

H11810

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. RA-10-01-08

Registry No. H11810

LOCALITY

State Washington

General Locality Lake Washington

Sublocality Lake Washington

2008

CHIEF OF PARTY

Captain Donald W. Haines, NOAA

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DATE

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION HYDROGRAPHIC TITLE SHEET	REGISTRY No H11810
INSTRUCTIONS — The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.	FIELD No: RA-10-01-08
State <u>Washington</u>	
General Locality <u>Lake Washington</u>	
Sub-Locality <u>Lake Washington</u>	
Scale <u>1:10,000</u> Date of Survey <u>April 1 to November 24, 2008</u>	
Instructions dated <u>2/26/2008</u> Project No. <u>S-N904-RA-08</u>	
Vessel <u>RA3 (1021), RA1 (1101), RA2 (1103), RA4 (2801), RA9 (915_Ceeducer)</u>	
Chief of party <u>CAPT Donald W. Haines, NOAA</u>	
Surveyed by <u>RAINIER Personnel</u>	
Soundings by <u>Reson SeaBat 8101, Tilted Reson 8125, Knudsen 320M, Reson 7125, Ceeducer</u>	
SAR by <u>Albert Foster</u> Compilation by <u>Peter Holmberg</u>	
Soundings compiled in <u>Fathoms</u>	
REMARKS: <u>All times are UTC. UTM Zone 10</u>	
<u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS)</u>	
<u>nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were</u>	
<u>generated during office processing.</u>	
<u>Page numbering may be interrupted or non sequential.</u>	
<u>All pertinent records for this survey, including the Descriptive Report, are archived at the</u>	
<u>National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.</u>	

Descriptive Report to Accompany Hydrographic Survey H11810

Project S-N904-RA-08

Lake Washington

Washington

Scale 1:10,000

April – November, 2008

NOAA Ship *Rainier* (s221)

Chief of Party: Captain Donald W. Haines, NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions S-N904-RA-08 dated 26 February 2008 and all other applicable direction¹, with the exception of deviations noted in this report. The survey area is Lake Washington, Washington. This survey corresponds to sheet “A” in the sheet layout provided with the Letter Instructions. S-N904-RA-08 will fill gaps in data from the 2004 and 2005 field seasons. Additionally this project will provide a training opportunity and shakedown for *Rainier* personnel and equipment before leaving Sand Point.

Complete multibeam echosounder (MBES) coverage was achieved in the survey area in waters 8 meters and deeper. In depths less than 8 meters additional MBES coverage was acquired to identify least depths over significant features or shoals, as appropriate for this survey. Except as noted below, vertical beam echosounder (VBES) data were acquired in depths from approximately 4 to 20 meters to define the navigable area limit, aid in the planning of SWMB data acquisition, and provide inshore bathymetry in navigationally significant areas. Total mileage acquired by each vessel and system is reference in Table 1.

Limited Shoreline Verification was performed for the survey area.

Although survey coverage does not extend to the 4-meter contour inside the log boom north of Coulon Beach Park and areas of private boat moorage, the Chief of Party, in consultation with Northwest Navigation Manager, Hydrographic Surveys Division Operations Branch, and Pacific Hydrographic Branch, determined that coverage is sufficient for submission.¹

¹ Standing Instructions for Hydrographic Surveys (February 2004), NOS Hydrographic Surveys Specifications and Deliverables (May 2008), OCS Field Procedures Manual for Hydrographic Surveying (April 2008), and all Hydrographic Surveys Technical Directives issued through the dates of data acquisition.

Data Acquisition Type	Hull Number with Mileage (nm)					Total
	1101	1103	1021	1905	2801	
VBES (mainscheme)	-	66.51	-	11.11	-	77.62
MBES (mainscheme)	13.29	-	92.53	-	33.04	138.86
Crosslines	-	15.83	0.80	6.27	0.33	23.23
Developments			0.10		0.38	0.48
Bottom Samples	-	-	-	-	-	0
Total Number of Items Investigated	-	-	-	-	-	0
Total Area Surveyed (sq. nm)	-	-	-	-	-	5.19

Table 1: Statistics for survey H11810

Data acquisition was completed during two time periods, the first conducted in April 2008, and completion of acquisition in November 2008.

Data acquisition was initially conducted, but not completed, from April 1 to April 21, 2008 (DN092 to DN112), prior to the start of the regular field season. This was the shakedown period for all survey systems including the new Reson 7125 sonar onboard RA-4 (2801) and for the tilted configuration of RA-1's (1101) Reson 8125 sonar.

Data acquisition was completed from November 18 to November 24, 2008 (DN323 to DN329). Platforms used were the swing mount Reson 8101 aboard RA-3 (1021), a Knudson 320M vertical beam echosounder aboard RA-2 (1103), and a CEEDUCER Pro vertical beam echosounder affixed to a 19 foot American Eagle SAFE boat, RA-9 (1905).

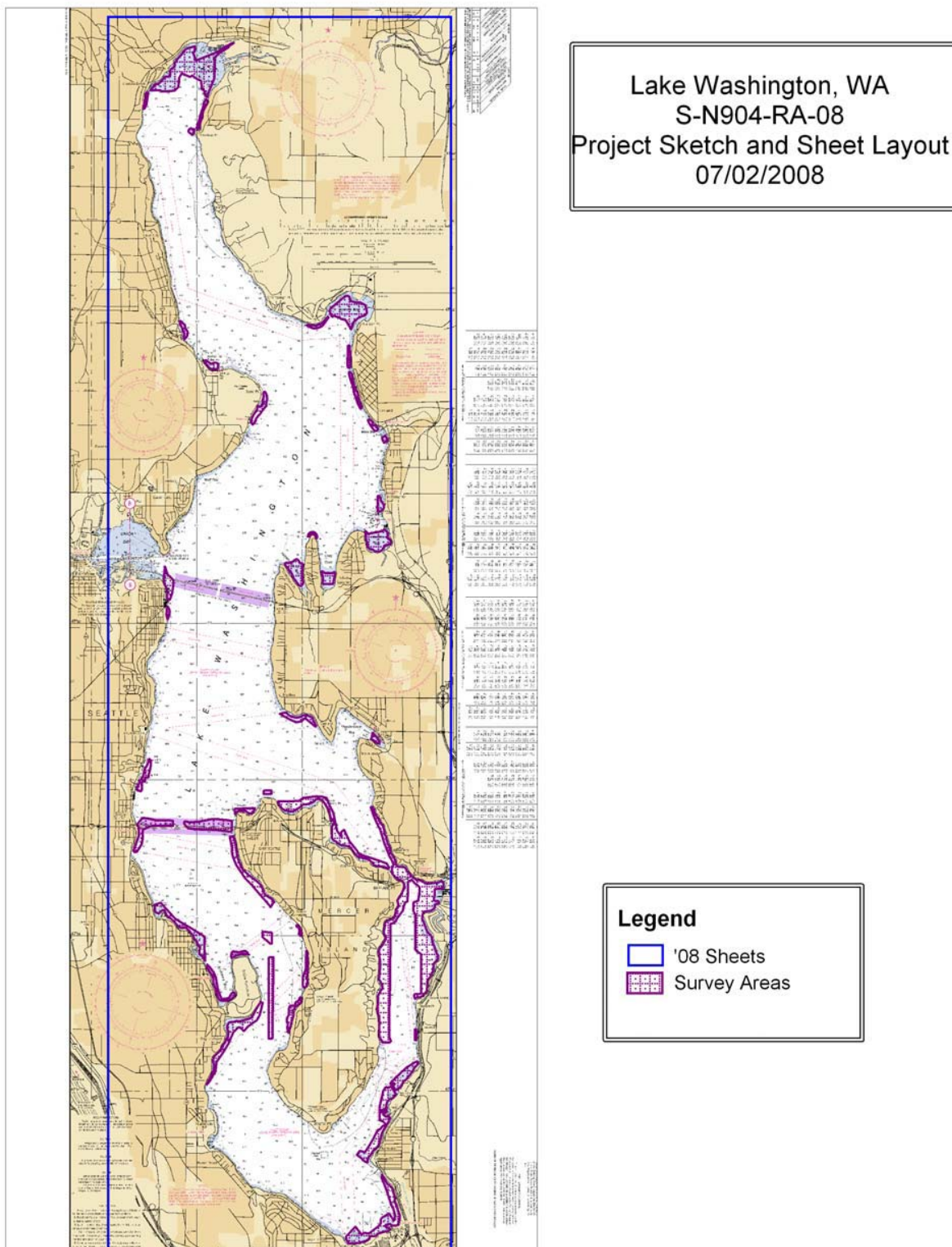


Figure 1. H11810 Survey Limits (Chart 18447).

B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *S-N904-RA-08 Data Acquisition and Processing Report* (DAPR), submitted under separate cover. Items specific to this survey, and any deviations from the DAPR are discussed in the following sections.

Final Approved Water Levels have been applied to this survey. See Section C. for additional information.

B1. Equipment and Vessels

Data for this survey were acquired by the following vessels:

Hull Number	Name	Acquisition Type
1101	RA-1	Tilted Multibeam Echosounder
1103	RA-2	Singlebeam Echosounder Detached Positions
1021	RA-3	Multibeam Echosounder
1905	RA-9	Singlebeam Echosounder
2801	RA-4	Multibeam Echosounder

Table 2. Data Acquisition Vessels for H11810.

Sound speed profiles were measured with SEACAT 19+ and Digibar Pro profilers in accordance with the Specifications and Deliverables.

No unusual vessel configurations were used for data acquisition.

B2. Quality Control

Crosslines

The assigned survey areas of H11810 are mostly long, narrow regions that are usually parallel to the coastline. The MBES and VBES cross each other naturally due to the nature of acquisition used for each. These crossing lines were used as independent crossline checks and account for 23.23 nautical miles, or 10.17% of mainscheme MBES and VBES hydrography.

Mainscheme bathymetry was manually compared to the crossline nadir beams in CARIS subset mode.

Crosslines exceeded IHO S-44 depth accuracy limits in areas south of the Lacy V. Murrow Memorial Bridge (the eastbound I-90 bridge), with errors as great as 1.13 meters in 26.82 meters of depth, exceeding IHO S-44 limits by about 0.5 meters.² The deep water surveyed east of Baily Peninsula crossline comparison revealed errors as great as 1.67 meters in 38.75 meters depth, nearly one meter out of IHO S-44 limits. These discrepancies are due to inadequate water level zoning and are discussed in section B2 below.

Crossline comparison north of the Lacy V. Murrow Memorial Bridge (the eastbound I-90 bridge), agreed within IHO-S44 depth accuracy error limits.

A statistical Quality Control Report has been conducted on representative data acquired with each system used on this survey. Results of these tests are included in the updated 2008 *Rainier* Hydrographic System Readiness Review package submitted with this survey.

Junctions

The following contemporary surveys junction with H11810 (Figure 2):

Registry #	Scale	Date
H11292	1:10,000	2004
H11293	1:10,000	2004
H11376	1:10,000	2004-05
H11377	1:10,000	2005

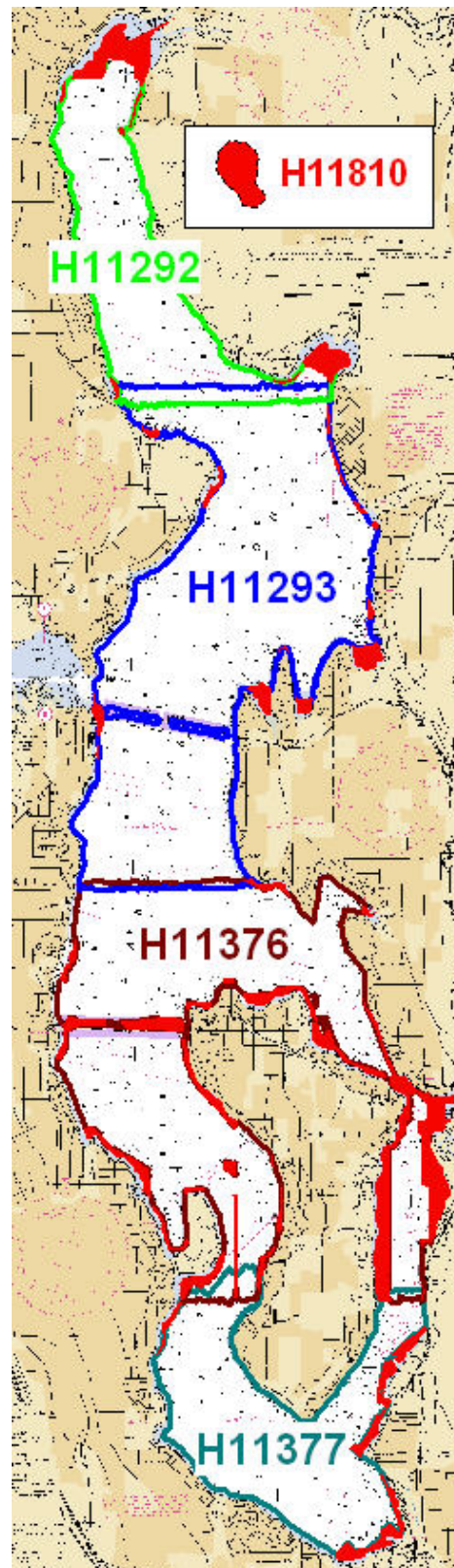


Figure 2: H11810 junction surveys.

Rainier was not supplied with CARIS Field Sheets and BASE surfaces from prior lake Washington surveys. A junction survey comparison for H11810 was not performed.³

Data Quality Factors

Meteorological Effect on Water Levels

Water level errors caused two distinct areas to exceed IHO S-44 standards for depth accuracy: the area adjacent south of the Lacey V. Murrow Memorial Bridge (the eastbound I-90 bridge), and the deep water surveyed east of Bailey Peninsula (see Figures 3 and 4). The largest vertical error is in the deep water surveyed east of Bailey Peninsula at 1.67 meters, exceeding IHO order 1 error standards. Data for H11810 were acquired in both the spring and fall of 2008 (see Figure 5). In both areas mentioned above, the differences correspond to data acquired in the spring and data acquired in the fall. However, the differences are not constant in magnitude nor direction (i.e. the data from acquired in the spring are deeper than fall data in some places and shoaler in others) which indicates that the error is not a constant water level offset, but rather quite localized.

These vertical offsets persisted after the application of Final Approved Water Levels as received from N/OPS1. N-OPS1 was contacted (see Correspondence in Appendix V submitted with this survey) in order to confirm the proper application of water levels. Although the water levels and tide gauge were properly applied, it appears as if this offset is caused by meteorological effects in the lake that could not properly be accounted for by the single tide gauge installed at Sand Point.

Hydrographic Survey H11377, conducted in the south of Lake Washington in 2005 by *Rainier* had the same difficulty with water levels. The Descriptive Report for that survey states: "...local weather may be the cause of the offset in the tide correctors."

The Lacey V. Memorial Bridge (the eastbound I-90 bridge), a floating bridge which stretches from Seattle to Mercer Island, may act as a barrier to wind driven water flow at the lake's surface. Mainscheme MBES from DN 093 (April 2, 2008) on each side of the bridge are all consistent. Crosslines in the same area run with VBES agree well with the mainscheme north of the bridge to within 0.3 m. However, south of the bridge for data run very closely in distance and time, the crossline to mainscheme differences exceed 0.7 m. The hydrographer attributes these differences to meteorological conditions as well as the affect of the bridge close by.

In general, this meteorological water level phenomenon cannot be modeled with a single tide station installed for the entire lake. The Hydrographer recommends that future surveys utilize a minimum of two gauges, one installed in south Lake Washington and the other installed at Sand Point.

Although the water level errors exceed the total allowable error for this survey, the hydrographer recommends using the shoaler sounding set to augment prior surveys and update the chart.⁴ The depths where these errors occur are greater than 60 ft, twice the depths

of the controlling depths of the Montlake Cut and Union Bay Channel. Therefore, it is not possible for these offsets to cause any danger to surface navigation.

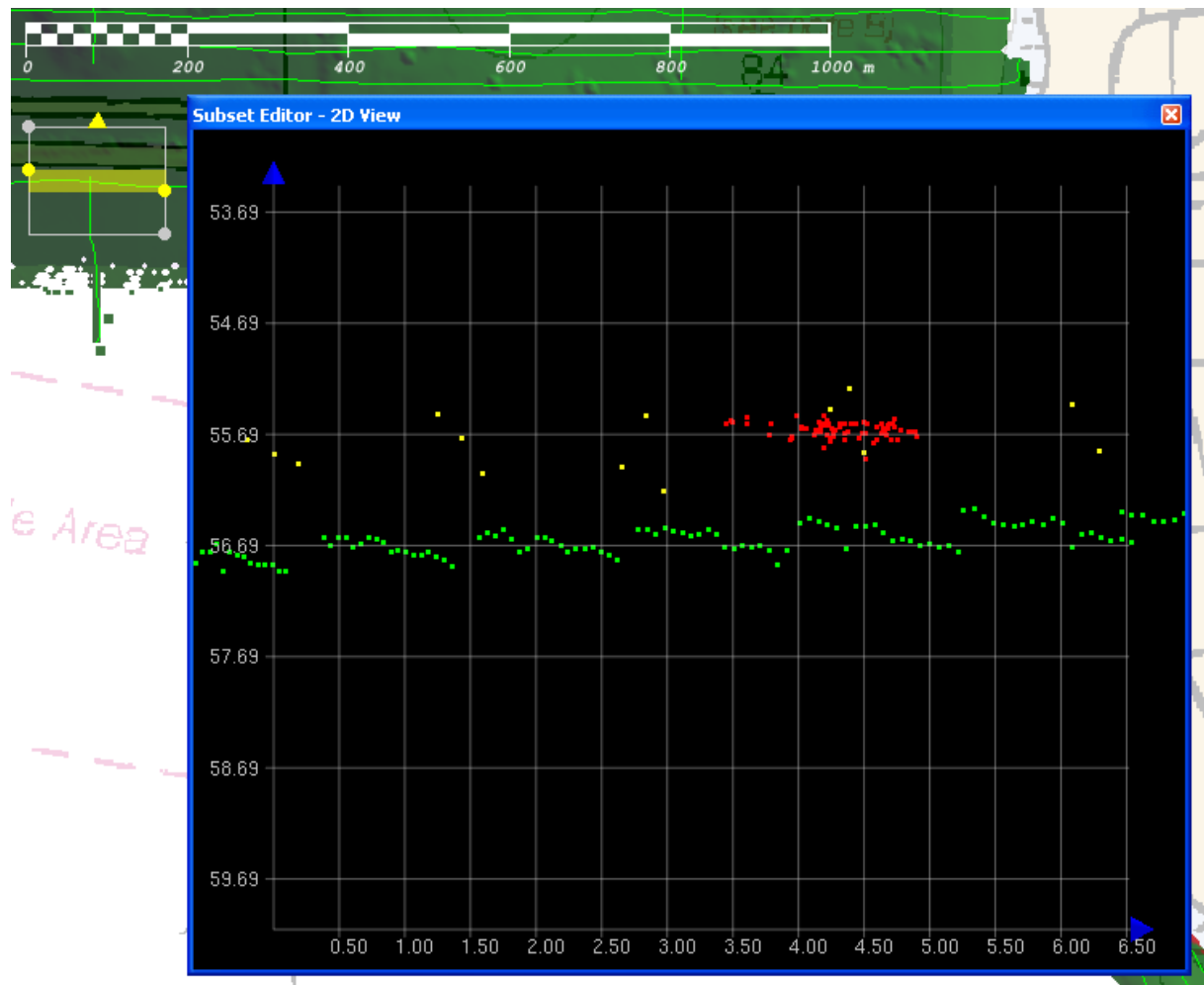


Figure 3: Crossline comparison adjacent south of the Lucey V. Murrow Memorial Bridge. The red vertical beam crossline collected November 21, 2008 (DN326) reveals a vertical offset of 1.1 meters over the green mainscheme Reson 8101 bathymetry collected April 2, 2008 (DN093) exceeding IHO S-44 depth accuracy limits by 0.21 meters.

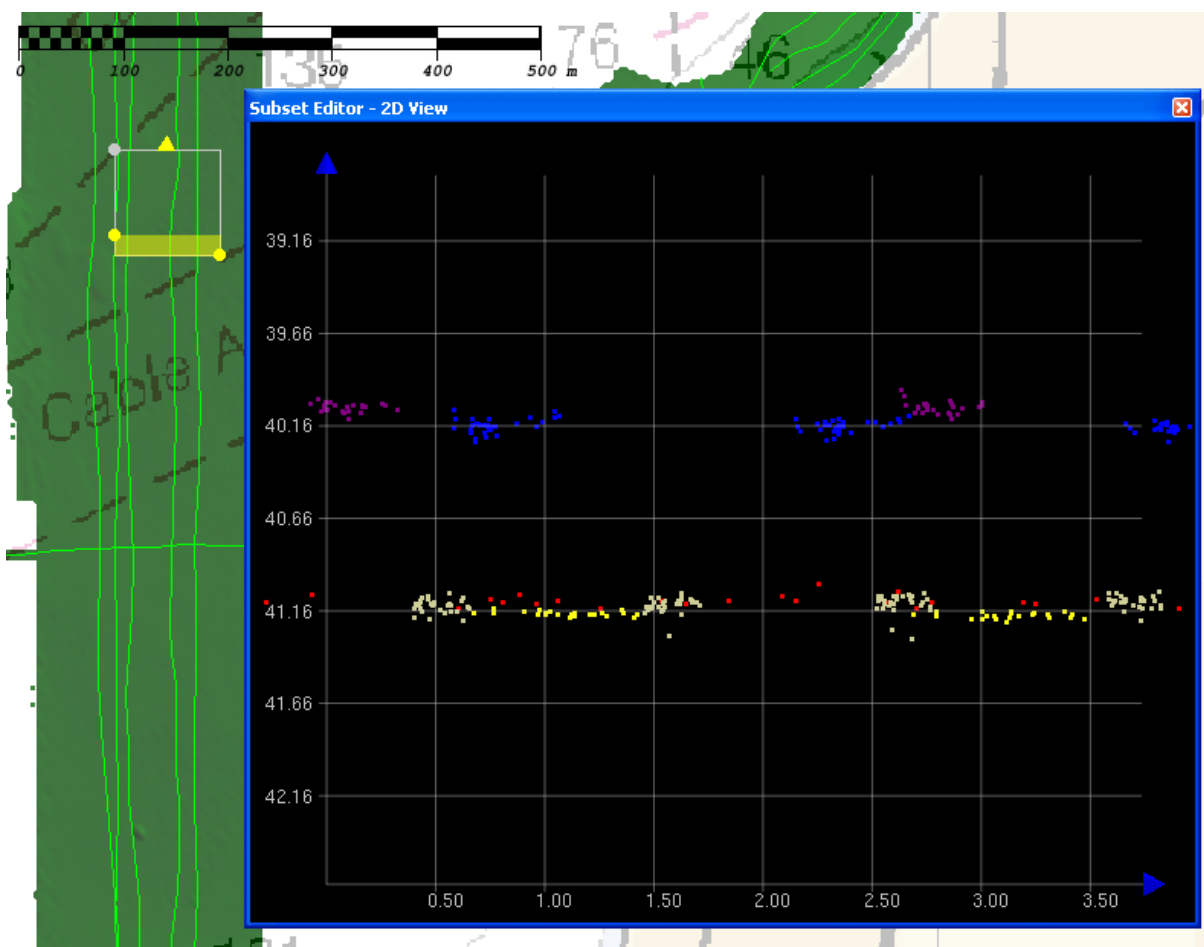


Figure 4: Mainscheme Reson 8101 data (blue and purple) east of Bailey Peninsula acquired April 2, 2008 (DN093), is 1.2 meters vertically offset from Reson 8101 data (tan, yellow, and red) acquired November 19, 2008 (DN324), exceeding IHO S-44 depth accuracy standards by 0.47 meters.

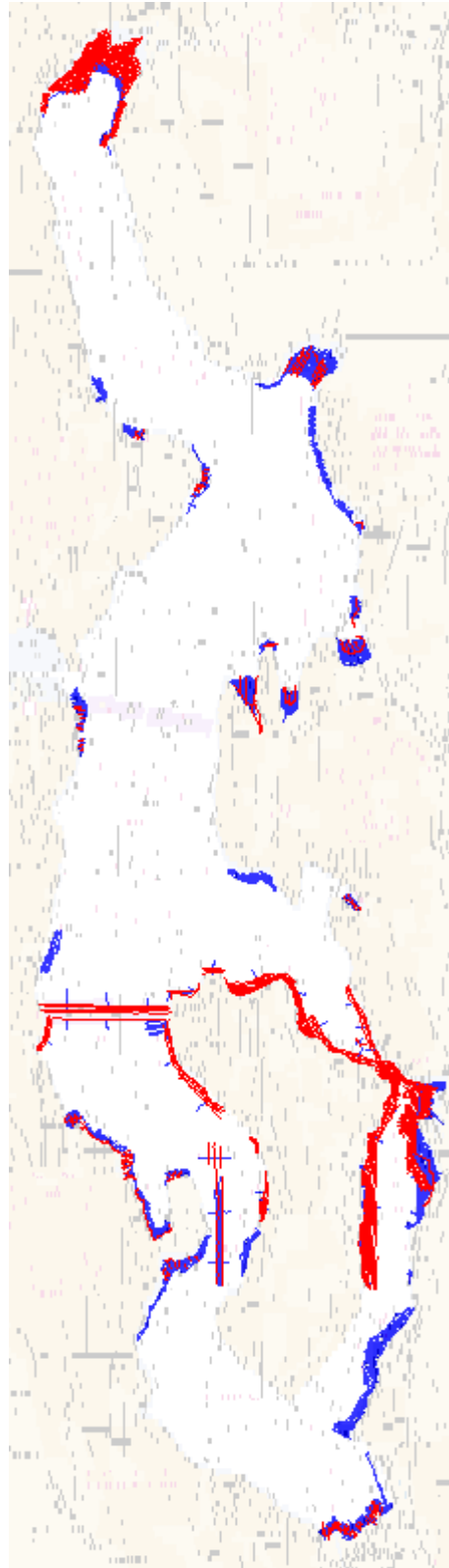


Figure 5: Periods of acquisition for survey H11810. Red is data acquired April 2-11 (DN093, DN094, DN095, and DN112). Blue is data acquired November 18-24 (DN323, DN324, DN325, DN326, and DN329).

Submerged Aquatic Vegetation

Eelgrass was prevalent throughout the survey in shallow water and protected bays. The eelgrass made bottom detection by the various sonars used on this project difficult to impossible. Although the eelgrass was more developed in the fall, acquisition in the spring had problems with eelgrass as well. Throughout H11810, when the seafloor was detectable, erroneous soundings caused by eelgrass were rejected. The Ceeducer VBES installed on skiff 1905 (RA-9) and the 7125 HF MBES on launch 2801 (RA-4) were particularly susceptible to noise from the eelgrass.

Because of the simplistic capability of the Ceeducer -- lacking the ability to adjust power, gain, and pulse width settings and the lack of a decent user display or paper trace -- sonar operators were unable to adjust settings that may have been able to penetrate eelgrass and track bottom (See figure 6). With no paper trace with which to compare the digital data in post-processing, determining weeds and bubbles was difficult. For this reason, a majority of the data acquired by skiff 1905 (RA-9) was rejected.

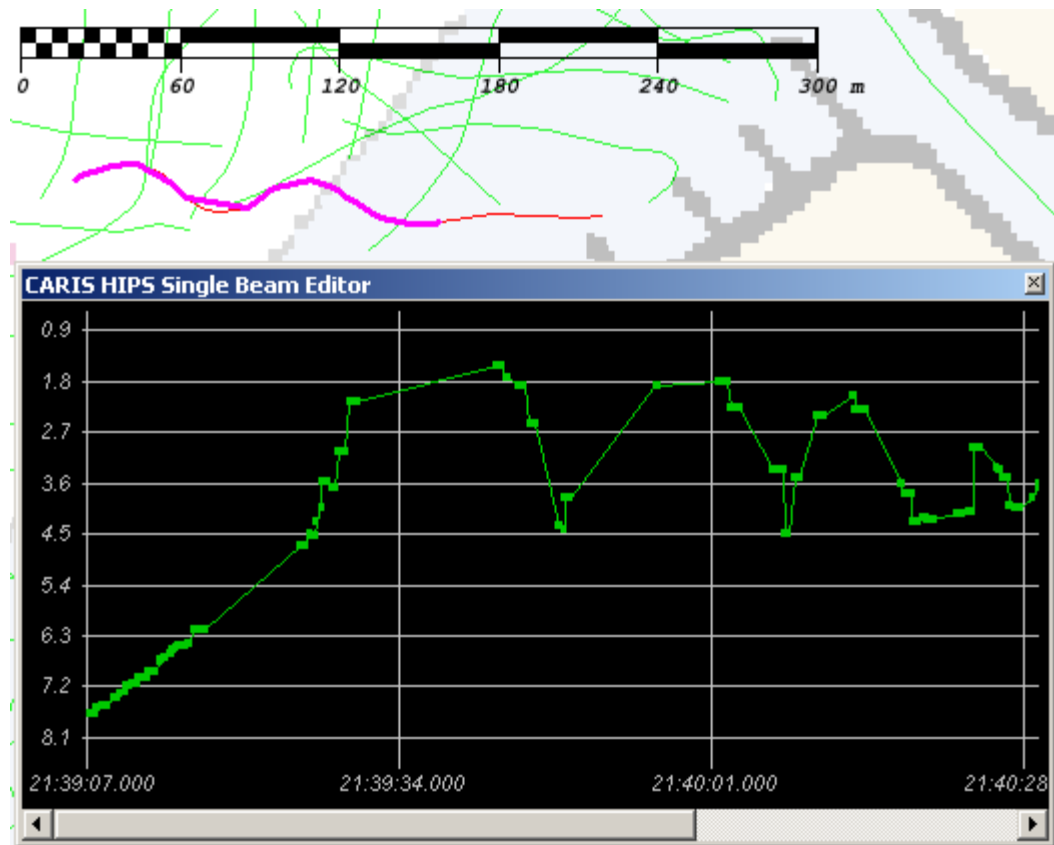


Figure 6: Typical example of Ceeducer bathymetry data acquired over eelgrass. Notice the data hold bottom until 6.3 meters depth and then the system is unable to track bottom due to eelgrass.

All the Ceeducer line data acquired in Yarrow Bay and Juanita Bay had to be rejected because the sonar was completely unable to track bottom amongst eelgrass (see Figure 7 and 8). Survey lines in these areas were flagged as 'Reject Line' in Caris HIPS and SIPS, and can be accessed for further review. Although some VBES data remain in these areas from launch 1103 (RA-2), they are not sufficient for updating the chart. The Hydrographer recommends that Yarrow Bay and Juanita Bay be reassigned as Field Examination surveys in the future.⁵

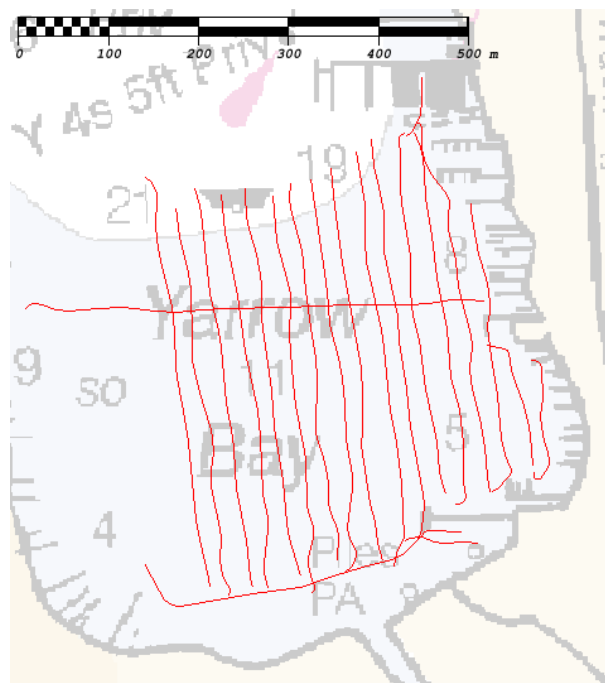


Figure 7: Ceeducer line data in Yarrow Bay flagged as 'Reject Line' in Caris HIPS and SIPS.



Figure 8: Ceeducer line data in Juanita Bay flagged as 'Reject Line' in Caris HIPS and SIPS.

For the rest of the Ceeducer data in H11810, data that appeared questionable were rejected sounding by sounding, although large quantities of data were rejected using this method, leaving large gaps in the survey area. (See figures 9 and 10 for other areas affected).

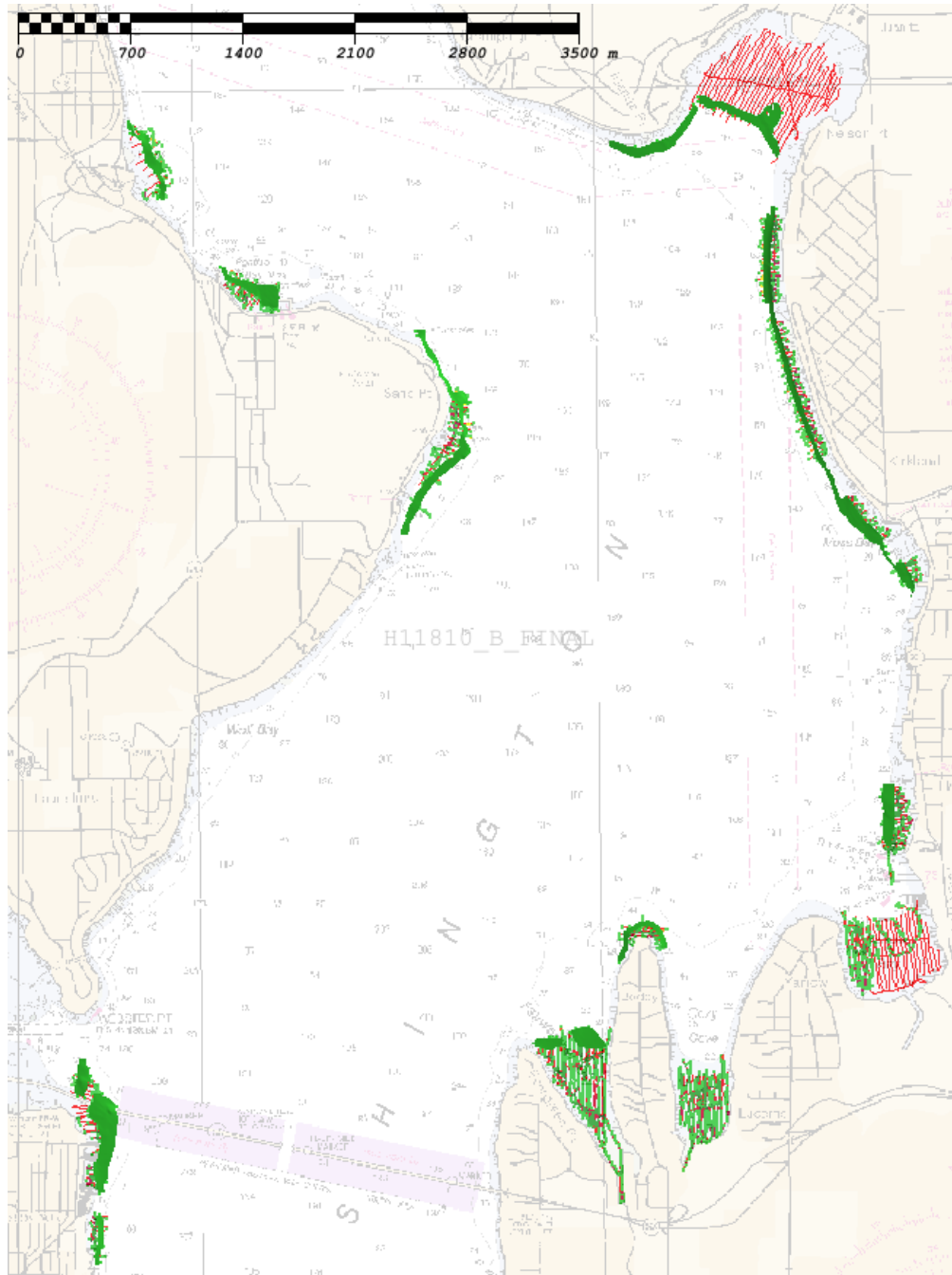


Figure 9: “Reject Line” and cleaned Ceeducer line data (red) created areas of no coverage in the mid-northern section of survey H11810.

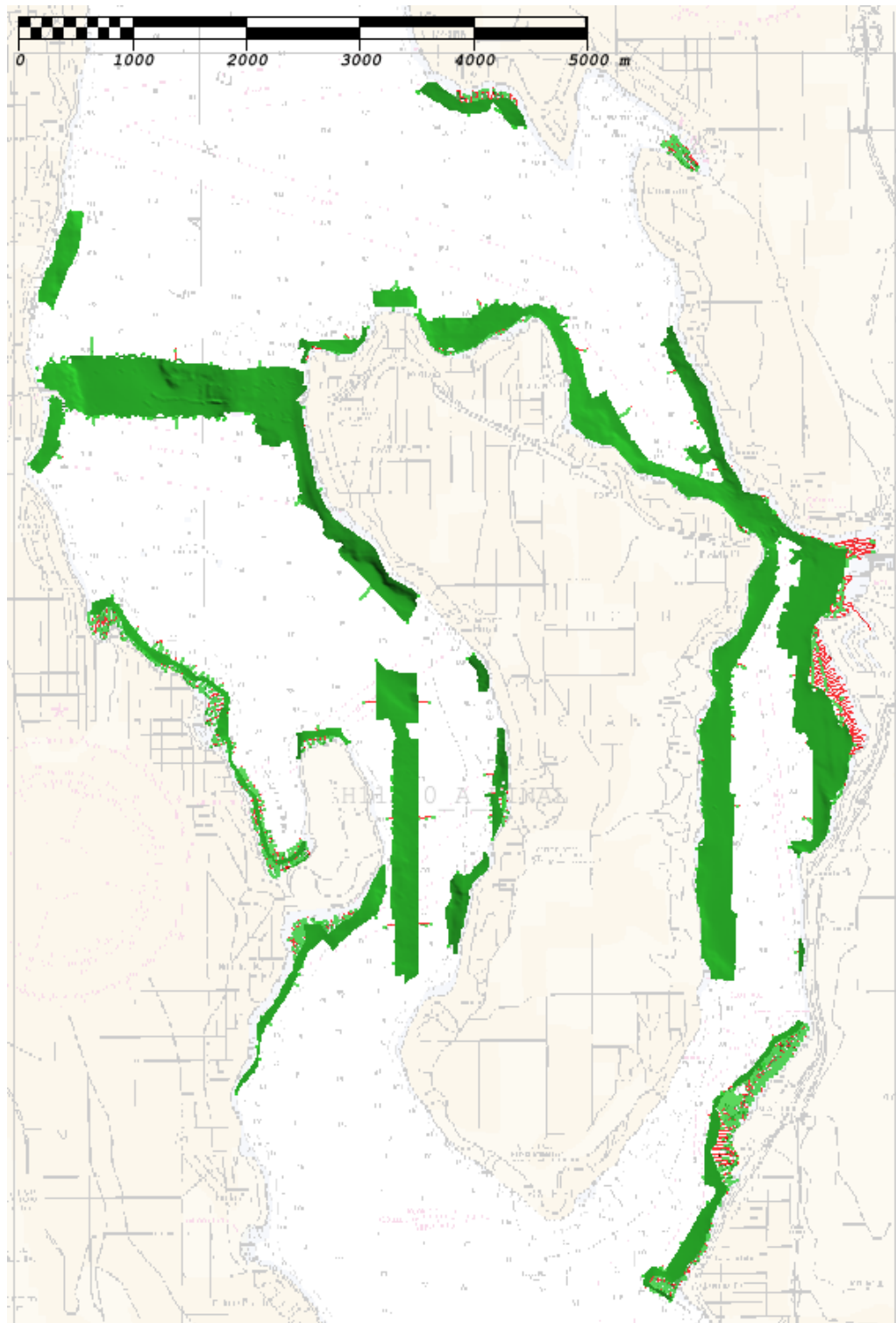


Figure 10: “Reject Line” and cleaned Ceeducer line data (red) created areas of no coverage in the mid southern section of survey H11810.

Eelgrass at the northern extent of Lake Washington also resulted in extremely noisy data that required thorough cleaning to all but the nadir beams (see Figure 11). Swath angular filters were used in this area, but were set according to the characteristics of each line. Although the filtering and cleaning reduced total coverage, the data is between 4 and 8 meters deep, and line spacing is set at 25 meters as required by the project instructions.

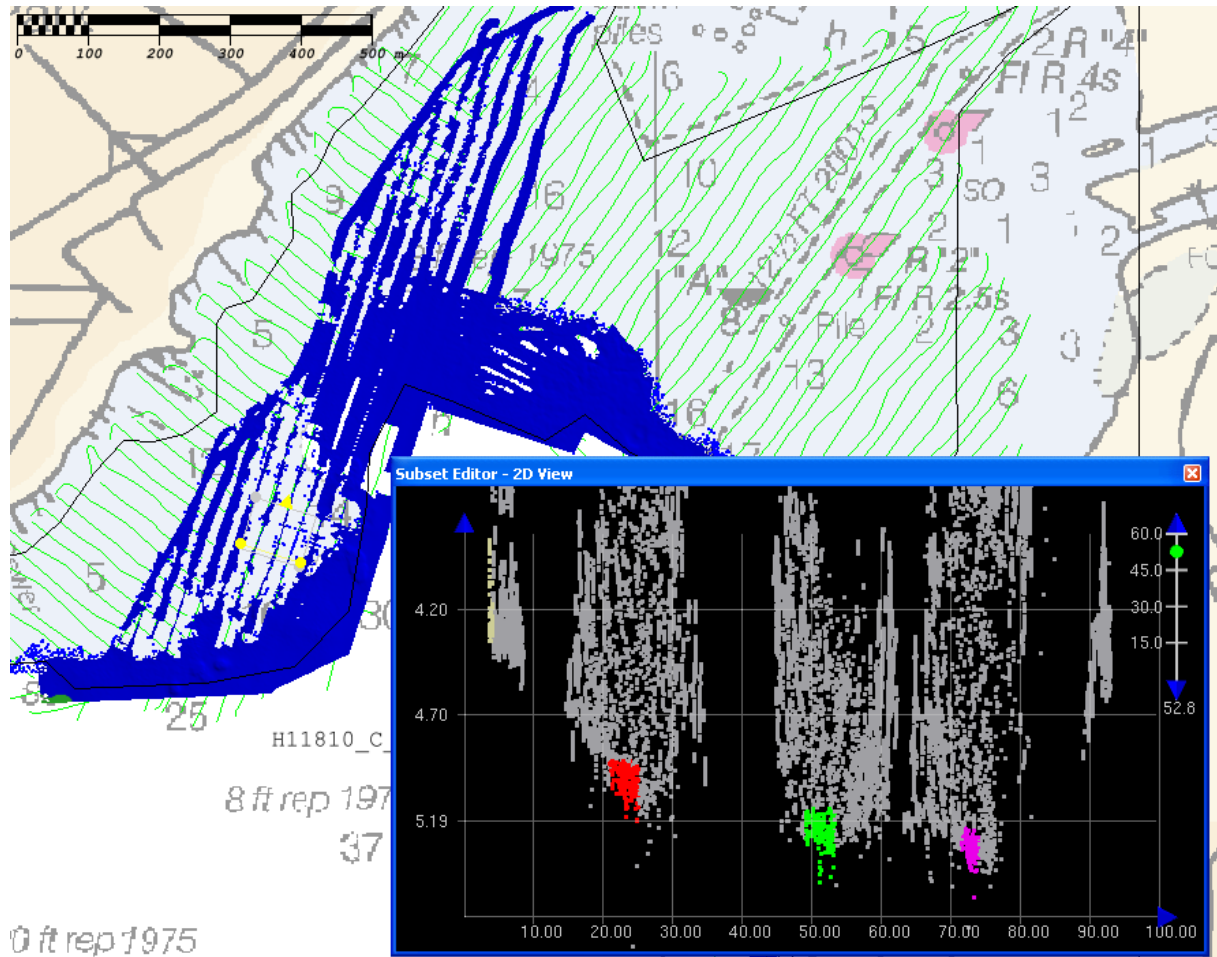


Figure 11: Multibeam data (blue) required excessive cleaning to the nadir beams due to the abundance and density of eelgrass in the area.

Horizontal Offset Issue

A single feature, located near the north end of Mercer Island, exhibited a horizontal offset of 0.62 meters from data acquired by Launch RA-3 (1021) on April 3, 2008 (DN094) (see Figure 12). The lines are 804_1716 and 836_1727. No other features within the area surveyed show a similar offset. Near shore operations most likely caused GPS interference that temporarily caused horizontal inaccuracy. The Hydrographer designated a least depth sounding

representing the feature. The horizontal error is within specifications and suitable for charting purposes.

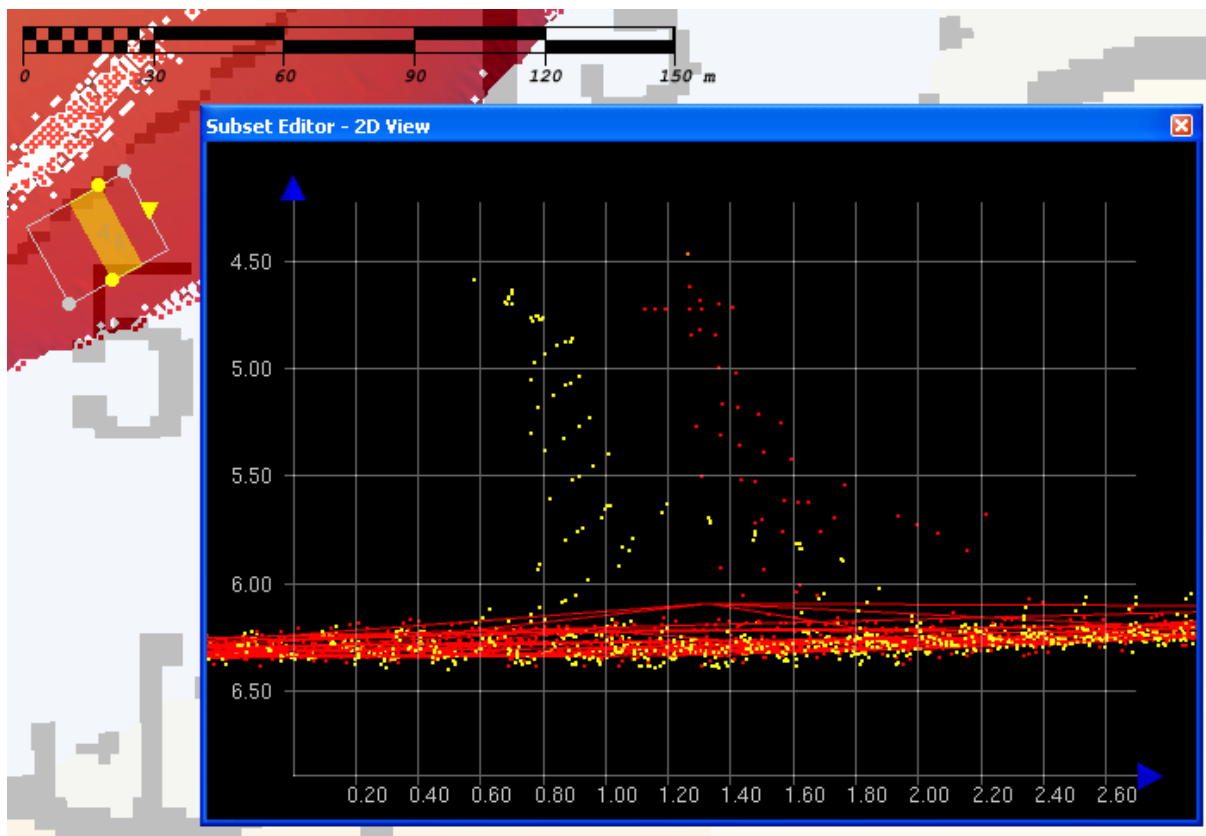


Figure 12: A feature near the north end of Beaumont, Mercer Island exhibits a horizontal offset of 0.62 meters.

GPS Multipath Error

Data acquired under the East Channel Bridge (which carries Interstate 90 between Mercer Island and Bellevue) exhibit vertical and horizontal offsets that vary up to 1.5 meters (see Figure 13). The Hydrographer attributes the offsets to surveying under the bridge which caused significant GPS multipath error.

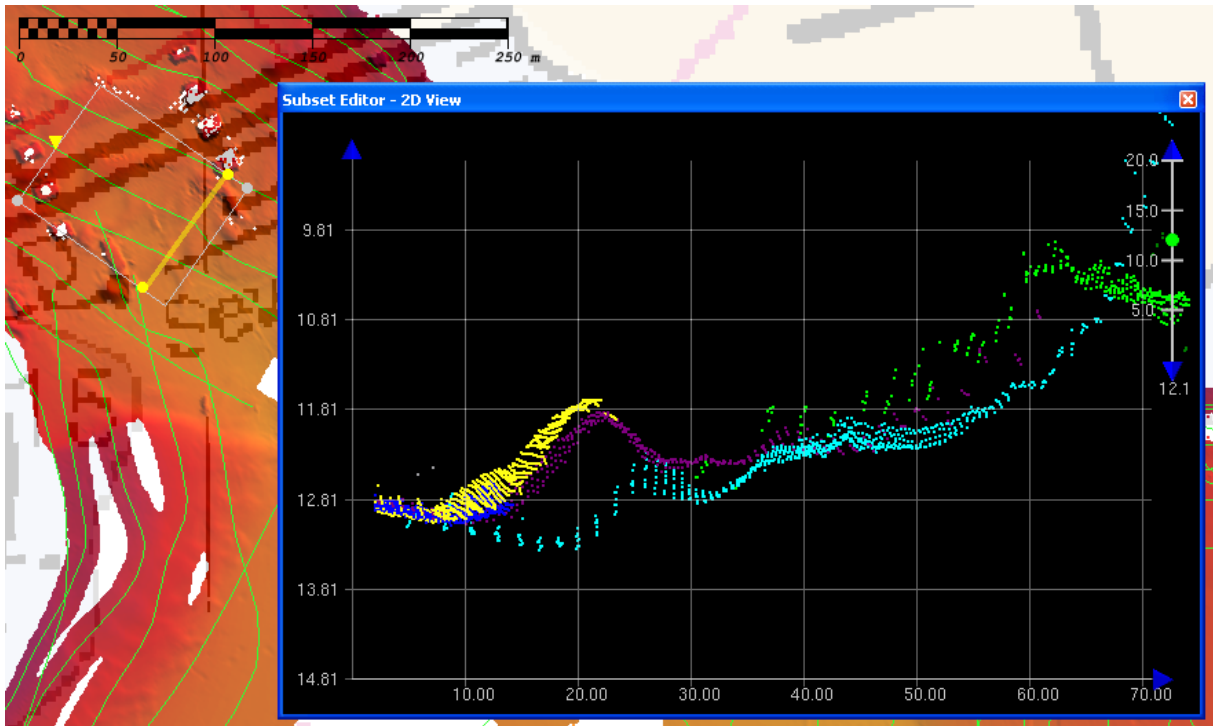


Figure 13: Bathymetry exhibits what is most likely significant multipath error due surveying under the East Channel Bridge.

Sparse Coverage to the 8 Meter Curve

On November 18, 2008 (DN323), Launch 1021 equipped with a Reson 8101, failed to acquire complete MBES data to the 8-meter curve in the vicinity of Coleman Point as required by the project instructions. The data are sparse, at places, ranging from the 9 meter to the 8 meter curve (see Figure 14). The pseudo-side scan data in this area have been reviewed and no features were observed. The hydrographer recommends charting these sparse data to indicate the general bathymetry.⁶

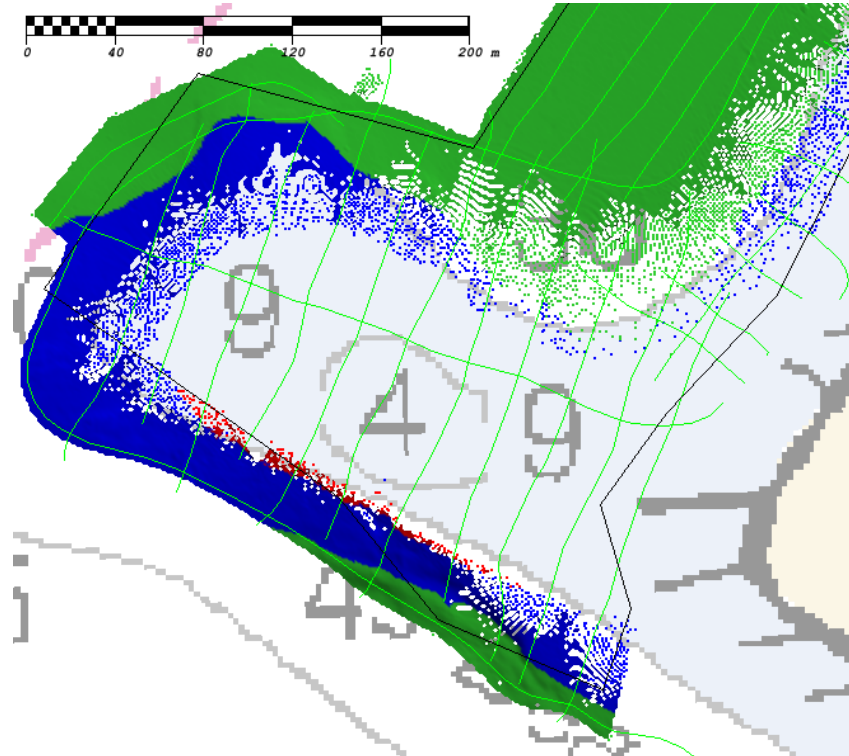


Figure 14: Data (red is to the 4 meter curve, blue is to the 8 meter curve, and green is data deeper than 8 meters) near Coleman Point is sparse, at places, ranging from the 9 meter to the 8 meter curve..

Holidays

Two holidays exist where coverage did not extend to the edge of the H11810 survey limits. A holiday located near the mouth of May Creek is 200 meters long and 25 meters wide (see Figure 15). A holiday located on the west side of Andrews Bay is 80 meters long and 12 meters wide (see Figure 16). Both holidays are a result of poor line steering on launch 1101 (RA-1).

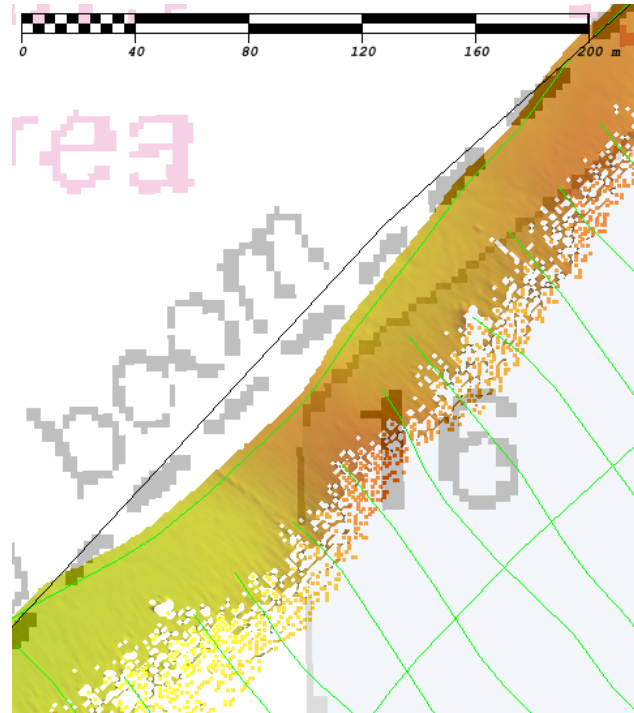


Figure 15: A holiday near May Creek, 200 meters long and 25 meters wide, as a result of Launch 1021 tilted Reson 8125 coverage pushing beyond the 8 meter curve.

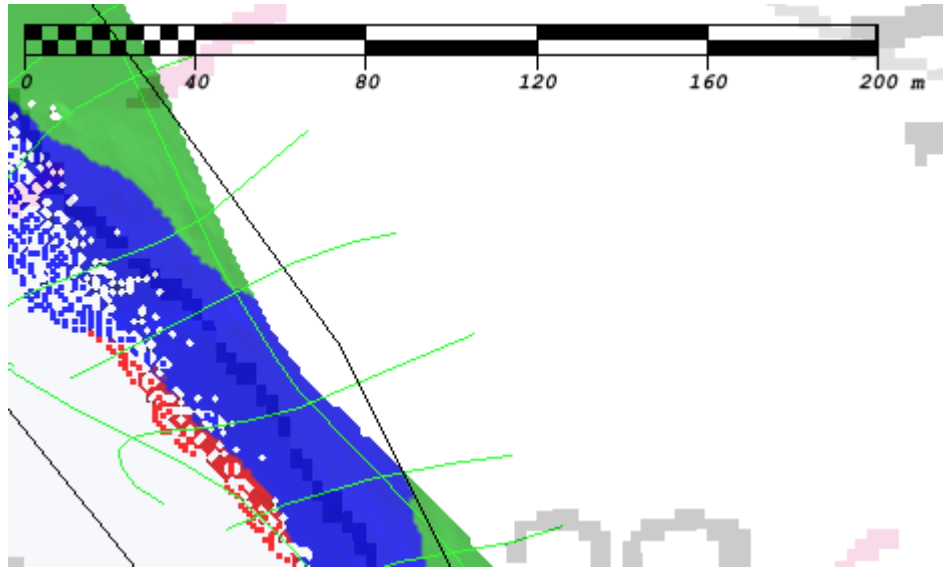


Figure 16: A holiday near Andrews Bay, 12 meters wide and 80 meters long, as a result of launch 1021 tilted Reson 8125 pushing beyond the 8 meter curve (red is to the 4 meter curve, blue is to the 8 meter curve, and green is data deeper then 8 meters).

H11810 survey operations were unable to gain access inside the log boom near Coulon Beach Park. The resulting holiday is nearly 1,000 meters long and 100 meters wide (see Figure 17). The Park Department posted a sign forbidding motorized vessel access (see Figure 18).⁷

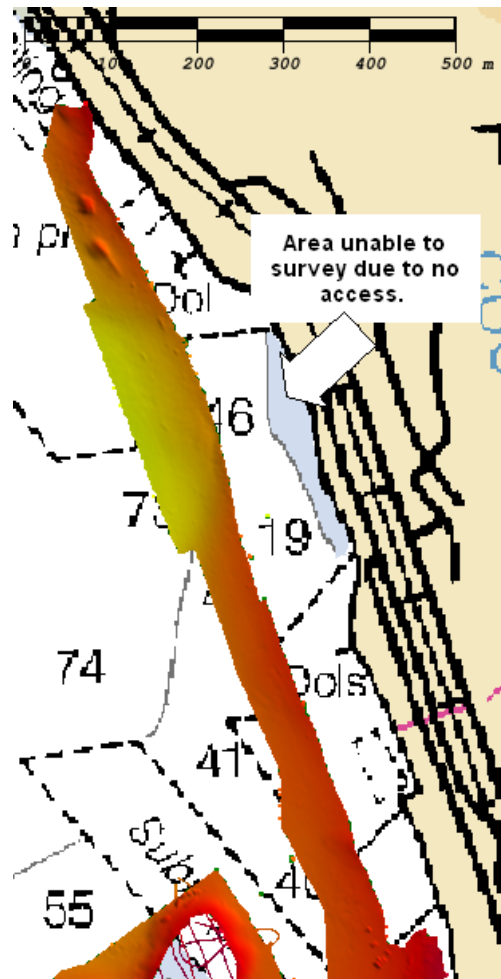


Figure 17: Area not surveyed due to lack of access near Coulon Beach Park.



Figure 18: The Park Department sign that forbade entrance to motorized boats.

B3. Data Reduction

Data reduction procedures for survey H11810 conform to those detailed in the *S-N904-RA-08 DAPR*.

B4. Data Representation

Four BASE surfaces were used in processing H11810. The submission Field Sheet and BASE Surface structure are shown in Figures 19 and 20 (see Table 3). Soundings and contours were generated in CARIS HIPS from the final combined BASE surface for field unit review purposes. They are included for reference only and are not intended as a deliverable.⁸

Depth Range (m)	Resolution (m)	Cube Parameters
0-21.5	1	Shallow
18.5-52	2	Deep
46-115	4	Deep

Table 3. Depth range, BASE surface, and CUBE parameters for sheet H11810.

All field sheets were created with the easting and northing of the field sheet corners set as a multiple of 16 meters to allow coincident node locations. For additional information on an individual field sheet's extents, see the associated .fsh file in the digital data.

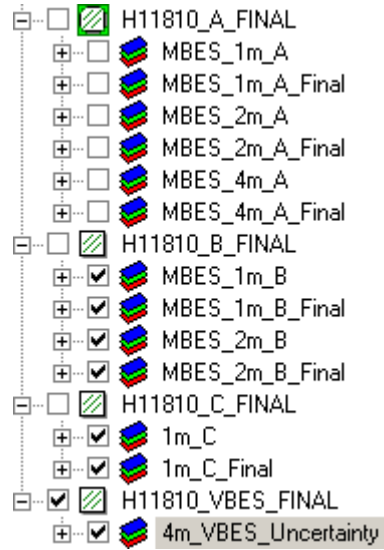


Figure 19: Field sheets and BASE surfaces submitted with H11810.

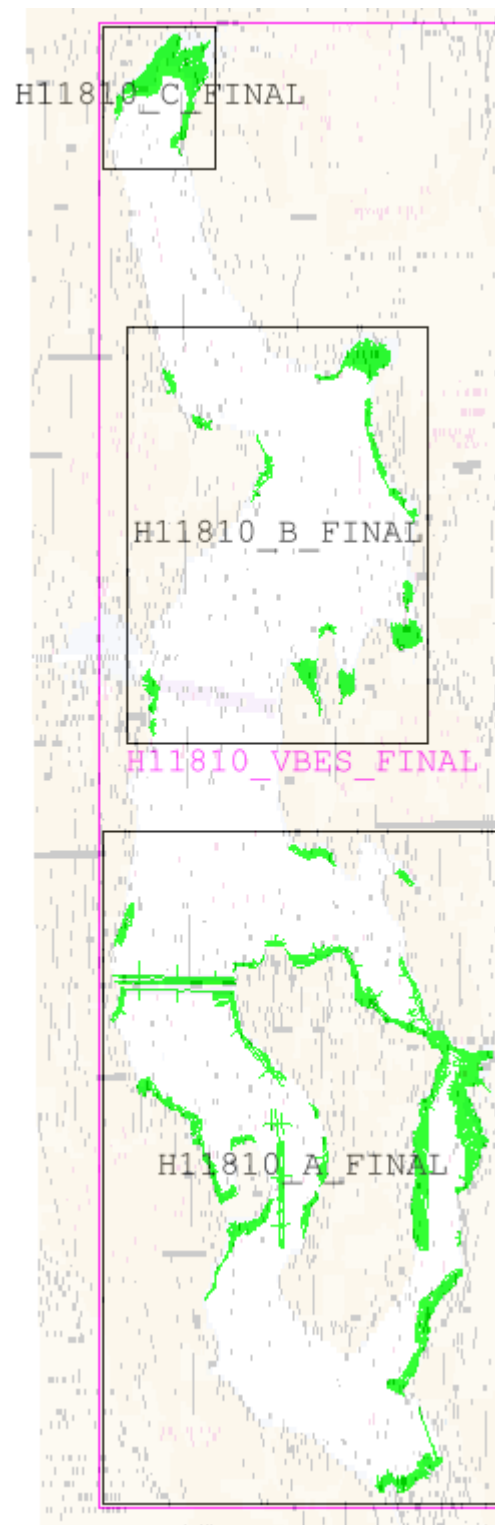


Figure 20: Layout of field sheet and track lines for H11810, overlaid on NOAA Chart 18447.

C. VERTICAL AND HORIZONTAL CONTROL

A complete description of vertical and horizontal control for survey H11810 can be found in the *S-N904-RA-08 Horizontal and Vertical Control Report*, submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. The differential corrector beacons utilized for this survey are given in Table 4.

Location	Frequency	Operator	Distance	Priority
Robertson Point	323 kHz	USCG	22nm	Primary

Table 4: Differential Corrector Sources for H11810.

Vertical Control

The vertical datum for this project is Lake Washington Low Water Datum (LWLWD). *Rainier* personnel installed Sutron 8210 “bubbler” tide gauge at the following subordinate station in accordance with the Letter Instructions; it served as control for datum determination and as the primary source for water level reducers for survey H11810. This station is described in detail in the *S-N904-RA-08 Horizontal and Vertical Control Report*.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Sand Point, WA	944- 7239	Subordinate	March 27, 2008	April 22, 2008

Table 5: Tide Stations installed by Rainier personnel for H11810

All data were reduced to LWLWD using final approved water levels from station Sand Point, WA (944-7239) using the tide file 9447239.tid and final time and height correctors using the zone corrector file N904RA2008CORP.zdf .

The request for Final Approved Water Levels for H11810 was submitted to CO-OPS on December 17, 2008, the Final Tide Note received⁹ on April 2, 2009, and correspondence concerning the tides issue received May 7, 2009. This documentation is included in Appendix IV.

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

D.1.a. Survey Agreement with Chart

Survey H11810 was compared with the following chart:

Chart	Scale	Edition and Date	Local Notice to Mariners Applied Through
18447	1:10,000	28 th Ed, Dec 2005	12/01/2005 ¹⁰

Table 6: Charts compared with H11810

Altered Shoreline near Cedar River, Renton

Shoreline near the mouth of Cedar River, Renton, is not well charted. Survey bathymetry and shoreline observations from the field were used to create the new shoreline in the H11810_Final_Feature_File.hob (see Figure 21).¹¹

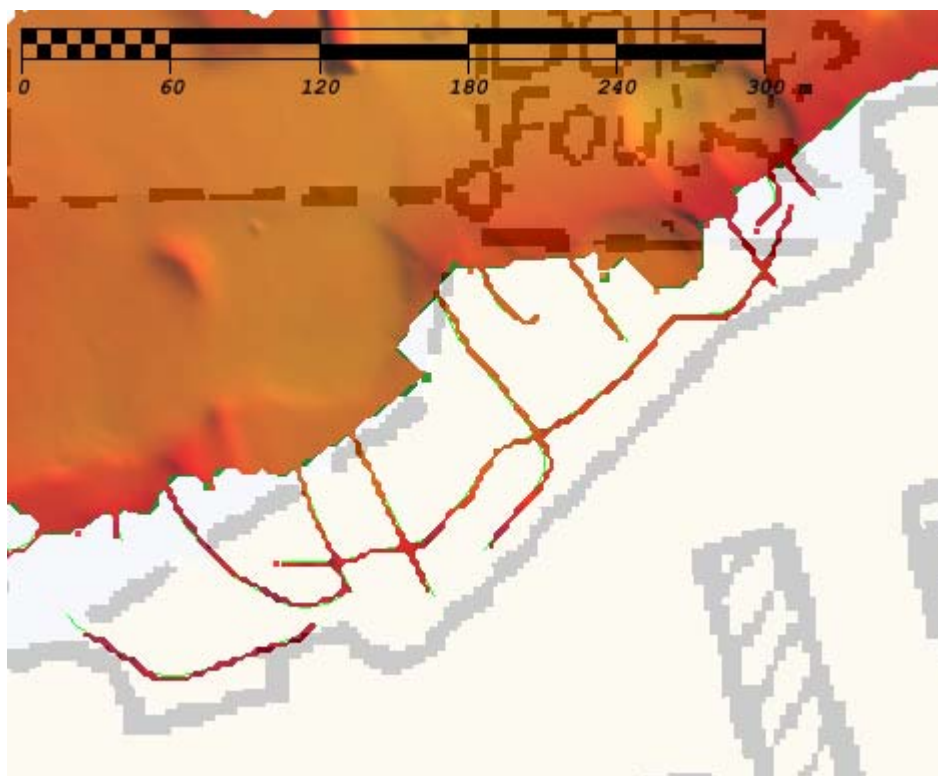


Figure 21: Vertical beam data shows where the charted shoreline has moved. The adjusted shoreline can be viewed in the submitted H11810_Final_Feature_File.hob file.

Ruined Pier Near May Creek

A charted ruined pier near May Creek was unable to be disproved during survey operations. During survey operations, an excavator barge was on-scene and disrupted the planned 25 meter line spaced VBES coverage over the charted ruined pier, creating a holiday (see Figure 22). Correspondence with Ms. Monica Shoemaker from the Washington State Department of Natural Resources indicates that a majority of the debris in this area have been removed. According to the correspondence, eight (8) pilings remain near shore and everything else has been removed. The hydrographer recommends removing the charted pier in ruins and charting pilings as per the documentation from DNR included in Appendix V of this report.¹²

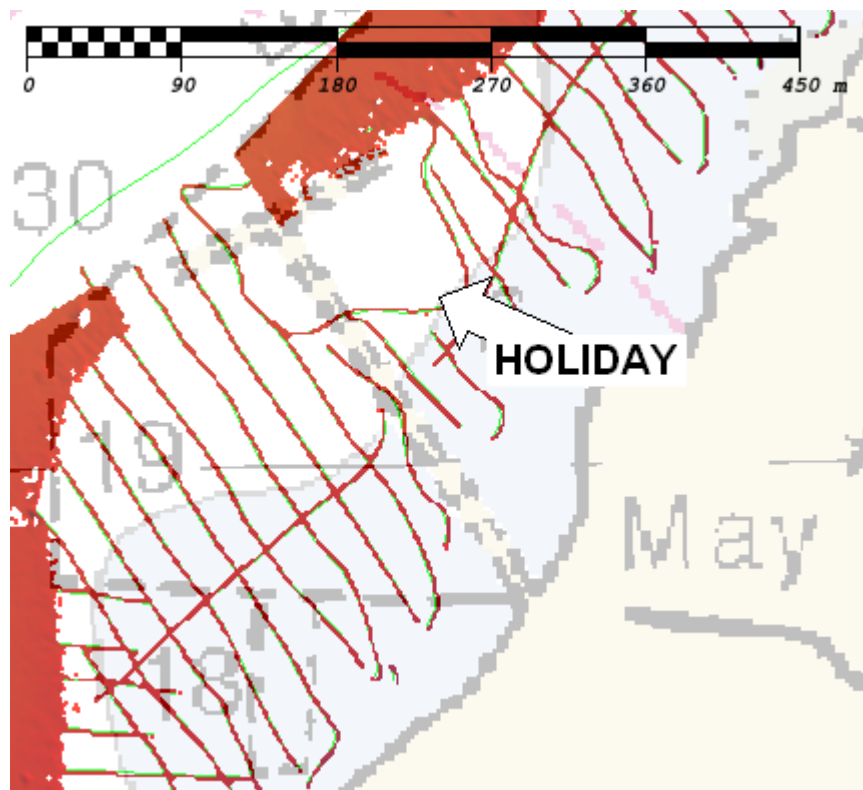


Figure 22: Holiday indicates the location of the excavator barge during survey operations.

CUBE Surface / Depths Comparison

General Areas

Bathymetry from survey H11810 generally agreed within 3 feet of the depths on chart 18447, with the exception of the areas: the northernmost tip of Lake Washington, Fairweather Bay, Cozy Cove, and Dabney Point.

Two soundings in the northernmost tip of Lake Washington were not within three feet of bathymetry (see Figure 23). The southernmost extents of Fairweather Bay and Cozy Cove were generally deeper than charted by five feet. Dabney Point exhibited five foot variances near shore.

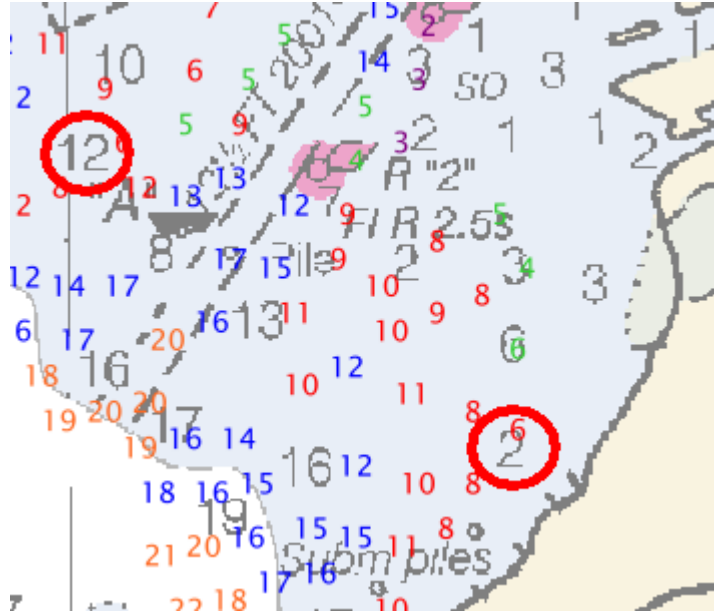


Figure 23: Two soundings not within 3 feet of charted depths in the northernmost tip of Lake Washington.

A 27 foot depth and 24 foot depth near Newcastle Landing are shoaler than mainscheme bathymetry of the area (see Figure 24). Complete MBES was achieved in the area and the Hydrographer recommends charting as per the digital data.¹³

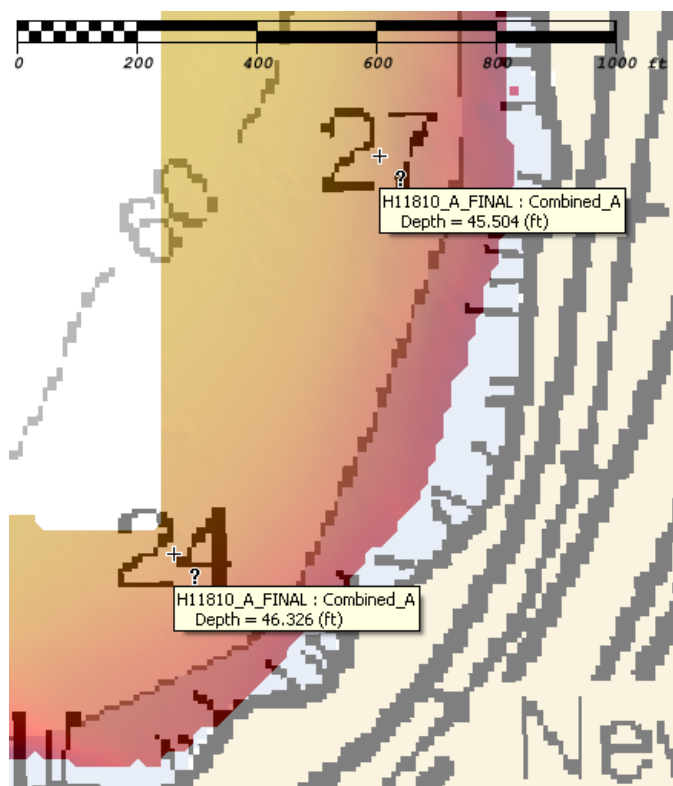


Figure 24: Charted depths of 27 feet and 24 feet are disproved by soundings near 46 feet deep.

A charted wreck, AWOIS 53103, of unknown depth located south of Faben Point was covered with Object Detection multibeam and not found (see Figure 25). See submitted survey features report (appendix II) for more information. The Hydrographer recommends removing the wreck from the chart.¹⁴

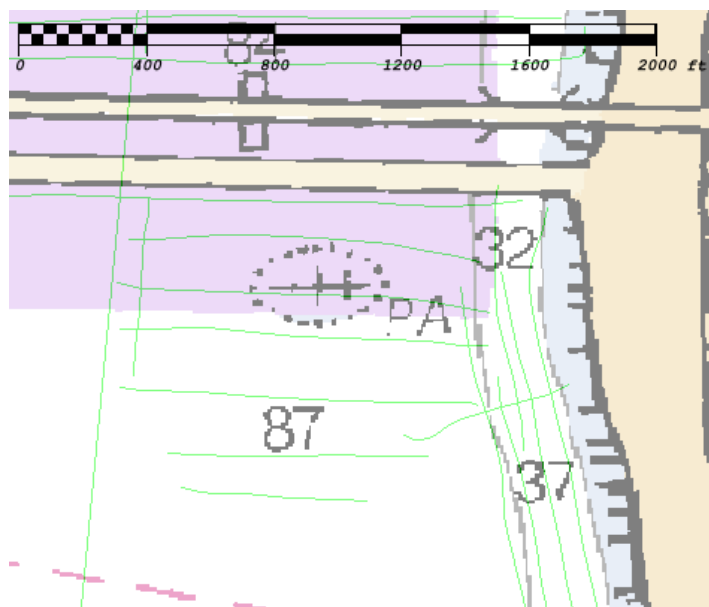


Figure 25: A charted wreck of unknown depth was not verified in mainscheme bathymetry.

A charted obstruction, AWOIS 53113, near Newport Shores was covered with Object Detection multibeam up to the 7 m curve (see Figure 26). Although numerous small obstructions, mainly what appeared to be logs, were noted in the search radius, nothing significant to navigation was found. See submitted survey features report (appendix II). The Hydrographer recommends removing the obstruction from the chart.¹⁵

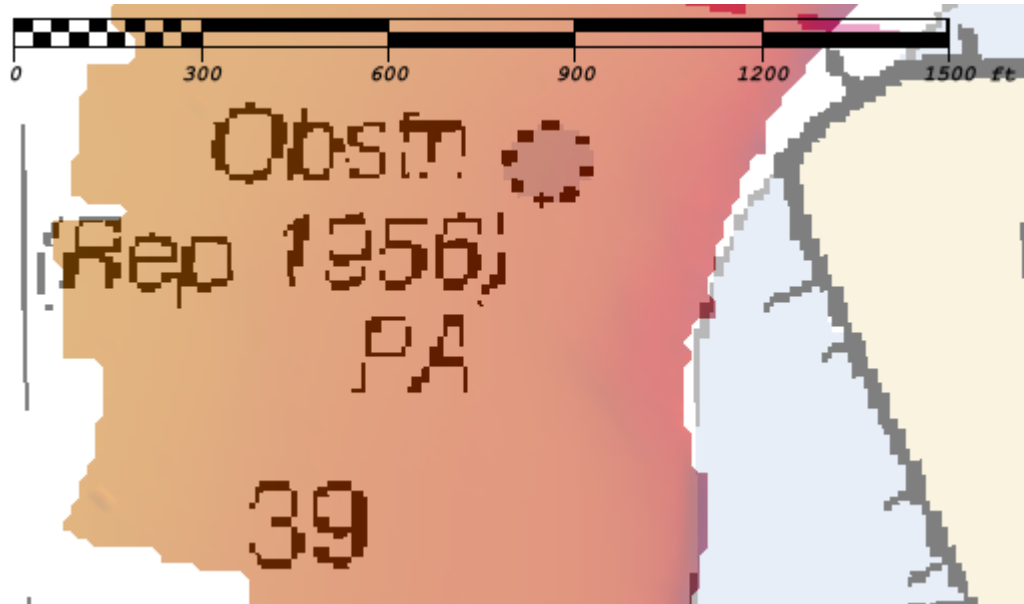


Figure 26: A charted obstruction was not seen in mainscheme bathymetry.

The charted representation of the East Channel Bridge is not as charted in mainscheme bathymetry. The East Channel bridge is not a single bridge; it is two bridges spanning Mercer Island to Bellevue (see Figure 27 and Figure 28). The Hydrographer recommends acquiring 'as built' to update the chart.¹⁶

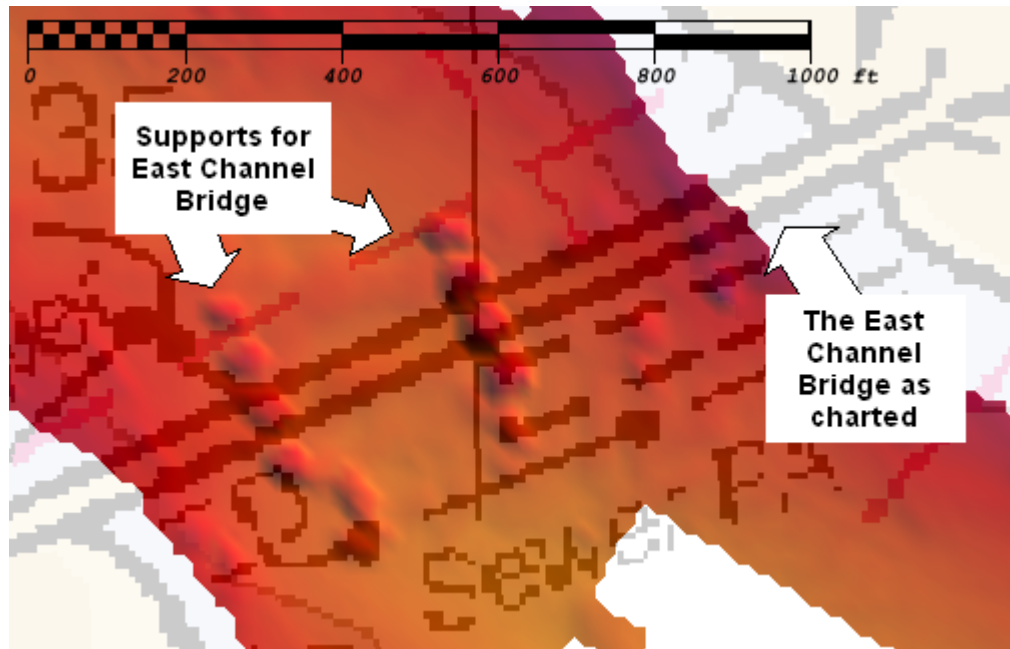


Figure 27: As charted, the East Channel Bridge does not reflect the true nature of the structure, as seen in the bridge's supports in mainscheme bathymetry.

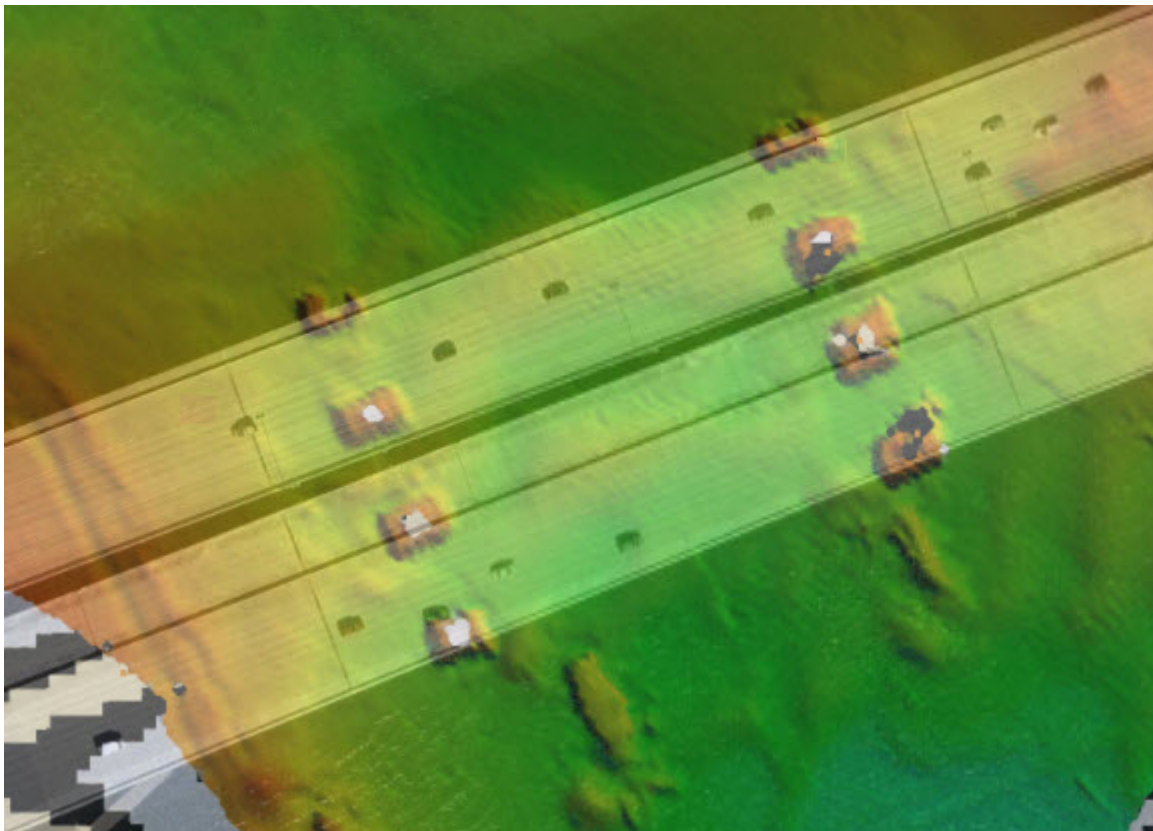


Figure 28: The true lay of the East Channel Bridge.

Survey H11810 does not encompass the entirety of the charted submerged forest near the west side of Mercer Island (see Figure 29). No indication of a submerged forest or upright trees

was observed in the areas of this survey. These data augment the data acquired in 2005 on survey H11376 and the Hydrographer concurs with the recommendations from that survey, namely: update the charted depths with survey soundings in the common area and revise the chart annotation to delete “clear of obstructions within 20 feet of lake level.”¹⁷

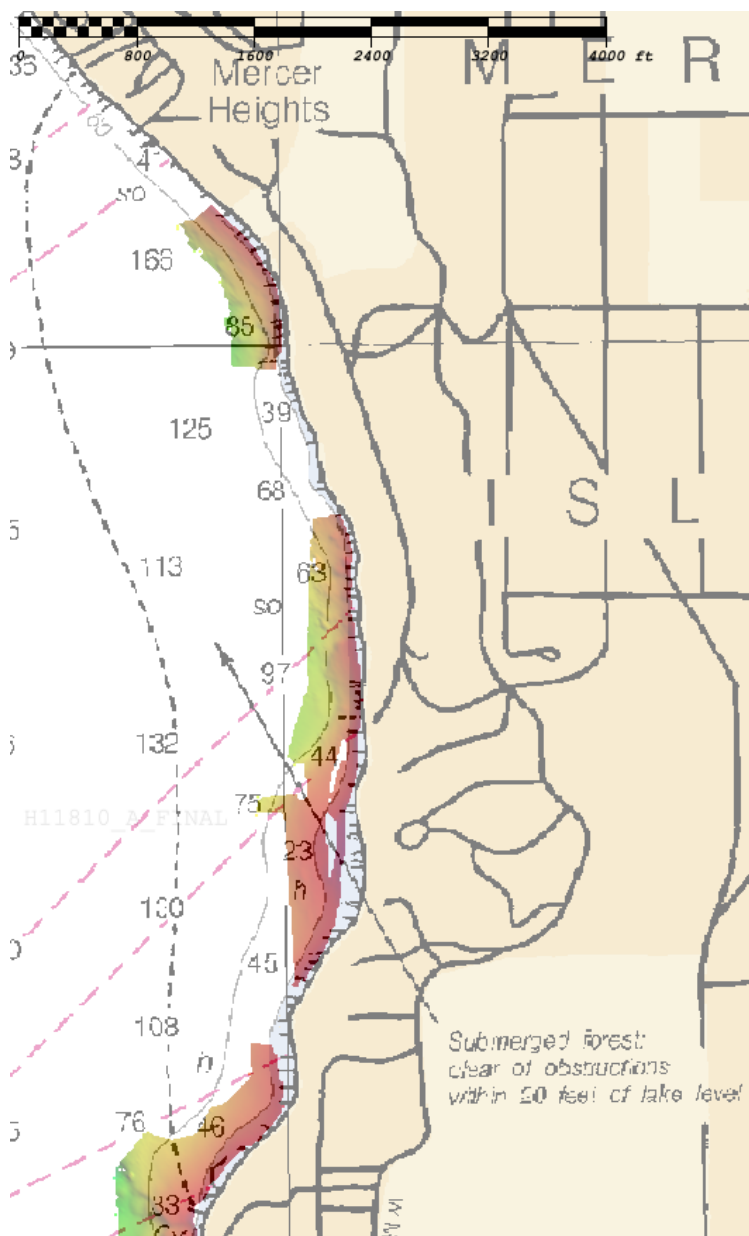


Figure 29: The few areas of mainscheme bathymetry within the charted submerged forest did not show any evidence of a submerged forest.

The charted snag near the east side of Mercer Island was verified in mainscheme bathymetry (see Figure 30). The shoalest depth of the snag is 21.95 feet.¹⁸

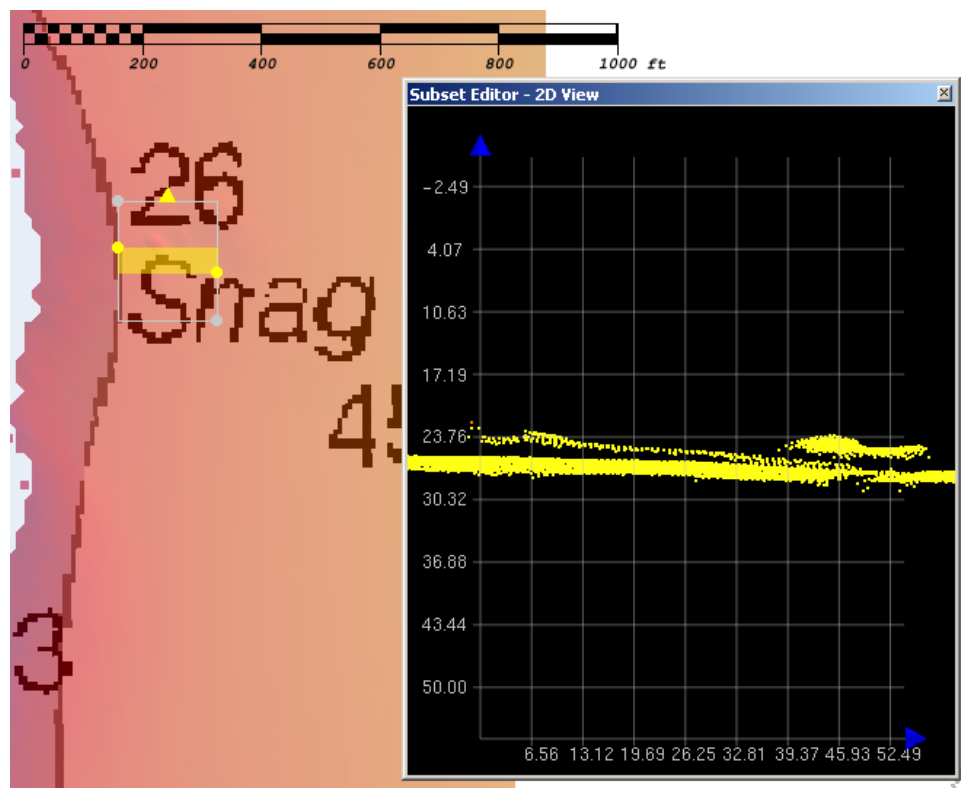


Figure 30: The charted snag as seen in mainscheme bathymetry with shoalest depth of 21.95 feet.

The Hydrographer recommends that survey soundings supersede all prior survey and charted depths in the common area.¹⁹

D.1.b. Dangers to Navigation

One danger to navigation (DTON) was found in survey H11810 and is described in the DTON Report in Appendix I, submitted on May 19, 2009.²⁰

D.1.c. Other Features

Automated Wreck and Obstruction Information System (AWOIS) Investigations

According to the project instructions, eight (8) AWOIS items were assigned for full investigation and five (5) were provided for background information only.

All of the assigned AWOIS items except 53114 were addressed in prior surveys.

Description of AWOIS item 53114 investigation is included in the Survey Feature Report in Appendix II.²¹

Additional Items

No additional charted items were investigated and no other features were located on survey H11810.

D.2. Additional Results

D.2.a. Prior Survey Comparison

Prior survey comparison was not performed.

D.2.b. Shoreline Verification

Shoreline Source

Vector photogrammetric data from project WA0402 were supplied by N/NGS3 in the form of digital Cartographic Feature File (CFF) GC-10539. Features shown on the current edition of chart 18424 but not included in the CFF were digitized manually in CARIS Notebook by *Rainier* personnel, and compiled with the CFF into a composite shoreline source file.

Shoreline Verification

Limited shoreline verification was conducted in accordance with the Specifications and Deliverables and FPM sections 6.1 and 6.2. Detached positions (DPs) acquired during shoreline verification were recorded in HYPACK and/or -, on DP forms, and processed in Pydro. These indicate revisions to features and features not found on the verified shoreline. In addition, annotations describing shoreline were recorded on hard copy plots of digital shoreline.

All shoreline data is submitted in Caris Notebook .hob files. The session H11810_NTBK contains the following:

HOB File	Purpose and Contents
H11810_Comp_Source.hob	Original Source Data as provided for project OPR-N395-RA-09 and filtered to the limits of survey H11810
H11810_Final_Feature_File.hob	Composite source data modified by the field to best represent the shoreline at survey scale. This includes the addition of new features and modification of source features. This file retains all features neither verified nor disproved by this survey
H11810_Disprovals.hob	Composite source items which were deleted or modified in position or geographic type.

Table 7. List and Description of Notebook HOB files.

Source Shoreline Changes and New Features

Items for survey H11810 that require further discussion and are associated with a detached position, have been flagged “Report” in Pydro in H11810.pss. Investigation methods and recommendations are listed in the Remarks and Recommendation tabs. This survey discovered a number of features on the seafloor. All ‘non skin of the earth’ features were designated in Caris. These features are included in the Survey Feature Report in Appendix II, however, only those features that were cartographically significant are represented in the Notebook .hob file.

Recommendations

The Hydrographer recommends that the shoreline as depicted in the Notebook .HOB files supersede and complement shoreline information compiled on the CFF and charts as described above.²²

D.2.c. Aids to Navigation

Two lighted buoys were found as charted and serving their intended purpose at the approach to Kenmore at the north end of Lake Washington. Five private lights are charted in Whalers Cove, however, these lights were not observed during daylight operations and not verified during this survey.²³

D.2.d. Overhead Features

Four bridges are located in the survey boundaries of H11810:

The Evergreen Point Floating Bridge, commonly referred to as the 520 bridge, is the longest floating bridge in the world at 2,310 meters. The western span of the bridge fell within survey limits of H11810. The bridge position was visually verified but the vertical clearance was not verified for this survey. The Hydrographer recommends retaining the charted vertical clearance.²⁴

The Lacey V. Murrow Memorial Bridge is the second longest floating bridge in the world at 2,020 meters. The Lacey V. Morrow Memorial Bridge carries the eastbound lanes of Interstate 90 across Lake Washington from Seattle to Mercer Island. The western span of the bridge fell within survey limits of H11810. The bridge position was visually verified but the vertical clearance was not verified for this survey. The Hydrographer recommends retaining the charted vertical clearance.²⁵

The Homer M. Hadley Memorial Bridge, 1,772 meters, carries the westbound and reversible express lanes of Interstate 90 across Lake Washington between Seattle and Mercer Island. The western span of the bridge fell within survey limits of H11810. The bridge position was visually verified but the vertical clearance was not verified for this survey. The Hydrographer recommends retaining the charted vertical clearance.²⁶

The East Channel Bridge, spanning nearly 500 meters, carries Interstate 90 between Mercer Island and Bellevue. The bridge position was visually verified but the vertical clearance was not verified for this survey. The Hydrographer recommends retaining the charted vertical clearance.²⁷

D.2.e. Submarine Cables and Pipelines

Of all submarine cables and pipeline areas in H11810, only the sewer lines near The East Channel Bridge (which carries Interstate 90 between Mercer Island and Bellevue) were detected in mainscheme bathymetry (see Figure 31). The sewer lines are located as charted. The Hydrographer recommends retaining all submarine cable and pipeline areas as charted.²⁸

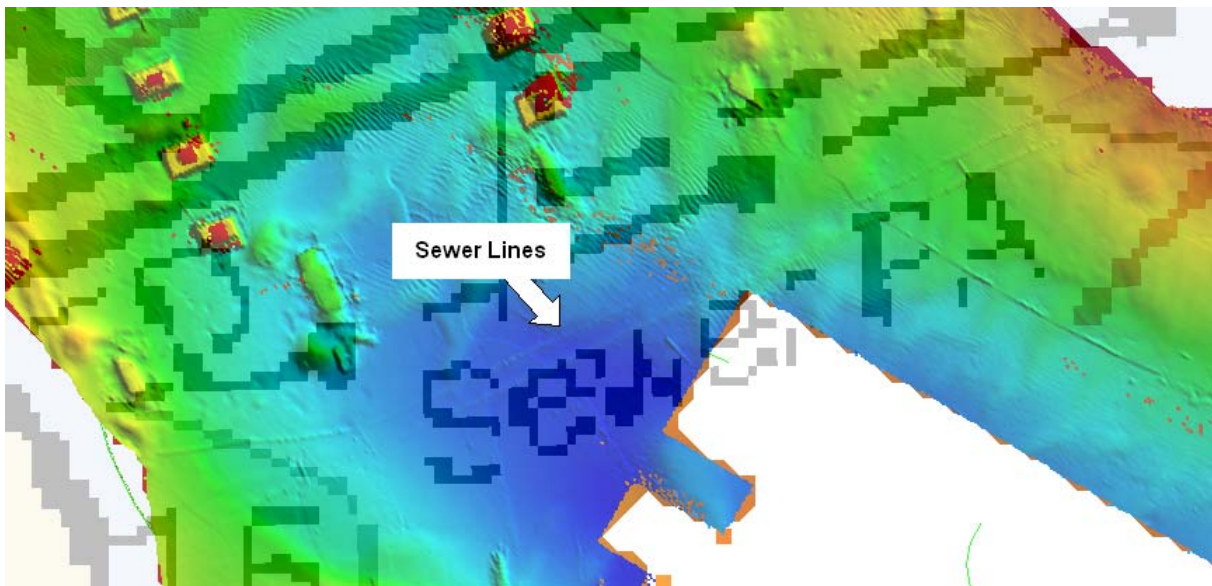


Figure 31: Sewer lines are visible in a half meter surface near the East Channel Bridge.

D.2.f. Ferry Routes

There are no ferry routes charted within the limits of survey H11810, and none were observed to be operating in the area.²⁹

D.2.g. Bottom Samples

Bottom samples were not performed in survey H11810.³⁰

D.2.h. Other Findings


There are no other findings in survey H11810.

E. APPROVAL

As Chief of Party, Field operations for hydrographic survey H11810 were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports. The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual (May 2008 edition), Field Procedures Manual (April 2008 edition), Standing and Letter Instructions, and all HSD Technical Directives issued through November, 2008. These data are adequate to supersede charted data in their common areas with the exception of deficiencies noted in the Descriptive Report. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report. All data and reports are respectfully submitted to N/CS34, Pacific Hydrographic Branch.

Listed below are supplemental reports submitted separately that contain additional information relevant to this survey:


<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
Data Acquisition and Processing Report for S-N904-RA-08	7/5/2009	N/CS34
Coast Pilot Report for S-N904-RA-08	TBD	N/CS26

Approved and Forwarded:  Donald W. Haines, CAPT/NOAA
I am approving this document
2009.07.24 08:30:12 -08'00'


Captain Donald W. Haines, NOAA
Commanding Officer, NOAA Ship *Rainier*

In addition, the following individuals were also responsible for overseeing data acquisition and processing of this survey:

Survey Sheet Manager:  Ian Colvert
I am the author of this document
2009.07.20 00:11:47 Z

Chief Survey Technician:  James B. Jacobson
I have reviewed this document
2009.07.20 00:05:52 Z

James B. Jacobson
Chief Survey Technician, NOAA Ship *Rainier*

Field Operations Officer:  Brent Pounds
for Charles J. Yoos
2009.07.21 18:20:43 -08'00'

Lieutenant Charles Yoos, NOAA
Field Operations Officer, NOAA Ship *Rainier*

¹ Concur.

² Despite exceeding IHO order 1 standards, data from H11810 are adequate to supersede previously charted partial bottom coverage data.

³ At the time H11810 was compiled, prior surveys H11292, H11293, H11376, and H11377 had already been applied to the chart. Therefore compilation around the edges of H11810 was performed in conjunction with the latest version of the chart.

⁴ Concur.

⁵ Concur with clarification, Yarrow and Juanita Bays should be resurveyed in the future as time and resources allow, however some of the VBES data that was able to track the bottom through the seagrass did acquire depths shoaler than those currently charted. Chart data per selected soundings and blue notes in H11810_CS.000.

⁶ Concur.

⁷ Retain charted data inside the log boom near Coulon Beach Park as is portrayed in H11810_CS.000.

⁸ The base surface H11810_OfficeFinalCombined_4m.csar created during the survey acceptance review was used in the compilation of H11810_CS.000.

⁹ Tide note is appended to this report.

¹⁰ H11810_CS.000 was compiled to the 29th edition 05/01/2008 of chart 18447 corrected through LNM dated 06/11/2011.

¹¹ H11810_CS.000 contains a blue note in this location advising removal of the dashed line bound area of shoreline.

¹² Do not concur. As stated in the supplemental correspondence from Rainier's field operations officer *'In order to remove submerged features from the chart, we have to obtain adequate coverage with our survey vessel to 'prove' that the feature no longer exists. Although we ran data in the area around the mouth of May Creek, we were unable to gather enough data to disprove the large T-pier that is currently charted as submerged (see attached.) Ironically, one of the reasons we were unable to get good sonar coverage is because there was an excavation barge sitting on top of the submerged pier, apparently pulling out pilings.'* Retain pier ruins as charted, per blue note in H11810_CS.000.

¹³ Concur with clarification, chart per H11810_CS.000.

¹⁴ Concur with clarification, wreck has been blue noted to be removed from the ENC, the wreck has already been removed from the RNC.

¹⁵ Concur, obstruction is blue noted to be removed from the chart.

¹⁶ Concur.

¹⁷ Concur.

¹⁸ Despite the verification of the snag, it has been blue noted to be removed as it is insignificant relative to shoaler depths that were selected for charting.

¹⁹ Concur with clarification, chart per H11810_CS.000.

²⁰ DTON report is appended to this report.

²¹ A separate report containing AWOIS items only has been created during office processing and is attached to this report.

²² Concur with clarification, the submitted hob files were used in the compilation of the HCell, however some changes were made to accommodate chart scale. Chart per H11810_CS.000.

²³ Despite not being observed during survey operations the private lights should be retained as charted. Because they are private it is unknown if they are seasonal.

²⁴ Concur.

²⁵ Concur.

²⁶ Concur.

²⁷ Concur.

²⁸ Concur.

²⁹ Concur.

³⁰ Although bottom samples were not collected, during the compilation of H11810 forty bottom samples were imported to be retained from ENC US5WA13M.

H11810 DTON Report

Registry Number: H11810
State: Washington
Locality: Lake Washington
Sub-locality: Lake Washington
Project Number: S-N904-RA-08
Survey Date: 04/21/2008

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18447	28th	12/01/2005	1:25,000 (18447_3)	USCG LNM: 03/20/2007 (03/04/2008) CHS NTM: None (01/25/2008) NGA NTM: 06/25/1994 (03/08/2008)
18448	34th	07/01/2006	1:80,000 (18448_1)	[L]NTM: ?
18440	28th	12/01/2005	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	32nd	07/01/2005	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	31st	06/01/2005	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	2.09 m	47° 32' 12.8" N	122° 12' 08.3" W	---

1 - DR_DToN

1.1) Profile/Beam - 3431/225 from h11810 / 1101_reson8125_hvf / 2008-112 / 917_1851

DANGER TO NAVIGATION

Survey Summary

Survey Position: 47° 32' 12.8" N, 122° 12' 08.3" W
Least Depth: 2.09 m (= 6.85 ft = 1.142 fm = 1 fm 0.85 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) ± 1.964 m ; TVU (TPEv) ± 0.435 m
Timestamp: 2008-112.19:05:33.953 (04/21/2008)
Survey Line: h11810 / 1101_reson8125_hvf / 2008-112 / 917_1851
Profile/Beam: 3431/225
Charts Affected: 18447_3, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

DTON. Possible piling or deadhead found with multibeam bathymetry. Designated sounding represents least depth from multibeam bathymetry, but should not be considered absolute proof of least depth because the sonar 'painted' the DTON at an angle with the outer beams (not the nadir beams).

Feature Correlation

Address	Feature	Range	Azimuth	Status
h11810/1101_reson8125_hvf/2008-112/917_1851	3431/225	0.00	000.0	Primary

Hydrographer Recommendations

Chart as submerged piling.

Cartographically-Rounded Depth (Affected Charts):

7ft (18447_3)

1fm (18448_1, 18440_1, 18003_1, 18007_1, 530_1)

2.1m (501_1, 50_1)

S-57 Data

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

SORDAT - 20081124

SORIND - US, US, nsurf, H11810

VALSOU - 2.089 m

Feature Images

[Image file K:/Projects/2008_Projects/S-N904-RA-08, Lake
Washington/H11810/PSS/Photos/H11801_DTON.JPG does not exist.]

H11810 AWOIS Items

Registry Number: H11810
State: Washington
Locality: Lake Washington
Sub-locality: Lake Washington
Project Number: S-N904-RA-08
Survey Dates: 11/19/2008 - 07/01/2009

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18447	28th	12/01/2005	1:25,000 (18447_3)	USCG LNM: 03/20/2007 (03/04/2008) CHS NTM: None (01/25/2008) NGA NTM: 06/25/1994 (03/08/2008)
18441	45th	04/01/2006	1:80,000 (18441_1)	[L]NTM: ?
18448	34th	07/01/2006	1:80,000 (18448_1)	[L]NTM: ?
18440	28th	12/01/2005	1:150,000 (18440_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	32nd	07/01/2005	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	31st	06/01/2005	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	AWOIS	[no data]	[no data]	[no data]	---
1.2	AWOIS	[no data]	[no data]	[no data]	---
1.3	AWOIS	[no data]	[no data]	[no data]	---
1.4	AWOIS	[no data]	[no data]	[no data]	---
1.5	AWOIS	[no data]	[no data]	[no data]	---
1.6	AWOIS	[no data]	[no data]	[no data]	---
1.7	AWOIS	[no data]	[no data]	[no data]	---

1.8	AWOIS	[no data]	[no data]	[no data]	---
1.9	AWOIS	[no data]	[no data]	[no data]	---
1.10	AWOIS	[None]	47° 35' 42.5" N	122° 13' 36.0" W	---
1.11	AWOIS	21.66 m	47° 35' 17.0" N	122° 15' 30.2" W	---
1.12	Obstruction	21.66 m	47° 35' 17.0" N	122° 15' 30.2" W	53103

1 - AWOIS

1.1) AWOIS #53074 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 44' 41.1" N, 122° 15' 50.0" W
Historical Depth: [None]
Search Radius: 100
Search Technique: VS, DI, HRSSS, HRSWMB, ES
Technique Notes: [None]

History Notes:

H11292, 2004; Visual Search of the area revealed no piles in charted locations. Area was covered with 100% SWMB. Numerous submerged timbers along the bottom and several vertical pile members detected. Hydrographer recommends charting piles to reflect new positions on smooth sheet.(KRW 04/24/2007)

CL1143/81-- USCG Auxilary investigation, 8/1/81: 7 piles charted on chart 18447, 19th ed. (3/7/81) between lat. 47/44/39N, lon. 122/15/26W and lat. 47/44/55N, lon. 122/15/46W do not exist. Position of search radius center scaled in MapInfo from raster chart. (ENT DAS 1/24/03)

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11292, 2004; Visual Search of the area revealed no piles in charted locations. Area was covered with 100% SWMB. Numerous submerged timbers along the bottom and several vertical pile members detected. Hydrographer recommends charting piles to reflect new positions on smooth sheet.(KRW 04/24/2007)

CL1143/81-- USCG Auxilary investigation, 8/1/81: 7 piles charted on chart 18447, 19th ed. (3/7/81) between lat. 47/44/39N, lon. 122/15/26W and lat. 47/44/55N, lon. 122/15/46W do not exist. Position of search radius center scaled in MapInfo from raster chart. (ENT DAS 1/24/03)

Addressed in H11292_awois_report.pdf. Did not investigate.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53074	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.2) AWOIS #53109 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 30' 24.4" N, 122° 12' 19.4" W
Historical Depth: [None]
Search Radius: 330
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

CL-1341/82, 10/17/82; REPORTS THE TERMINATION OF A LOG STORAGE AREA IN LAT. 47/30/25 N. LON. 122/12/15 W. (NAD27) CHART COMPLIER CONVERTED AREA LABEL TO SUBMERGED PILES. THE OFF SHORE COORDINATES OF THE REGION ARE LAT. 47/30/30.55 N, LON. 122/12/31.51 W.; LAT. 47/30/31.36 N, LON. 122/12/25.11 W. (NAD 83). (ENTERED 01/04 BY KRW).

Survey Summary

Charts Affected: 18447_3, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

CL-1341/82, 10/17/82; REPORTS THE TERMINATION OF A LOG STORAGE AREA IN LAT. 47/30/25 N. LON. 122/12/15 W. (NAD27) CHART COMPLIER CONVERTED AREA LABEL TO SUBMERGED PILES. THE OFF SHORE COORDINATES OF THE REGION ARE LAT. 47/30/30.55 N, LON. 122/12/31.51 W.; LAT. 47/30/31.36 N, LON. 122/12/25.11 W. (NAD 83). (ENTERED 01/04 BY KRW).

Addressed in H11377_awois_report.pdf

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53109	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.3) AWOIS #53110 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 30' 49.4" N, 122° 12' 29.4" W
Historical Depth: [None]
Search Radius: 420
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

CL-1341/82, 10/17/82; REPORTS THE TERMINATION OF A LOG STORAGE AREA IN LAT. 47/30/50 N. LON. 122/12/25 W. (NAD27) CHART COMPLIER CONVERTED AREA LABEL TO SUBMERGED PILES. THE OFF SHORE COORDINATES OF THE REGION ARE LAT. 47/30/53.59 N, LON. 122/12/48.48 W.; LAT. 47/30/56.11 N, LON. 122/12/44.89 W.; LAT. 47/30/42.0 N, LON. 122/12/29.47 W. (NAD 83). (ENTERED 01/04 BY KRW).

Survey Summary

Charts Affected: 18447_3, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

CL-1341/82, 10/17/82; REPORTS THE TERMINATION OF A LOG STORAGE AREA IN LAT. 47/30/50 N. LON. 122/12/25 W. (NAD27) CHART COMPLIER CONVERTED AREA LABEL TO SUBMERGED PILES. THE OFF SHORE COORDINATES OF THE REGION ARE LAT. 47/30/53.59 N, LON. 122/12/48.48 W.; LAT. 47/30/56.11 N, LON. 122/12/44.89 W.; LAT. 47/30/42.0 N, LON. 122/12/29.47 W. (NAD 83). (ENTERED 01/04 BY KRW).

Addressed in H11377_awois_report.pdf

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53110	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.4) AWOIS #53111 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 31' 47.7" N, 122° 12' 30.2" W
Historical Depth: [None]
Search Radius: 200
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

CL- 733/50, 1950; REPORTS THE EXISTANCE OF PILES FOR THE PURPOSE OF LOG MOORING. THE OFF SHORE EXTENT OF THE AREA IS LAT. 47/31/47.71 N, LON. 122/12/30.18 W.; LAT. 47/31/45.04 N, LON. 122/12/28.56 W. (NAD83) SEE CHART FOR ENTIRE EXTENT. (ENTERED 01/04 BY KRW).

Survey Summary

Charts Affected: 18447_3, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

CL- 733/50, 1950; REPORTS THE EXISTANCE OF PILES FOR THE PURPOSE OF LOG MOORING. THE OFF SHORE EXTENT OF THE AREA IS LAT. 47/31/47.71 N, LON. 122/12/30.18 W.; LAT. 47/31/45.04 N, LON. 122/12/28.56 W. (NAD83) SEE CHART FOR ENTIRE EXTENT. (ENTERED 01/04 BY KRW).

Addressed in H11377_awois_report.pdf

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53111	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.5) AWOIS #53091 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 41' 39.4" N, 122° 16' 12.4" W
Historical Depth: [None]
Search Radius: 100
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

H11292, 2004; Probable submerged piling was found within AWOIS 53091 radius. Charted Submerged pile should be removed and a new pile should be added in Lat. 047° 41' 38.822" Lon. 122° 16' 11.276" (NAD83) (KRW 04/24/2007)

CL 1352, 10/22/84; USCG AUX. LETTER REPORTS TWO VISIBLE DOLPHINS (THREE MEMBERS EACH) 25 FT APART IN LAT. 47/41/40 N, LON. 122/16/08 W (NAD27) (ENTERED 12/03 BY KRW)

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11292, 2004; Probable submerged piling was found within AWOIS 53091 radius. Charted Submerged pile should be removed and a new pile should be added in Lat. 047° 41' 38.822" Lon. 122° 16' 11.276" (NAD83) (KRW 04/24/2007)

CL 1352, 10/22/84; USCG AUX. LETTER REPORTS TWO VISIBLE DOLPHINS (THREE MEMBERS EACH) 25 FT APART IN LAT. 47/41/40 N, LON. 122/16/08 W (NAD27) (ENTERED 12/03 BY KRW)

Addressed in H11292_awois_report.pdf. Did not investigate.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53091	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.6) AWOIS #53095 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 40' 33.0" N, 122° 14' 55.0" W
Historical Depth: [None]
Search Radius: 200
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

H11293, 2004; Reports dolphins disproved visually and with 100% SWMB. (KRW 06/12/2007)

CL-1423, 10/10/1980; REPORTS THE EXISTANCE OF 3 DOLPHINS 150 FT APART 50 FT OFF THE DOCK CENTERED IN LAT. 47/40/33 N, LON 122/14/55 W. (NAD27). (ENTERED 12/03 BY KRW). POSITION AQUIED FROM MAPINFO RASTER CHART.

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11293, 2004; Reports dolphins disproved visually and with 100% SWMB. (KRW 06/12/2007)

CL-1423, 10/10/1980; REPORTS THE EXISTANCE OF 3 DOLPHINS 150 FT APART 50 FT OFF THE DOCK CENTERED IN LAT. 47/40/33 N, LON 122/14/55 W. (NAD27). (ENTERED 12/03 BY KRW). POSITION AQUIED FROM MAPINFO RASTER CHART.

Addressed in survey H11293, 2004; Reports dolphins disproved visually and with 100% SWMB.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53095	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.7) AWOIS #53097 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 39' 28.0" N, 122° 12' 39.0" W
Historical Depth: [None]
Search Radius: 200
Search Technique: VS,S2,MB,DI
Technique Notes: [None]

History Notes:

H11293, 2004; Reports dolphins disproved visually and with 100% SWMB. (KRW 06/12/2007)

CL-1423/80, 11/10/1980; REPORTS THE EXISTANCE OF DOLPHINS IN LAT. 47/39/25 N, LON. 122/12/37 W.(NAD 83) (ENTERED 12/03 BY KRW). POSITION AQUIRED FROM CURRENT RASTER CHART.

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11293, 2004; Reports dolphins disproved visually and with 100% SWMB. (KRW 06/12/2007)

CL-1423/80, 11/10/1980; REPORTS THE EXISTANCE OF DOLPHINS IN LAT. 47/39/25 N, LON. 122/12/37 W.(NAD 83) (ENTERED 12/03 BY KRW). POSITION AQUIRED FROM CURRENT RASTER CHART.

Addressed in survey H11293, 2004; Reports dolphins disproved visually and with 100\$ SWMB.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53097	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.8) AWOIS #53098 - UNKNOWN

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 39' 25.4" N, 122° 12' 32.7" W
Historical Depth: [None]
Search Radius: 200
Search Technique: VS,MB,ES,DI,SD
Technique Notes: [None]

History Notes:

H11293, 2004; Wreck not visually observed. Submerged wreck verified with SWMB in location 47°39'25.453"N,

122°12'32.665"W. (KRW 06/12/2007)

CL-1341/1982, 11/17/82; USPS REPORTS THE EXISTANCE OF A DANGEROUS VISIBLE WRECK OF A BURNED FERRY, ON THE SOUTH SIDE OF THE PROMIENT DOCK, IN LAT. 47/39/25N. LON. 122/12/28 W.(NAD27). A PORTION OF THE HULL IS VISIBLE. THE PROMINENT DOCK SHOWN IS IN DISREPAIR AND NOT PROMINENT FOR THE LAST 100FT OF LENGTH. (ENTERED 12/03 BY KRW).

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11293, 2004; Wreck not visually observed. Submerged wreck verified with SWMB in location 47°39'25.453"N,

122°12'32.665"W. (KRW 06/12/2007)

CL-1341/1982, 11/17/82; USPS REPORTS THE EXISTANCE OF A DANGEROUS VISIBLE WRECK OF A BURNED FERRY, ON THE SOUTH SIDE OF THE PROMIENT DOCK, IN LAT. 47/39/25N. LON. 122/12/28 W.(NAD27). A PORTION OF THE HULL IS VISIBLE. THE PROMINENT DOCK SHOWN IS IN DISREPAIR AND NOT PROMINENT FOR THE LAST 100FT OF LENGTH. (ENTERED 12/03 BY KRW).

Addressed in survey H11293, 2004; Wreck not visually observed. Submerged wreck verified with SWMB.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53098	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.9) AWOIS #53101 - OBSTRUCTION

No Primary Survey Feature for this AWOIS Item

Search Position: 47° 40' 24.4" N, 122° 12' 29.5" W
Historical Depth: [None]
Search Radius: 100
Search Technique: VS,S2,MB,ES,DI,SD
Technique Notes: [None]

History Notes:

H11293, 2004; Dolphins were not observed during SWMB. No shoreline investigation was completed, therefore, it is recommended that the dols be retain at their charted position.(KRW 06/12/2007)

POSITION APPROXIMATE CENTER OF THE THREE DOLPHINS.

CL 1423-1980, 11/10/1980; REPORTS THE ESISTANCE OF 3 VISIBLE DOLPHINS ALONG SIDE A DOCK IN LAT. 47/40/25 N. LON. 122/12/25 W. (NAD27). (ENTERED 12/03 BY KRW).

Survey Summary

Charts Affected: 18447_3, 18441_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

H11293, 2004; Dolphins were not observed during SWMB. No shoreline investigation was completed, therefore, it is recommended that the dols be retain at their charted position.(KRW 06/12/2007)

POSITION APPROXIMATE CENTER OF THE THREE DOLPHINS.

CL 1423-1980, 11/10/1980; REPORTS THE ESISTANCE OF 3 VISIBLE DOLPHINS ALONG SIDE A DOCK IN LAT. 47/40/25 N. LON. 122/12/25 W. (NAD27). (ENTERED 12/03 BY KRW).

Addressed 2004, H11293-B.

Feature Correlation

Address	Feature	Range	Azimuth	Status
S-N904-08	AWOIS # 53101	0.00	000.0	Primary

Hydrographer Recommendations

[None]

S-57 Data

[None]

1.10) AWOIS #53114 - OBSTRUCTION

Primary Survey Feature is GP No. - 4 from ChartGPs - Digitized

Search Position: 47° 35' 42.3" N, 122° 13' 36.4" W
Historical Depth: [None]
Search Radius: 100
Search Technique: S2,MB,DI
Technique Notes: [None]

History Notes:

CL- 1931/75, 11/11/1975; THE USCG AUX. REPORTS THE VISIBLE PILE IN LAT. 47/35/43 N, LON. 122/13/32 W. (NAD27) WAS REMOVED DURING A PARK RENOVATION. THE PILE IS NOW CHARTED AS A SUBMERGED PILE. (ENTERED 01/04 BY KRW).

Survey Summary

Survey Position: 47° 35' 42.5" N, 122° 13' 36.0" W
Least Depth: [None]
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2009-182.19:16:57 (07/01/2009)
GP Dataset: ChartGPs - Digitized
GP No.: 4
Charts Affected: 18447_3, 18441_1, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

Multibeam coverage extends to the 4 meter curve, but does not cover the AWOIS item.

Feature Correlation

Address	Feature	Range	Azimuth	Status
ChartGPs - Digitized	4	0.00	000.0	Primary
S-N904-08	AWOIS # 53114	9.19	068.9	Secondary (grouped)

Hydrographer Recommendations

Retain as charted.

S-57 Data

[None]

Feature Images

[Image file K:/Projects/2008_Projects/S-N904-RA-08, Lake Washington/H11810/PSS/Photos/AWOS_53114.jpg does not exist.]

1.11) AWOIS #53103 - UNKNOWN

**Primary Survey Feature is Profile/Beam - 324/83 from h11810 /
1021_reson8101_hvf / 2008-324 / 000_1708**

Search Position: 47° 35' 17.4" N, 122° 15' 28.4" W

Historical Depth: [None]

Search Radius: 175

Search Technique: S2,MB,DI,SD

Technique Notes: [None]

History Notes:

LNM 24/88, 06/14/1988; REPORTS A DANGEROUS SUNKEN WRECK, PA, IN LAT. 47/35/18 N, LON. 122/15/24 W. (NAD27).(ENTERED 01/04 BY KRW).

Survey Summary

Survey Position: 47° 35' 17.0" N, 122° 15' 30.2" W

Least Depth: 21.66 m (= 71.05 ft = 11.842 fm = 11 fm 5.05 ft)

TPU ($\pm 1.96\sigma$): THU (TPEh) ± 1.376 m ; TVU (TPEv) ± 0.426 m

Timestamp: 2008-324.17:10:11.317 (11/19/2008)

Survey Line: h11810 / 1021_reson8101_hvf / 2008-324 / 000_1708

Profile/Beam: 324/83

Charts Affected: 18447_3, 18441_1, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

Designated sounding on an obstruction.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h11810/1021_reson8101_hvf/2008-324/000_1708	324/83	0.00	000.0	Primary
S-N904-08	AWOIS # 53103	39.23	251.3	Secondary

Hydrographer Recommendations

[None]

S-57 Data

Geo object 1: Obstruction (OBSTRN)
Attributes: SORDAT - 20081124
SORIND - US, US, nsurf, H11810
VALSOU - 21.657 m

1.12) Profile/Beam - 324/83 from h11810 / 1021_reson8101_hvf / 2008-324 / 000_1708

Primary Feature for AWOIS Item #53103

Search Position: 47° 35' 17.4" N, 122° 15' 28.4" W

Historical Depth: [None]

Search Radius: 175

Search Technique: S2,MB,DI,SD

Technique Notes: [None]

History Notes:

LNM 24/88, 06/14/1988; REPORTS A DANGEROUS SUNKEN WRECK, PA, IN LAT. 47/35/18 N, LON. 122/15/24 W. (NAD27).(ENTERED 01/04 BY KRW).

Survey Summary

Survey Position: 47° 35' 17.0" N, 122° 15' 30.2" W

Least Depth: 21.66 m (= 71.05 ft = 11.842 fm = 11 fm 5.05 ft)

TPU ($\pm 1.96\sigma$): THU (TPEh) ± 1.376 m ; TVU (TPEv) ± 0.426 m

Timestamp: 2008-324.17:10:11.317 (11/19/2008)

Survey Line: h11810 / 1021_reson8101_hvf / 2008-324 / 000_1708

Profile/Beam: 324/83

Charts Affected: 18447_3, 18441_1, 18448_1, 18440_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

Designated sounding on an obstruction.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h11810/1021_reson8101_hvf/2008-324/000_1708	324/83	0.00	000.0	Primary
S-N904-08	AWOIS # 53103	39.23	251.3	Secondary

Hydrographer Recommendations

[None]

S-57 Data

Geo object 1: Obstruction (OBSTRN)
Attributes: SORDAT - 20081124
SORIND - US, US, nsurf, H11810
VALSOU - 21.657 m



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : March 31, 2009

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: S-N904-RA-2008
HYDROGRAPHIC SHEET: H11810

LOCALITY: Lake Washington, WA
TIME PERIOD: April 1-19 and November 18-25, 2008

TIDE STATION USED: 944-7239 Sand Point, WA
Lat. 47° 41.3' N Long. 122° 15.5' W

PLANE OF REFERENCE: 0.000 meters
(LAKE WASHINGTON LOW WATER OF LAKE DATUM - [LWLWD])

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project S-N904-RA-2008, H11810, during the time period between April 1 and 19 and November 18 and 25, 2008.

Please use the zoning file "N904RA2008CORP" submitted with the project instructions for Lake Washington, WA. Zone LW1 is the applicable zone for H11810.

Refer to attachments for zoning information.

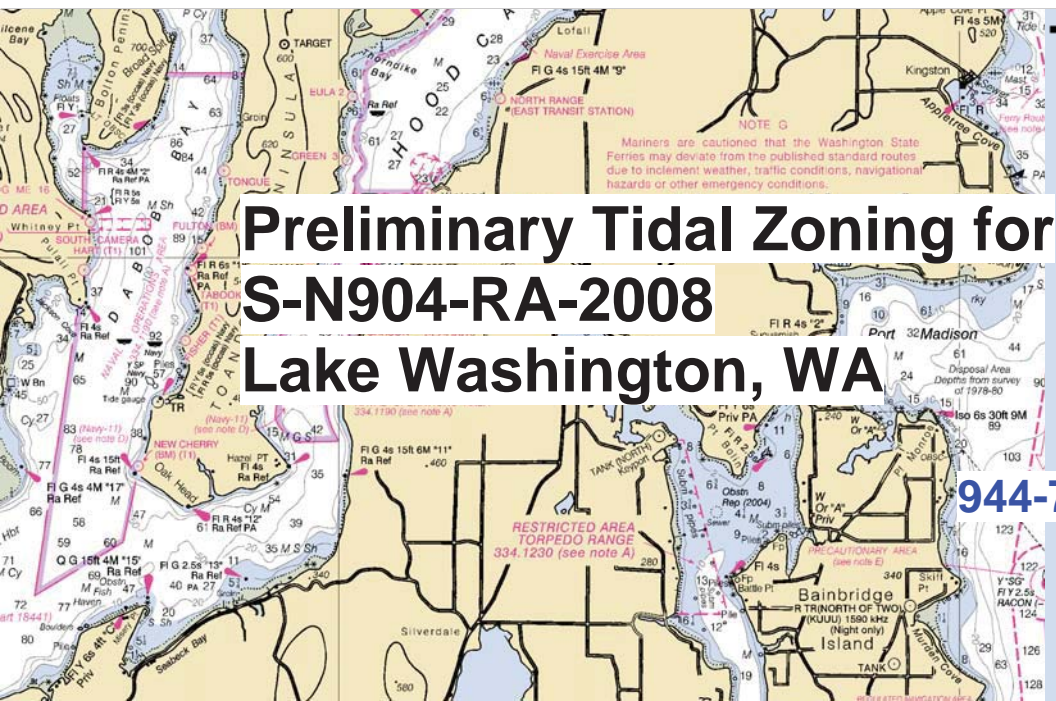
Note 1: The provided time series data at Sand Point, WA (944-7239) are tabulated in metric units (meters), relative to LWLWD and on Greenwich Mean Time (GMT). Retrieve verified water level using the Station Datum option to retrieve water level data on LWLWD.

Peter J. Stone

Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=CO-OPS, ou=NOAA/
NOS, email=peter.stone@noaa.gov, c=US
Date: 2009.04.02 14:52:40 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION



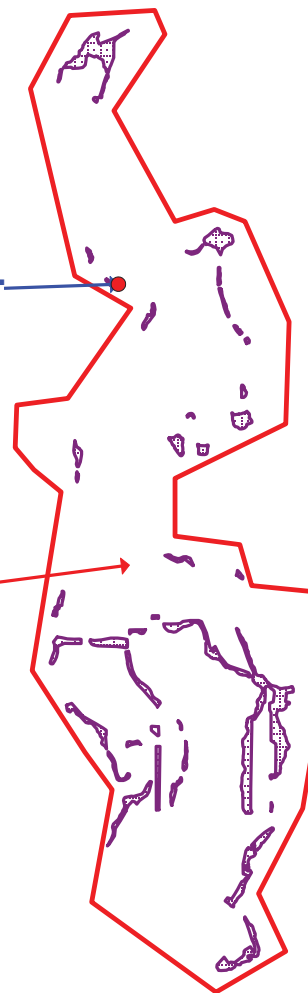


Preliminary Tidal Zoning for S-N904-RA-2008 Lake Washington, WA

944-7239 SAND POINT



LW1
Time Corrector 0 mins.
Range Corrector x1.00
Reference 944-7239



H11810 HCell Report
Peter Holmberg, Physical Scientist
Pacific Hydrographic Branch

1.0 Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H11810 used:

Office of Coast Survey HCell Specifications: Version: 4.0, 2 June, 2010.
HCell Reference Guide: Version 2.0, 2 June, 2010.

2.0 Compilation Scale

Depths and features for HCell H11810 were compiled to the largest scale raster chart shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18447_3	1:25,000	29th	05/01/2008	06/11/2011

The following ENC's were also used during compilation:

Chart	Scale
US5WA13M	1:25,000

3.0 Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 3-meter surface H11810_3m_Final in CARIS BASE Editor. A shoal-biased selection was made at 1:25,000 and 1:10,000 survey scales using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-4.7	10	3
10	20	4
20	50	4.5
50	200	5

In CARIS BASE Editor soundings were manually selected from the high density sounding layers (SS) and imported into a new layer (CS) created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

4.0 Depth Contours

Depth contours at the intervals on the largest scale chart are included in the *_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and feet equivalent contour values are shown in the table below.

Chart Contour Intervals in Feet from Chart 18447	Metric Equivalent to Chart Feet, Arithmetically Rounded	Metric Equivalent of Chart Fathoms, with NOAA Rounding Applied	Fathoms with NOAA Rounding Applied	Feet with NOAA Rounding Removed for Display on H11810_SS.000
6	1.828	2.057	6.75	6
18	5.4864	5.715	18.75	18
60	18.288	18.517	60.75	60

With the exception of the zero contours included in the *_CS file, contours have not been deconflicted against shoreline features, soundings and hydrography, as all other features in the *_CS file and soundings in the *_SS have been. This may result in conflicts between the *_SS file contours and HCell features at or near the survey limits. Conflicts with M_QUAL, COALNE and SBDARE objects, and with DEPCNT objects representing MLLW, should be expected. HCell features should be honored over *_SS.000 file contours in all cases where conflicts are found.

5.0 Meta Areas

The following Meta object areas are included in HCell H11810:

M_QUAL

The Meta area objects were constructed on the basis of the limits of the hydrography.

6.0 Features

Features addressed by the field units are delivered to PHB where they are deconflicted against the hydrography and the largest scale chart. These features, as well as features to be retained from the chart and features digitized from the Base Surface, are included in the HCell. The geometry of these features may be modified to emulate chart scale per the HCell Reference Guide on compiling features to the chart scale HCell.

7.0 Spatial Framework

7.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

7.2 Horizontal and Vertical Units

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Feet
Height Units (HUNI):	Feet
Positional Units (PUNI):	Meters

During creation of the HCell in CARIS BASE Editor and CARIS S-57 Composer, all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less. Units and precision are shown below.

BASE Editor and S-57 Composer Units:

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest decimeter

See the HCell Reference Guide for details of conversion from metric to charting units, and application of NOAA rounding.

7.3 S-57 Object Classes

The CS HCell contains the following Object Classes:

\$CSYMB	Blue Notes (points) —Notes to the MCD chart Compiler
LNDARE	Islet
* LOGPON	Floating booms
* MORFAC	Mooring buoys, and dolphins
M_QUAL	Data quality Meta object
* OBSTRN	Obstructions
* PILPNT	Piles
* SBDARE	bottom samples
* SLCONS	Shoreline construction
SOUNDG	Soundings at chart scale density
* UWTROC	Rocks
WEDKLP	Eelgrass
* WRECKS	Wrecks

* The M_QUAL is adequate for NDB product searches except for features in these object classes which reside outside the M_QUAL limits.

The SS HCell contains the following Object Classes:

DEPCNT	Generalized contours at chart scale intervals (See table under section 4.)
SOUNDG	Soundings at the survey scale density (See table under section 3.)

8.0 Data Processing Notes

There were no significant deviations from the standards and protocols given in the HCell Specification and HCell Reference Guide.

9.0 QA/QC and ENC Validation Checks

H11810 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

10.0 Products

10.1 HSD, MCD and CGTP Deliverables

H11810_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:135,000 and 1:52,150.
H11810_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:40,000 and 1:10,000.
H11810_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11810_outline.gml	Survey outline
H11810_outline.xsd	Survey outline

11.0 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 3.0	Creation of soundings and bathy-derived features, creation of the, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.2	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12.0 Contacts

Inquiries regarding this HCell content or construction should be directed to:

Peter Holmberg
Physical Scientist
Pacific Hydrographic Branch
Seattle, WA
206-526-6843
Peter.Holmberg@noaa.gov

APPROVAL SHEET
H11810

Initial Approvals:

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproof of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

I have reviewed the HCell, accompanying data, and reports. This survey and accompanying digital data meet or exceed OCS requirements and standards for products in support of nautical charting except where noted in the Descriptive Report.