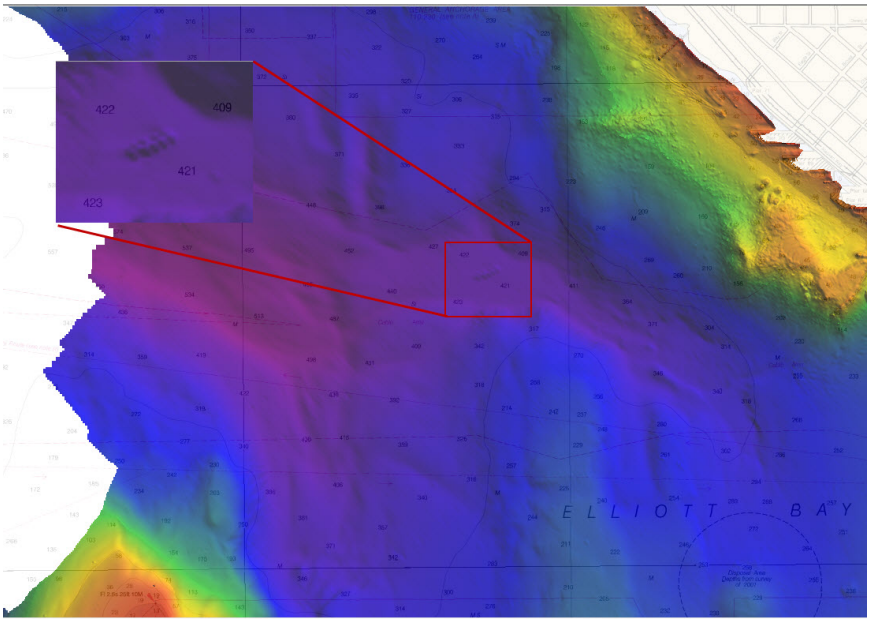


Figure 29: Uncharted wreck approximately 300-feet in length.

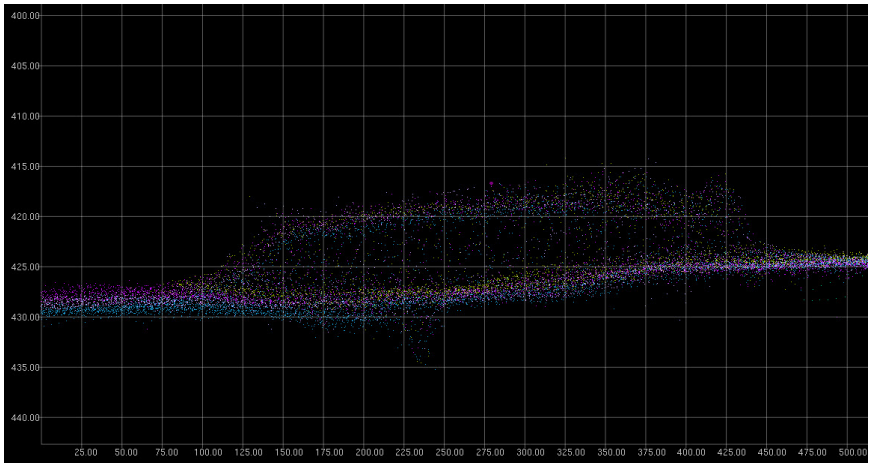


Figure 30: Uncharted wreck approximately 300-feet in length, profile view.

Despite the fact that the Coast Pilot indicates a project depth of 30 ft for the Duwamish Waterway, it defers determination of the final depths to the latest chart or Local Notice to Mariners. The controlling depths for Georgetown Reach near the 1st Avenue South Bridge are listed on the latest chart as: LOQ - 16.1 ft, MHC - 21.1 ft, ROQ - 20.4 ft.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5WA15M	1:10000	15	11/15/2011	05/02/2012	NO

Table 16: Largest Scale ENCs

US5WA15M

General comparison of ENC yields same notes as discussed in Chart Comparrison of 18450, above. The ENC was noted to have digital features (piles, dols, etc) not shown on chart. A copy of the ENC was filtered to include obstructions, piles, and mooring/warping facilities within MBES coverage. Each feature was attributed as observed in field data in an effort to deconflict features. Please refer to included F00613_Final_Feature_File.hob.

The F00613 Final Feature File was included in the hydrographic data submission and is not attached to this report.

D.1.3 AWOIS Items

No AWOIS items exist for this survey.

D.1.4 Charted Features

No charted features that contain the label PA, ED, PD, or Rep exist for this survey. Features such as piles, dols, wrecks, and obstructions within the extents of the MBES coverage were investigated. These features have been included and attributed in the F00613_Final_Feature_File.hob.

D.1.5 Uncharted Features

Numerous piles, dols, and other pier construction exist throughout survey. New features have been included and attributed in the F00613_Final_Feature_File.hob.

D.1.6 Dangers to Navigation

Danger to Navigation Reports are included in Appendix I of this report.

There were 18 DTONs submitted within the limits of the survey, four of which were not applied to the charts due chart scale limitations. All other field reported DTONs have been applied to the charts. An additional DTON was identified during office processing and has recently been applied to the charts. Three of the original DTONs were removed by the Port of Seattle. The area was re-surveyed in 2013 and the original DTONs have been recommended to be removed from the chart. See attached DTON Reports.

D.1.7 Shoal and Hazardous Features

Shoals or potentially hazardous features exist for this survey. Shoals inshore of the NALL were not investigated. All shoals and hazards offshore of NALL were investiged and general differences have been noted in Chart Comparisons (above).

D.1.8 Channels

Channels, designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, and/or channel and range lines exist within the survey limits, and agree with what is charted (18450).

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

Although shoreline verification was not required, the field addressed features that fell within the limits of the survey.

D.2.2 Prior Surveys

Prior surveys exist for this survey, but were not investigated, other than for junction comparisons as noted above in B.2.3.

D.2.3 Aids to Navigation

Aids to navigation (ATONs) exist for this survey; all are located as charted and serving their intended purpose.

D.2.4 Overhead Features

Overhead features exist for this survey, but were not investigated.

D.2.5 Submarine Features

Submarine features exist for this survey, but were not fully investigated. As noted in the chart comparison, West of Duwamish Head a charted sewer line appears to be 70 to 110 meters from the charted position (Figure 20 above).

D.2.6 Ferry Routes and Terminals

Ferry routes and/or terminals exist and are serving their intended purpose.

D.2.7 Platforms

No platforms exist for this survey.

Platforms exist within the survey area, but they weren't investigated.

D.2.8 Significant Features

No significant features exist for this survey.

D.2 Construction and Dredging

Present and/or planned construction or dredging exists within the survey limits, but was not investigated.

E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2012-12-05
Coast Pilot Report	2012-12-14

Approver Name	Approver Title	Approval Date	Signature
CDR James M. Crocker, NOAA	Chief of Party	5/2/2013	Digitally signed by James M. Crocker Date: 2013.05.08 09:04:20 -07'00'
LT Caryn M. Zacharias, NOAA	Field Operations Officer	5/1/2013	Caryn M. Zacharias 2013.05.01 17:38:15 -07'00'
LT Timothy M. Smith, NOAA	Field Operations Officer II	5/1/2013	Digitally signed by Tim Smith DN: cn=Tim Smith, o=NOAA, ou=NOAA Ship Fairweather, email=timothy.m.smith@noaa.gov, c=US Date: 2013.05.01 06:48:56 -07'00'
CST Tami M. Beduhn	Chief Survey Technician	4/24/2013	Tami Beduhn 2013.04.24 14:36:58 -07'00'
ENS Joshua D. Witmer, NOAA	Sheet Manager	4/24/2013	

F. Table of Acronyms

Acronym	Definition
AFF	Assigned Features File
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Exectutive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

Descriptive Report Addendum - Survey F00613

Project: S-N923-FA-12

Sublocality: Elliot Bay

Scale: 1:5000

May 2013

NOAA Ship *Fairweather*

Chief of Party: CDR David J. Zezula, NOAA

A. Area Surveyed

The surveyed area is located in Elliot Bay, WA, around cruise ship terminal piers 90 and 91.

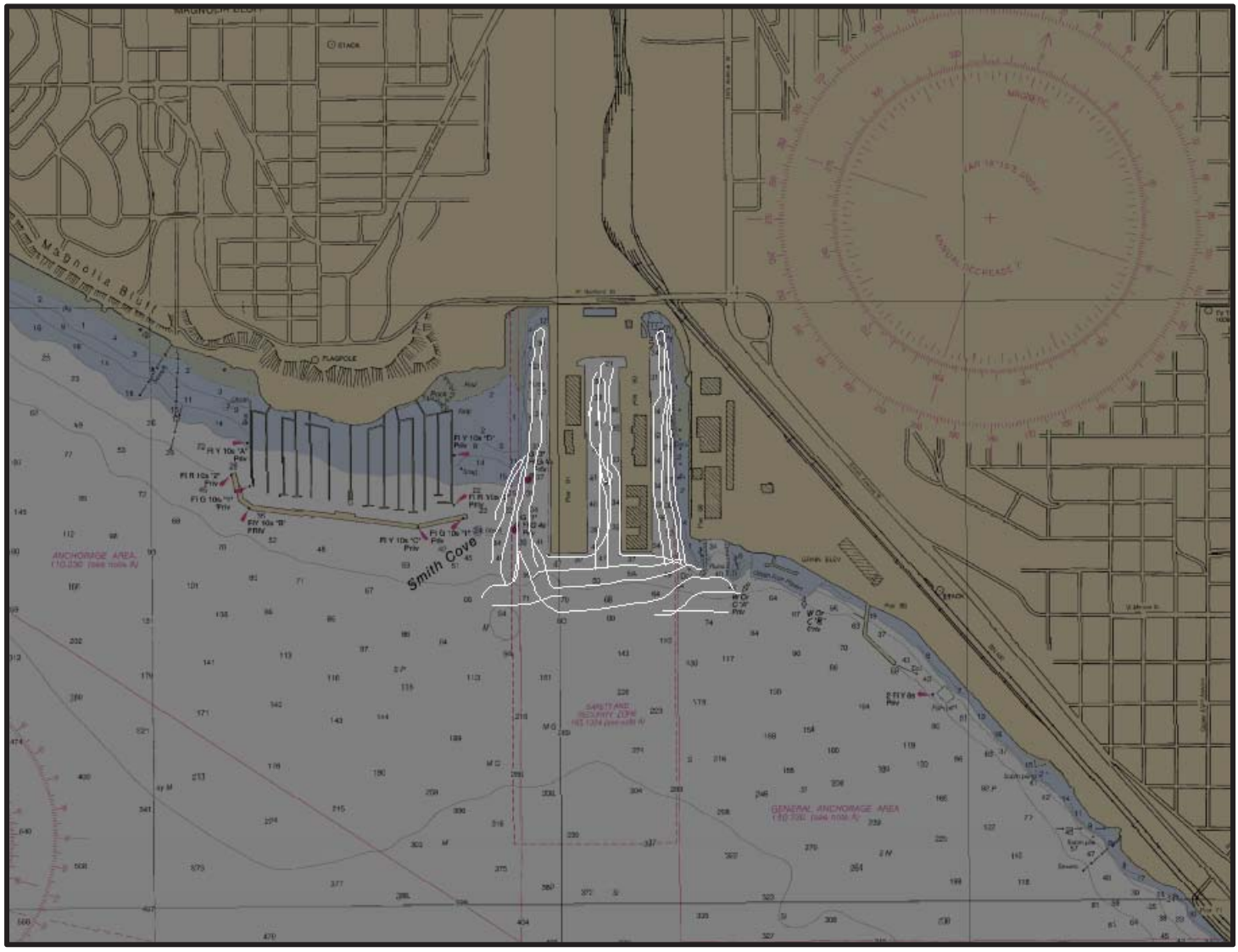


Figure 1: Survey lines collected in 2013

A.1 Survey Limits

There is no deviation in the survey limit from the descriptive report (DR), F00613.

A.2 Survey Purpose

The purpose of the additional survey was to assess the removal of three DTONs between piers 90 and 91 on the North side of Elliot Bay. The DTON removal was conducted months after the initial data collection.

There are no further deviations from the survey purpose as stated in the F00613 DR.

A.3 Survey Quality

All additional data (2013) is adequate to supersede previous data (2012).

A.4 Survey Coverage

All additional data fell within the original survey outline. Multiple holidays exist in the dataset due to hypack logging issues. None of the holidays were addressed due to time constraints and that the priority area was only around the DTON removal site.

Figure 2 shows the locations of data gaps and holidays.

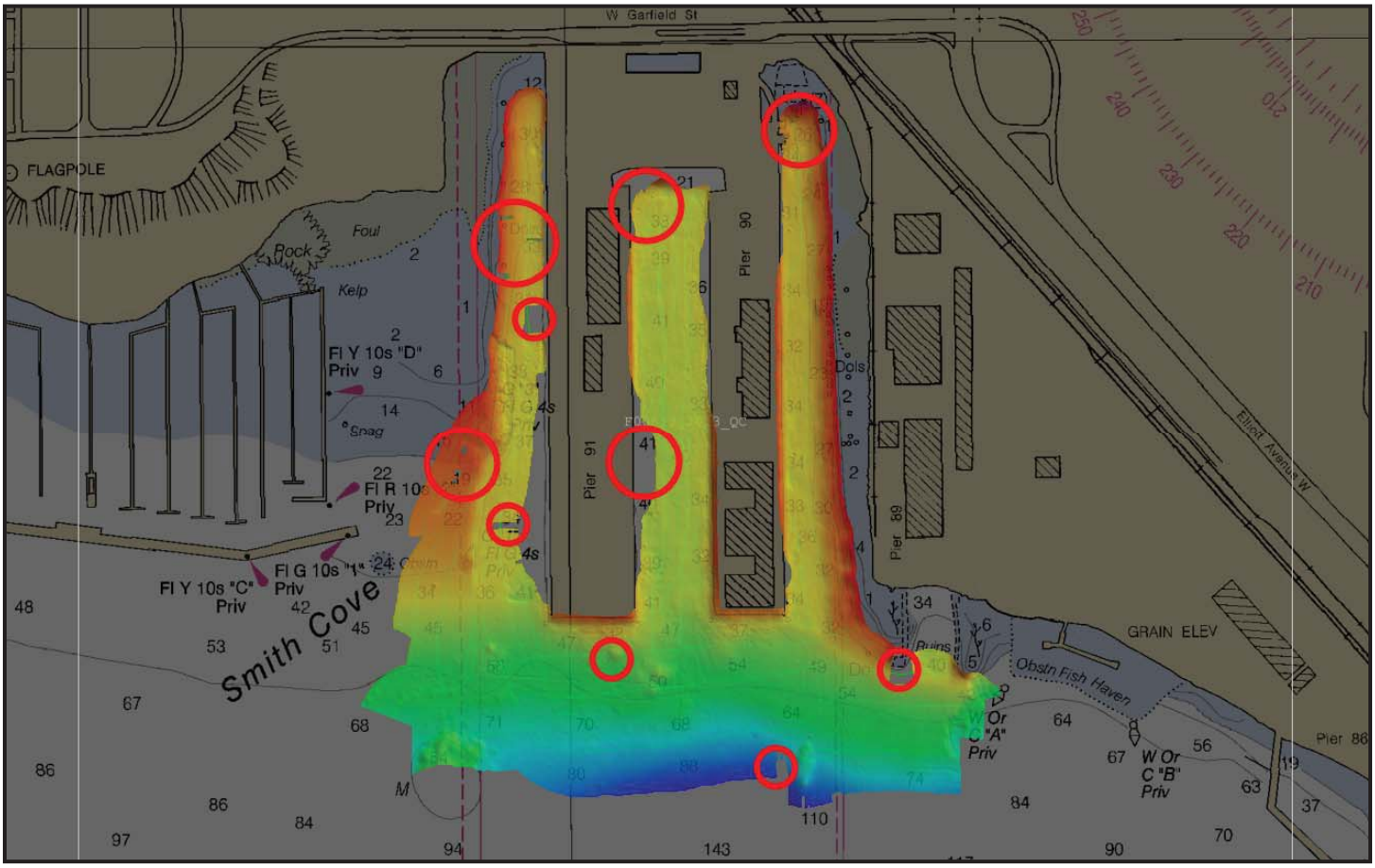


Figure 2: Location of data gaps & Holidays in F00613 addendum

The two data gaps on the East side of Pier 91 could not be covered due to two boats docked on the pier. This did not affect acquisition of data over the DTON locations.

A.5 Survey Statistics

The following table lists the main scheme and crossline acquisition mileage for the additional data collected for this survey:

	HULL ID	***2805***	***Total***
LNM	**SBES Mainscheme**	0.00	0.00
	MBES Mainscheme	5.93	5.93
	Lidar Mainscheme	0.00	0.00
	SSS Mainscheme	0.00	0.00
	SBES/MBES Combo Mainscheme	0.00	0.00
	MBES/SSS Combo Mainscheme	0.00	0.00
	MBES/SSS Combo Mainscheme	0.00	0.00
	SBES/MBES Combo Crosslines	0.00	0.00
	Lidar Crosslines	0.00	0.00
Number of Bottom Samples			0
Number of DP's			0
Number of Items Items Investigated by Dive Ops			0
Total Number of SNM			0.1

Table 1: Hydrographic Survey Statistics

The following table lists the specific dates of the data acquisition for the additional survey data:

Survey Dates
5/31/2013

Table 2: Dates of Hydrography

A.6 Shoreline

There is no shoreline verification requirement for this project.

A.7 Bottom Samples

There is no bottom sample requirement for this project.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviation from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during collection of the additional data:

Hull ID	***2805***
LOA	8.64 meters
Draft	1.12 meters

Table 3: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	**Model**	**Type**
Reson	7125	MBES
Reson	SVP71	Sound Speed System
Sea Bird	SBE 19 plus	Conductivity, Temperature and Depth
Applanix	POS MV V4	Positioning and Attitude System

Table 4: Major Systems Used

B.2 Quality Control

There were no deviations from the quality control methods or uncertainty parameters as listed in the F00613 DR.

B.3 Echo Sounding Corrections

There are no deviations from the F00613 DR.

B.4 Backscatter

Due to loss of raw data, there is no backscatter data submitted for the 2013 survey data.

B.5 Data Processing

B.5.1 Software Updates

See DAPR for OPR-N395-FA-13 resubmitted with this addendum. Final Data Processing took place in CARIS HIPS and SIPS 8.1.7.

B.5.2 Surfaces

The following CARIS Surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00613_MB_halfm_MLLW	CUBE	0.5 meters	-	NOAA_0.5m	Complete MBES
F00613_MB_1m_MLLW	CUBE	1 meters	-	NOAA_1m	Complete MBES
F00613_MB_2m_MLLW	CUBE	2 meters	-	NOAA_2m	Complete MBES
F00613_MB_halfm_MLLW_Final	CUBE	0.5 meters	0 meters - 12 meters	NOAA_0.5m	Complete MBES
F00613_MB_1m_MLLW_Final	CUBE	1 meters	10 meters - 20 meters	NOAA_1m	Complete MBES
F00613_MB_2m_MLLW_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
F00613_MB_2m_Combined	CUBE	2 meters	-	NOAA_2m	Complete MBES

B.5.3 Data Logs

Data acquisition logs for the additional data was lost along with the raw data.

B.5.6 Critical Soundings

Survey F00613 addendum requires 3 designated soundings to accurately represent the seafloor.

C. Vertical and Horizontal Control

C.1 Vertical Control

There were no deviations from the F00613 DR.

C.2 Horizontal Control

There were no deviations from the F00613 DR.

D. Results and Recommendations

D.1 Chart Comparison

There was no additional chart comparison conducted.

D.1.1 Dreading Request and Report

See Appendix I and II for the dredging request and reports following the submittal of DTON report F00613.

D.2.1 Comparison with Previous Data

The 3 removed DTONS were investigated. Figure 3 shows their locations.

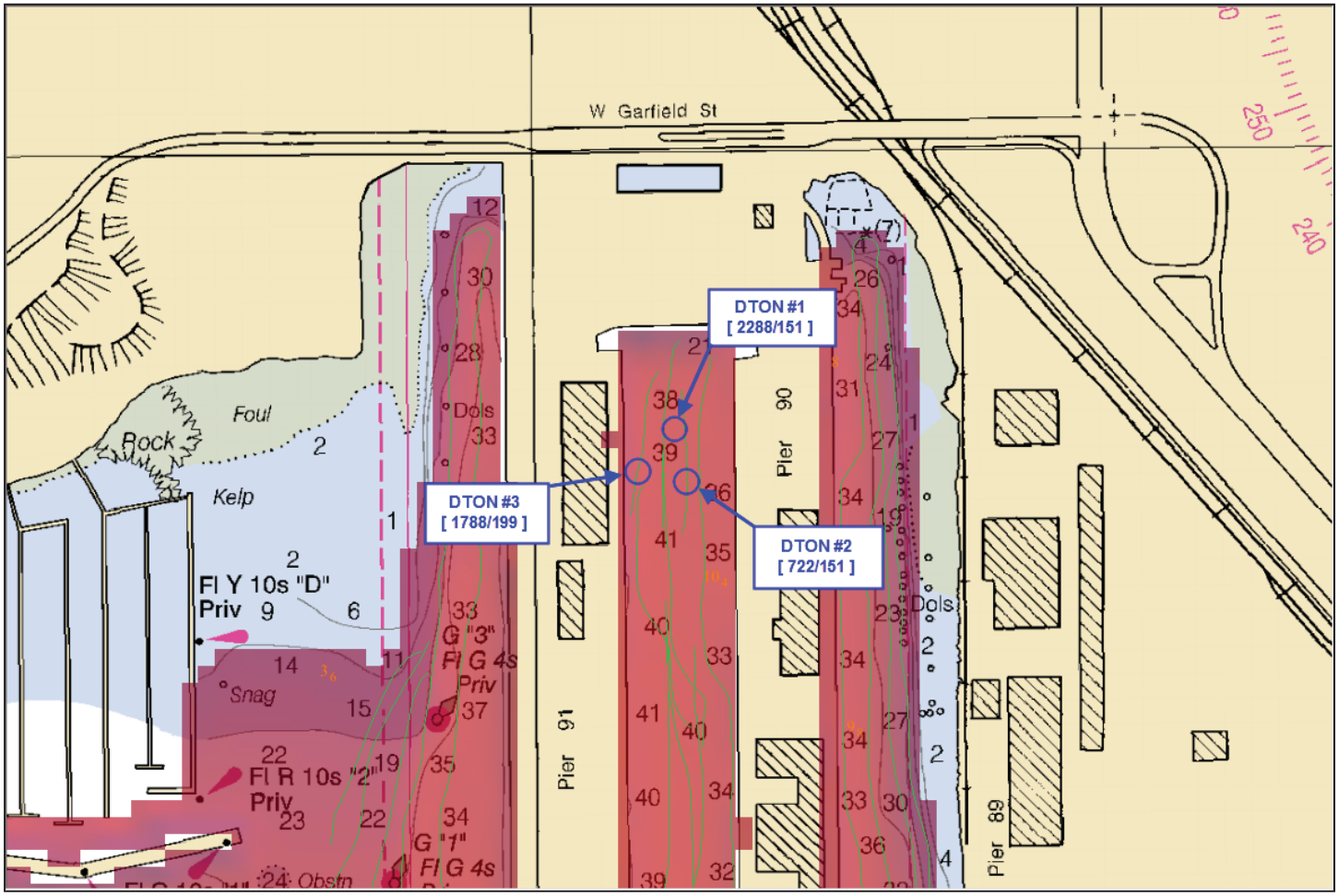


Figure 3: Location of Removed DTONs

Table 5 shows the 3 DTONS with their respective depths.

DTON	OLD LEAST DEPTH	NEW LEAST DEPTH
2288/151	9.6 m	11.5 m
722/151	9.8 m	11.5 m
1488/199	7.6 m	11.1 m

Table 5: Least Depths of Removed DTONs

Appendix II, original DTON report is included for reference.

D.2.1.1 DTON 2288/151

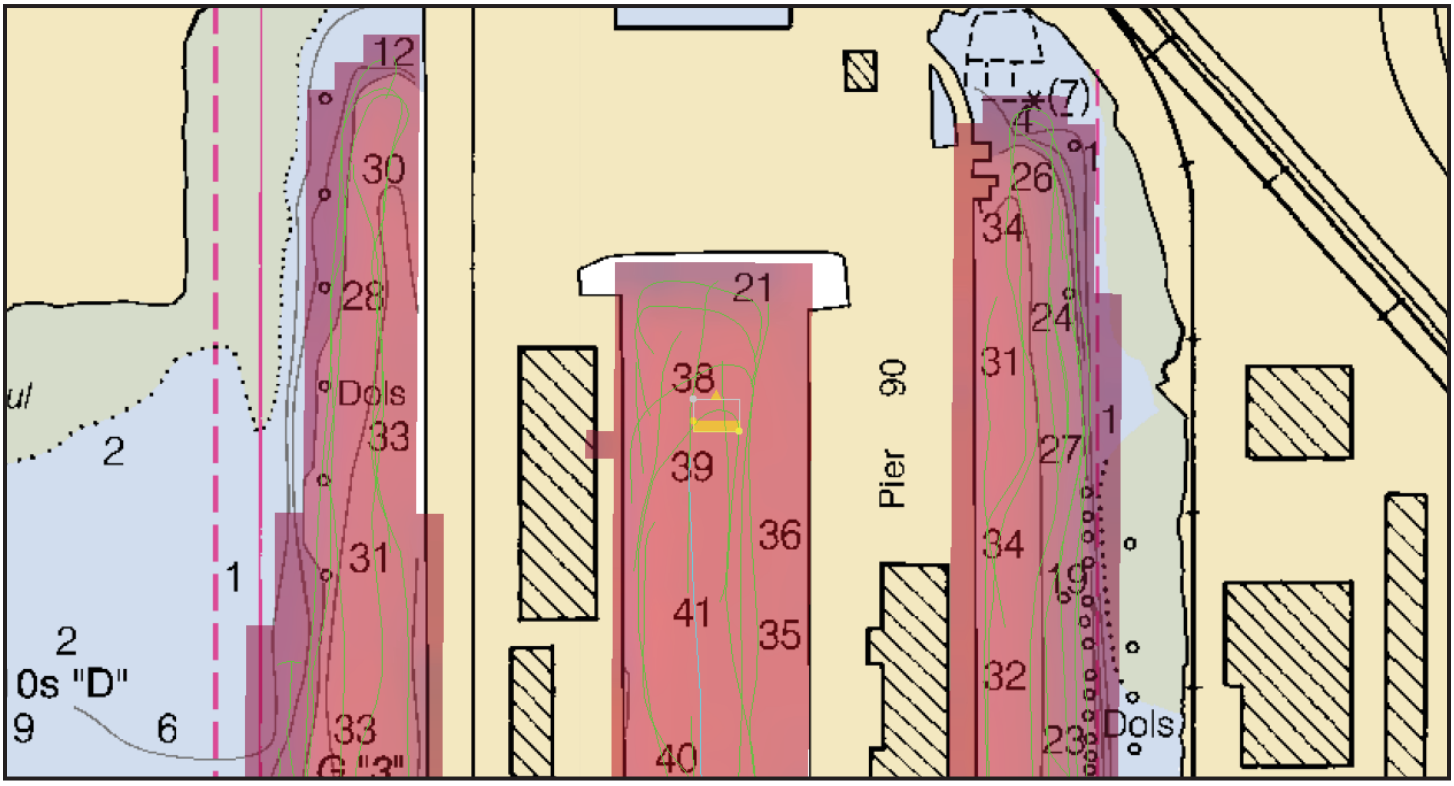


Figure 4: DTON 2288/151 Location

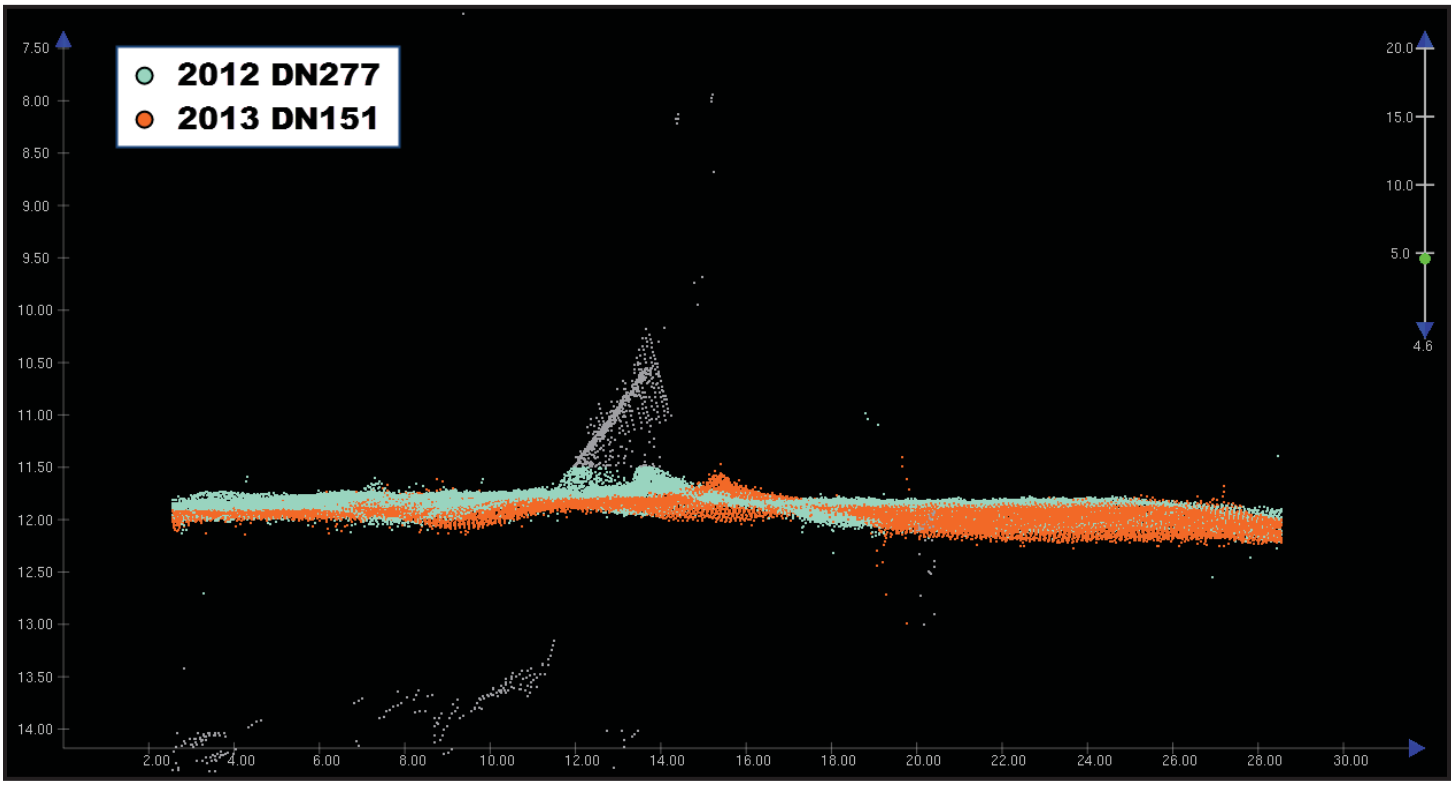


Figure 5: DTON 2288/151 – 2012 & 2013 Data Overlay

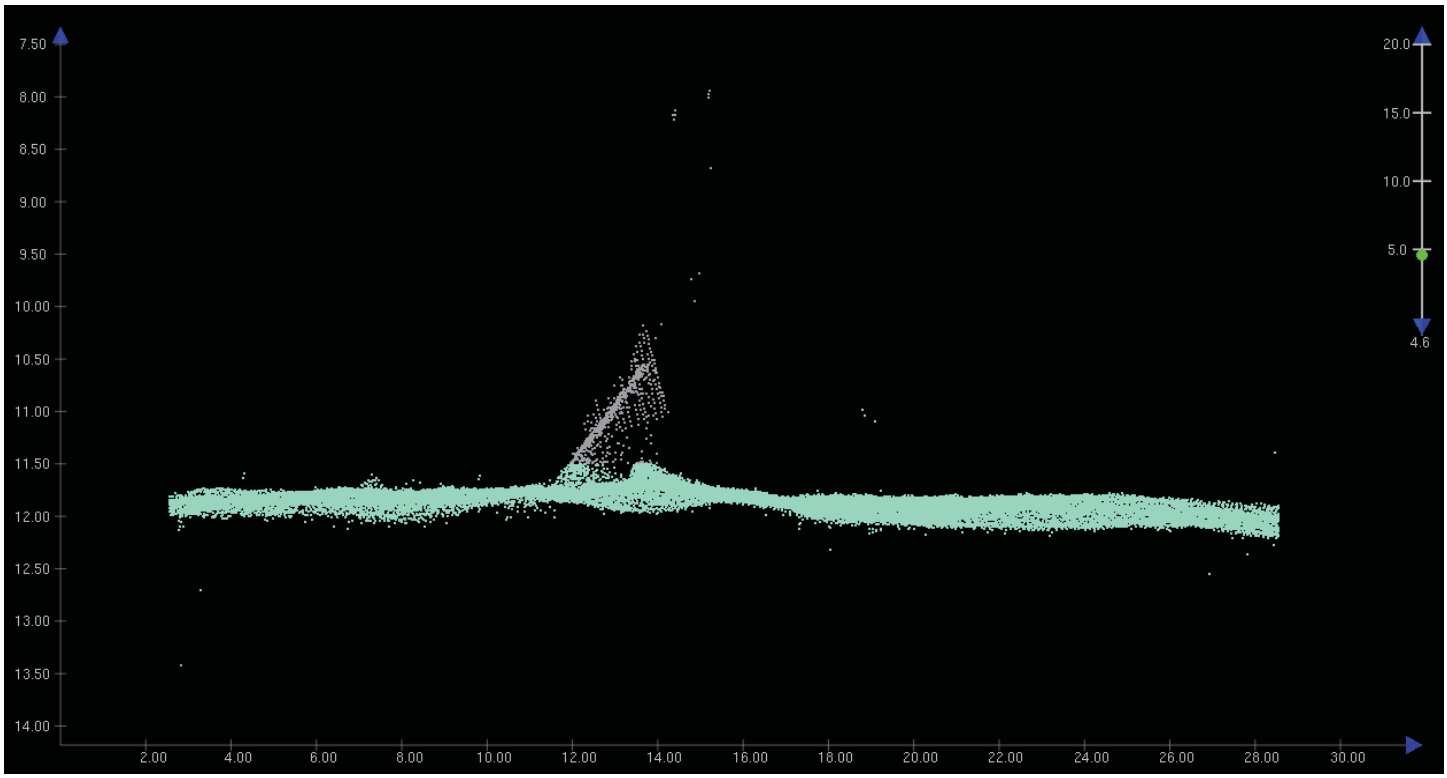


Figure 6: Data Collected on DN277 2012

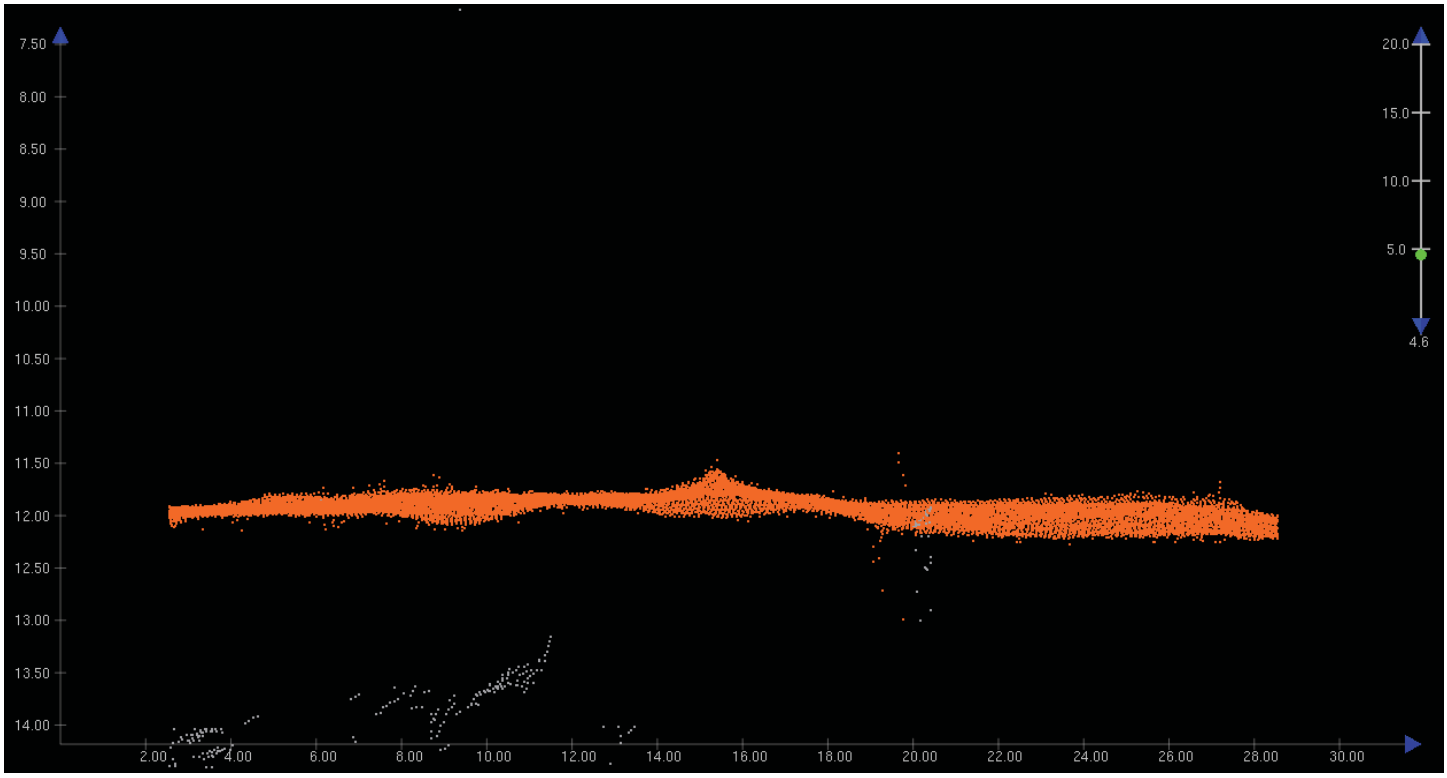


Figure 7: Data Collected on DN151 2013

D.2.1.2 DTON 722/151

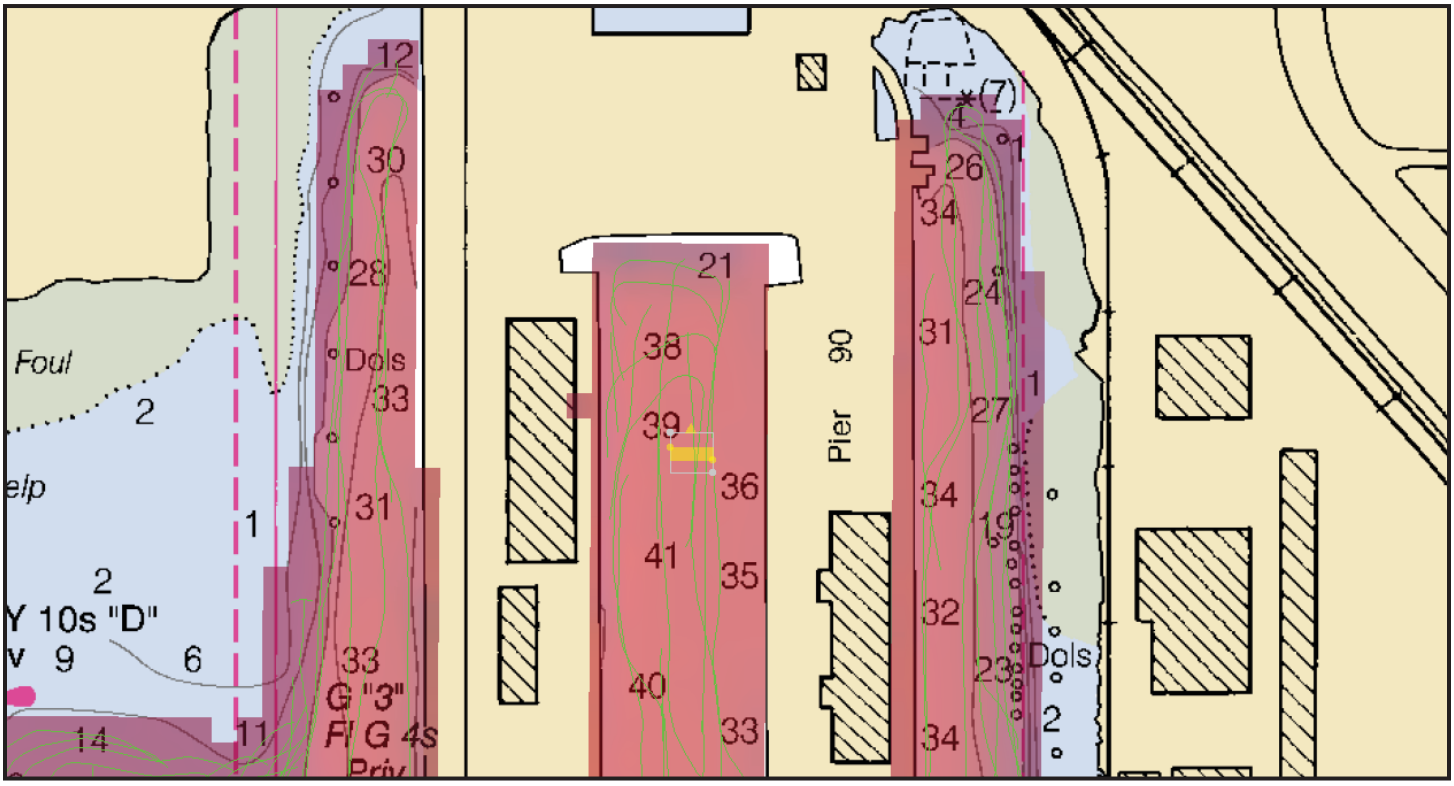


Figure 8: DTON 722/151 Location

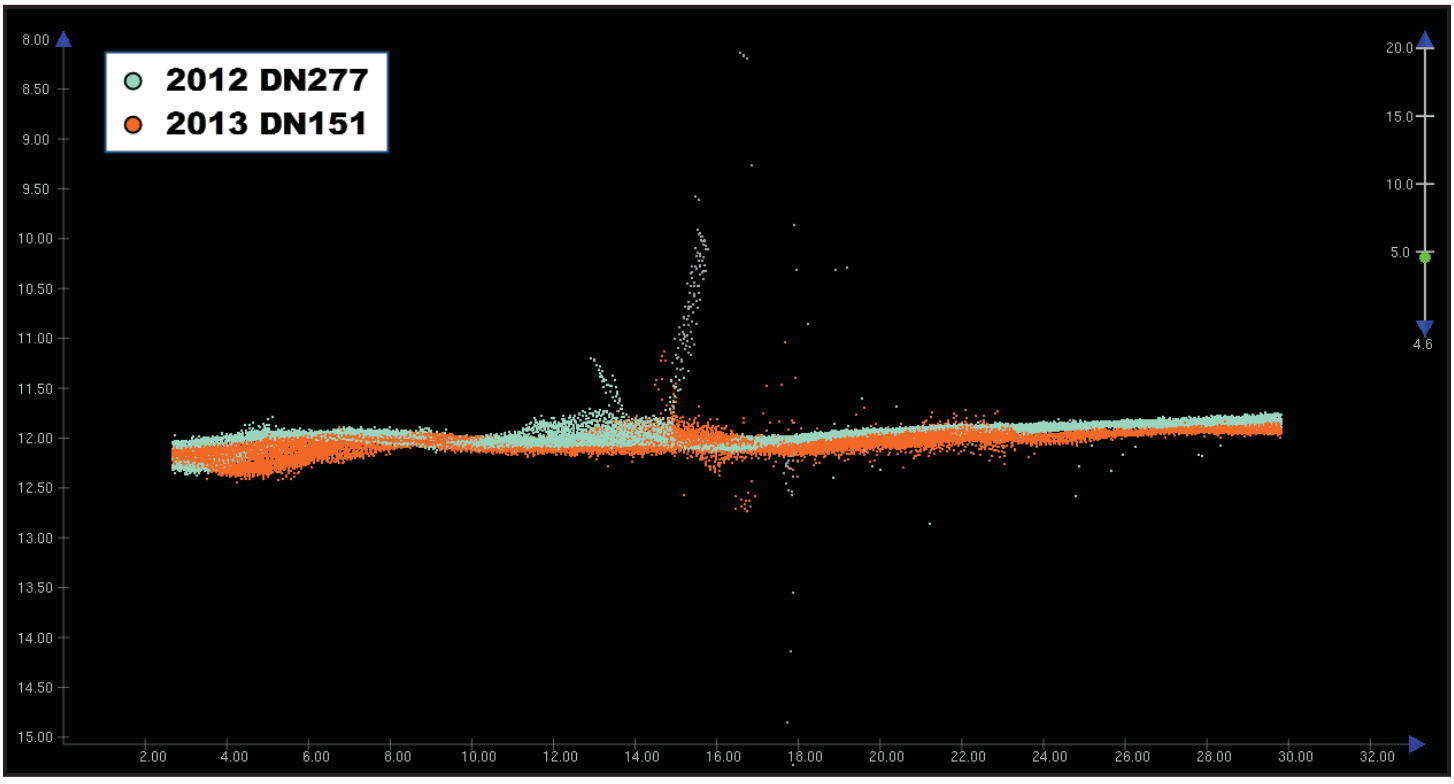


Figure 9: DTON 722/151 – 2012 & 2013 Data Overlay

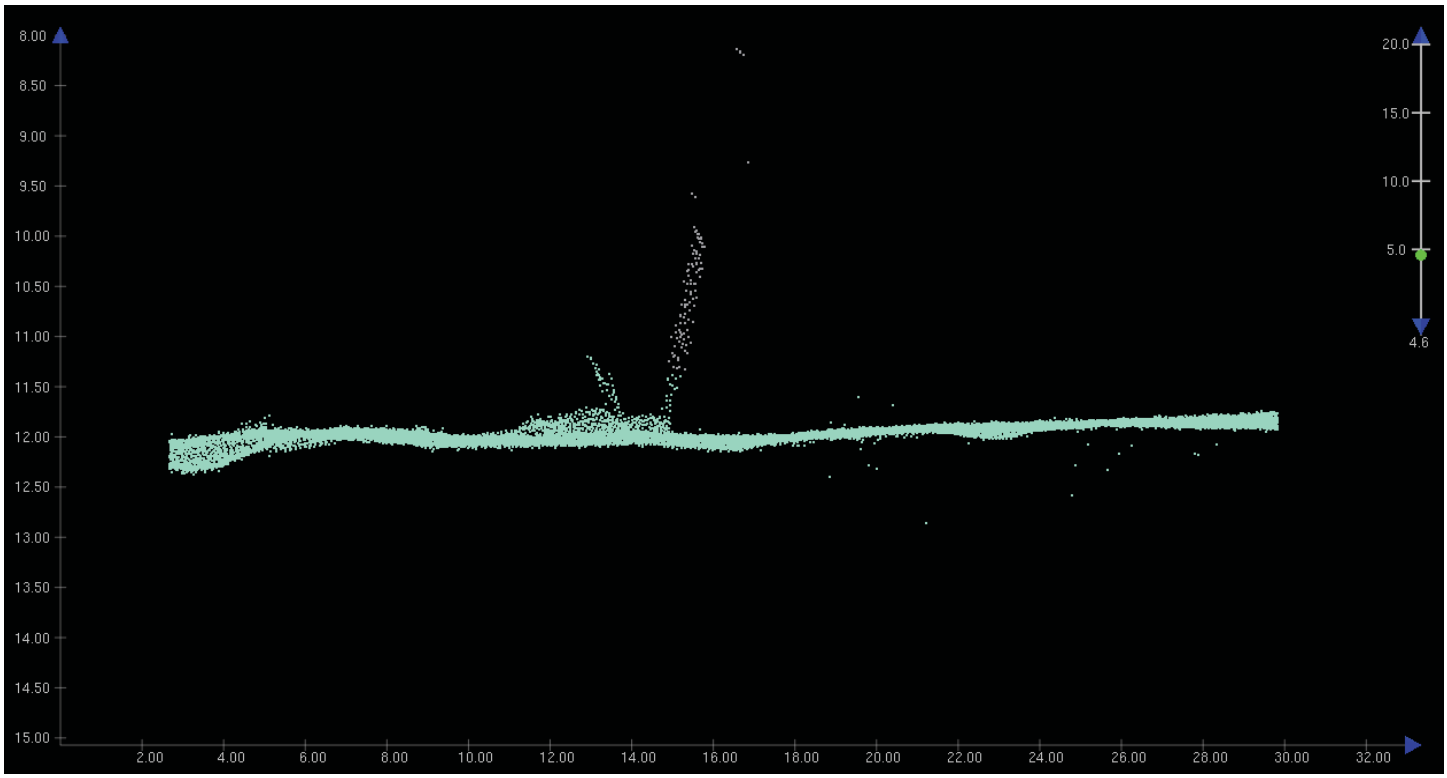


Figure 10: Data Collected on DN277 2012

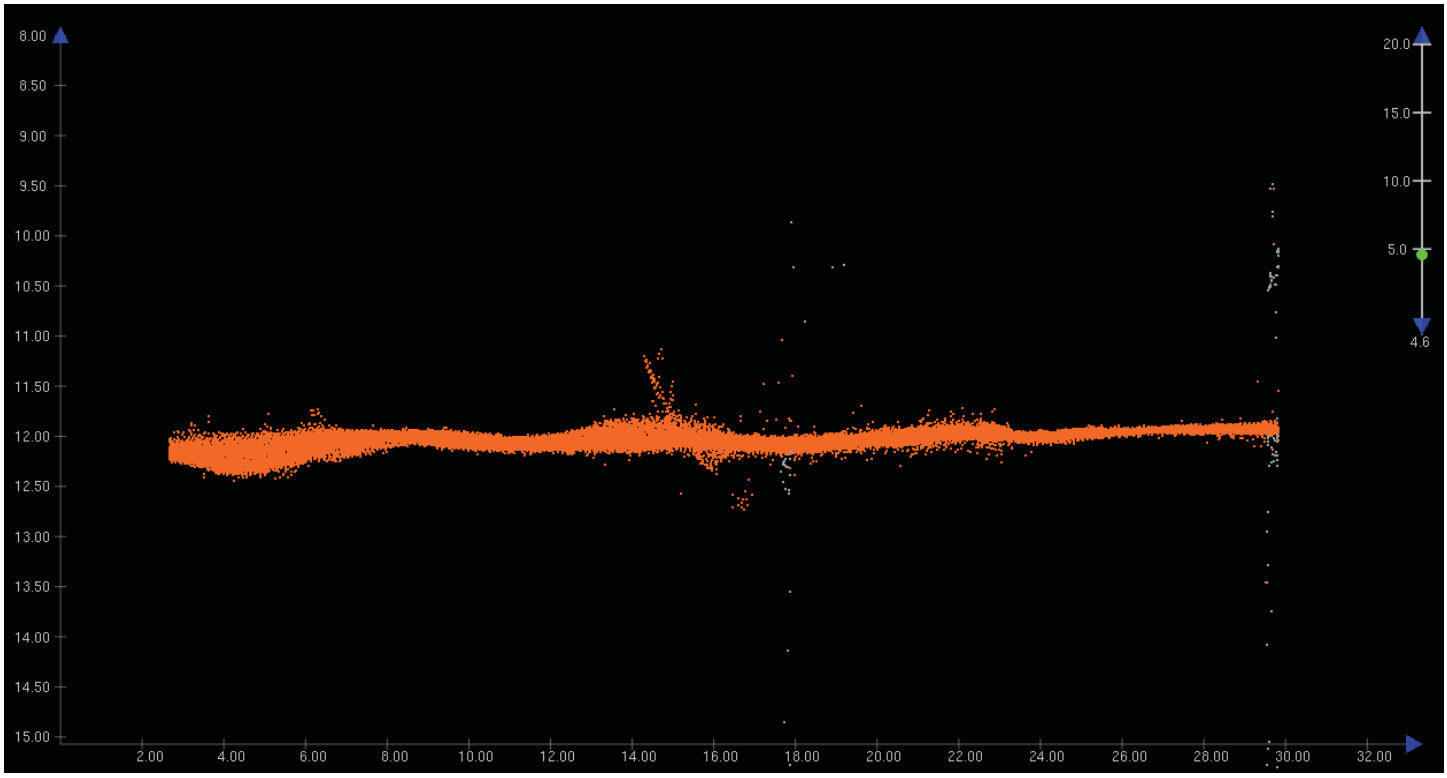


Figure 11: Data Collected on DN151 2013

D.2.1.3 DTON 1788/199

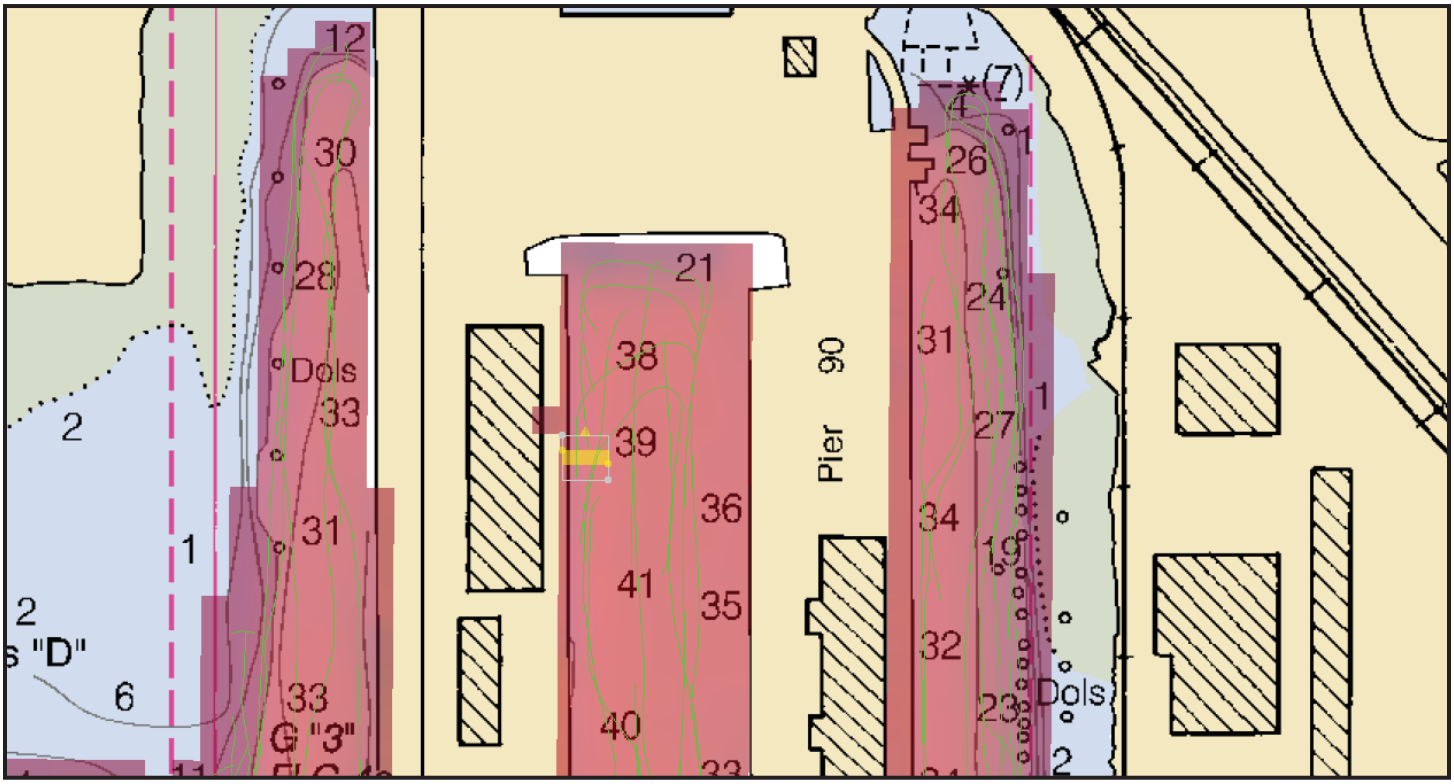


Figure 12: DTON 1788/199 Location

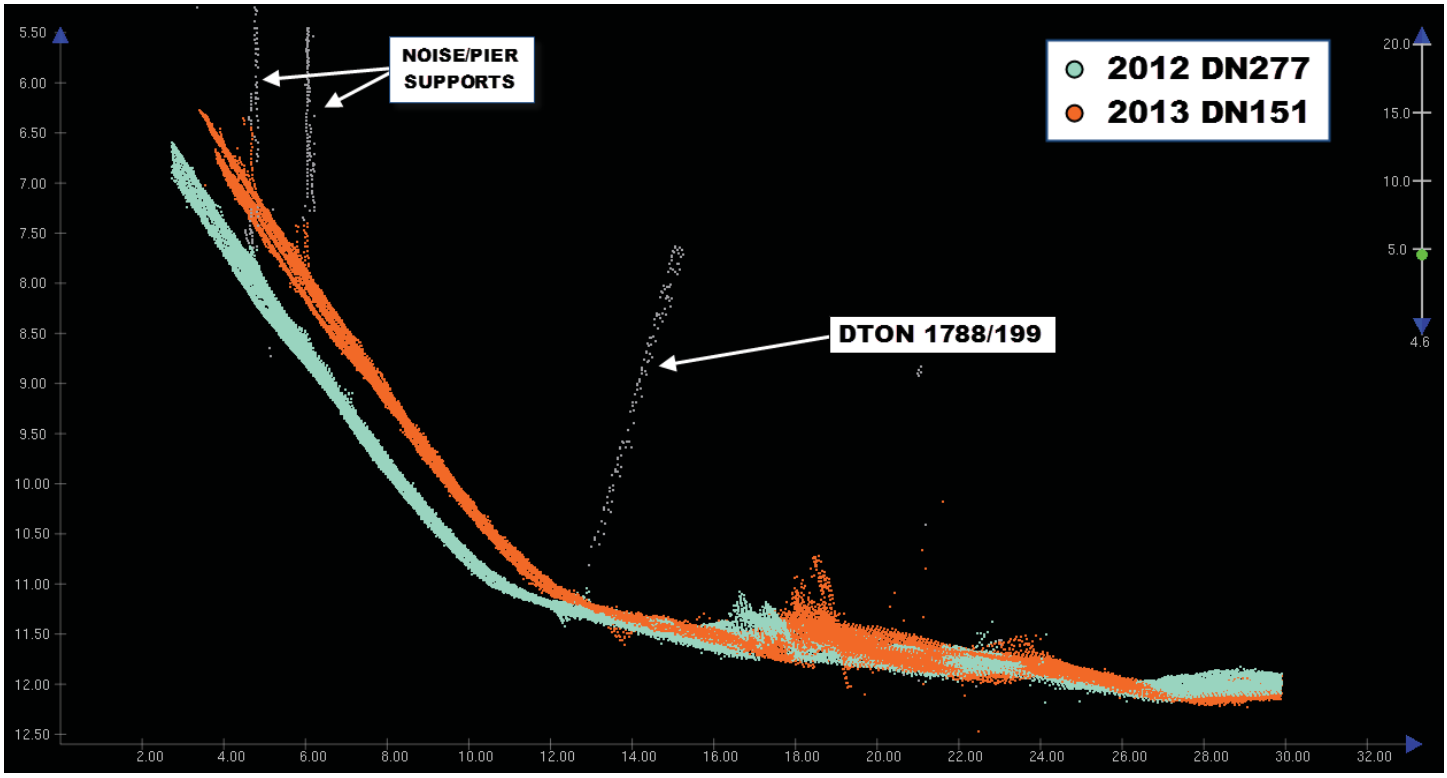


Figure 13: DTON 1788/199 – 2012 & 2013 Data Overlay

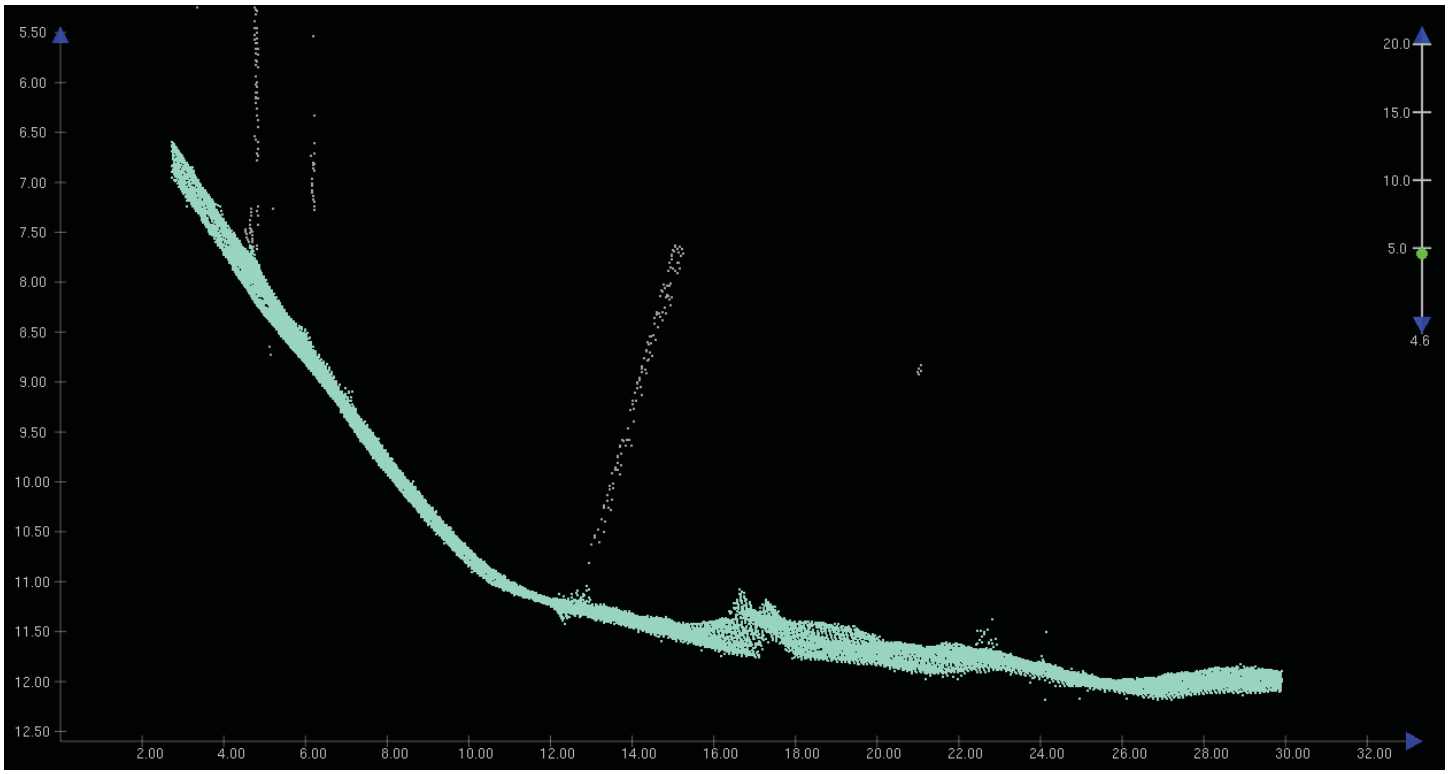


Figure 14: Data Collected on DN277 2012

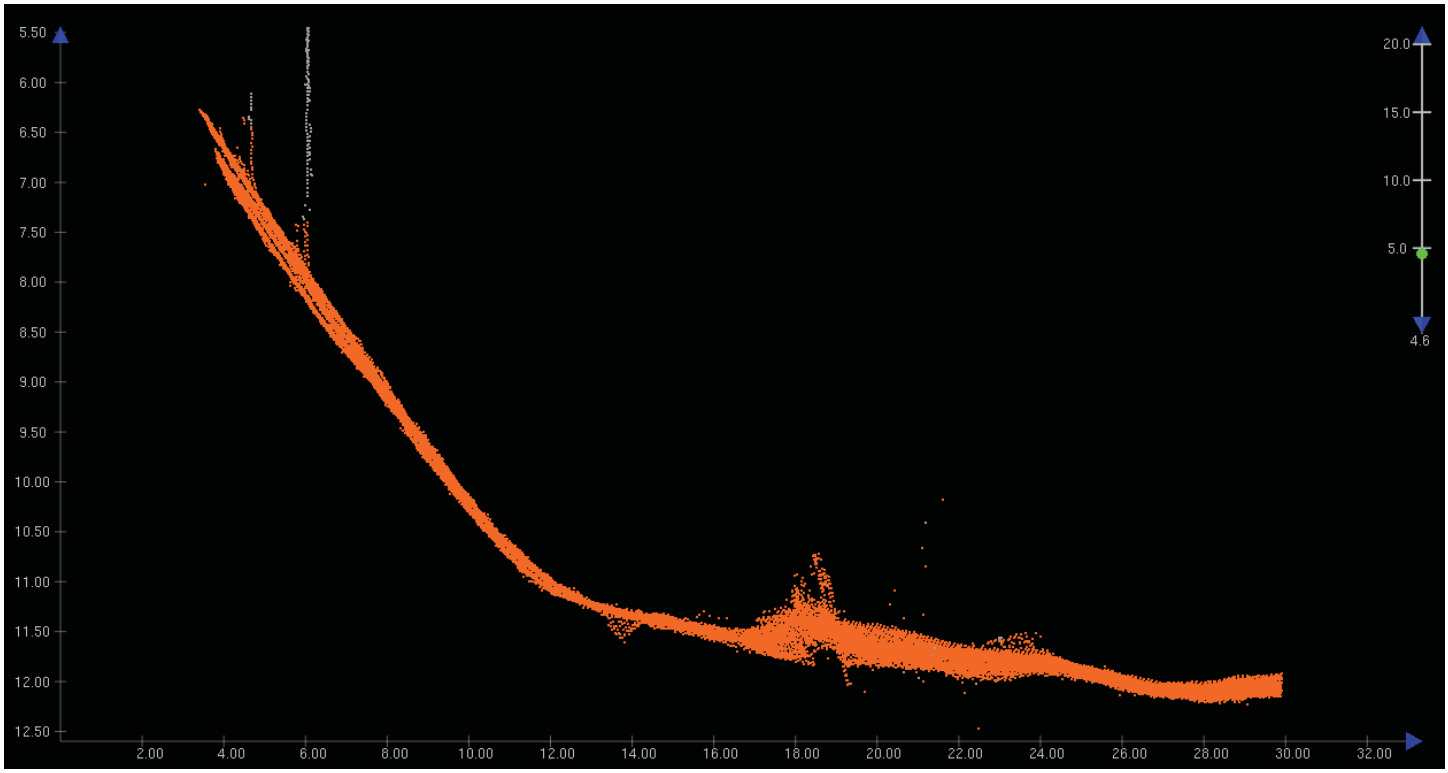


Figure 15: Data Collected on DN151 2013

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 25, 2012

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: S-N923-FA-2012
HYDROGRAPHIC SHEET: F00613 Revised

LOCALITY: Elliot Bay, WA
TIME PERIOD: May 31 - October 17, 2012

TIDE STATION USED: 9447130 Seattle, WA
Lat.47° 36.16'N Long. 122° 20.36' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.2 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: PS163, PS164 and PS166

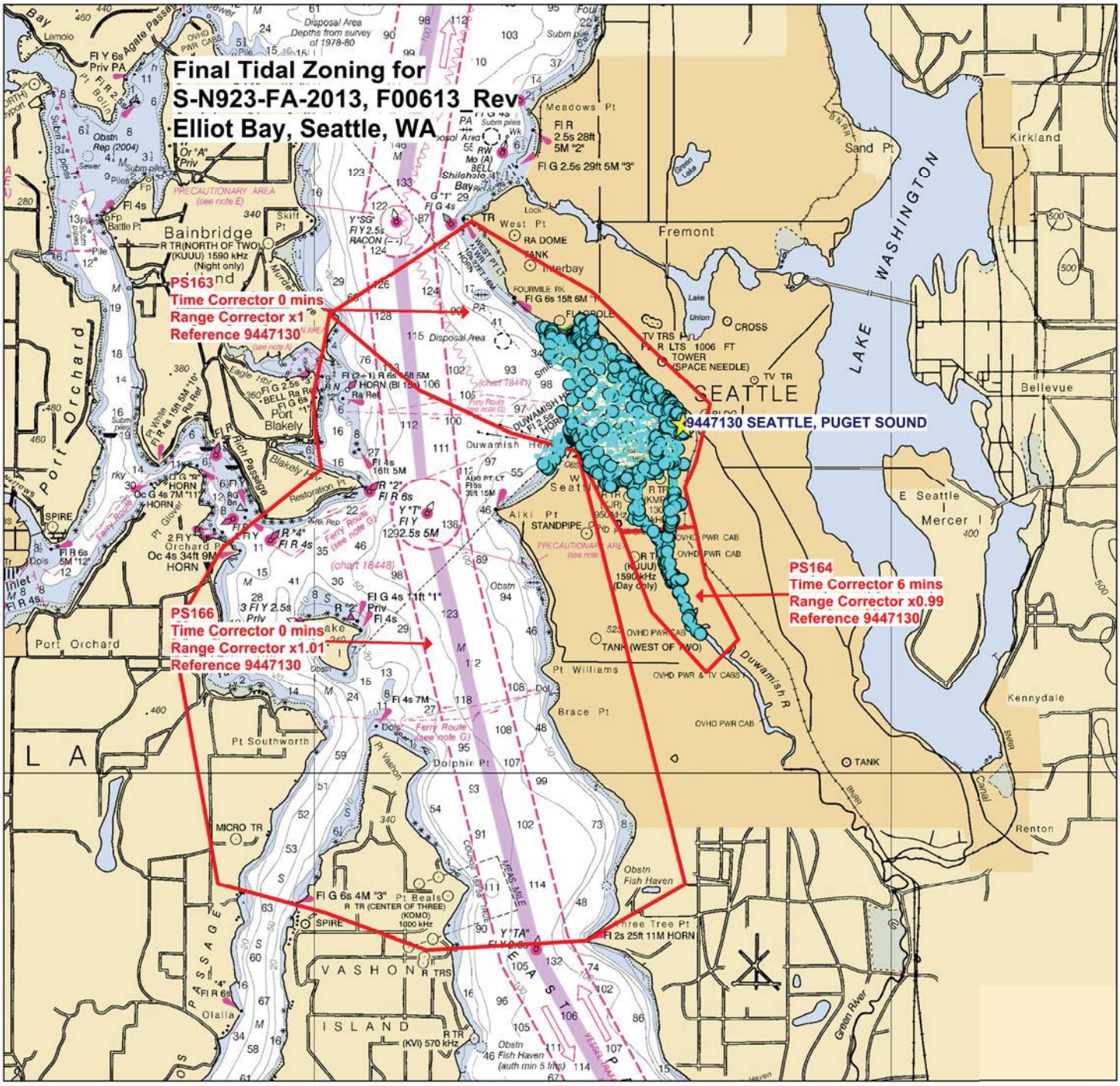
Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

HOVIS.GERALD.THOMAS.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.1365860250
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.1365860250
Date: 2012.11.01 07:46:21 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final Tidal Zoning for
S-N923-FA-2013, F00613_Rev
Elliot Bay, Seattle, WA
PS163
Time Corrector 0 mins
Range Corrector x1
Reference 9447130
PS164
Time Corrector 6 mins
Range Corrector x0.99
Reference 9447130
PS166
Time Corrector 0 mins
Range Corrector x1.01
Reference 9447130
9447130 SEATTLE, PUGET SOUND
Bainbridge
Port Orchard
Port Blakely
Port Orchard
Pt Southworth
Fremont
SEATTLE
Alki Pt
Pt Williams
Brace Pt
Dolphin Pt
Meadows Pt
West Pt
Sand Pt
Kirkland
Bellevue
E Seattle
Mercer I
Kennydale
Renton
Three Tree Pt
Pt Beals
VASHON ISLAND
LAKE WASHINGTON
Duwamish R
Green River
MICRO TR
SPIRE
TANK
PRECAUTIONARY AREA
Disposal Area
Ferry Route
Obstn
Fish Haven

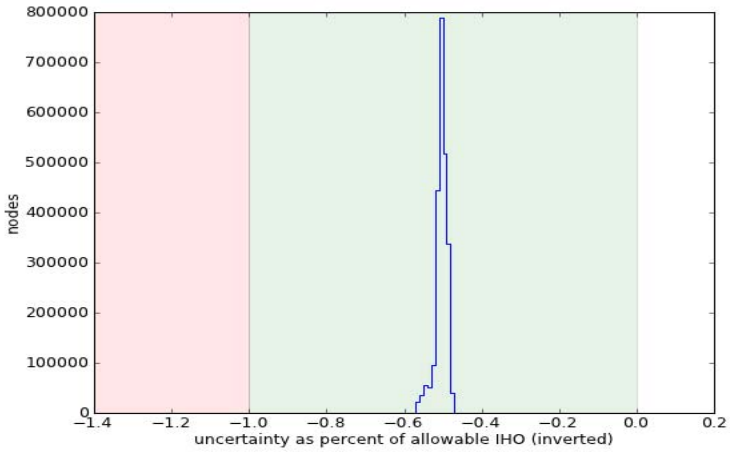
F00613_1m_Final_10to20_Density_IHO

The finalized surface has 2386408 nodes with 209193428 soundings.

Uncertainty Standards

100.00% | PASS

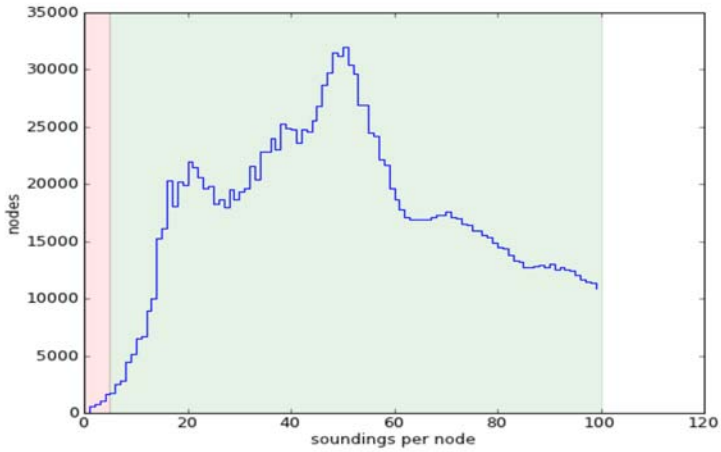
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (2386408/2386408).



Object Detection Coverage

99.83% | PASS

Nodes with 5 or more soundings **99.83%** (2382402/2386408).
Sounding count average is **87.66** soundings per node.
Sounding count mode is **51** soundings per node.



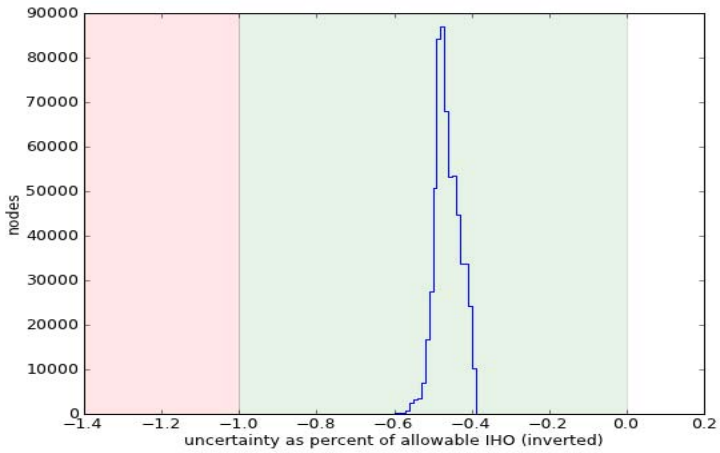
F00613_2m_Final_18to40_Density_IHO

The finalized surface has 605923 nodes with 48862327 soundings.

Uncertainty Standards

100.00% | PASS

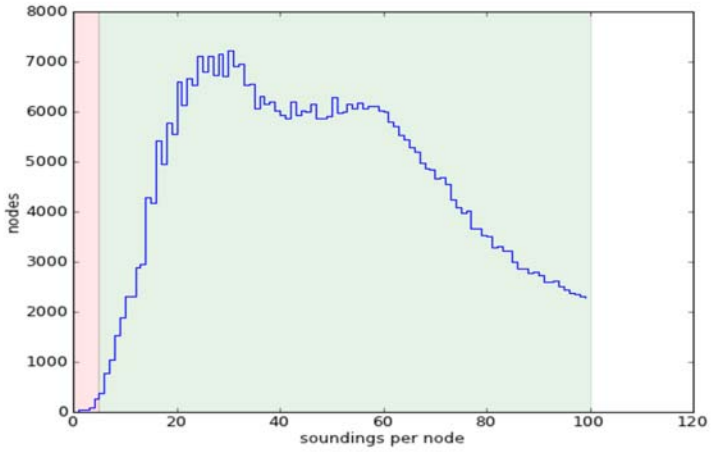
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (605923/605923).



Object Detection Coverage

99.93% | PASS

Nodes with 5 or more soundings **99.93%** (605487/605923).
Sounding count average is **80.64** soundings per node.
Sounding count mode is **31** soundings per node.



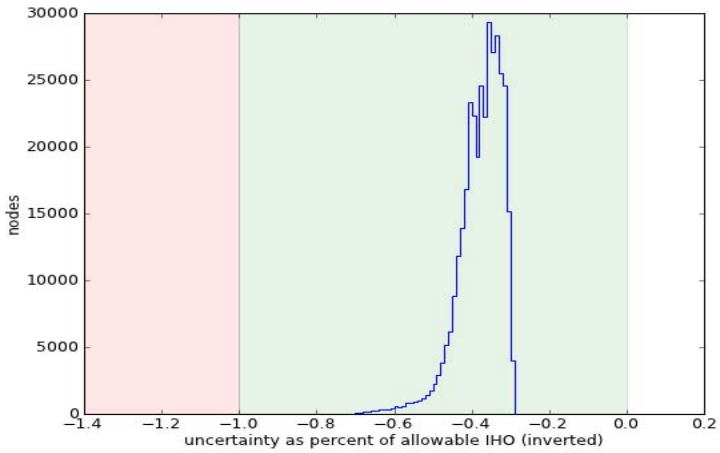
F00613_4m_Final_36to80_Density_IHO

The finalized surface has 349295 nodes with 25426602 soundings.

Uncertainty Standards

100.00% | PASS

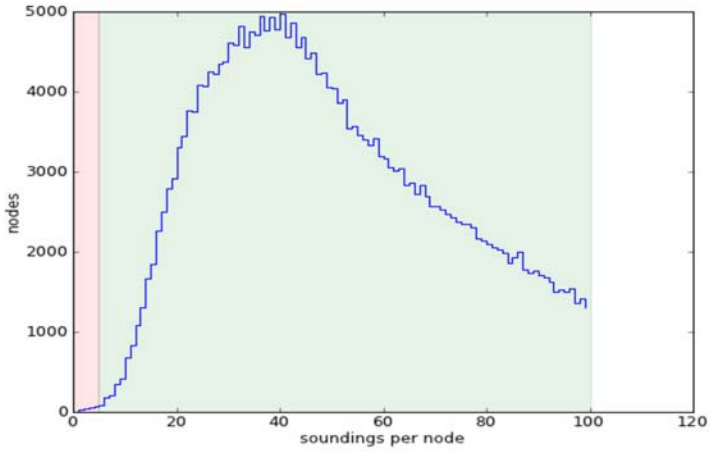
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (349295/349295).



Object Detection Coverage

99.94% | PASS

Nodes with 5 or more soundings **99.94%** (349099/349295).
Sounding count average is **72.79** soundings per node.
Sounding count mode is **41** soundings per node.



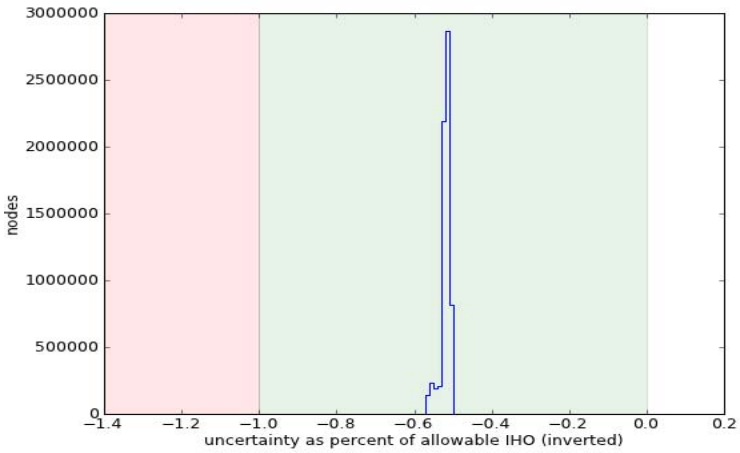
F00613_05m_Final_0to12_Density_IHO

The finalized surface has 6639599 nodes with 375611445 soundings.

Uncertainty Standards

100.00% | PASS

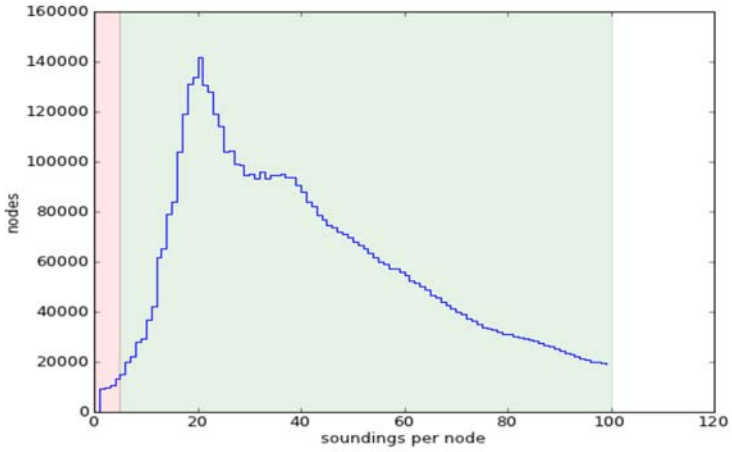
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (6639599/6639599).



Object Detection Coverage

99.35% | PASS

Nodes with 5 or more soundings **99.35%** (6596456/6639599).
Sounding count average is **56.57** soundings per node.
Sounding count mode is **21** soundings per node.



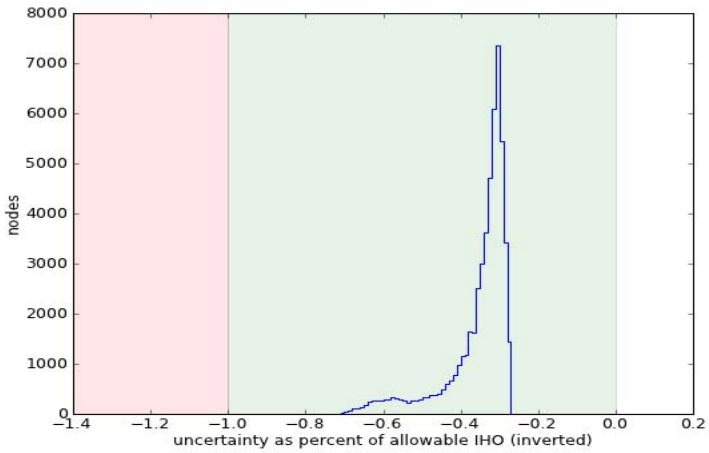
F00613_8m_Final_72to100_Density_IHO

The finalized surface has 53033 nodes with 8285047 soundings.

Uncertainty Standards

100.00% | PASS

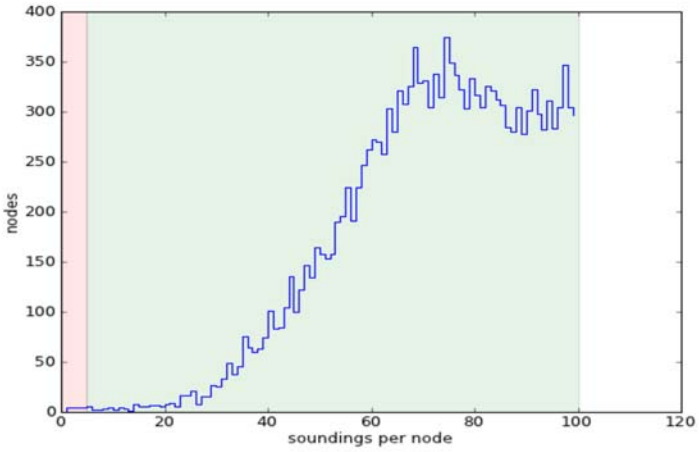
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (53033/53033).



Object Detection Coverage

99.97% | PASS

Nodes with 5 or more soundings **99.97%** (53015/53033).
Sounding count average is **156.22** soundings per node.
Sounding count mode is **75** soundings per node.



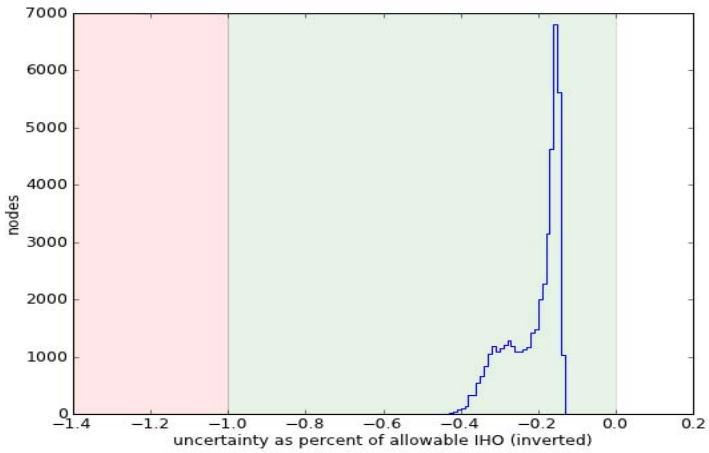
F00613_8m_Final_100.001to160_Density_IHO

The finalized surface has 44125 nodes with 3948240 soundings.

Uncertainty Standards

100.00% | PASS

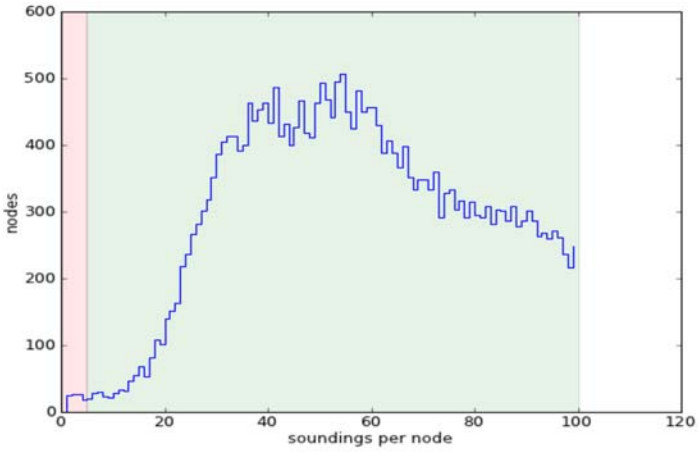
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (44125/44125).



Object Detection Coverage

99.78% | PASS

Nodes with 5 or more soundings **99.78%** (44028/44125).
Sounding count average is **89.48** soundings per node.
Sounding count mode is **55** soundings per node.



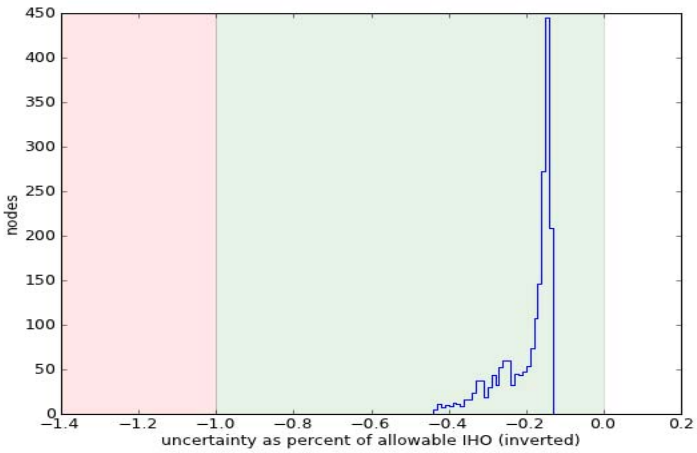
F00613_16m_Final_144to320_Density_IHO

The finalized surface has 1983 nodes with 564596 soundings.

Uncertainty Standards

100.00% | PASS

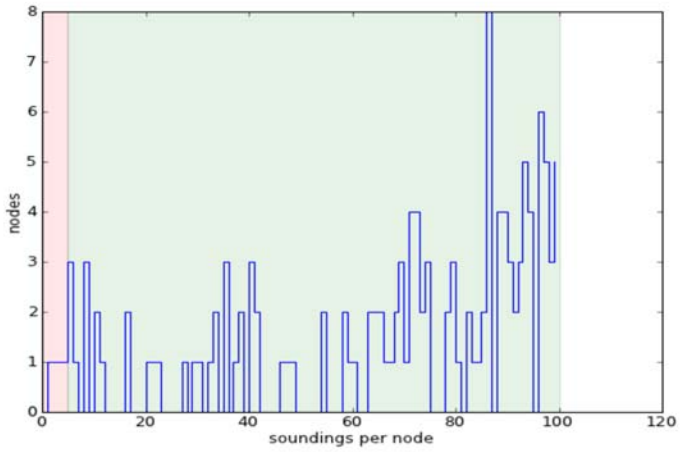
Nodes with Uncertainty less then or equal allowable IHO error **100.00%** (1983/1983).



Object Detection Coverage

99.80% | PASS

Nodes with 5 or more soundings **99.80%** (1979/1983).
Sounding count average is **284.72** soundings per node.
Sounding count mode is **87** soundings per node.



F00613 Danger to Navigation Report

Registry Number: F00613
State: Washington
Locality:
Sub-locality: Elliot Bay
Project Number: S-N923-FA-12
Survey Dates: Elliot Bay - 10-17-2012

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18450	18th	02/01/2004	1:10,000 (18450_1)	USCG LNM: 4/10/2012 (5/15/2012) CHS NTM: None (4/27/2012) NGA NTM: 8/9/1997 (5/19/2012)
18449	18th	10/01/2003	1:25,000 (18449_1)	[L]NTM: ?
18474	8th	10/01/2003	1:40,000 (18474_1)	[L]NTM: ?
18445	32nd	08/01/2007	1:80,000 (18445_1)	[L]NTM: ?
18441	46th	12/01/2007	1:80,000 (18441_1)	[L]NTM: ?
18440	29th	09/01/2007	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Obstruction	6.69 m	47° 36' 23.4" N	122° 20' 32.3" W	---
1.2	Obstruction	6.92 m	47° 36' 24.4" N	122° 20' 33.6" W	---
1.3	Obstruction	4.20 m	47° 36' 28.3" N	122° 20' 38.4" W	---
1.4	Obstruction	8.78 m	47° 36' 54.2" N	122° 21' 25.9" W	---
1.5	Obstruction	6.88 m	47° 36' 57.1" N	122° 21' 29.1" W	---

1.6	Obstruction	4.84 m	47° 36' 57.9" N	122° 21' 29.0" W	---
1.7	Obstruction	9.84 m	47° 36' 52.3" N	122° 21' 24.3" W	---
1.8	Obstruction	5.98 m	47° 36' 51.3" N	122° 21' 19.8" W	---
1.9	Obstruction	4.60 m	47° 36' 12.8" N	122° 20' 24.1" W	---
1.10	Obstruction	3.90 m	47° 36' 12.4" N	122° 20' 23.0" W	---
1.11	Obstruction	2.46 m	47° 36' 02.5" N	122° 20' 16.8" W	---
1.12	Obstruction	2.98 m	47° 36' 21.0" N	122° 20' 30.1" W	---
1.13	Obstruction	3.39 m	47° 36' 21.0" N	122° 20' 28.5" W	---
1.14	Obstruction	3.66 m	47° 36' 20.4" N	122° 20' 26.5" W	---
1.15	Obstruction	5.33 m	47° 36' 12.4" N	122° 20' 25.8" W	---

1 - Dangers To Navigation

1.1) 575/512

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 23.4" N, 122° 20' 32.3" W
Least Depth:	6.69 m (= 21.94 ft = 3.656 fm = 3 fm 3.94 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.063 m ; **TVU (TPEv)** ±0.267 m
Timestamp:	2012-156.21:23:49.836 (06/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-156 / 2012m_1562122
Profile/Beam:	575/512
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_1562122	575/512	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

22ft (18450_1, 18449_1)

3 ½fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

3fm 4ft (18474_1, 18445_1)

6.7m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - Graph, US, US, F00613

TECSOU - 3:found by multi-beam

VALSOU - 6.687 m

WATLEV - 3:always under water/submerged

Feature Images

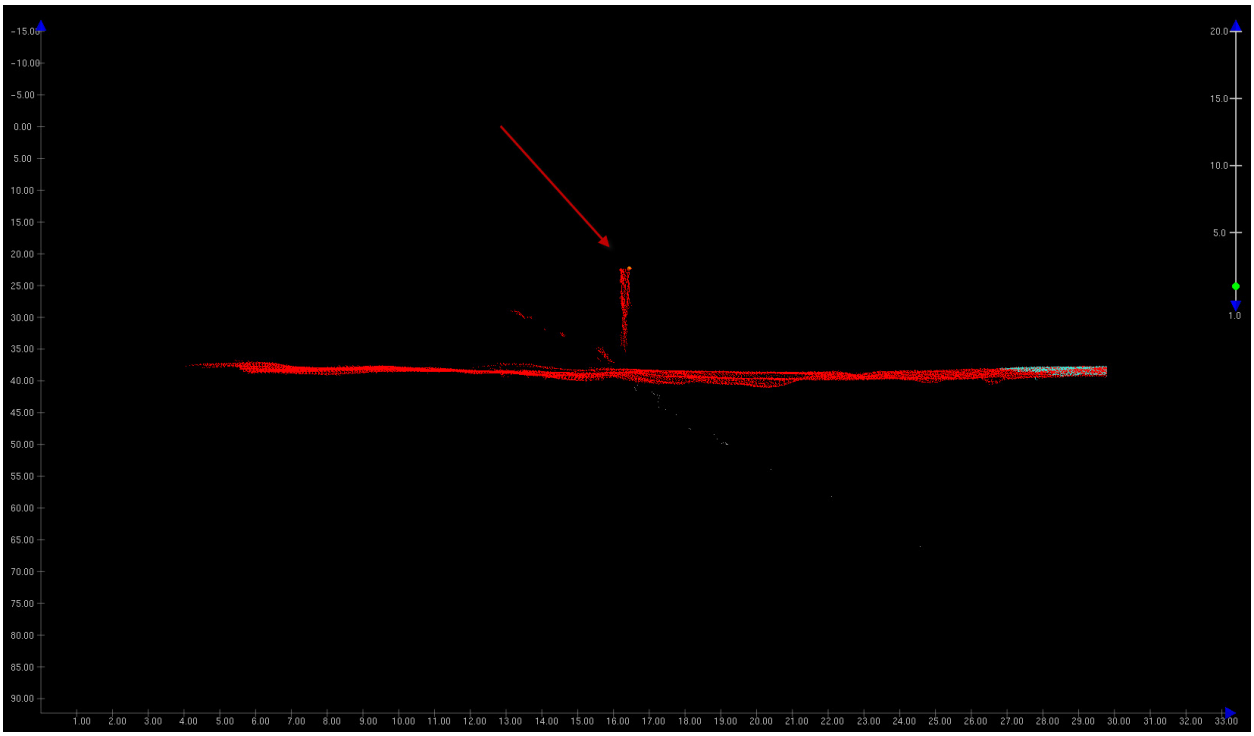


Figure 1.1.1

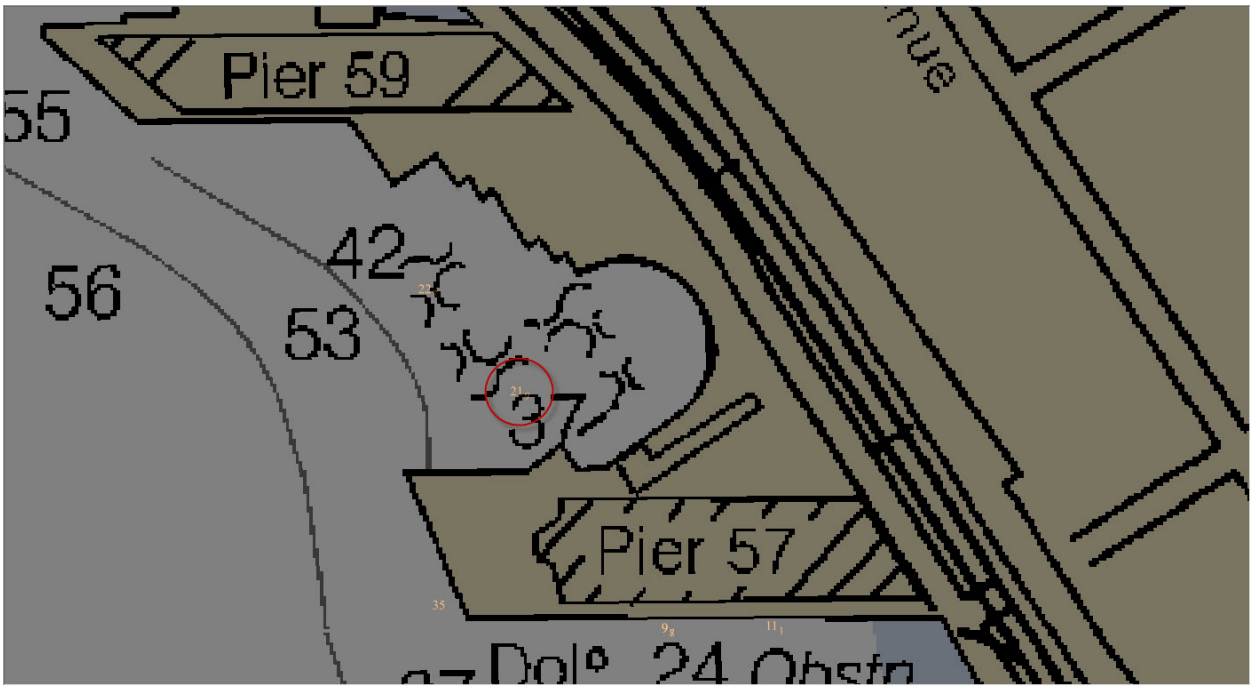


Figure 1.1.2

1.2) 846/61

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 24.4" N, 122° 20' 33.6" W
Least Depth:	6.92 m (= 22.71 ft = 3.784 fm = 3 fm 4.71 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.063 m ; **TVU (TPEv)** ±0.265 m
Timestamp:	2012-156.21:26:04.578 (06/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-156 / 2012m_1562125
Profile/Beam:	846/61
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_1562125	846/61	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

22ft (18450_1, 18449_1)

3 ¾fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

3fm 4ft (18474_1, 18445_1)

6.9m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 6.921 m

WATLEV - 3:always under water/submerged

Feature Images

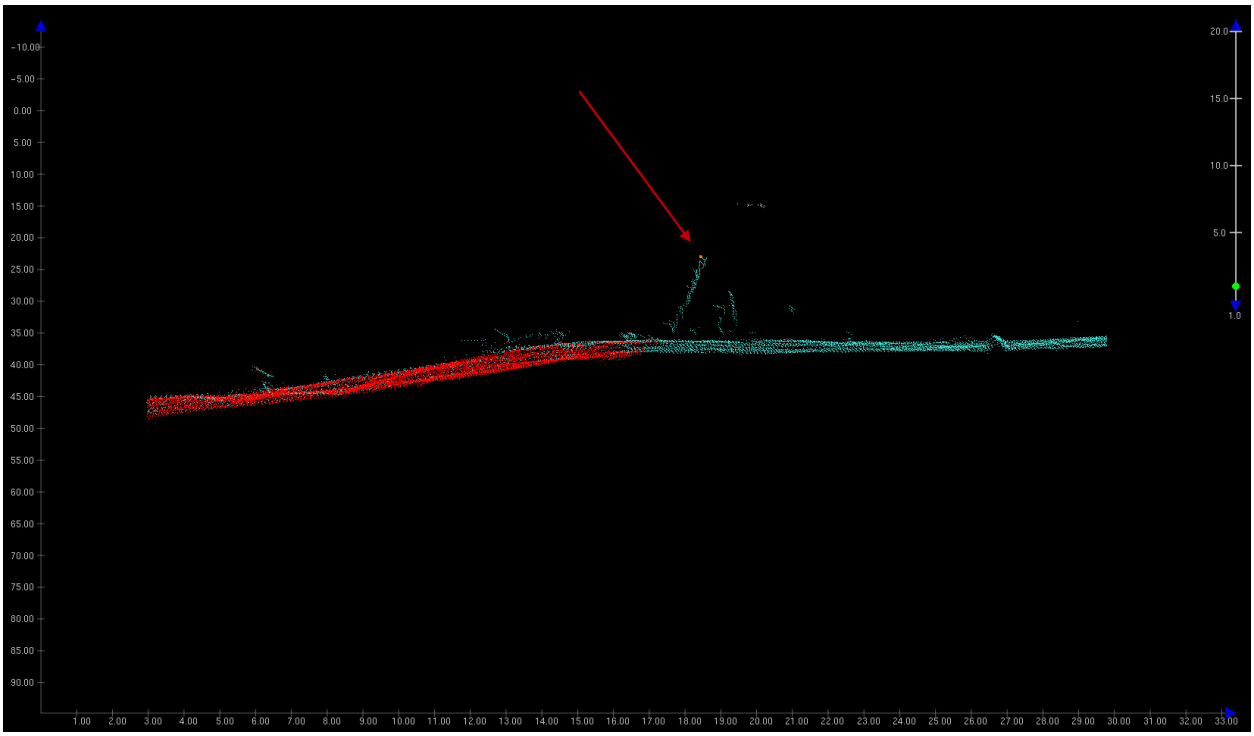


Figure 1.2.1

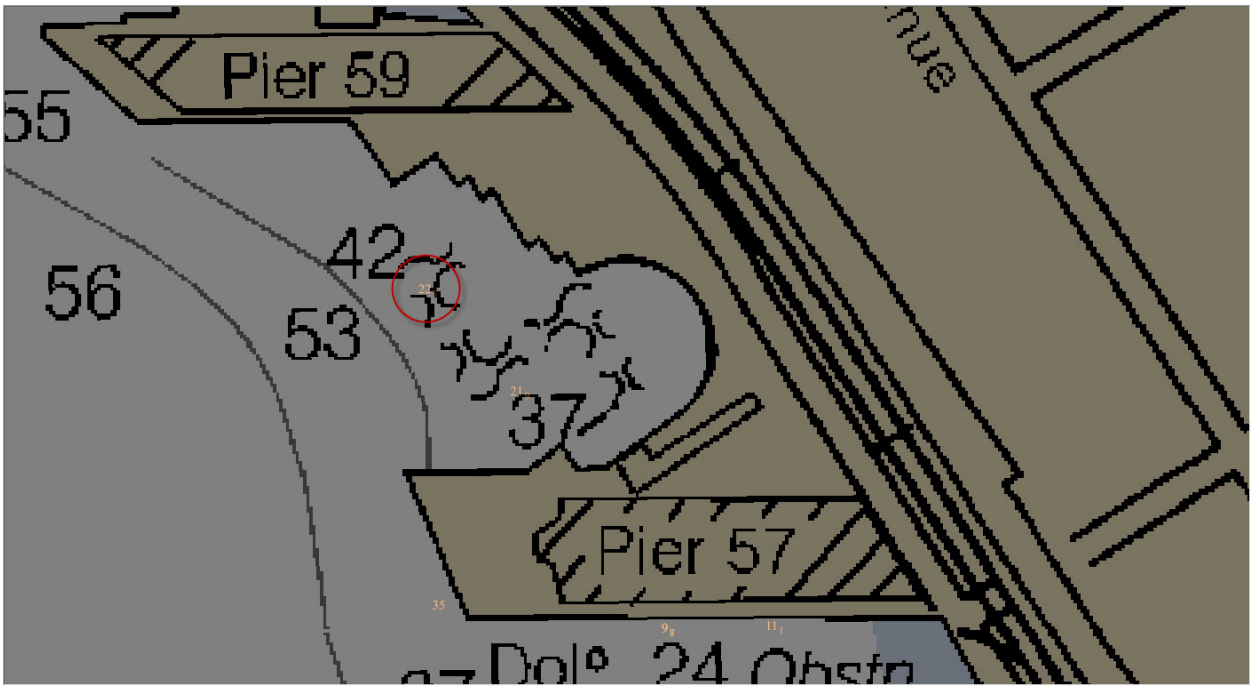


Figure 1.2.2

1.3) 639/70

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 28.3" N, 122° 20' 38.4" W
Least Depth:	4.20 m (= 13.77 ft = 2.294 fm = 2 fm 1.77 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.049 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-156.21:28:11.329 (06/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-156 / 2012m_1562127
Profile/Beam:	639/70
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_1562127	639/70	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

14ft (18450_1, 18449_1)

2 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

2fm 2ft (18474_1, 18445_1)

4.2m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 4.196 m

WATLEV - 3:always under water/submerged

Feature Images

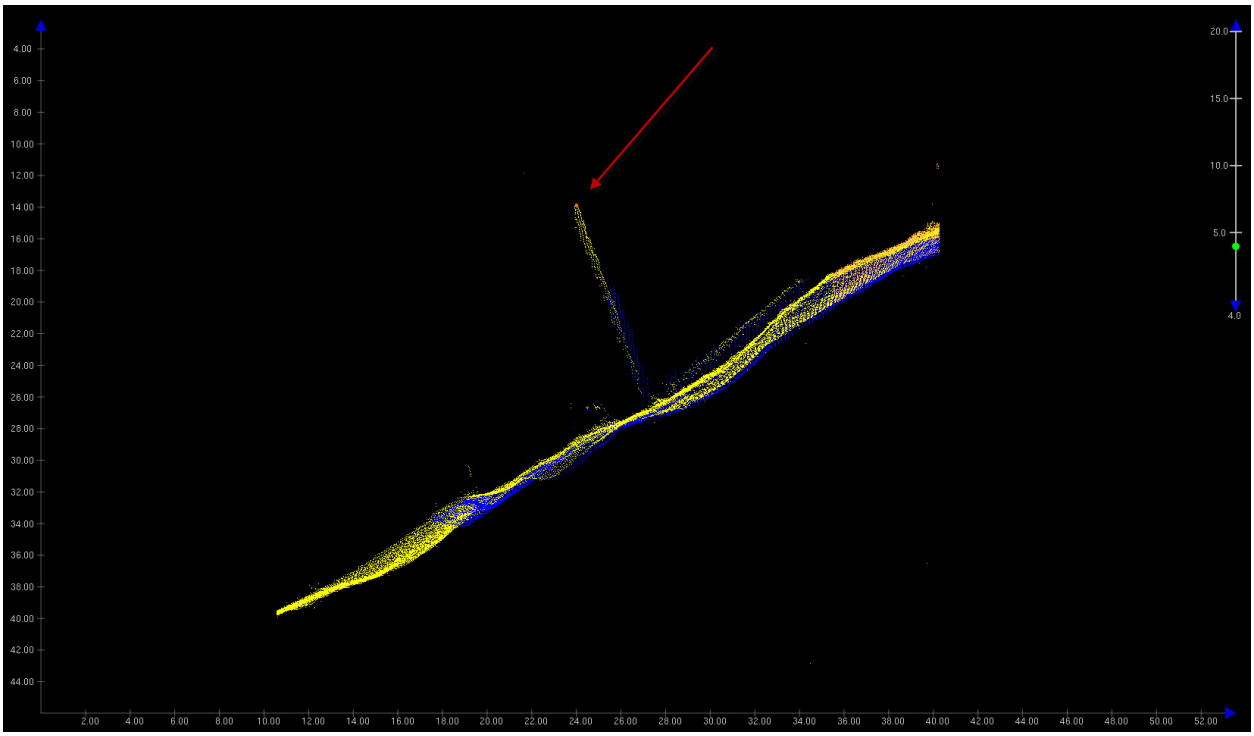


Figure 1.3.1

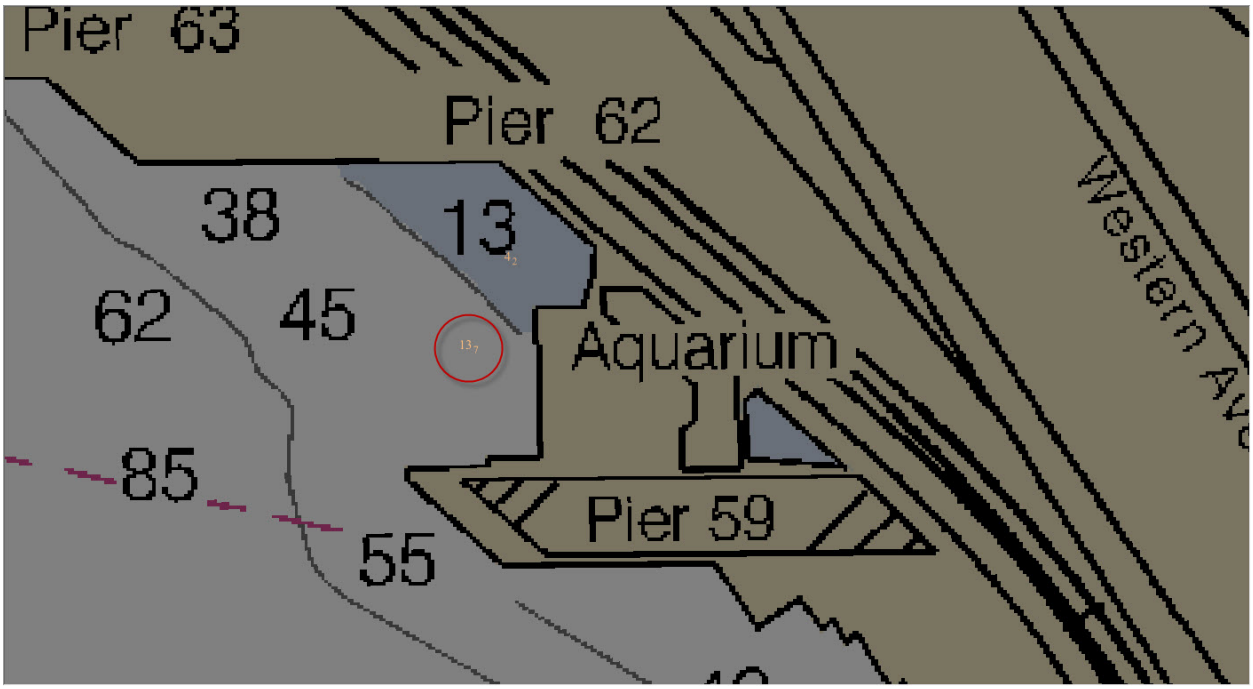


Figure 1.3.2

1.4) 3635/290

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 54.2" N, 122° 21' 25.9" W
Least Depth:	8.78 m (= 28.81 ft = 4.802 fm = 4 fm 4.81 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.058 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.17:27:55.112 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781720
Profile/Beam:	3635/290
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781720	3635/290	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

29ft (18450_1, 18449_1)

4 ¾fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

4fm 5ft (18474_1, 18445_1)

8.8m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 8.781 m

WATLEV - 3:always under water/submerged

Feature Images

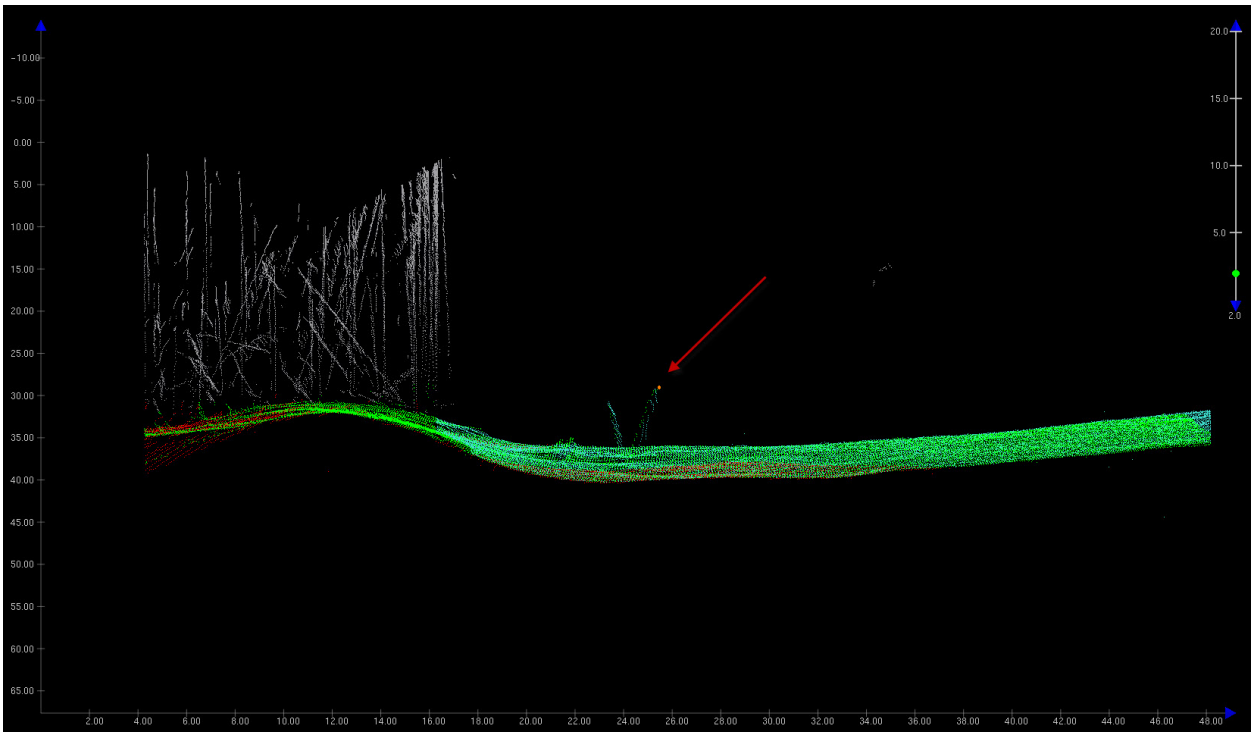


Figure 1.4.1

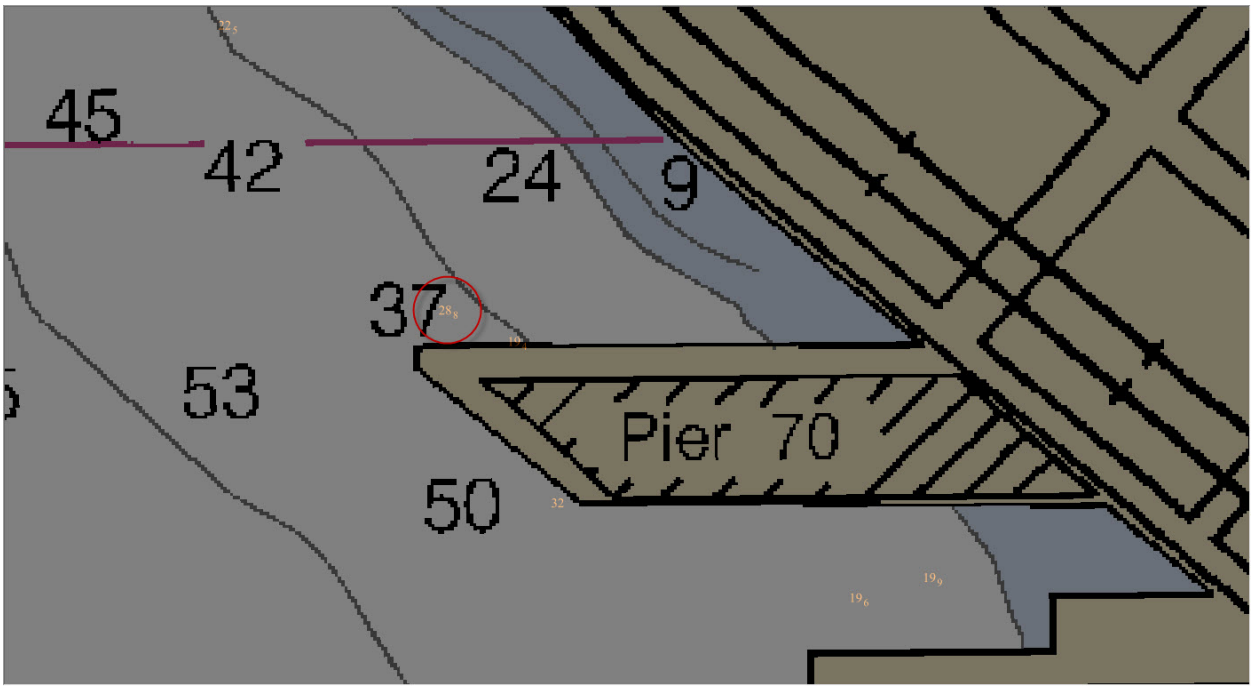


Figure 1.4.2

1.5) 732/481

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 57.1" N, 122° 21' 29.1" W
Least Depth:	6.88 m (= 22.57 ft = 3.762 fm = 3 fm 4.57 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.089 m ; **TVU (TPEv)** ±0.267 m
Timestamp:	2012-278.18:04:02.470 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781803
Profile/Beam:	732/481
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781803	732/481	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

22ft (18450_1, 18449_1)

3 ¾fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

3fm 4ft (18474_1, 18445_1)

6.9m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 6.880 m

WATLEV - 3:always under water/submerged

Feature Images

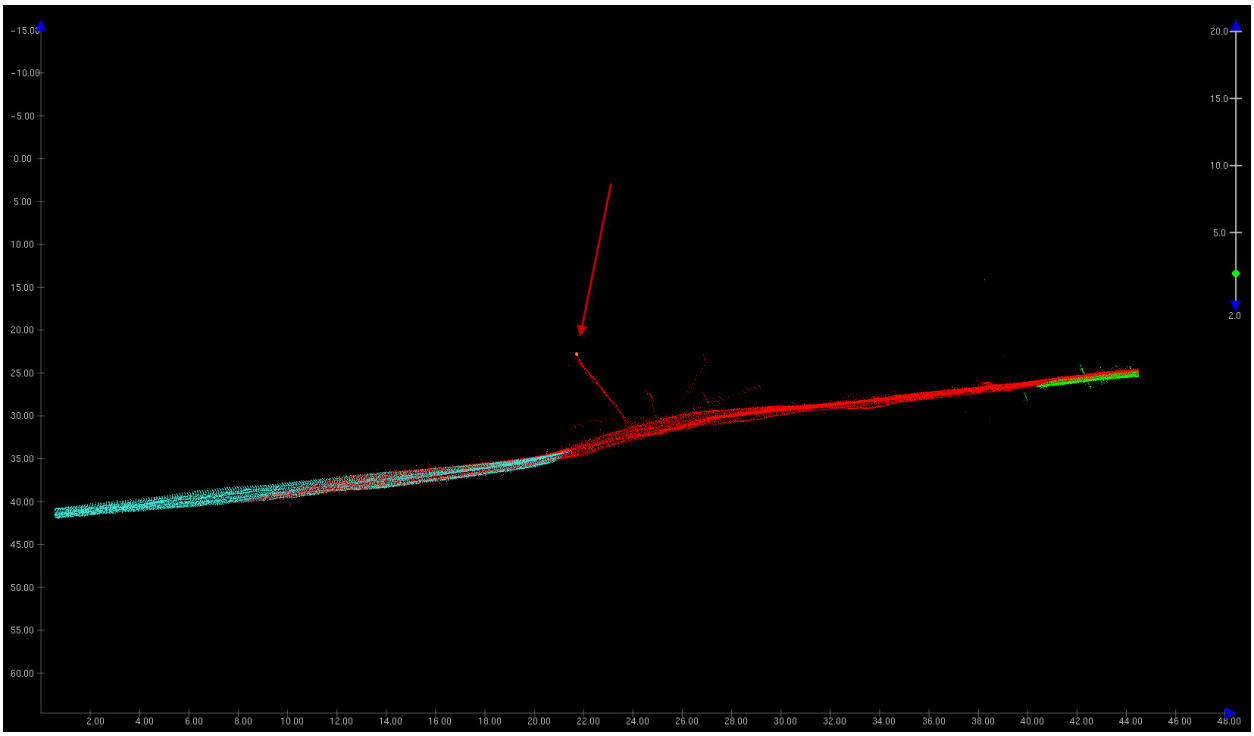


Figure 1.5.1

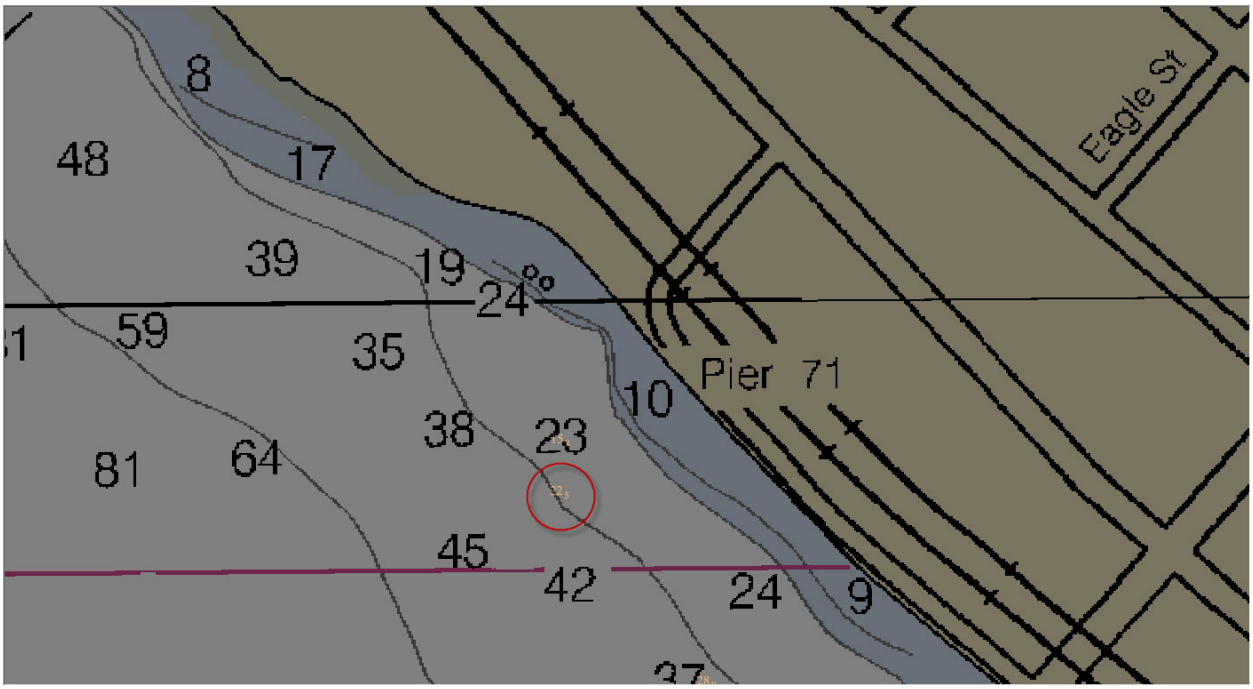


Figure 1.5.2

1.6) 687/174

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 57.9" N, 122° 21' 29.0" W
Least Depth:	4.84 m (= 15.87 ft = 2.645 fm = 2 fm 3.87 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.073 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.18:03:59.003 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781803
Profile/Beam:	687/174
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781803	687/174	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

16ft (18450_1, 18449_1)

2 ½fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

2fm 4ft (18474_1, 18445_1)

4.8m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 4.838 m

WATLEV - 3:always under water/submerged

Feature Images

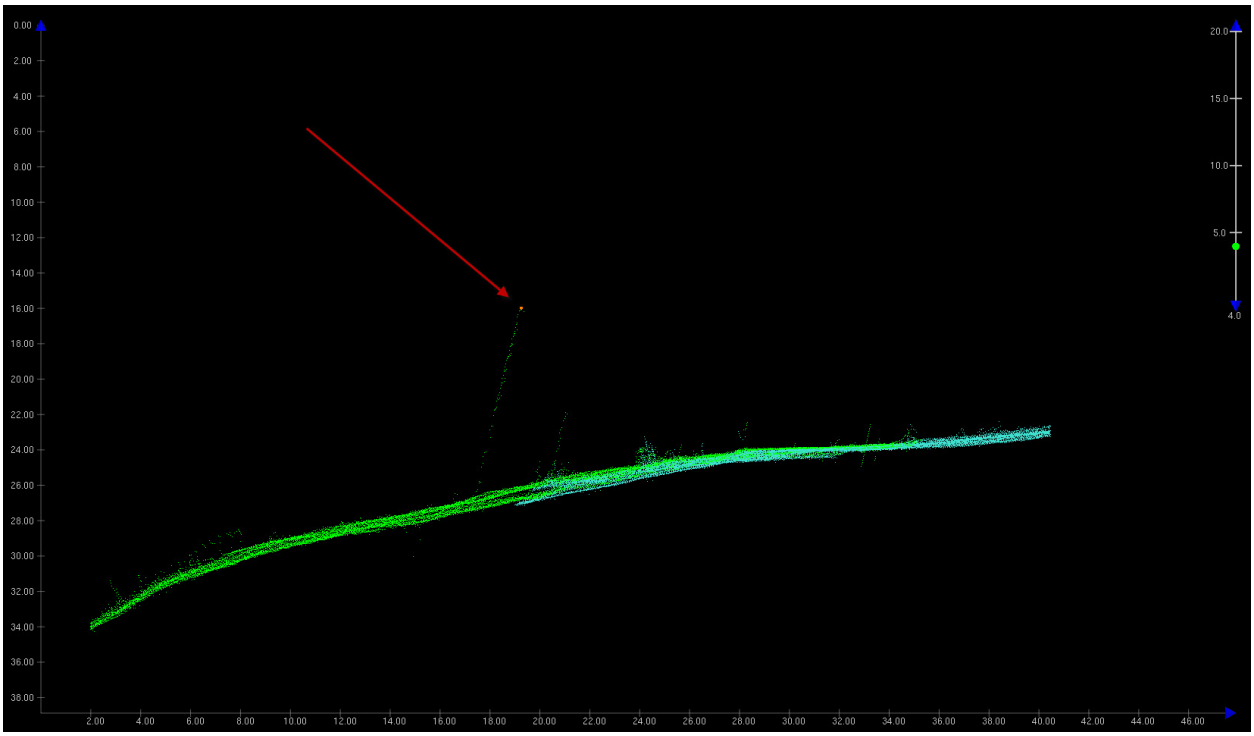


Figure 1.6.1

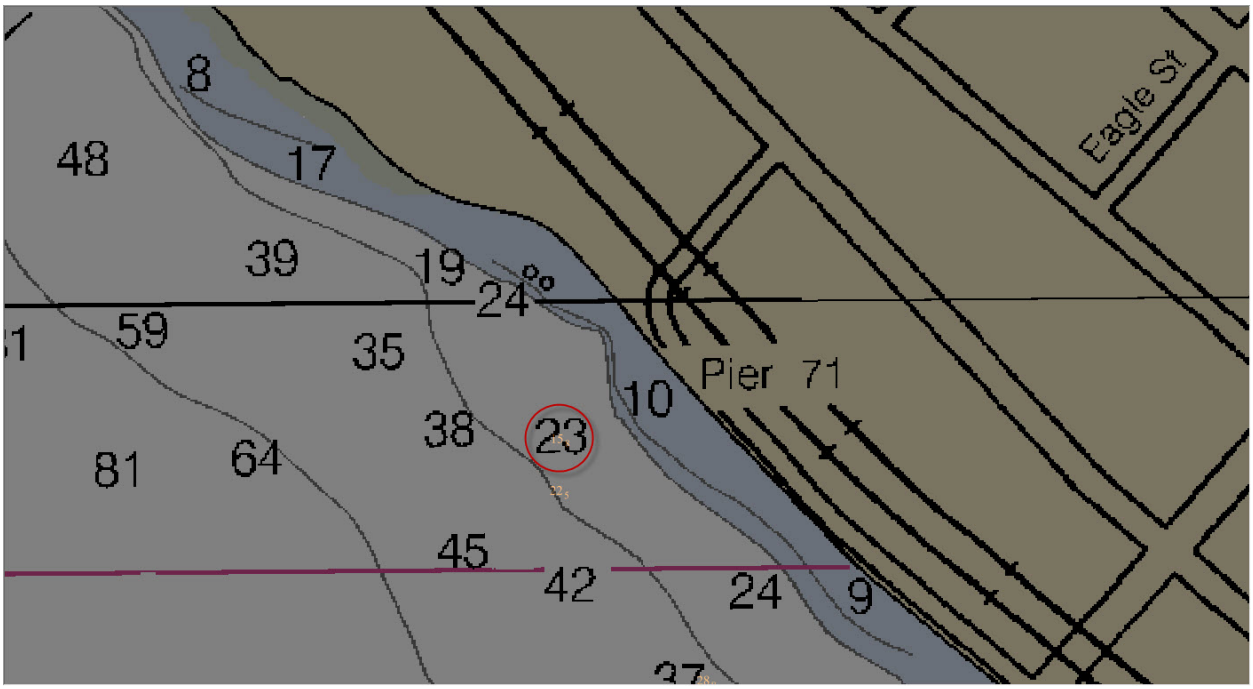


Figure 1.6.2

1.7) 107/149

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 52.3" N, 122° 21' 24.3" W
Least Depth:	9.84 m (= 32.28 ft = 5.380 fm = 5 fm 2.28 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.070 m ; **TVU (TPEv)** ±0.265 m
Timestamp:	2012-278.18:21:33.864 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781821
Profile/Beam:	107/149
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile extending outward from pier-face with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781821	107/149	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

32ft (18450_1, 18449_1)

5 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

5fm 2ft (18474_1, 18445_1)

9.8m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 9.839 m

WATLEV - 3:always under water/submerged

Feature Images

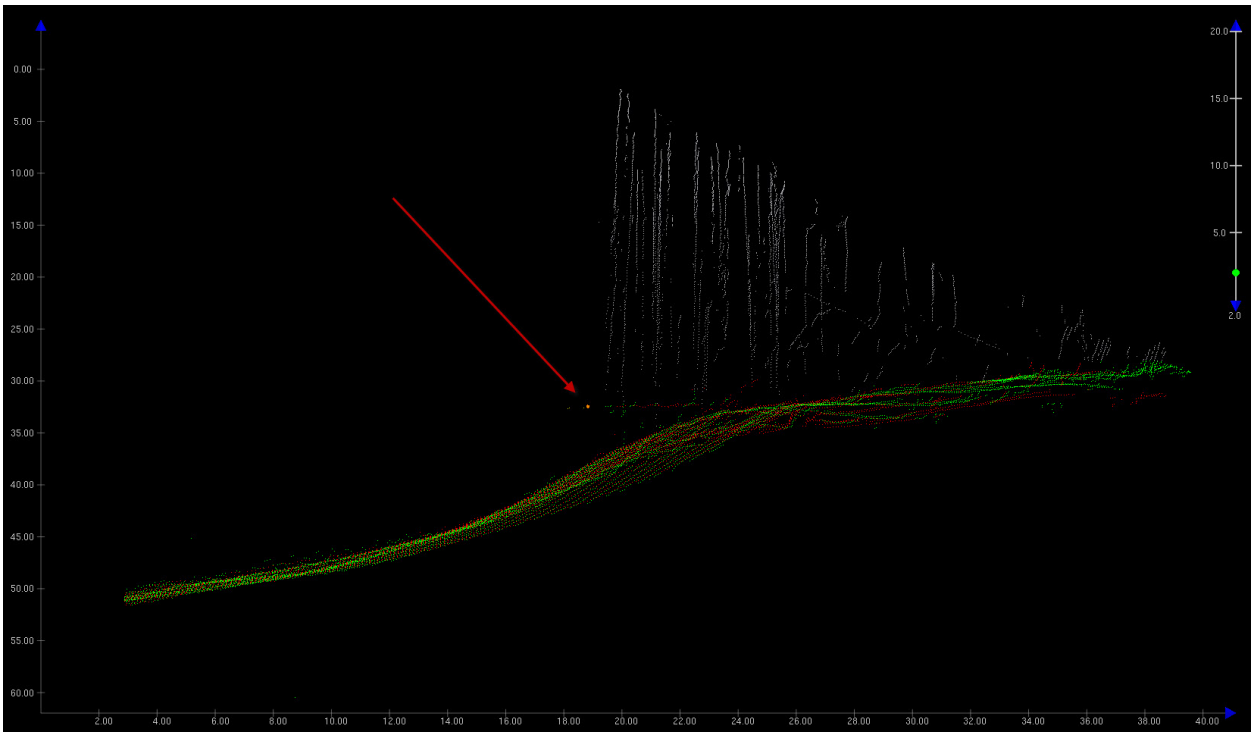


Figure 1.7.1

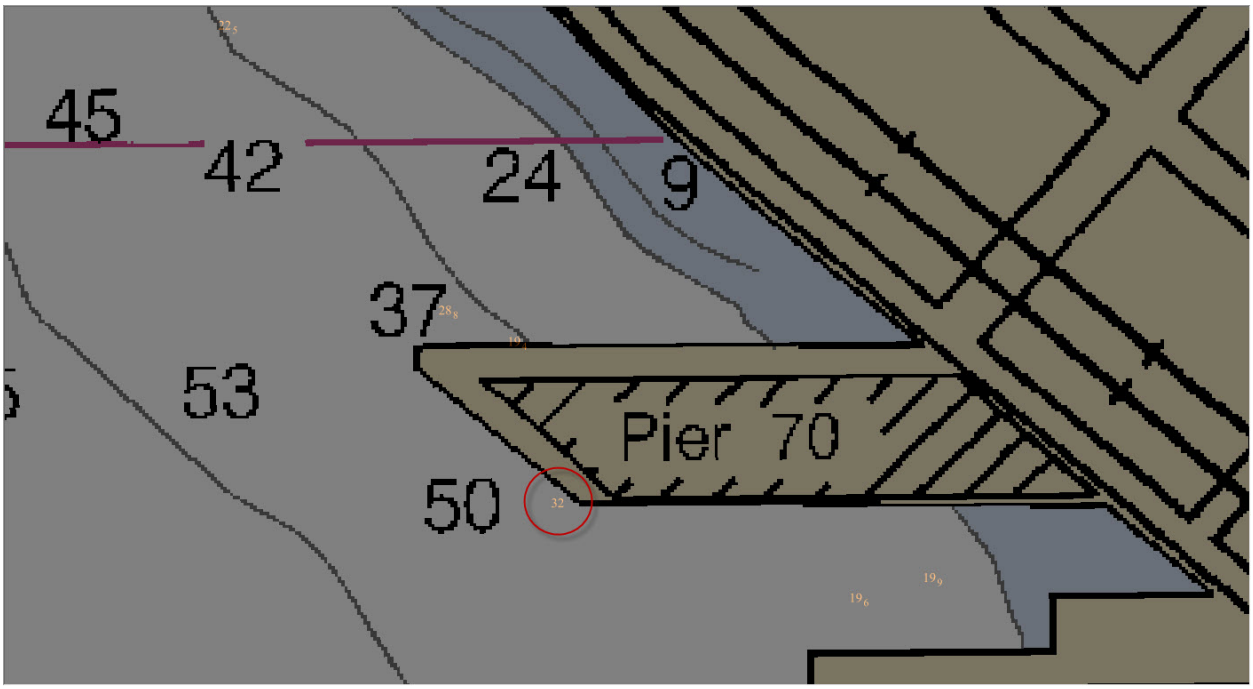


Figure 1.7.2

1.8) 396/361

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 51.3" N, 122° 21' 19.8" W
Least Depth:	5.98 m (= 19.63 ft = 3.272 fm = 3 fm 1.63 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.059 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.18:24:07.161 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781823
Profile/Beam:	396/361
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is debris with an aquired least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781823	396/361	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

19ft (18450_1, 18449_1)

3 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

3fm 1ft (18474_1, 18445_1)

6.0m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 5.984 m

WATLEV - 3:always under water/submerged

Feature Images

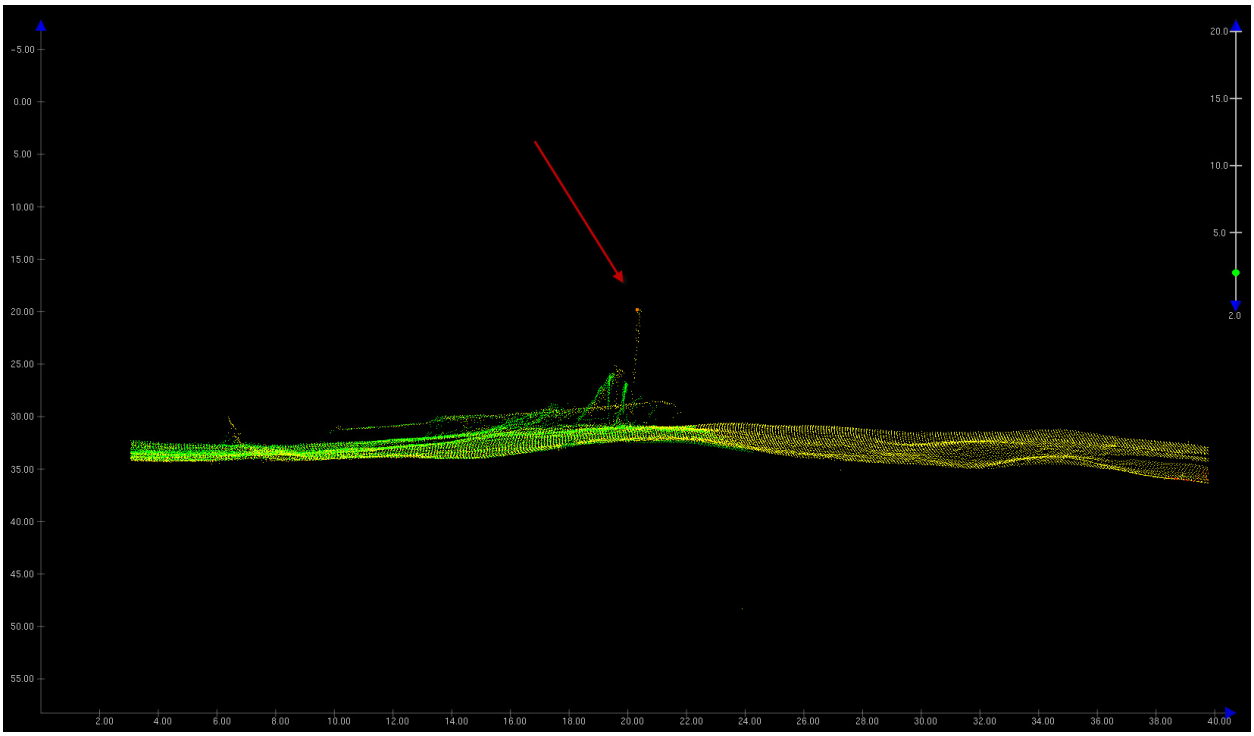


Figure 1.8.1

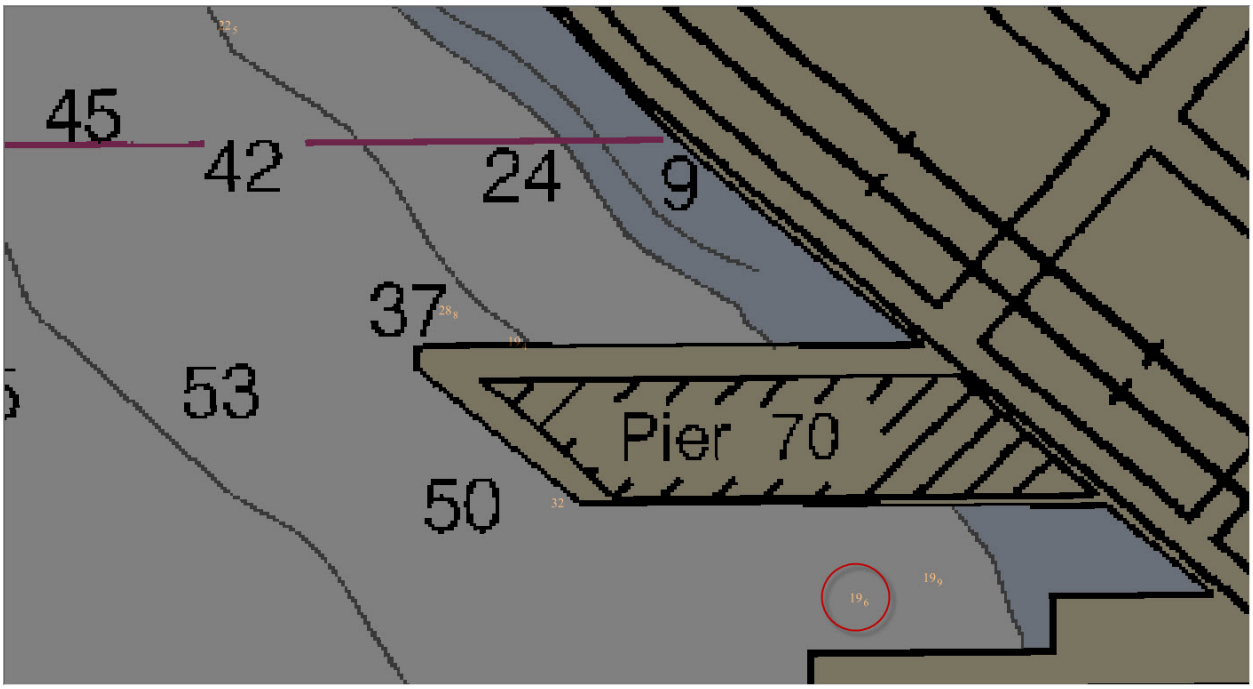


Figure 1.8.2

1.9) 1202/411

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 12.8" N, 122° 20' 24.1" W
Least Depth:	4.60 m (= 15.08 ft = 2.514 fm = 2 fm 3.08 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.065 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.19:40:33.975 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781938
Profile/Beam:	1202/411
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781938	1202/411	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

15ft (18450_1, 18449_1)

2 ½fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

2fm 3ft (18474_1, 18445_1)

4.6m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	NINFOM - 20121017

QUASOU - 2:depth unknown

SORDAT - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 4.597 m

WATLEV - 3:always under water/submerged

Feature Images

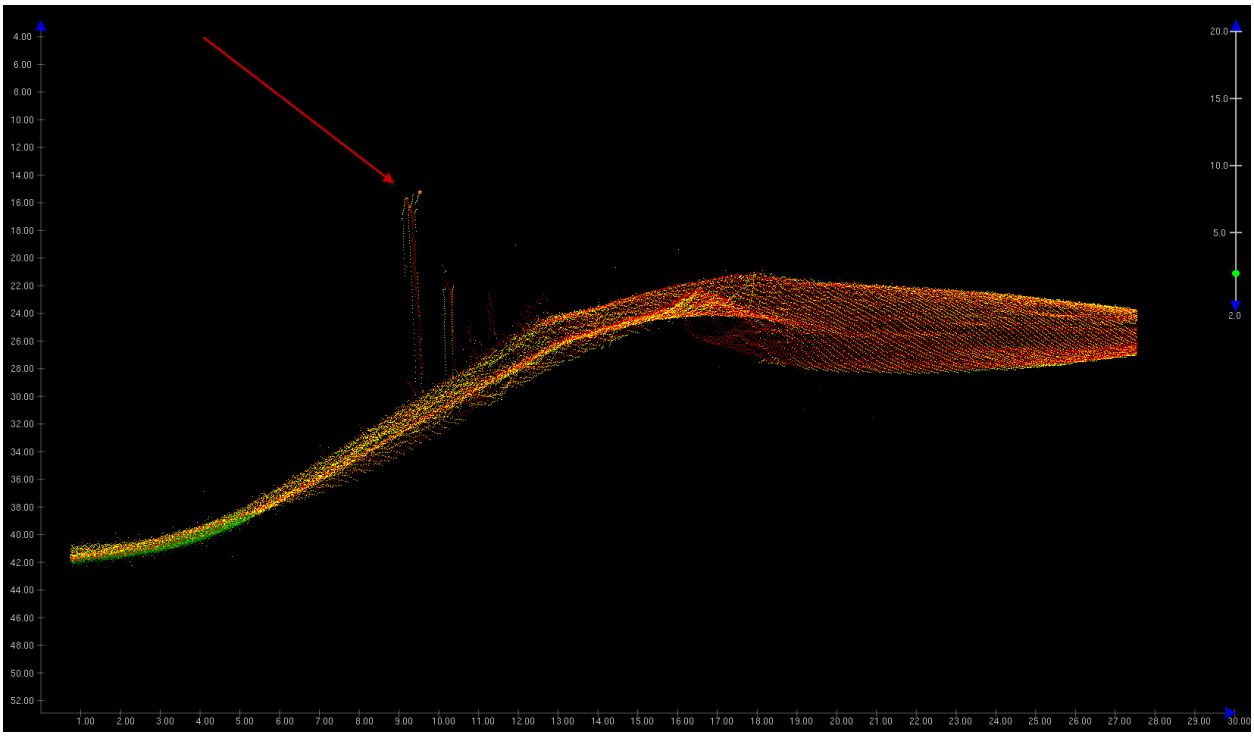


Figure 1.9.1

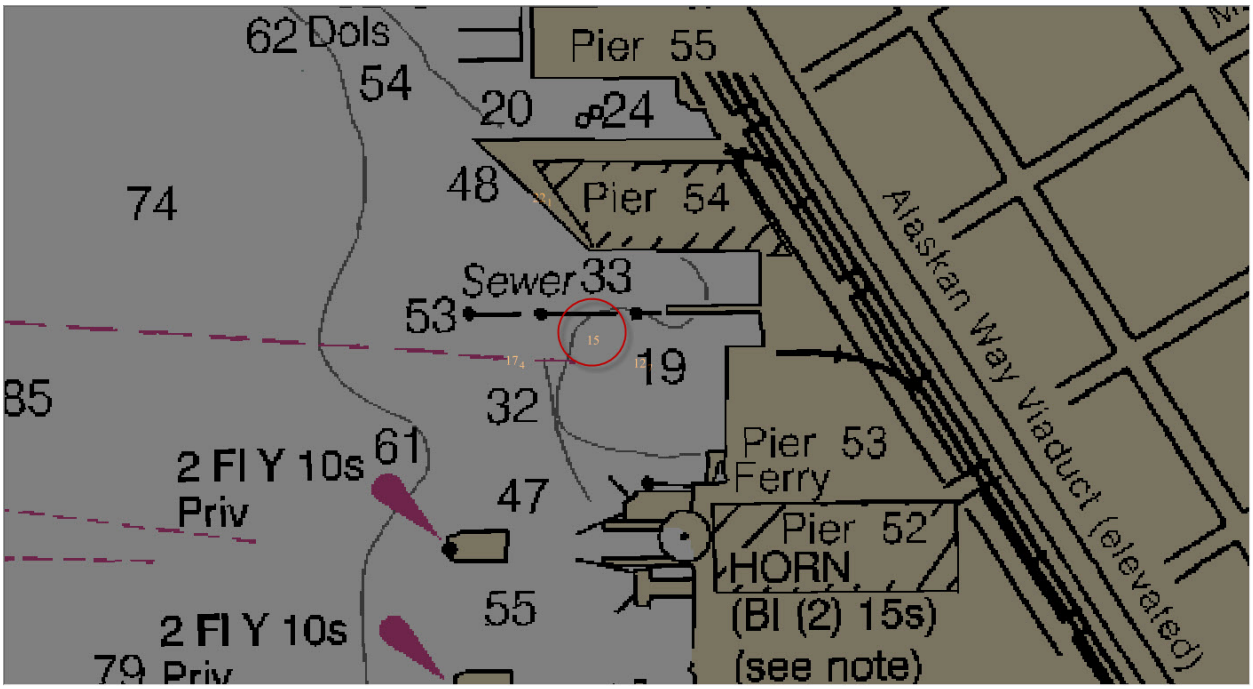


Figure 1.9.2

1.10) 1286/18

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 12.4" N, 122° 20' 23.0" W
Least Depth:	3.90 m (= 12.80 ft = 2.133 fm = 2 fm 0.80 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.071 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-278.19:40:40.792 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781938
Profile/Beam:	1286/18
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile/debris with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781938	1286/18	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

13ft (18450_1, 18449_1)

2fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

2fm 1ft (18474_1, 18445_1)

3.9m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 3.901 m

WATLEV - 3:always under water/submerged

Feature Images

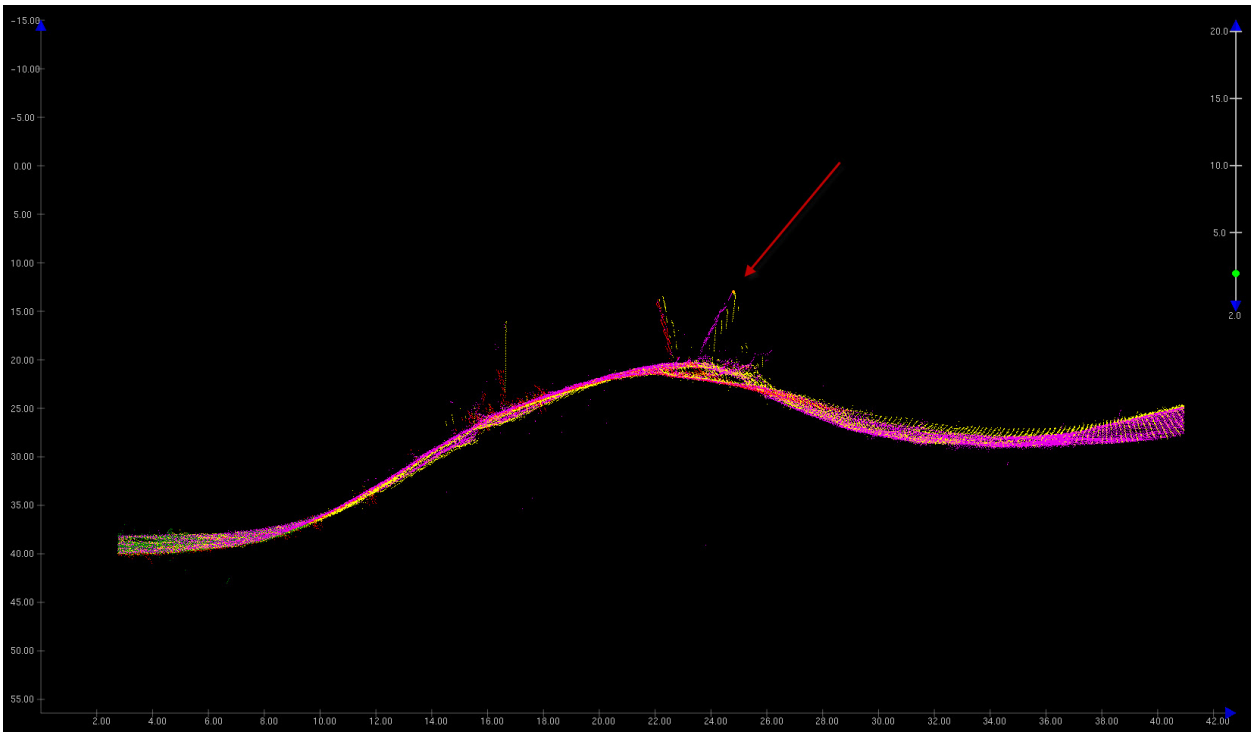


Figure 1.10.1

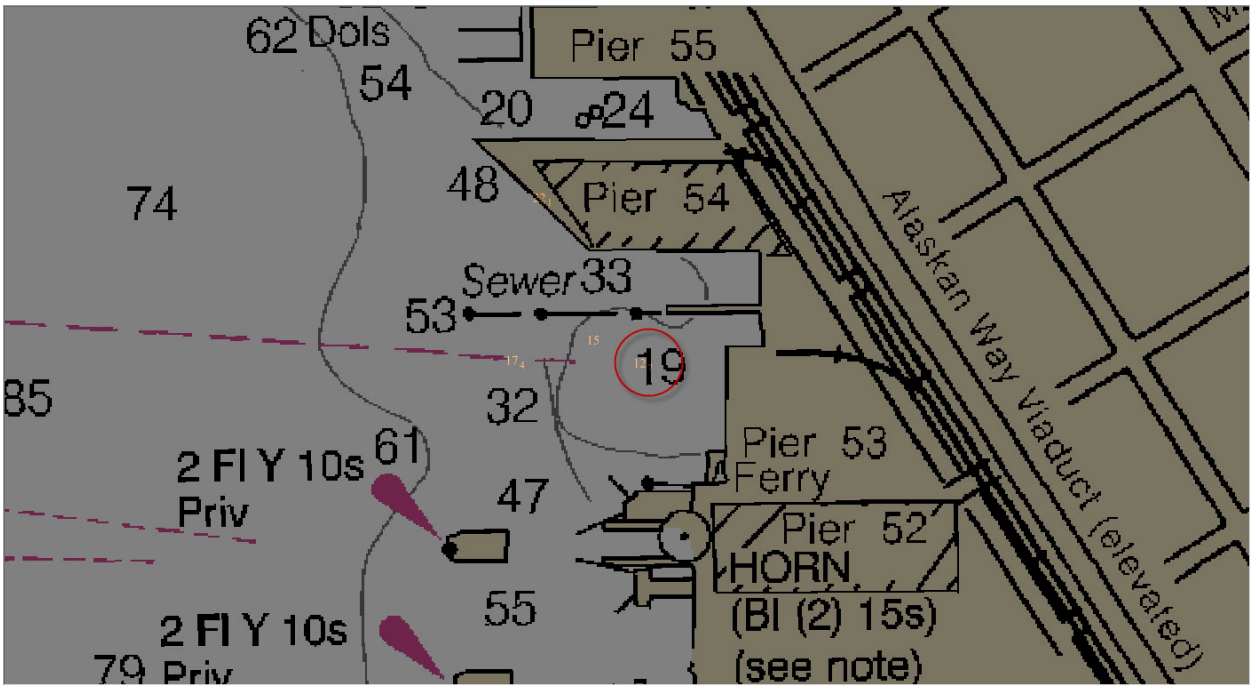


Figure 1.10.2

1.11) 2822/1

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 02.5" N, 122° 20' 16.8" W
Least Depth:	2.46 m (= 8.06 ft = 1.344 fm = 1 fm 2.06 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.049 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.20:00:12.444 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2781956
Profile/Beam:	2822/1
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be a pile/debris with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2781956	2822/1	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

8ft (18450_1, 18449_1)

1 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

1fm 2ft (18474_1, 18445_1)

2.5m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 2.458 m

WATLEV - 3:always under water/submerged

Feature Images

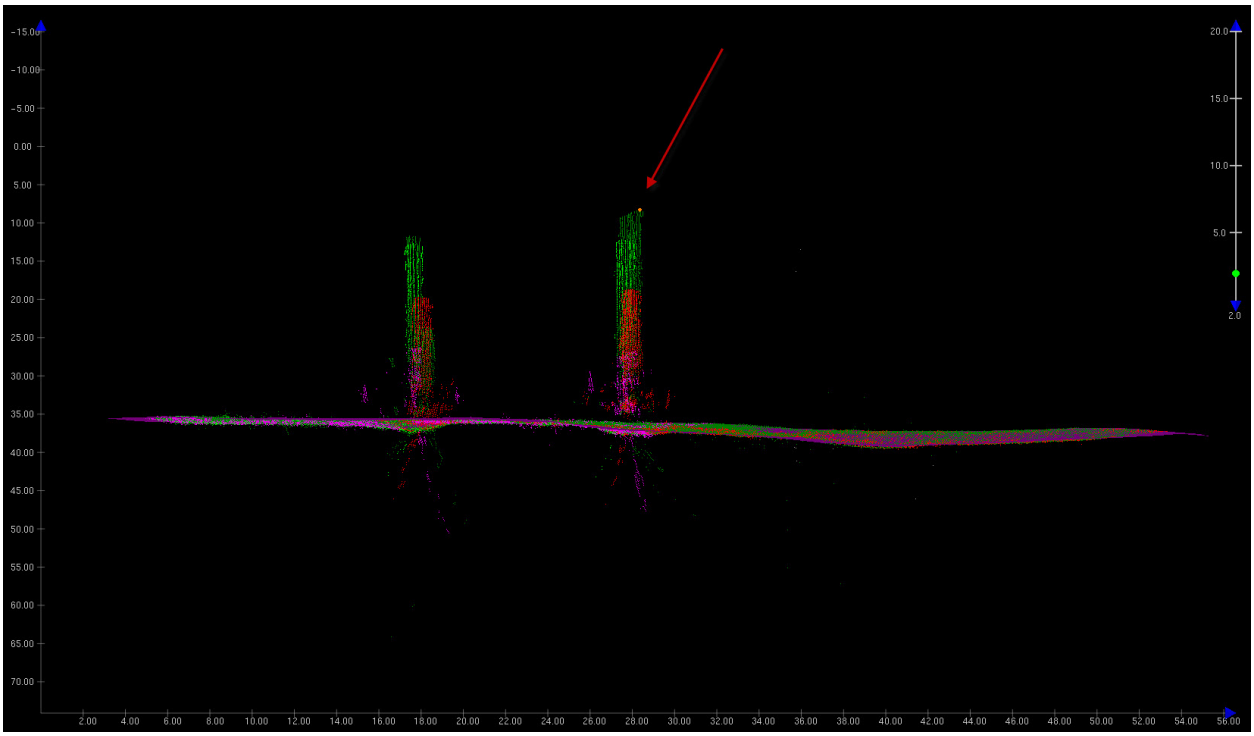


Figure 1.11.1

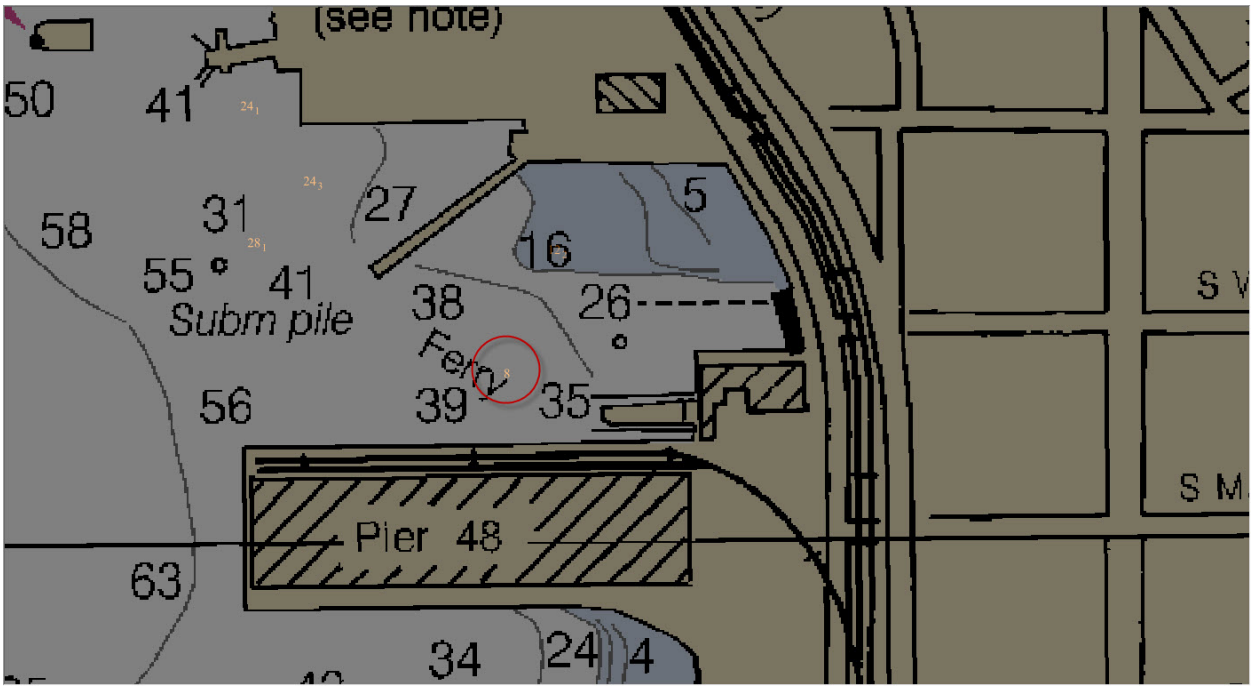


Figure 1.11.2

1.12) 668/1

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 21.0" N, 122° 20' 30.1" W
Least Depth:	2.98 m (= 9.78 ft = 1.631 fm = 1 fm 3.78 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.053 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-278.20:16:23.719 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2782015
Profile/Beam:	668/1
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Note: Field unit was not given a Composite Feature File to compare and deconflict features that may or may not already be known. This feature is likely a pile supporting an uncharted floating pier that can be seen in 'Google' imagery.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2782015	668/1	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

10ft (18450_1, 18449_1)

1 ½fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

1fm 4ft (18474_1, 18445_1)

3.0m (501_1, 50_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 2.982 m

Feature Images

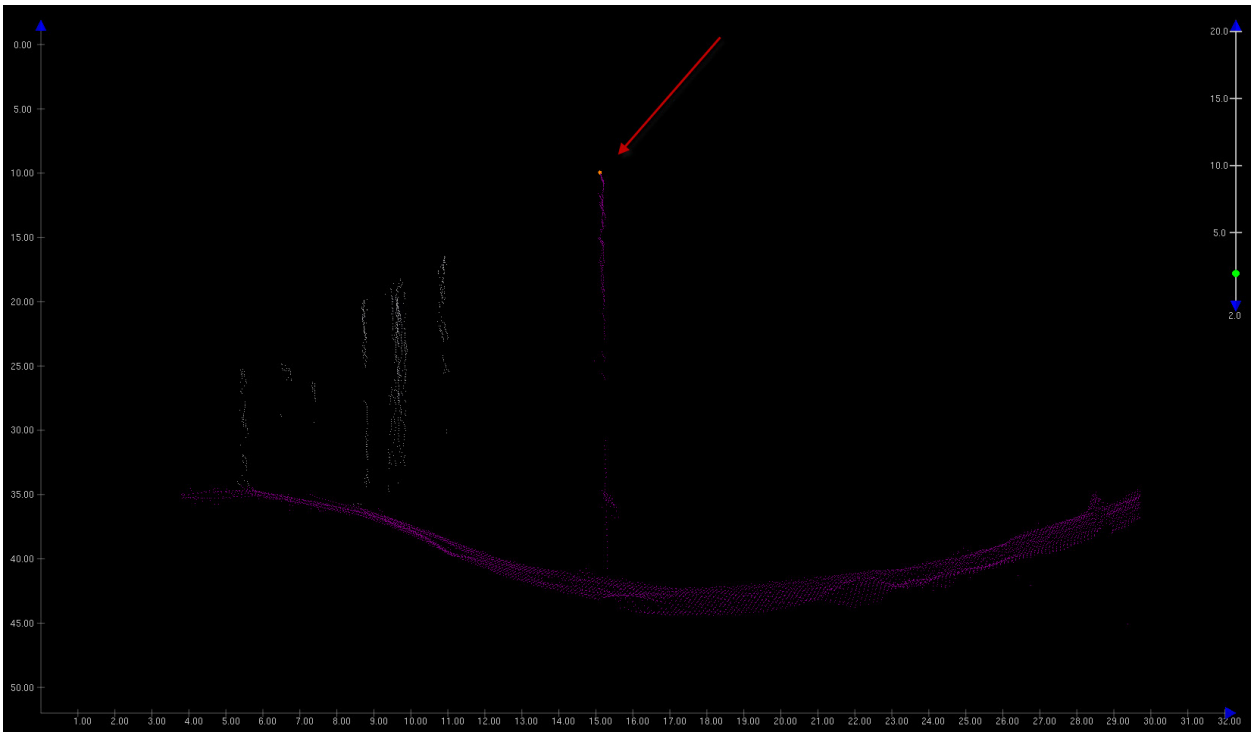


Figure 1.12.1

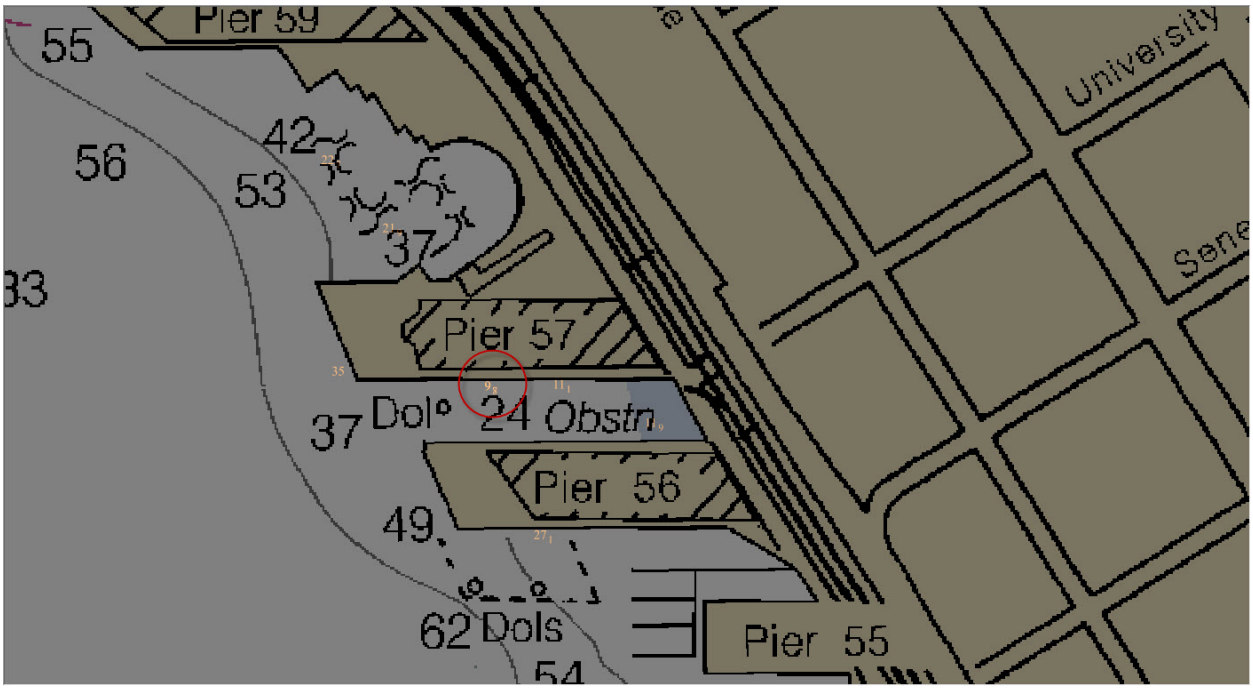


Figure 1.12.2

1.13) 1021/1

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 21.0" N, 122° 20' 28.5" W
Least Depth:	3.39 m (= 11.12 ft = 1.853 fm = 1 fm 5.12 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.056 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-278.20:16:49.713 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2782015
Profile/Beam:	1021/1
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature is a pile with an aquired least depth substantially shallower than the surrounding charted depths. Aquired least depth with outer beams of MBES; object may be shoaler.

Note: Field unit was not given a Composite Feature File to compare and deconflict features that may or may not already be known. This feature is likely a pile supporting an uncharted floating pier that can be seen in 'Google' imagery.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2782015	1021/1	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

11ft (18450_1, 18449_1)

1 ¾fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

1fm 5ft (18474_1, 18445_1)

3.4m (501_1, 50_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: QUASOU - 2:depth unknown

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 3.389 m

Feature Images

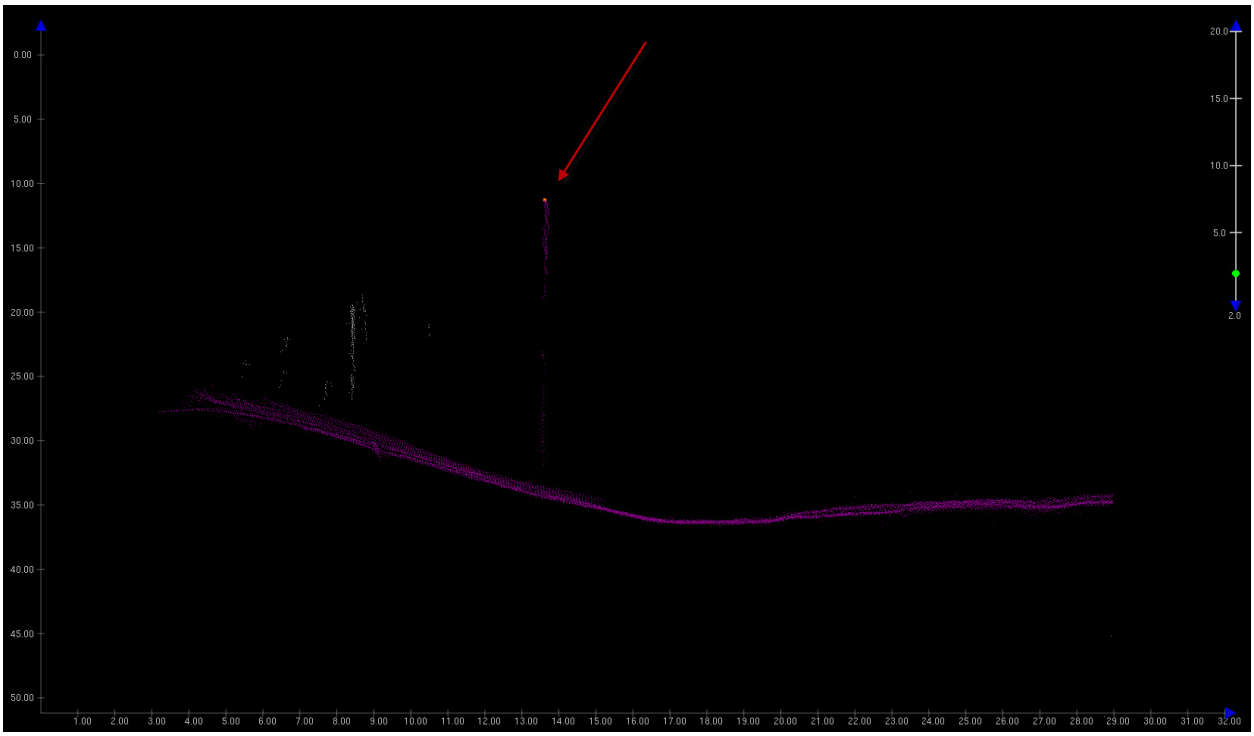


Figure 1.13.1

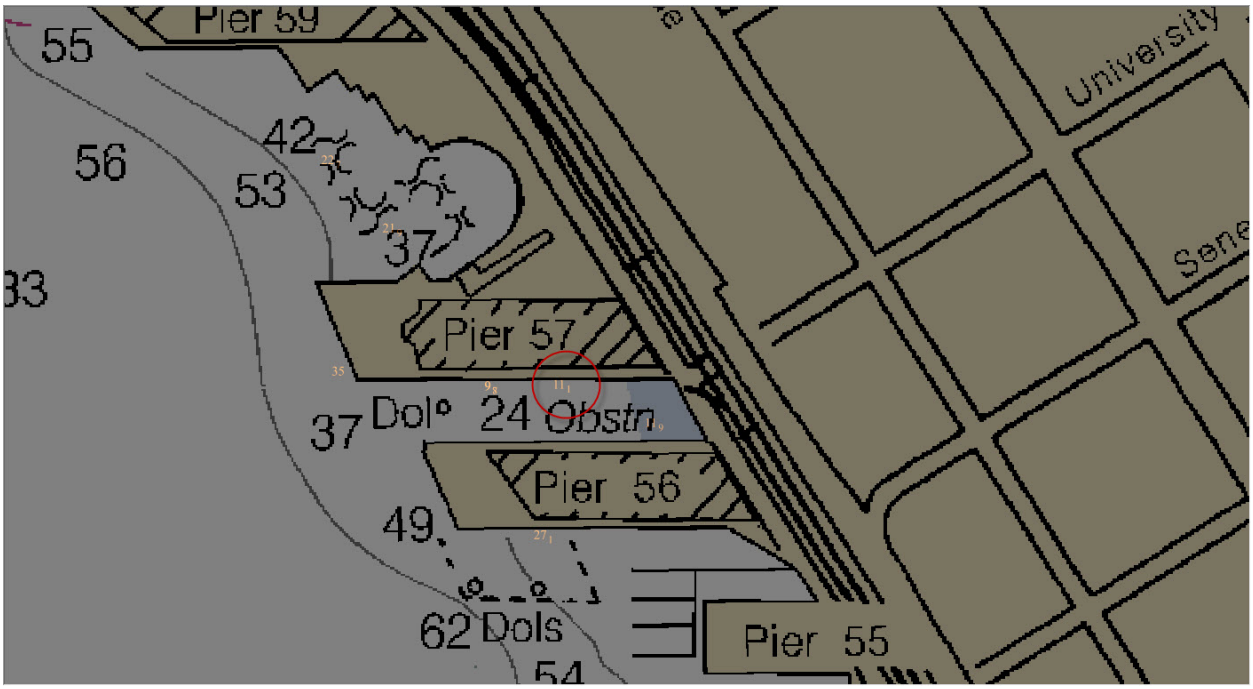


Figure 1.13.2

1.14) 1710/460

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 20.4" N, 122° 20' 26.5" W
Least Depth:	3.66 m (= 11.99 ft = 1.999 fm = 1 fm 5.99 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.048 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-278.20:17:27.359 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2782015
Profile/Beam:	1710/460
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2782015	1710/460	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

12ft (18450_1, 18449_1)

2fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

0fm 0ft (18474_1, 18445_1)

3.7m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 3.656 m

WATLEV - 3:always under water/submerged

Feature Images

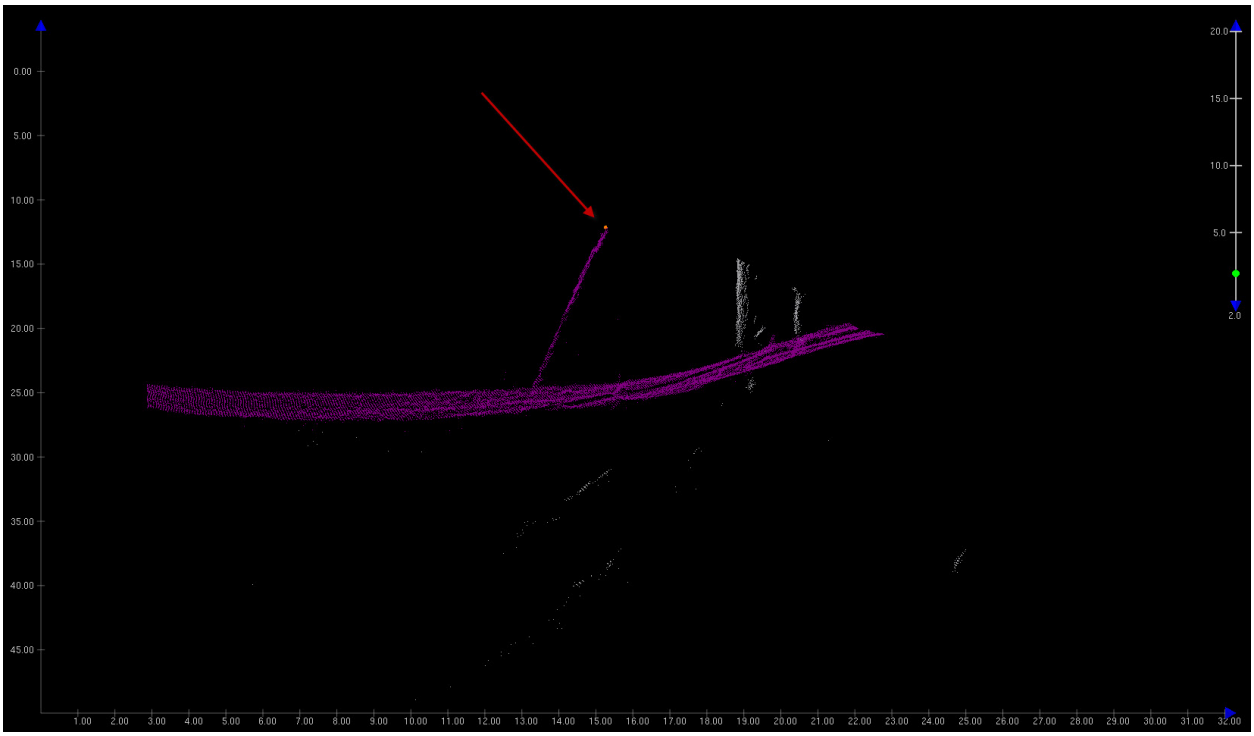


Figure 1.14.1

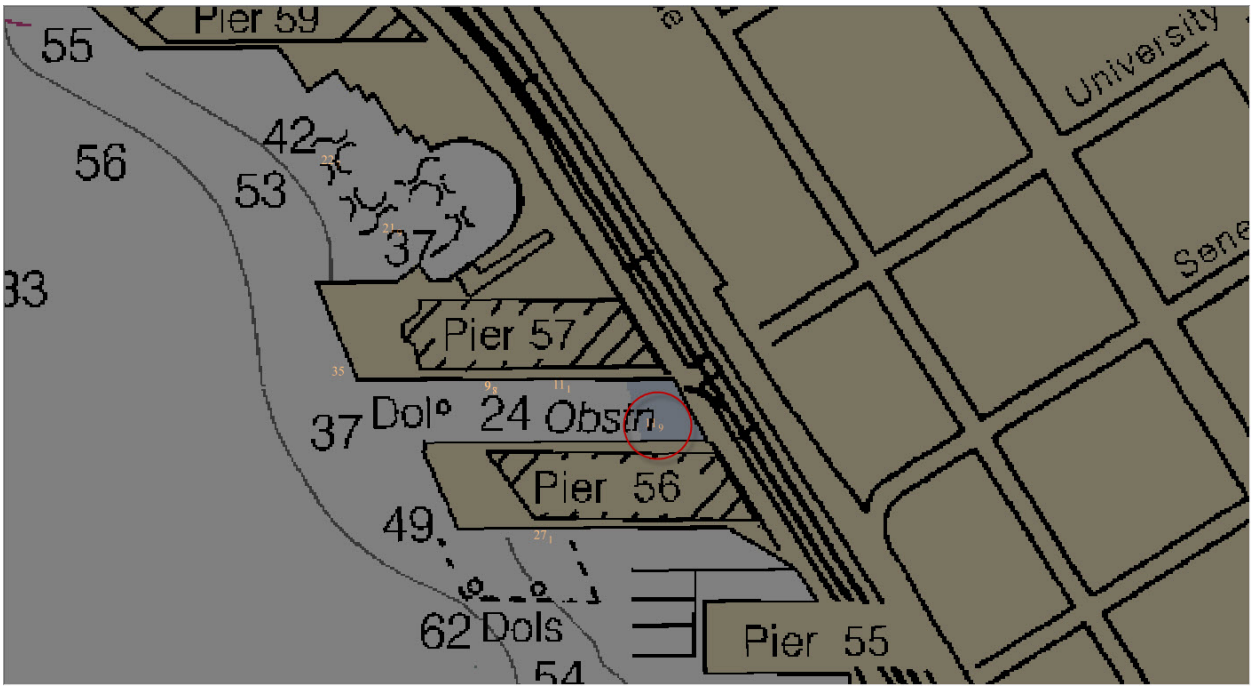


Figure 1.14.2

1.15) 305/64

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 36' 12.4" N, 122° 20' 25.8" W
Least Depth:	5.33 m (= 17.48 ft = 2.913 fm = 2 fm 5.48 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.062 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-278.20:30:22.534 (10/04/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-278 / 2012m_2782029
Profile/Beam:	305/64
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2782029	305/64	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

17ft (18450_1, 18449_1)

2 ¾fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

2fm 5ft (18474_1, 18445_1)

5.3m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 5.327 m

WATLEV - 3:always under water/submerged

Feature Images

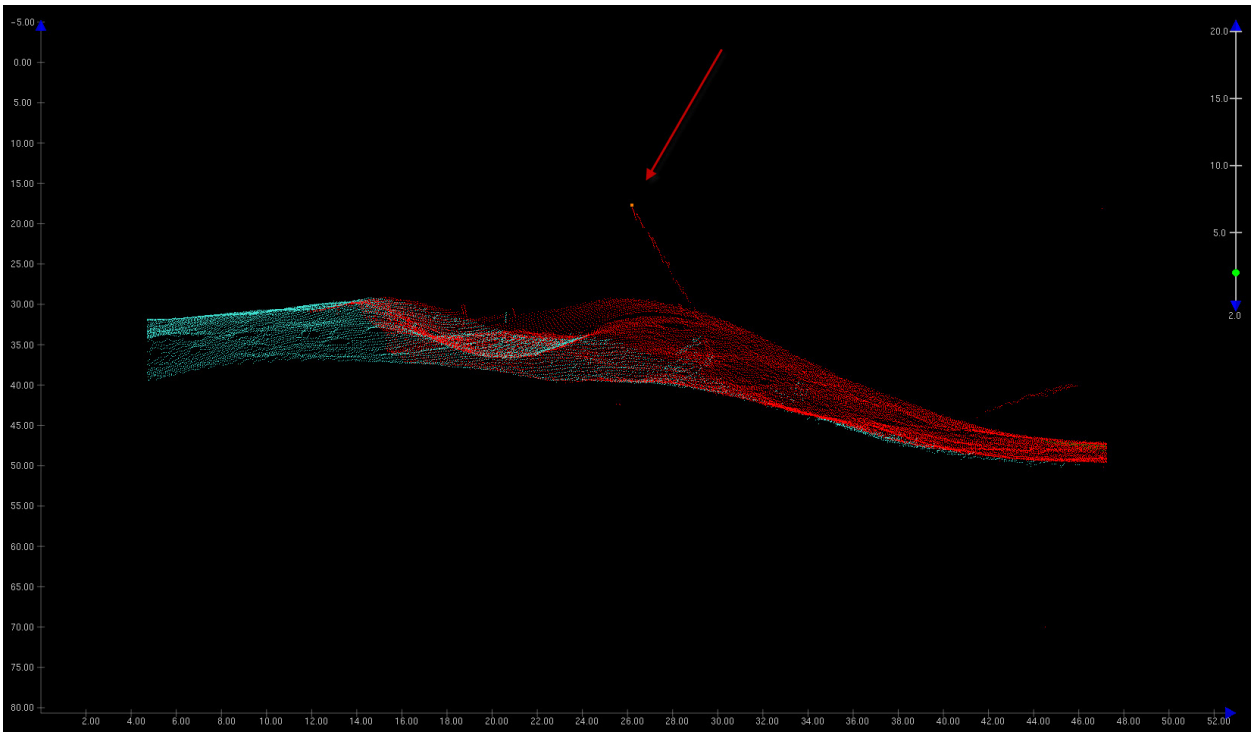


Figure 1.15.1

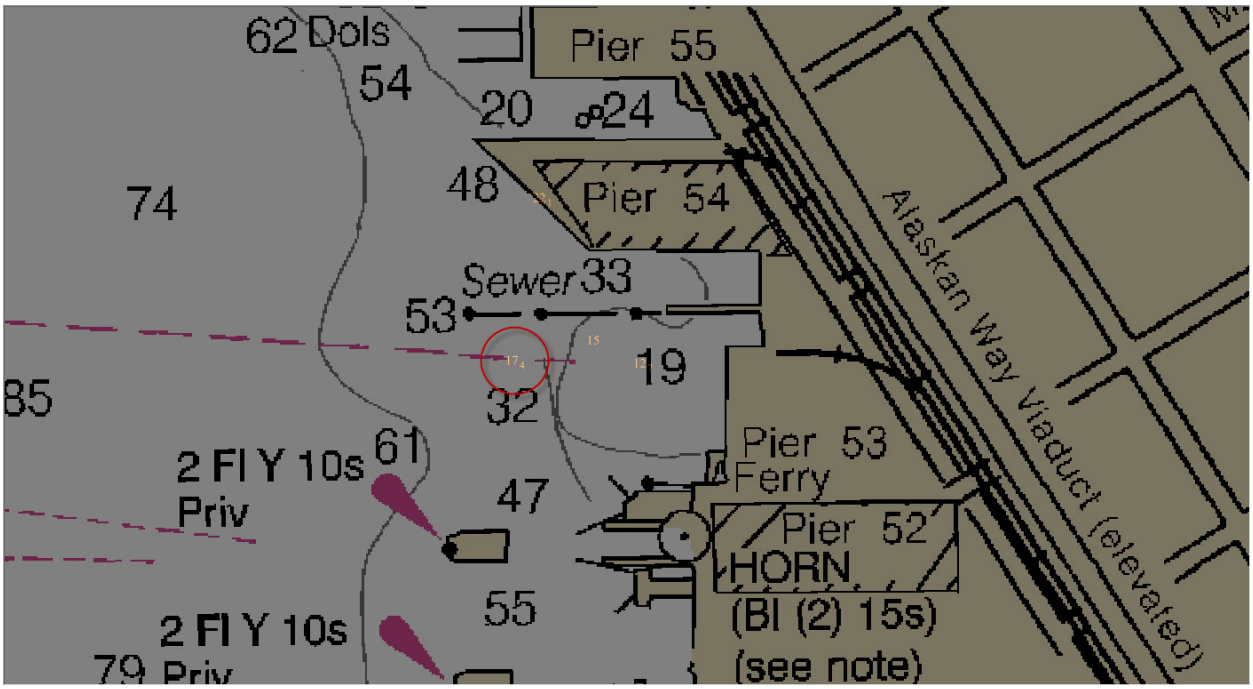


Figure 1.15.2

F00613 Danger to Navigation Report

Registry Number: F00613
State: Washington
Locality:
Sub-locality: Elliot Bay
Project Number: S-N923-FA-12
Survey Dates: Elliot Bay - 10-17-2012

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18450	18th	02/01/2004	1:10,000 (18450_1)	USCG LNM: 4/10/2012 (5/15/2012) CHS NTM: None (4/27/2012) NGA NTM: 8/9/1997 (5/19/2012)
18449	18th	10/01/2003	1:25,000 (18449_1)	[L]NTM: ?
18474	8th	10/01/2003	1:40,000 (18474_1)	[L]NTM: ?
18445	32nd	08/01/2007	1:80,000 (18445_1)	[L]NTM: ?
18441	46th	12/01/2007	1:80,000 (18441_1)	[L]NTM: ?
18440	29th	09/01/2007	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Obstruction	9.65 m	47° 37' 51.4" N	122° 22' 53.4" W	---
1.2	Obstruction	9.88 m	47° 37' 50.0" N	122° 22' 53.1" W	---
1.3	Obstruction	7.60 m	47° 37' 50.3" N	122° 22' 55.5" W	---

1 - Dangers To Navigation

1.1) 2288/151

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 37' 51.4" N, 122° 22' 53.4" W
Least Depth:	9.65 m (= 31.67 ft = 5.278 fm = 5 fm 1.67 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.053 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-277.18:11:03.364 (10/03/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-277 / 2012m_2771808
Profile/Beam:	2288/151
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2771808	2288/151	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

31ft (18450_1, 18449_1)

5 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

5fm 1ft (18474_1, 18445_1)

9.7m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 9.653 m

WATLEV - 3:always under water/submerged

Office Notes

DTON was removed by Port of Seattle. Removal was confirmed by 2013 re-survey.

Feature Images

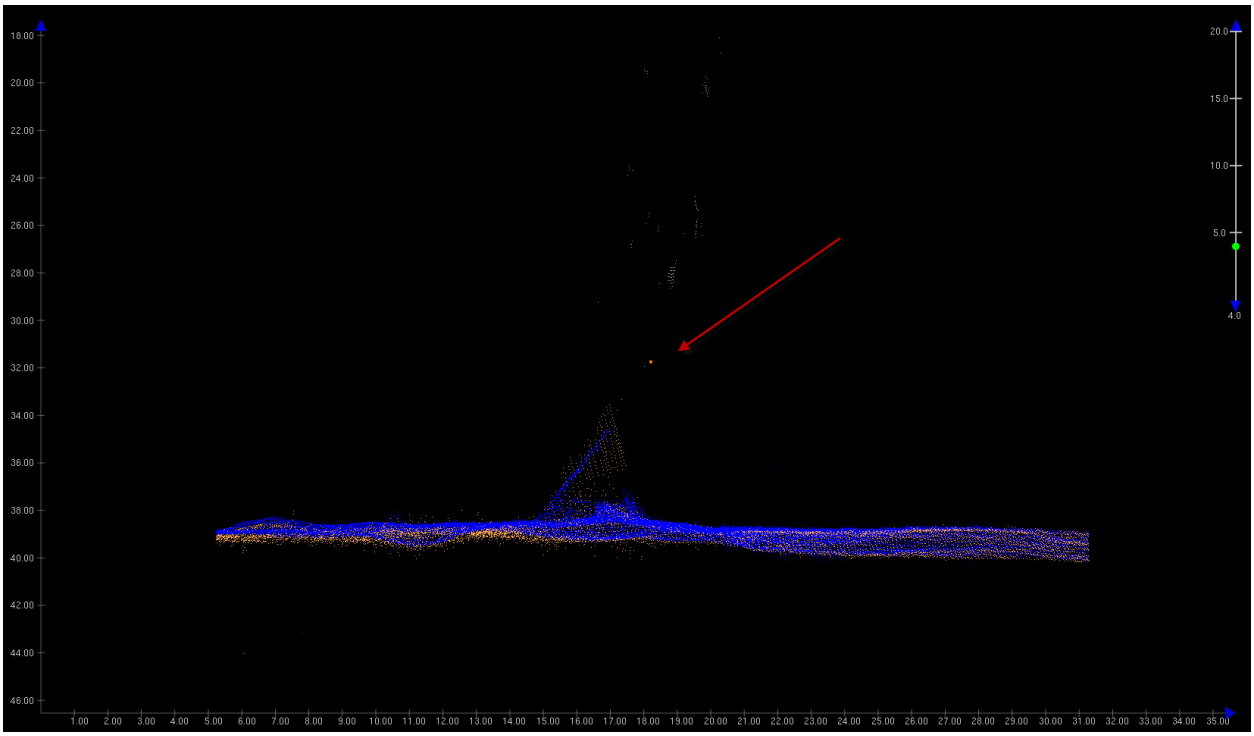


Figure 1.1.1

Figure 1.1.2

1.2) 722/151

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 37' 50.0" N, 122° 22' 53.1" W
Least Depth:	9.88 m (= 32.41 ft = 5.402 fm = 5 fm 2.41 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.070 m ; **TVU (TPEv)** ±0.264 m
Timestamp:	2012-277.19:22:25.723 (10/03/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-277 / 2012m_2771921
Profile/Beam:	722/151
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2771921	722/151	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

32ft (18450_1, 18449_1)

5 ¼fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

5fm 2ft (18474_1, 18445_1)

9.9m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 9.880 m

WATLEV - 3:always under water/submerged

Office Notes

DTON was removed by Port of Seattle. Removal was confirmed by 2013 re-survey.

Feature Images

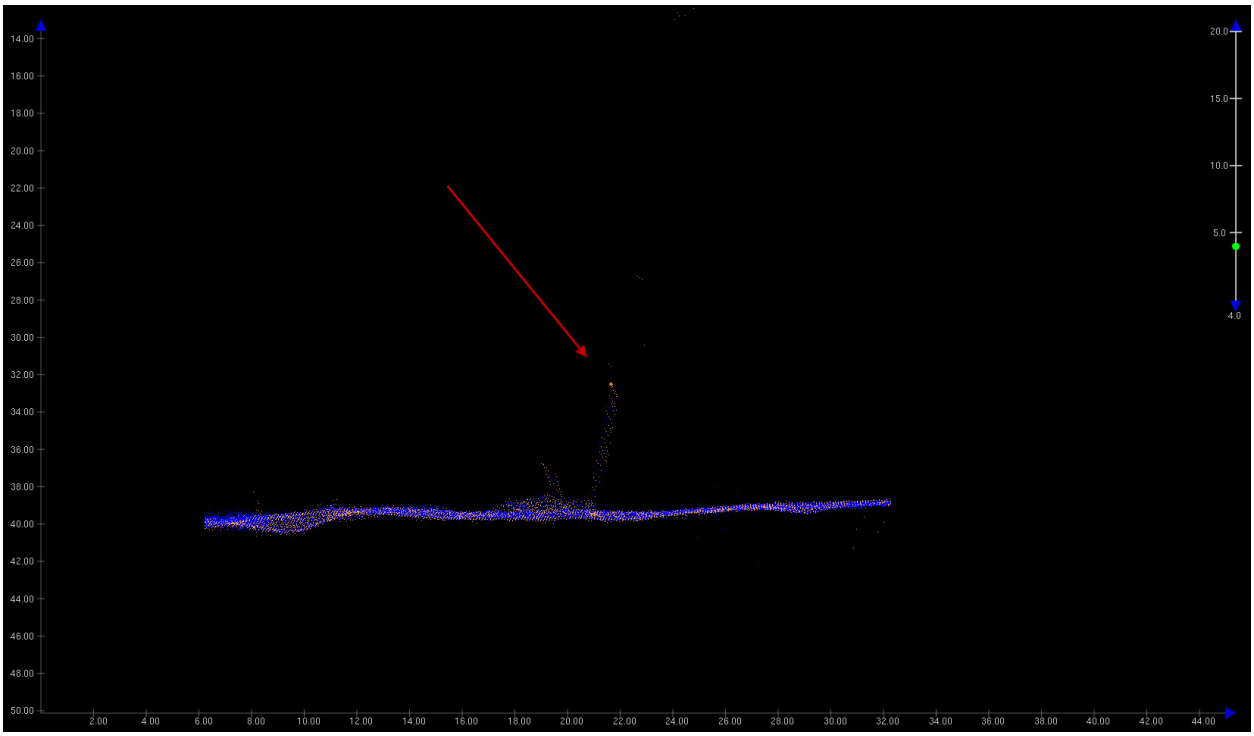


Figure 1.2.1

Figure 1.2.2

1.3) 1788/199

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 37' 50.3" N, 122° 22' 55.5" W
Least Depth:	7.60 m (= 24.94 ft = 4.157 fm = 4 fm 0.94 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.055 m ; **TVU (TPEv)** ±0.263 m
Timestamp:	2012-277.19:23:47.449 (10/03/2012)
Survey Line:	f00613 / fa_2808_400khz_7125_512bms_2012 / 2012-277 / 2012m_2771921
Profile/Beam:	1788/199
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

The navigable area was covered with 100% MBES (Reson 7125 SV). Final tides have been applied. The feature appears to be pile/debris with a least depth substantially shallower than the surrounding charted depths.

Feature Correlation

Source	Feature	Range	Azimuth	Status
2012m_2771921	1788/199	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

25ft (18450_1, 18449_1)

4fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

4fm 1ft (18474_1, 18445_1)

7.6m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	QUASOU - 6:least depth known

SORDAT - 20121017

SORIND - graph,US,US,F00613

TECSOU - 3:found by multi-beam

VALSOU - 7.602 m

WATLEV - 3:always under water/submerged

Office Notes

DTON was removed by Port of Seattle. Removal was confirmed by 2013 re-survey.

Feature Images

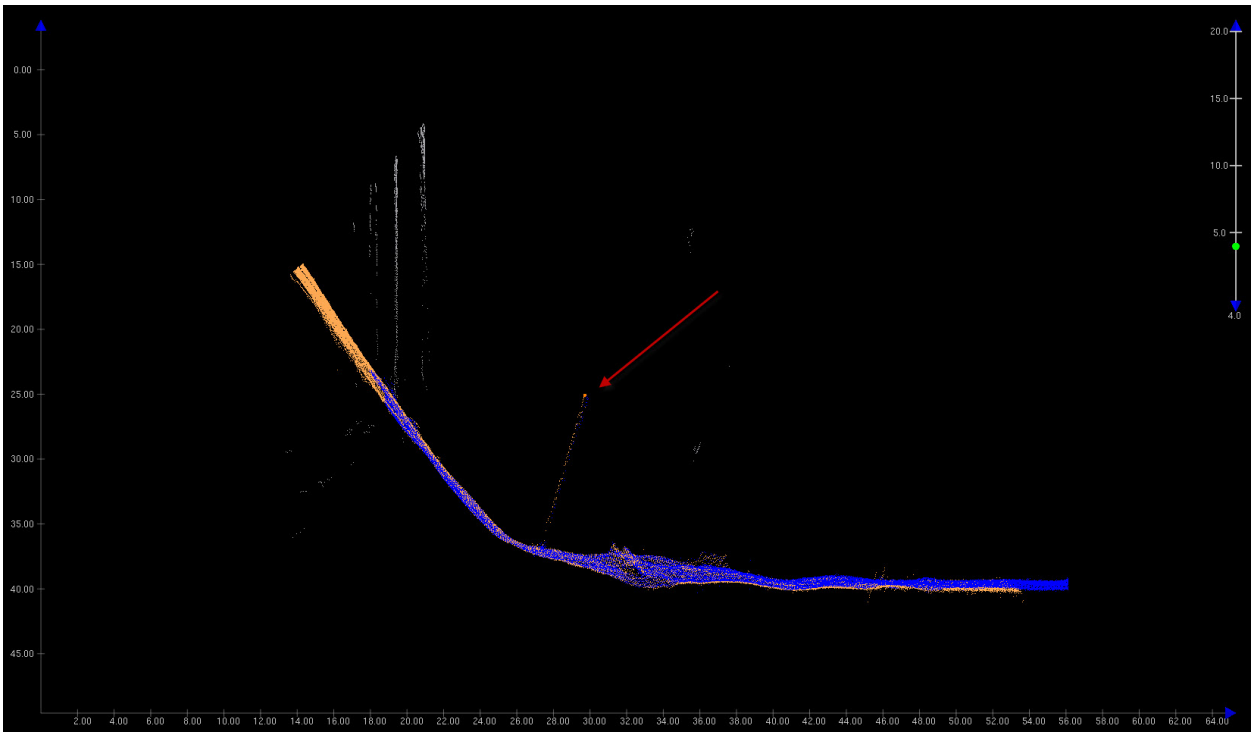


Figure 1.3.1

Figure 1.3.2

F00613 Danger to Navigation Report

Registry Number:

State:

Locality:

Sub-locality:

Project Number:

Survey Date: 05/31/2013

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18450	19th	11/01/2012	1:10,000 (18450_1)	USCG LNM: 2/18/2014 (6/17/2014) CHS NTM: None (12/27/2013) NGA NTM: 8/9/1997 (6/28/2014)
18449	18th	10/01/2003	1:25,000 (18449_1)	[L]NTM: ?
18474	8th	10/01/2003	1:40,000 (18474_1)	[L]NTM: ?
18445	32nd	08/01/2007	1:80,000 (18445_1)	[L]NTM: ?
18441	46th	12/01/2007	1:80,000 (18441_1)	[L]NTM: ?
18440	29th	09/01/2007	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Obstruction	1.83 m	47° 37' 43.0" N	122° 23' 11.6" W	---

1 - Dangers To Navigation

1.1) US 0000000719 00001 / F00613_DTON_Smith_Cove.000

DANGER TO NAVIGATION

Survey Summary

Survey Position:	47° 37' 43.0" N, 122° 23' 11.6" W
Least Depth:	1.83 m (= 5.99 ft = 0.998 fm = 0 fm 5.99 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2013-151.00:00:00.000 (05/31/2013)
Dataset:	F00613_DTON_Smith_Cove.000
FOID:	US 0000000719 00001(0226000002CF0001)
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

6 foot snag found between charted 22 and 18 foot soundings.

Feature Correlation

Source	Feature	Range	Azimuth	Status
F00613_DTON_Smith_Cove.000	US 0000000719 00001	0.00	000.0	Primary

Hydrographer Recommendations

Submit as DTON. Chart 6 foot OBSTRN.

Cartographically-Rounded Depth (Affected Charts):

6ft (18450_1, 18449_1)

1fm (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

1fm 0ft (18474_1, 18445_1)

1.8m (501_1, 50_1)

S-57 Data

Geo object 1:	Obstruction (OBSTRN)
Attributes:	CATOBS - 1:snag / stump
	QUASOU - 6:least depth known

SORDAT - 20130531

SORIND - US,US,graph,F00613

TECSOU - 3:found by multi-beam

VALSOU - 1.826 m

WATLEV - 3:always under water/submerged

Feature Images

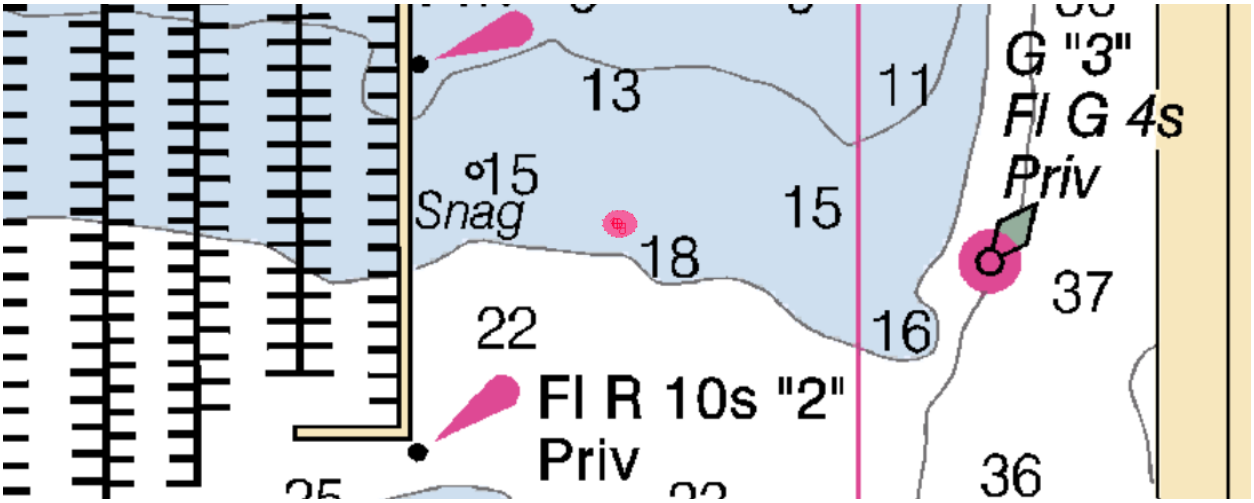


Figure 1.1.1

F00613 Feature Report

Registry Number: F00613
State: Washington
Locality: Elliott Bay
Sub-locality: Elliott Bay
Project Number: S-N923-FA-12
Survey Dates: 05/31/2012 - 05/31/2013

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18450	18th	02/01/2004	1:10,000 (18450_1)	[L]NTM: ?
18449	18th	10/01/2003	1:25,000 (18449_1)	[L]NTM: ?
18474	8th	10/01/2003	1:40,000 (18474_1)	[L]NTM: ?
18445	32nd	08/01/2007	1:80,000 (18445_1) 1:40,000 (18445_6)	[L]NTM: ?
18441	46th	12/01/2007	1:80,000 (18441_1)	[L]NTM: ?
18448	34th	07/01/2006	1:80,000 (18448_1)	[L]NTM: ?
18440	29th	09/01/2007	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude
1.1	Wreck	42.60 m	47° 35' 16.7" N	122° 22' 16.6" W
1.2	Wreck	63.30 m	47° 35' 48.4" N	122° 21' 05.6" W
2.1	Wreck	126.20 m	47° 36' 36.7" N	122° 22' 14.9" W

1 - Charted Features

1.1) US 0000941413 00001 / F00613_Wrecks.000

Survey Summary

Survey Position:	47° 35' 16.7" N, 122° 22' 16.6" W
Least Depth:	42.60 m (= 139.76 ft = 23.294 fm = 23 fm 1.76 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2002-335.00:00:00.000 (12/01/2002)
Dataset:	F00613_Wrecks.000
FOID:	US 0000941413 00001(0226000E5D650001)
Charts Affected:	18450_1, 18449_1, 18445_6, 18474_1, 18441_1, 18445_1, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

WRECKS/remrks: Seen in MBES data

Hydrographer Recommendations

Retain

Cartographically-Rounded Depth (Affected Charts):

140ft (18450_1, 18449_1)

23ft (18441_1, 18448_1, 18440_1, 18003_1, 18007_1, 530_1)

23fm (18445_6, 18474_1, 18445_1)

42m (501_1, 50_1)

S-57 Data

Geo object 1:	Wreck (WRECKS)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20021200
	SORIND - US,US,graph,chart 18450
	VALSOU - 42.600 m
	WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Update charted postion and least depth.

1.2) US 0000941412 00001 / F00613_Wrecks.000

Survey Summary

Survey Position:	47° 35' 48.4" N, 122° 21' 05.6" W
Least Depth:	63.30 m (= 207.68 ft = 34.613 fm = 34 fm 3.68 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2002-335.00:00:00.000 (12/01/2002)
Dataset:	F00613_Wrecks.000
FOID:	US 0000941412 00001(0226000E5D640001)
Charts Affected:	18450_1, 18449_1, 18474_1, 18441_1, 18445_1, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

WRECKS/remrks: Seen in MBES data

Hydrographer Recommendations

Retain

Cartographically-Rounded Depth (Affected Charts):

207ft (18450_1, 18449_1)

34ft (18441_1, 18448_1, 18440_1, 18003_1, 18007_1, 530_1)

34fm (18474_1, 18445_1)

63m (501_1, 50_1)

S-57 Data

Geo object 1:	Wreck (WRECKS)
Attributes:	CATWRK - 1:non-dangerous wreck
	QUASOU - 6:least depth known
	SORDAT - 20021200
	SORIND - US,US,graph,chart 18450
	VALSOU - 63.300 m
	WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Update charted postion and least depth.

2 - New Features

2.1) US 0000941414 00001 / F00613_Wrecks.000

Survey Summary

Survey Position:	47° 36' 36.7" N, 122° 22' 14.9" W
Least Depth:	126.20 m (= 414.04 ft = 69.006 fm = 69 fm 0.04 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2013-151.00:00:00.000 (05/31/2013)
Dataset:	F00613_Wrecks.000
FOID:	US 0000941414 00001(0226000E5D660001)
Charts Affected:	18450_1, 18449_1, 18445_6, 18474_1, 18441_1, 18445_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

WRECKS/remrks: New submerged wreck

Hydrographer Recommendations

Chart new submerged wreck (18450)

Cartographically-Rounded Depth (Affected Charts):

414ft (18450_1, 18449_1)

69ft (18441_1, 18440_1, 18003_1, 18007_1, 530_1)

69fm (18445_6, 18474_1, 18445_1)

126m (501_1, 50_1)

S-57 Data

Geo object 1:	Wreck (WRECKS)
Attributes:	CATWRK - 1:non-dangerous wreck
	QUASOU - 6:least depth known
	SORDAT - 20130531
	SORIND - US,US,graph,F00613
	TECSOU - 3:found by multi-beam
	VALSOU - 126.198 m
	WATLEV - 3:always under water/submerged

Office Notes

Concur.

APPROVAL PAGE

F00613

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- F00613_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- F00613_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2015.01.30 08:58:50 -08'00'

Approved:_____

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Digitally signed by Peter Holmberg
DN: cn=Peter Holmberg, o, ou=signing for Benjamin K. Evans, email=benjamin.k.evans@noaa.gov, c=US
Date: 2015.01.30 09:00:27 -08'00'

Approved:_____

CDR Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch