UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Coast Survey
Silver Spring, Maryland 20910-3282

Final Project Instruction

Date Submitted: March 6, 2014

Platform: NOAA Ship *Fairweather*

Project Number: FA-14-01

Project Title: Strait of Juan de Fuca

Project Dates: **April 7, 2014 to April 25, 2014**

Prepared by: _____ Digitally signed by GONSALVES.MICHAEL.O.1275635126 Date: 2014.03.18 15:58:57 -04'00' Dated: _____
LCDR Michael Gonsalves, NOAA
Chief, Operations Branch
Hydrographic Surveys Division

Approved by: _____ Dated: _____
Jeffrey Ferguson
Chief, Hydrographic Surveys Division
Office of Coast Survey

Approved by: _____ Digitally signed by BLAKE.WADE.JAMES.1025936538 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=BLAKE.WADE.JAMES.1025936538 Date: 2014.03.24 12:22:46 -07'00' Dated: _____
CAPT Wade J. Blake, NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

A. Brief Summary and Project Period

B. Days at Sea (DAS)

Of the 19 DAS scheduled for this project, 19 DAS are funded by a Line Office Allocation. This project is estimated to exhibit a medium Operational Tempo.

C. Operating Area

The project area is located in the Strait of Juan de Fuca, Washington. A map of the project area may be found with the detailed project instructions appended to these instructions.

D. Summary of Objectives

The primary objective of this survey is to support safe navigation. Hydrographic data will be acquired and processed to update nautical charts and all dangers to navigation observed during survey operations will be identified and disseminated.

E. Participating Institutions

N/A

F. Personnel/Science Party: name, title, gender, affiliation, and nationality

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Argento, Adam	PS	4/7/2014	5/9/2014	M	NOAA	USA
Fandel, Christina	PS	4/7/2014	4/25/2014	F	NOAA	USA

G. Administrative

1. Points of Contacts:

Principle Investigator
LCDR Michael Gonsalves, NOAA
Chief, Operations Branch
Hydrographic Surveys Division
1315 East West Hwy
Silver Spring, MD 20910
(301) 713-2702 x112
Michael.gonsalves@noaa.gov

Project Coordinator

Christina Fandel
Physical Scientist, Operations Branch
Hydrographic Surveys Division
1315 East West Hwy
Silver Spring, MD 20910
(301) 713 – 2702 x 178
christina.fandel@noaa.gov

Chief Scientist

CDR David Zezulla, NOAA
Commanding Officer, NOAA Ship *Fairweather*
1010 Stedman Street
Ketchikan, AK 99901
(907) 254-2842
co.fairweather@noaa.gov

2. Diplomatic Clearances

None Required

3. Licenses and Permits

None Required

II. Operations

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary

The planned itinerary is:

DEP	4/7/2014	Mon	Seattle, WA	FA-14-01
ARR	4/25/2014	Fri	Anacortes, WA	OPR-N305 Strait of Juan de Fuca

Every effort shall be made by the Commanding Officer to maximize the operational efficiency of assigned projects.

B. Staging and Destaging

N/A

C. Operations to be Conducted:

Hydrographic survey operations shall be conducted per the appended project instructions using four survey launches up to 10 hr/day for data acquisition and project field support. Alternatively, the Commanding Officer may elect to run concurrent 24 hr ship survey operations for short periods of time or for extended periods of time with reduced launch operations.

D. Dive Plan

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (http://www.ndc.noaa.gov/dr.html) and require the approval of the ship's Commanding Officer.

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations:

- Poor weather conditions
- Equipment failure
- Safety concerns
- Personnel shortages

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

- Four fully outfitted and operational survey launches to support shallow water survey operations utilizing hull mounted side scan sonar, multibeam, and vertical beam sonar systems.
- Ship fully outfitted with hydrographic survey equipment to support multibeam survey operations.
- Personnel and staff to operate the ship's survey equipment for 24 hr/day operations and a minimum of 2 survey launches and equipment for up to 10 hr/day concurrently, at the discretion of the command to ensure the most efficient survey operations.
- A fully staffed survey department to efficiently manage the project's data processing requirements.

B. Equipment and Capabilities provided by the scientists (itemized)

Hydrographic Surveys Division shall provide Physical Scientists for hydrographic data acquisition, processing, training, and data quality assurance support during project survey operations. Additionally, shore based technical support shall be provided for survey systems and data acquisition and processing software.

IV. Hazardous Materials

A. Policy and Compliance

No Hazardous Materials are being brought aboard the ship for this project.

B. Inventory

No Hazardous Materials are being brought aboard the ship for this project.

C. Chemical safety and spill response procedures

No Hazardous Materials are being brought aboard the ship for this project.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Pre-Project Meeting: The Principle Investigator and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting: The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships', specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements

for scientific participants will be made available to the ship's command at least seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02 JAN 2012) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/~noaaforms/eforms/nf57-10-01.pdf.

All NHSQs submitted after March 1, 2014 must be accompanied by NOAA Form (NF) 57-10-02 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either

form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:

Regional Director of Health Services
Marine Operations Center – Pacific
2002 SE Marine Science Dr.
Newport, OR 97365
Telephone 541-867-8822
Fax 541-867-8856
Email MOP.Health-Services@noaa.gov

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations

Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged at least 30 days in advance.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.

Completion of the above requirements prior to boarding the ship is required.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

Foreign National access to the NOAA ship or Federal Facilities is not required for this project.

VIII. Appendices

1. Primary Project Instructions: OPR-N305-FA-14 Strait of Juan de Fuca, WA

Hydrographic Survey Project Instructions

Project Name:	Strait of Juan de Fuca
Project Number:	OPR-N305-FA-14
Assigned Field Unit:	NOAA Ship *Fairweather*
Assigned Processing Branch:	Pacific Hydrographic Branch
Signed Date:	03/06/2014
Project Instructions Version:	Final
Planned Acquisition Time:	Start Date: 04/2014 End Date: 04/2014
Delivery Dates:	120 days from completion of data acquisition.

Purpose and Location:
The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. The survey area is in the vicinity of three, high-density traffic lanes separated by shoal areas and is frequently transited by large commercial vessels traveling both north to Cherry Point, Washington and Vancouver, British Columbia and south to Tacoma and Seattle, Washington. Additionally, a request for a survey in the vicinity of Friday Harbor was submitted to determine the extent of shoaling off the Northwest end of Brown Island. This shoaling may influence the Washington State Ferry's accessibility to Friday Harbor, particularly during times of negative tide. This project will cover approximately 44 square nautical miles of critical and re-survey areas as identified in the 2012 NOAA Hydrographic Survey Priorities (NHSP).
Supporting Documents:
Hydrography shall consist of Navigable Area Surveys in accordance with the following support documents. Data from surveys is intended to supersede all prior survey data in the common area.
Hydrographic Survey Technical Directive (HTD) 2013-4: Configuration Management
NOS Field Procedures Manual (FPM), April 2013
NOS Hydrographic Surveys Specifications and Deliverables (HSSD), April 2013

PERSONNEL SAFETY AND DATA QUALITY SHALL ALWAYS BE EMPHASIZED OVER DATA QUANTITY! THE HYDROGRAPHER SHALL NEVER SUBJECT PERSONNEL OR BOATS TO UNDUE RISKS AND HAZARDS.

Registry Details:

General Locality: Strait of Juan de Fuca, Washington

Registry Number	*Priority*	*Sublocality*	*State or Territory*	*Scale*	*Estimated SNM*	*Instructions*
H12625	1	Salmon Bank to Kanaka Bay	Washington	12500	22	
H12626	2	Cattle Point to McArdie Bay	Washington	12500	16	
H12623	3	Protection Island and Dallas Bank	Washington	20000	6	
F00637	4	Friday Harbor	Washington	10000	1	
F00638	5	Brown Island to Flat Point	Washington	12500	4	

Coverage & Limits:

Inshore Limit:The inshore limit of hydrography will be the farthest offshore of the following: (1) the 4-meter depth contour or (2) the line defined by the distance seaward from the MHW line which is equivalent to 0.8 millimeters at the scale of the largest scale nautical chart.

Coverage Type: Complete Coverage

Instructions:

Coverage Water Depth	*Coverage Required*
4 meters to 8 meters water depth	25 m spaced Set Line Spacing SBES or MBES with Time Series Backscatter
Greater than 8 meters water depth	Multibeam with Time Series Backscatter

Assigned Tasks

Acknowledgement:

Acknowledge receipt of these instructions and submit any comments or questions via email to Christina Fandel at christina.fandel@noaa.gov.

Aids to Navigation (ATONs):

There are no ATONs specifically assigned for this project. Any ATONs located within the survey area should be verified so that they serve their intended purpose in accordance with section 7.2 of the HSSD.

Automated Wreck and Obstruction Information System (AWOIS) Items:	
Investigate AWOIS items in accordance with section 2.2.2.2 and 2.5.4.1 of the FPM.	
Number of AWOIS items provided for Full Investigation:	4
Number of AWOIS items provided for Information Only:	3

Maritime Boundary Points (MBPs):
There are no Maritime Boundary investigation requirements for this project.

Bottom Samples:
Obtain bottom samples in accordance with section 7.1 of the HSSD in areas designated by the feature object class springs (SPRING) in the Project Reference File (PRF). Review the recommended bottom sample locations with regards to the acquired survey data. Contact HSD Operations Branch if it is determined that modifying the bottom sample plan would better differentiate the varying bottom characteristic within the survey area. Any modification to the bottom sample plan shall closely maintain the same plan provided. This may increase or decrease the sample density but should closely maintain the same numbers of samples per survey as originally assigned.

Chart Comparison:

Use only the latest editions of the largest scale NOS charts covering the project area. Compare in accordance with section 4.5 of the FPM and section 8.1.4, D.1 of the HSSD. Resolve any discrepancies identified in the field and explain them in the Descriptive Report. The charts, listed below, were used in the preparation of these project instructions and accompanying project files.

Affected Raster Charts

Chart Number	*Scale*	*Edition Number*	*Edition Date*	*LNM Date*	*NM Date*
18429	25000	10	01/2007	01/02/2007	01/13/2007
18434	25000	7	04/2008	04/01/2008	04/12/2008
18471	40000	11	12/2007	11/20/2007	12/01/2007
18465	80000	39	10/2011	10/04/2011	10/22/2011
18423	80000	38	10/2011	10/18/2011	10/22/2011

Affected ENCs

ENC Name	*Scale*	*Edition*	*Update Application Date*	*Issue Date*	*Preliminary*
US5WA32M	25000	12	05/27/2011	02/19/2014	NO
US5WA42M	25000	10	01/24/2013	10/16/2013	NO
US5WA16M	40000	13	07/23/2012	07/16/2013	NO
US4WA34M	80000	14	05/15/2012	06/07/2013	NO
US5WA40M	25000	7	02/13/2012	11/01/2013	NO

Coast Pilot:

Review and make recommendations for changes to the Coast Pilot. Coast Pilot excerpts can be downloaded from the Coast Pilot website (http://www.nauticalcharts.noaa.gov/nsd/cpdownload.htm). Submit the revised Coast Pilot section or a report stating no changes are recommended, via email to Coast.Pilot@noaa.gov and ocs.ndb@noaa.gov with a courtesy copy to the HSD OPS project planner and the appropriate Processing Branch. The report should be submitted as soon as possible following field work for the project. Refer to sections 3.5.7 and 5.2.2.2.5 of the FPM for more information.

Dangers to Navigation (DTONs):

Generate DTON reports in accordance with the HSSD, section 8.1.3. DTON reports should be sent to ocs.ndb@noaa.gov. It is of paramount importance that DTONs be reported as soon as possible.

Junctions:

Junction with data from the surveys listed below. Refer to sections 2.2.2.3 and 4.5.2 of the FPM.

Registry Number	*Scale*	*Year*	*Platform*	*Relative Location*
H11371	20000	2005	NOAA Ship *Rainier*	SE
H11317	10000	2004	NOAA Ship *Rainier*	S
H11316	20000	2004	NOAA Ship *Rainier*	SW
H10828	10000	1999	Pacific Hydrographic Party	E

Progress Reports:

Email monthly progress reports in accordance with section 5.2.2.2.1 of the FPM to progress.sketches@noaa.gov with a copy to the chief of the assigned Processing Branch. The submittal is due within 5 days after the end of each month.

Survey Outlines:

Generate a survey outline in accordance with the HSSD, section 8.1.2. Submit survey outlines to survey.outlines@noaa.gov.

Horizontal Control Requirements:

Comply with the horizontal control requirements in section 3 of the HSSD.

Vertical Control Requirements:

Comply with the vertical control requirements in section 4 of the HSSD.

Discrete Zoning

Comply with the requirements from CO-OPS which are included with the project data from the Operations Branch. Submit surveys with final approved water levels applied. Contact the Operations Branch if this causes the survey to miss a submission deadline.

VDatum

Please refer to Appendix 1 attached to this document for ERS vertical specific deliverables. Vertical control will either be the CO-OPS provided model or VDATUM, and will officially be decided on upon delivery of interim deliverable products, as per Appendix 1. The uncertainties contained in the table below are reported at the 1-sigma confidence level.

VDatum Version	Geoid	Area	Area Version	Separation Uncertainty
3.2	2012	Washington - Juan de Fuca Strait	2	14.0 centimeters

NWLON Gauges

Operating Water Level Station	*Station ID*
Friday Harbor	9449880
Port Townsend	9444900

Orthometric Imagery:

No Orthometric Imagery has been provided for this project.

Shoreline and Nearshore Features:

Conduct a limited shoreline verification using the composite source file (CSF). All other submerged or visible cultural features inside the limit of survey shall be verified. All features with attribute asgnmt populated with 'Assigned' shall be addressed even if they are inshore of NALL. For reference, prior survey features are provided in S57 format. See section 3.5.5.2.2 of the FPM.

User Contacts

The following primary offices and persons shall be contacted at or near the beginning and end of the field operations to discuss survey objectives and accomplishment (Mandatory) or are listed for contact at the discretion of the Commanding Officer (Reference).

NOAA Navigation Manager, Northwest Region
Crescent Moegling
NOAA
Phone: 206-526-6840
Fax: 206-526-4514
Email: crescent.moegling@noaa.gov
Obligation: Mandatory

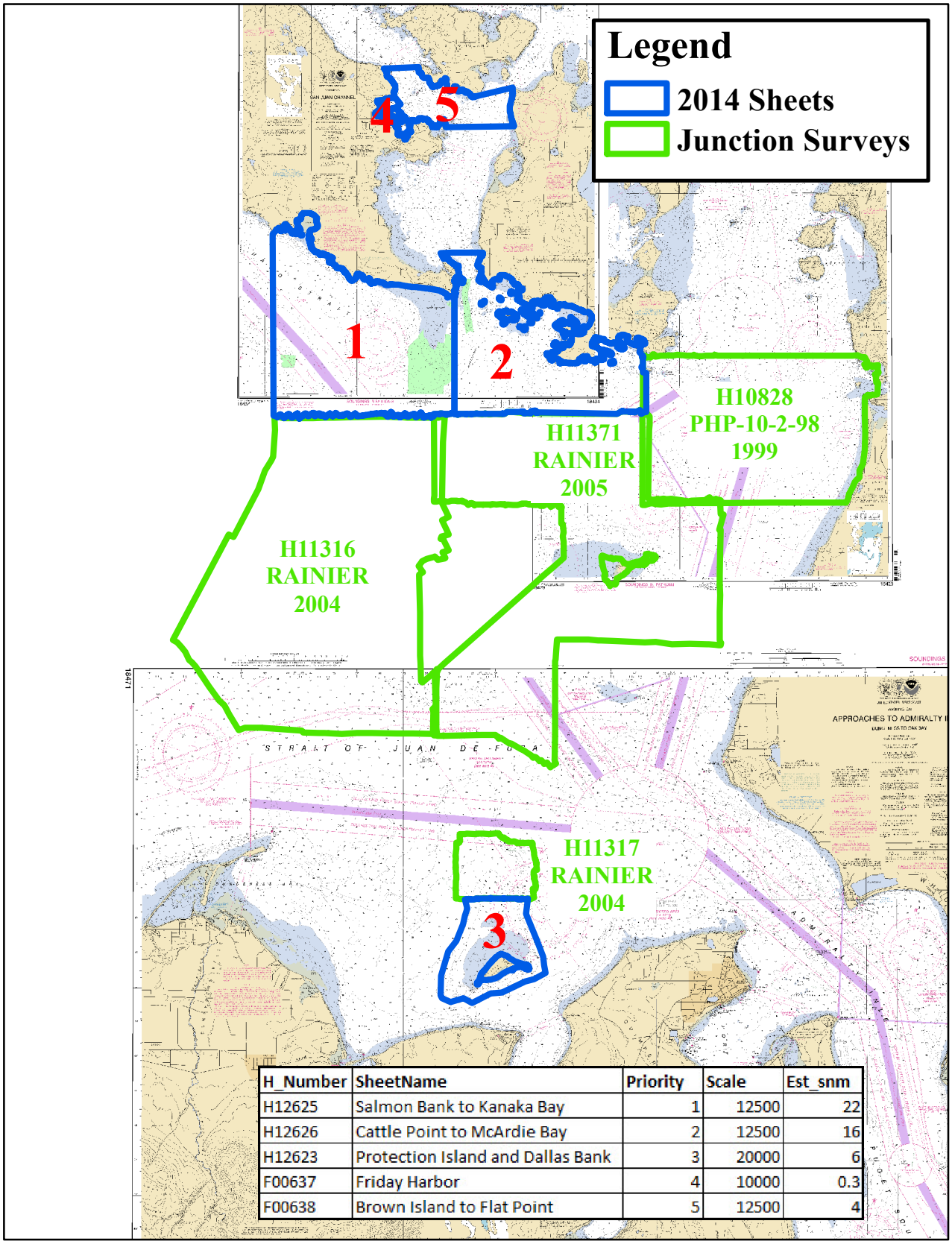
U.S. Coast Guard District Commander, District 13
Steven Fischer
Thirteenth U.S. Coast Guard District
Phone: 206-220-7282
Fax:
Email: Steven.M.Fischer3@uscg.mil
Obligation: Mandatory

Washington State Archaeologist
Rob Whitlam
Department of Archaeology and Historic Preservation
Phone: 360-586-3080
Fax:
Email: Rob.whitlam@dahp.wa.gov
Obligation: For Reference

President Puget Sound Pilots
Captain Jonathan Ward
Puget Sound Pilots
Phone: 206-728-6400
Fax:
Email: President@pspilots.org
Obligation: For Reference

OPR-N305-FA-14
Strait of Juan de Fuca, WA
Sheet Layout
03/06/2014

Actual SNM: 49
Critical Area SNM: 44



H_Number	SheetName	Priority	Scale	Est_snm
H12625	Salmon Bank to Kanaka Bay	1	12500	22
H12626	Cattle Point to McArdie Bay	2	12500	16
H12623	Protection Island and Dallas Bank	3	20000	6
F00637	Friday Harbor	4	10000	0.3
F00638	Brown Island to Flat Point	5	12500	4

Appendix I

OPR-N305-FA-14 ERS Test & Evaluation Deliverables

1 DELIVERABLES

Commanding Officer, NOAA Ship *Fairweather* shall provide an analysis of VDatum ERS test and evaluation no greater than 60 days from the completion of data acquisition. Preliminary results to include:

- Recommendation on vertical transformation technique (VDatum ERS or Tidal Package) using crossline data. Compare crossline HIPS PVDL ProcessedDepths, referenced to MLLW reduced via discrete zoning, relative to crossline HIPS PVDL ProcessedDepths, referenced to MLLW reduced via VDatum (Pydro/Post Acquisition Tools/Tool/Caris/Compare Time Series Data).

Upon review of interim deliverables, HSD will determine the final vertical transformation technique to be used to create the final deliverables. For further information on final deliverables refer to the HSSD & FPM.

WATER LEVEL INSTRUCTIONS
OPR-N305-FA-2014 Strait of de Fuca, WA
(02/25/2014 LH)

1.0. TIDES AND WATER LEVELS

1.1. Specifications

Tidal data acquisition, data processing, tidal datum computation and final tidal zoning shall be performed utilizing sound engineering and oceanographic practices as specified in National Ocean Service (NOS) Hydrographic Surveys Specifications and Deliverables (HSSD), dated April, 2013, and OCS Field Procedures Manual (FPM), dated May, 2013. Specifically reference Chapter 4 of the HSSD and Sections 1.5.8, 1.5.9, 2.4.3, and 3.4.2 of the FPM.

1.2. Vertical Datums

The tidal datums for this project are referenced to Chart Datum, Mean Lower Low Water (MLLW) and Mean High Water (MHW). Soundings are referenced to MLLW and heights of overhead obstructions (bridges and cables) are referenced to MHW.

1.2.1. Water Level Data Acquisition Monitoring

The Commanding Officer (or Team Leader) and the Center for Operational Oceanographic Products and Services (CO-OPS) are jointly responsible for ensuring that valid water level data are collected during periods of hydrography. The Commanding Officer (or Team Leader) is required to monitor the pertinent water level data via the CO-OPS Web site at http://tidesandcurrents.noaa.gov/hydro.shtml, or through regular communications with CO-OPS/Oceanographic Division (OD) personnel before and during operations. During traditional non duty hours, the Commanding Officer/Team Leader may contact the Continuous Operational Real-Time Monitoring System (CORMS) watch stander who is available 24 hours/day - 7 days/week for assistance in assessing the status of applicable water level station operation. The CORMS watch stander may be contacted either by phone at 301-713-2540 or by Email: CORMS@noaa.gov. Problems or concerns regarding the acquisition of valid water level data identified by the Commanding Officer/Team Leader shall be communicated with CO-OPS/OD (nos.coops.hpt@noaa.gov) to coordinate the appropriate course of action to be taken such as gauge repair and/or developing contingency plans for hydrographic survey operations. In addition, CO-OPS is required to coordinate with the Commanding Officer (or Team Leader) before interrupting the acquisition of water level data for the NWLON stations mentioned above for any reason during periods of hydrography.

1.2.2. The Hydro Hot List (HHL)

Please contact CO-OPS' Hydrographic Planning Team (HPT) at nos.coops.hpt@noaa.gov and CO-OPS' Operational Engineering Team (OET) at nos.coops.oetteam@noaa.gov at least three business days before survey operations begin, and within 1 business day after survey operations are completed so that the appropriate CO-OPS National Water Level Observation Network (NWLON) control water level station(s), as well as any required subordinate station(s), is/are added to or removed from the CO-OPS Hydro Hotlist (HHL) (http://tidesandcurrents.noaa.gov/hydro). Include start and end survey dates, full project number (e.g. OPR-H355-TJ-10), and control and subordinate station numbers. The notification must be

sent to both teams as OET is responsible for configuring the station in the CO-OPS data base and HPT manages the addition and removal of stations from the HHL.

Station	Station ID	Control or Subordinate	Type (e.g. NWLON, PORTS©, etc)	Comment
Friday Harbor	9449880	Control	NWLON	
Port Townsend	9444900	Control	NWLON	

Table 1: All stations that need to be added to the HHL in support of OPR-N305-FA-2014

It is important to know that the addition of a water level station to the HHL ensures the station is monitored by CORMS and any problems are reported daily. However, platforms should view the HHL each morning of active survey operations and click on the "Plot" to double check that there are no problems with the required stations on that day. If a platform notices problems with data on their survey day of operation, please contact HPT at nos.coops.hpt@noaa.gov, CORMS at CORMS@noaa.gov, and their respective headquarters point of contact at HSD or NSD. Stations on the HHL are given priority for maintenance should a station cease normal operation during scheduled times of hydrography. CO-OPS will notify a field unit within 1 business day if a HHL water level station ceases operation during scheduled times of hydrography. This is in addition to the daily CORMS report that CORMS sends to NOAA field units, if the field unit's e-mail address is added to the CORM's daily e-mail list. To be added to the CORMS daily HHL report, the platform should contact CO-OPS' Data Monitoring and Analysis Team (DMAT) at nos.co-ops.dmat@noaa.gov and request to be added.

If the stations are listed on HHL, then weekly priority processing will occur and, for those water level stations, verified 6-minute water level data will be made available every week on Monday or Tuesday. If Monday happens to be a federal holiday, then the 6-minute verified water level data will be made available on the following Tuesday or Wednesday.

1.3. Tide Reducer Stations

1.3.1. CO-OPS Long Term Water Level Station Operation and Maintenance

The NWLON stations Friday Harbor, WA (9449880) and Port Townsend, WA (9444900), will provide water level reducers for this project. Therefore it is critical that they remain in operation during the survey. See Sections 1.1. and 1.2. concerning responsibilities.

No leveling is required at Friday Harbor, WA (9449880) and Port Townsend, WA (9444900) by NOAA's Fairweather personnel.

CO-OPS/FOD is responsible for the operation and maintenance of all NWLON primary control stations. If a problem is identified at an NWLON primary control station, FOD shall make all reasonable efforts to repair the malfunctioning station. However, CO-OPS may request assistance from the NOAA ship or NRT personnel in the actual repair of the water level station to facilitate a rapid repair. CO-OPS/FOD and the Commanding Officer (or Team Leader) shall maintain the required communications until the repairs to the water level station have been completed.

1.3.2. Subordinate Station Requirements

No subordinate water level stations are required for this project, however, supplemental and/or back-up water level stations may be necessary depending on the complexity of the hydrodynamics and/or the severity of the environmental conditions of the project area. The installation and continuous operation of water level measurement systems (tide gauges) at subordinate station locations is left to the discretion of the Commanding Officer (or Team Leader), subject to the approval of CO-OPS. If the Commanding Officer (or Team Leader) decides to install additional water level stations, then a 30-day minimum of continuous data acquisition is required. For all subordinate stations, data must be collected throughout the entire survey period for which they are applicable, and not less than 30 continuous days. This is necessary to facilitate the computation of an accurate datum reference as per NOS standards.

1.3.3. Tide Component Error Estimation

The estimated tidal error contribution to the total survey error budget in the vicinity of Strait of de Fuca is 0.23 meters at the 95% confidence level, and includes the estimated gauge measurement error, tidal datum computation error, and tidal zoning error. It should be noted that the tidal error component can be significantly greater than stated if a substantial meteorological event or condition should occur during time of hydrography.

1.3.4. GOES Satellite Enabled Subordinate Stations

This section is not applicable for this project.

1.3.5. Benchmark Recovery and GPS Requirements

This section is not applicable for this project.

1.3.6. This section is not applicable for this project.

1.4. Discrete Tidal Zoning

1.4.1. The water level stations at Friday Harbor, WA (9449880) and Port Townsend, WA (9444900) are the reference stations for preliminary tides for hydrography in Strait of de Fuca, WA. The time and height correctors listed below for applicable zones should be applied to the preliminary data at the reference stations during the acquisition and preliminary processing phases of this project. **Preliminary data may be retrieved in one month increments over the Internet from the CO-OPS SOAP web services at http://opendap.co-ops.nos.noaa.gov/axis/text.html.** The Commanding Officer (or Team Leader) must notify CO-OPS/ED personnel immediately of any problems concerning the preliminary tides. Preliminary data are six-minute time series data relative to MLLW in metric units on Greenwich Mean Time. For the time corrections, a negative (-) time correction indicates that the time of tide in that zone is earlier than (before) the preliminary tides at the reference station. A positive (+) time correction indicates that the time of tide in that zone is later than (after) the predicted tides at the reference station. For height corrections, the water level heights **relative to MLLW** at the reference station are multiplied by the range ratio to estimate the water level heights relative to MLLW in the applicable zone.

Zone	Time Corrector(mins)	Range Ratio	Predicted Reference Station
PS84	-66	x0.86	9449880
PS85	-72	x0.89	9449880
PS86	-78	x0.87	9449880
PS91	-36	x0.86	9444900
PS92	-30	x0.87	9444900
PS95	-30	x0.88	9444900
PS98	-66	x0.89	9449880
PS220	-48	x0.90	9449880
PS221	-48	x0.91	9449880
PS222	-48	x0.93	9449880
PS261	-66	x0.90	9449880
PS262	-60	x0.91	9449880
PS262A	-54	x0.93	9449880
PS263	-60	x0.91	9449880
PS264	-54	x0.93	9449880
PS265	-42	x0.93	9449880
PS266	-30	x0.94	9449880
PS270	-6	x0.97	9449880
PS287	0	x1.00	9449880
PS310	-54	x0.89	9449880
PS311	-60	x0.91	9449880
PS312	-54	x0.93	9449880
PS313	-48	x0.95	9449880

1.4.2. Polygon nodes and water level corrections referencing Friday Harbor, WA (9449880) and Port Townsend, WA (9444900) are provided in CARIS® format denoted by a *.zdf extension file name.

NOTE: The tide corrector values referenced to Friday Harbor, WA (9449880) and Port Townsend, WA (9444900) are provided in the zoning file "N305FA2014CORP" for this project and are in the fourth set of correctors designated as TS4. Longitude and latitude coordinates are in decimal degrees. Negative (-) longitude is a MapInfo® representation of West longitude.

"Preliminary" data for the control water level stations, Friday Harbor, WA (9449880) and Port Townsend, WA (9444900), are available in near real-time and verified data will be available on a weekly basis for the previous week. **These water level data may be obtained from the CO-OPS SOAP web services at http://opendap.co-ops.nos.noaa.gov/axis/text.html.**

1.4.3 Zoning Diagram(s)

Zoning diagrams, created in MapInfo® and Adobe PDF, are provided in digital format to assist with the zoning in section 1.4.1.

1.4.4 Final Zoning

Upon completion of project OPR-N305-FA-2014, submit a Pydro generated request for final tides, with times of hydrography abstract and mid/mif tracklines attached. Forward this request to Final.Tides@noaa.gov . Provide the project number, as well as a sheet number, in the subject line of the email.

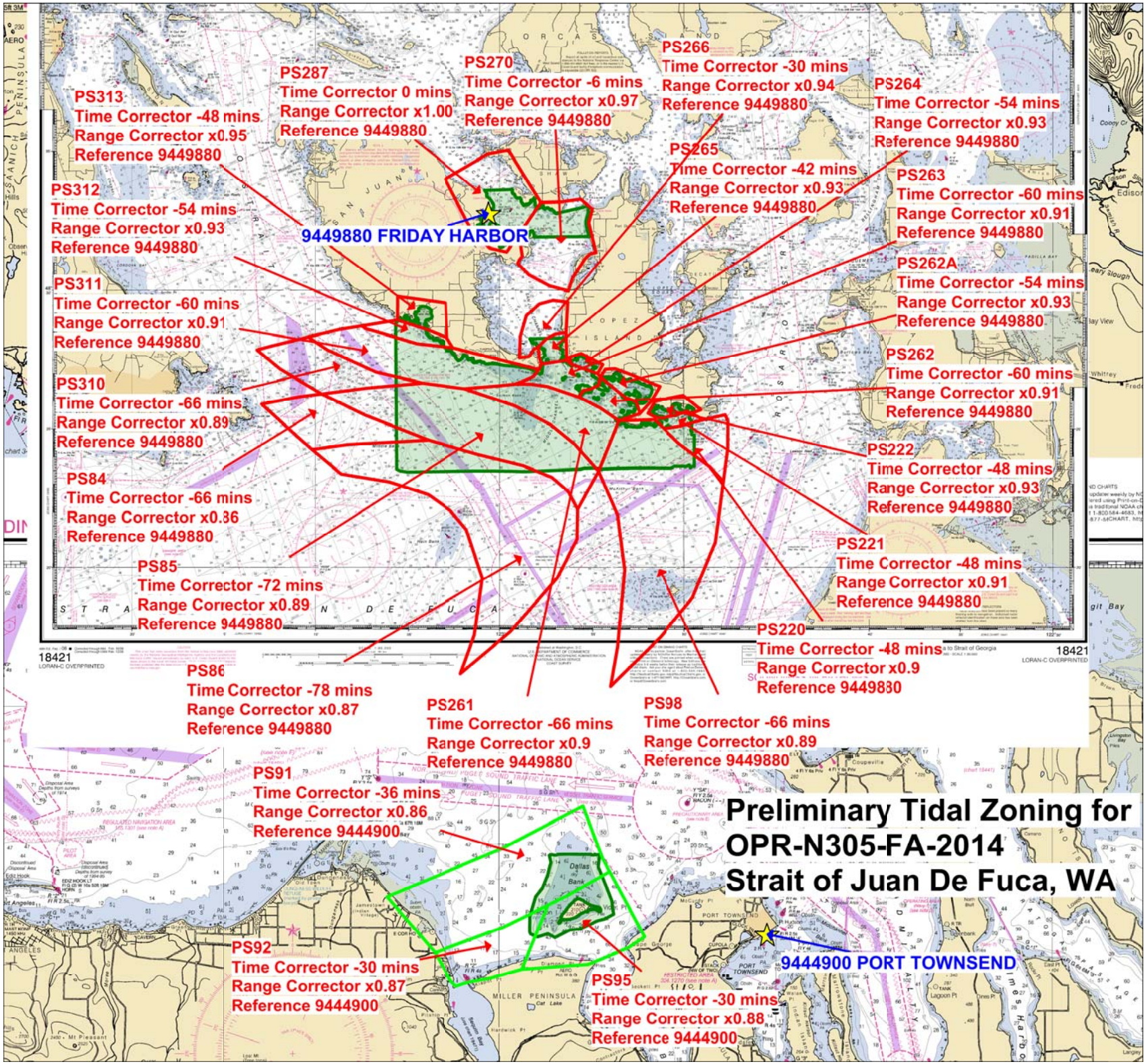
CO-OPS will review the times of hydrography, final tracklines, and six-minute water level data from all applicable water level gauges. After review, CO-OPS will send a notice indicating that the tidal zoning scheme sent with the project instructions has been approved for final zoning. If there are any discrepancies, CO-OPS will make the appropriate adjustments and forward a revised tidal zoning scheme to the field group and project manager for final processing.

1.5 Fetchtides

Preliminary and verified six minute water level time series data may be retrieved from the CO-OPS database via the Fetchtides application. Fetchtides provides a mechanism to store imported data locally and combines multiple days of data into one CARIS readable tide (.tid) file. Fetchtides is available for download at Hydrosoft Online (https://inside.nos.noaa.gov/hydrosoft/hydrosoftware.html. For more information, please see the Fetchtides User Manual in the FPM chapter 3 appendix.

1.6 Water Level Records

This section is not applicable for this project.


PS313
Time Corrector -48 mins
Range Corrector x0.95
Reference 9449880
PS287
Time Corrector 0 mins
Range Corrector x1.00
Reference 9449880
PS270
Time Corrector -6 mins
Range Corrector x0.97
Reference 9449880
PS266
Time Corrector -30 mins
Range Corrector x0.94
Reference 9449880
PS264
Time Corrector -54 mins
Range Corrector x0.93
Reference 9449880
PS265
Time Corrector -42 mins
Range Corrector x0.93
Reference 9449880
PS263
Time Corrector -60 mins
Range Corrector x0.91
Reference 9449880
PS312
Time Corrector -54 mins
Range Corrector x0.93
Reference 9449880
9449880 FRIDAY HARBOR
PS262A
Time Corrector -54 mins
Range Corrector x0.93
Reference 9449880
PS311
Time Corrector -60 mins
Range Corrector x0.91
Reference 9449880
PS262
Time Corrector -60 mins
Range Corrector x0.91
Reference 9449880
PS310
Time Corrector -66 mins
Range Corrector x0.89
Reference 9449880
PS222
Time Corrector -48 mins
Range Corrector x0.93
Reference 9449880
PS84
Time Corrector -66 mins
Range Corrector x0.86
Reference 9449880
PS221
Time Corrector -48 mins
Range Corrector x0.91
Reference 9449880
PS85
Time Corrector -72 mins
Range Corrector x0.89
Reference 9449880
PS220
Time Corrector -48 mins
Range Corrector x0.9
Reference 9449880
PS86
Time Corrector -78 mins
Range Corrector x0.87
Reference 9449880
PS261
Time Corrector -66 mins
Range Corrector x0.9
Reference 9449880
PS98
Time Corrector -66 mins
Range Corrector x0.89
Reference 9449880
PS91
Time Corrector -36 mins
Range Corrector x0.86
Reference 9444900
Preliminary Tidal Zoning for
OPR-N305-FA-2014
Strait of Juan De Fuca, WA
9444900 PORT TOWNSEND
PS92
Time Corrector -30 mins
Range Corrector x0.87
Reference 9444900
PS95
Time Corrector -30 mins
Range Corrector x0.88
Reference 9444900