H11434

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC/LIDAR

Field No. OPR-P183-KRL-05

Registry No. H11434

LOCALITY

State Alaska

General Locality Southwest Alaska Peninsula, Shumagin Islands

Sublocality The Whaleback Andronica Island

2005

CHIEF OF PARTY

Mark Sinclair Darren Stephenson

LIBRARY & ARCHIVES

DATE

HYDROGRAPHIC TITLE SHEET

NOAA FORM 77-28U.S. DEPARTMENT OF COMMERCE (11-72) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION **HYDROGRAPHIC TITLE SHEET**	REGISTRY NO. **H11434**
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. **N/A**

State: Alaska

General Locality: Southwest Alaska Peninsula Shumagin Islands

Sub-Locality: The Whaleback Andronica Island

Scale: 1:10,000 **Date of Survey:** April 29 to August 12, 2005

Instructions dated: April 18, 2005 **Project No:** OPR-P183-KRL-05

Vessel: Tenix LADS Aircraft, VH – LCL

Hydrographer: M.J. Sinclair **Chief of Party:** D.J. Stephenson

Surveyed by: S.R. Ramsay, M.S. Hawkins, T.M. Farrow, J.K. Young, B.C. McWilliam, S.G. Denton, A.P. Reed, J Weick

Soundings taken by echo sounder, hand lead, pole: Laser Airborne Depth Sounder

Graphic record scaled by: V. Sicari and L.R. Chamberlain

Graphic records checked by: S.R. Ramsay and J.G. Guilford

Protracted by: N/A **Automated plot:** HP Design Jet 800PS

Verification by: K. Sampadian, K. Reser

Soundings in: Fathoms at MLLW

REMARKS: Contract # NC-NJ3000-4-00010 01.

Contractor: Tenix LADS Incorporated, 925 Tommy Munro Drive, Suite J, Biloxi, MS 39532.

Sub contractor: John Oswald and Associates, 12001 Audubon Dr, Anchorage, AK 99516.

Times: All times are recorded in UTC.

Purpose: The purpose of this survey is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area. Projection is UTM Zone 4.

DESCRIPTIVE REPORT TO ACCOMPANY

HYDROGRAPHIC SURVEY H11434

SCALE 1:10,000, SURVEYED IN 2005

TENIX LADS AIRCRAFT, VH-LCL

TENIX LADS, INC. (TLI)

MARK SINCLAIR, HYDROGRAPHER

PROJECT
Project Number: OPR-P183-KRL-05 **Original:** DG 133C-03-CQ-0011
Date of Instructions: April 18, 2005 **Task Order:** T0007

Date of Supplemental Instructions: May 7, 2003 email regarding meeting with PHB, NOAA and November 24, 2004 e-mail regarding SOW revision.

Sheet Number: AE
Registry Number: H11434

PURPOSE[1]

To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

A. AREA SURVEYED

The LADS Mk II aircraft operated out of Sand Point Airport from April 29 to August 12, 2005. During this period twenty-four survey sorties were flown under Task Order 7 OPR-P183-KRL-05 Southwest Alaska Peninsula Shumagin Islands, AK. Survey operations covered six smooth sheets. This Descriptive Report describes Sheet AE, which covers The Whaleback and Andronica Island area North West of Nagai Island (see Figure 1).

Environmental factors such as wind strength and direction, cloud cover, high ground and water clarity influenced the area of data acquisition on a daily basis. See section B.2 Quality.

The planned and actual linear miles sounded for the areas are provided at Appendix III. The sheet limits are as follows for Sheet AE:

	Latitude (NAD 83)	Longitude (NAD 83)
NW corner	55°.36756270 N	160°.13338896 W
SE corner	55°.25788532 N	160°.01380892 W

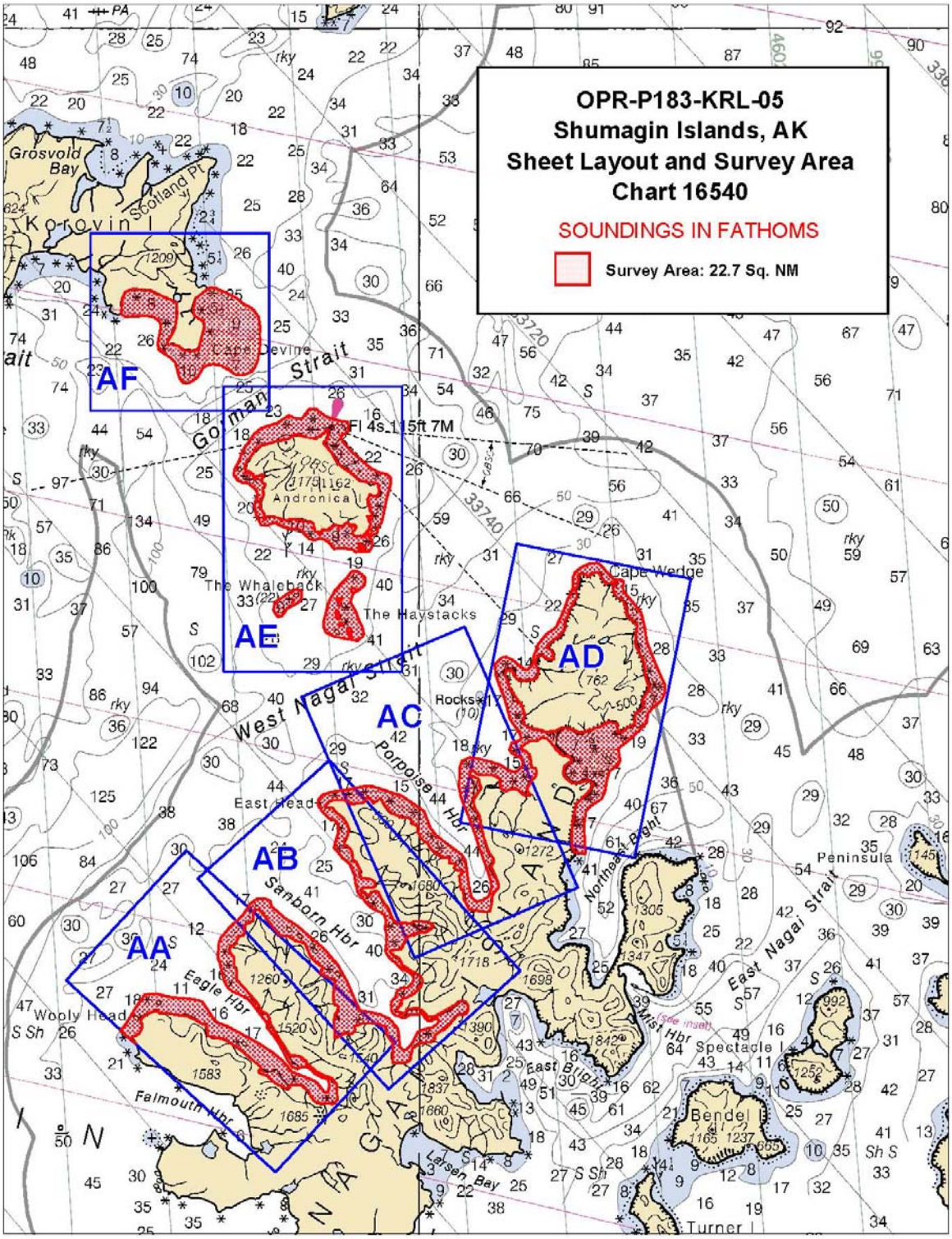


Figure 1 - Survey Area for Task Order 7 OPR-P183-KRL-05

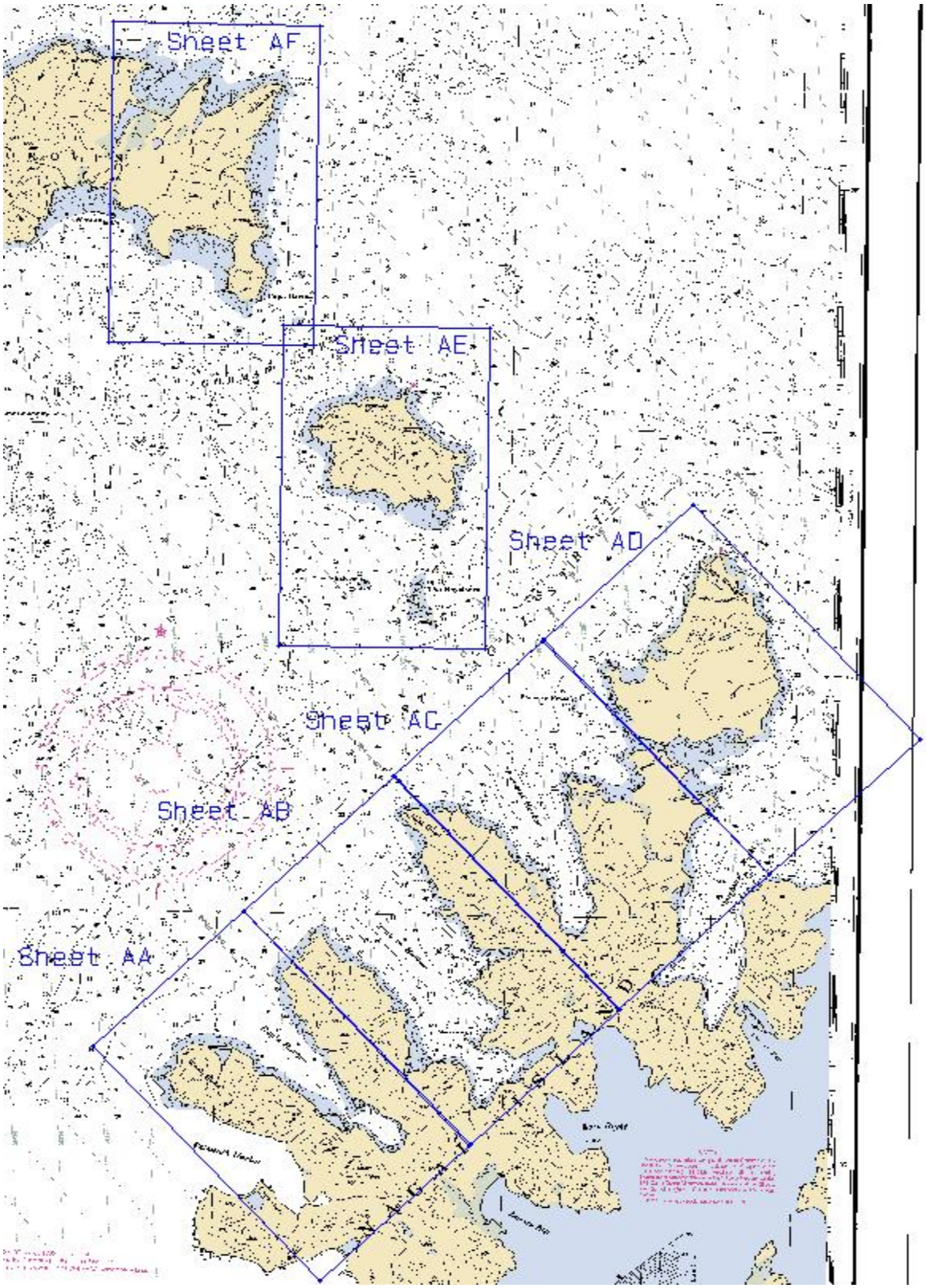


Figure 2 – Amended Sheet limits for Task Order 7 OPR-P183-KRL-05

B. ACQUISITION AND PROCESSING

Refer to the Data Acquisition and Processing Report for a detailed description of the equipment, processing and quality control procedures. A general description and items specific to this survey are discussed in the following sections.

B.1 EQUIPMENT

Data collection was conducted using the LADS Mk II Airborne System, data processing using the LADS Mk II Ground System and data visualization, quality control and final products using Caris HIPS 5.3, GMT/VTK, Terramodel and MicroStation version 8.

A protype Digital Imagery capture system was installed at the commencement of this survey which allowed digital images from the downward looking video to be captured.

B.1.1 Airborne System

The LADS Mk II Airborne System (AS) consists of a Dash 8-200 series aircraft which has a transit speed of 250 knots at altitudes of up to 25,000 feet and an endurance of up to eight hours. Survey operations are conducted from heights between 1,200 and 2,200 feet at ground speeds between 140 and 175 knots. The aircraft is fitted with a Nd: YAG laser which is eye safe in accordance with ANSI Z136.1-2000, American National Standard for Safe Use of Lasers. The laser operates at 900 Hertz from a stabilized platform to provide 5x5 or 4x4 meter laser spot spacing in the main line sounding mode of operation. These two modes of data capture resolution require an over ground aircraft speed of 175 and 140 knots respectively. The electro-mechanical scanner also provides examination modes of sounding with laser spot spacings of 3x3 and 2x2 meters and swath widths of 100 and 50 meters respectively.

Green laser pulses are scanned beneath the aircraft in a rectilinear pattern. The pulses are reflected from the land, sea surface, within the water column and from the seabed. The green returned laser energy is captured by the green receiver and then digitized and logged onto digital linear tape. An infra-red beam is also directed vertically beneath the aircraft. The height of the aircraft is determined by the infra-red laser return, which is supplemented by the inertial height from the Attitude and Heading Reference System and GPS height. The LADS Mk II system can operate by day and night. The depth penetration of the system may be improved at night by removing the daylight filter from the receiving optics. Survey operations may be restricted at night by elevations in or near the survey area, which may invoke civil aviation lowest safe altitude rules. Real-time positioning is obtained by either an Ashtech GG24 GPS receiver providing autonomous GPS. Ashtech Z12 GPS receivers are also provided as part of the Airborne System and Ground Systems to log KGPS data on the aircraft and at a locally established GPS base station.

B.1.2 Ground System

The LADS Mk II Ground System (GS) ‘Forrest’ was used to conduct data processing in the field. Forrest consists of a portable Compaq Alpha ES40 Series 3 processor server with 1 GB

EEC RAM, 764 GB disk space, digital linear tape (DLT) drives and magazines, digital audio tape (DAT) drive, CD ROM drive and is networked to up to 12 Compaq 1.5 GHz PCs and a HP 800ps Design Jet Plotter, printers and QC workstations. Forrest was transported to the deployment site. Quality control checks and editing of the data were also conducted on Ground System Forrest. GS 'Forrest' was destroyed by hurricane Katrina August 29, 2005 and was replaced by GS 'Katrina'.

The GS supports survey planning, data processing, quality control and data export. The GS component also includes a KGPS base station, which provides independent post-processed position and height data. A comprehensive description of the GS is provided in the Data Acquisition and Processing Report.

B.2 QUALITY

B.2.1 Data Density

The survey area was sounded at 4x4 meter laser spot spacing with main lines of sounding spaced at 80 meters, which provided the required 200% coverage.

At the sea surface the footprint of the laser beam is approximately 2.5 meters in diameter. As the beam passes through the water column it slowly diverges due to scattering. It should be noted that at 4x4 meter laser spot spacing there is a gap of between 1 to 1.5 meters between the illuminated area of adjacent soundings at the sea surface. There is a possibility that small objects in shallow water along the coastline may fall between consecutive 4x4 meter soundings and not be detected.

B.2.2 Water Clarity

The water clarity in the survey area was generally good for laser survey, however, it did vary from poor to excellent and this required close management and extra lines to be planned. The maximum lidar depths measured during the survey exceeded 35 meters, although 20-25 meters was the generally achieved depth.

B.2.3 Data Management

The database is identified as follows:

Database Name	General Locality	Sheets
Nagai	Shumagin Islands	AE

A detailed table of databases and line numbers is presented in the Data Acquisition and Processing Report.

B.2.4 Data Acquisition

Survey operations were planned when suitable weather conditions prevailed. The first survey sortie was flown on April 29, 2005. Survey sorties were conducted when there was minimal low cloud in the survey area and this generally occurred if the wind was below 20 knots from

the west to the north. In general the aircraft departed at 1400 hours local time. The final survey sortie was conducted on August 2, 2005.

B.2.5 Sea Conditions - Sea State, Waves, Swell, White Water

The sea state ranged from 1 to 3 throughout the survey and was generally state 2. This did not affect data quality except where significant white water occurred around rocks in exposed areas. White water creates saturated surface pulses; where this occurred the soundings have been edited and the area reflown on a calm day.

Calm seas were experienced on occasions. Under such calm conditions the sea may become glassy which degrades the sea surface model. Long period swell was not significant during the survey and an allowance has been made in the assessment of accuracy.

B.2.6 Kelp

Kelp is one of the factors that increases the complexity of a particular survey area. It is one of the reasons why 200% coverage is recommended in these areas. Kelp reduces the survey coverage achieved by lidar. Kelp also increases the amount of data processing which is required and the amount of boatwork which is recommended in section D.1.3 additional boatwork inside lidar area and D.1.4. chart comparison spreadsheet. Large areas of kelp exist in the survey area.

Kelp areas can be recognized in the data by the following indications:

- Mid water column pulses, frequently with low amplitude and poorly defined leading edges.
- Returns from the seabed are highly attenuated.
- Soundings in shallow water are very sparse.
- Soundings do not correlate with overlapping data from adjacent lines.

The effect of kelp is to limit the penetration of the laser. This reduces the laser coverage of the seabed in kelp areas. Data processing takes much longer in these areas, as more points need to be assessed and reviewed by the surveyors validating, checking, conducting quality control and approving the data.

Kelp areas appear as gaps in the data on the coverage plot. In such areas of partial coverage kelp symbols have been inserted on the smooth sheet.

Rocks detected by the system in kelp areas may be difficult to discriminate as rock or kelp returns. When it is doubtful whether the return is from rock or kelp, a recommendation for additional boatwork is given in section D.1.4 chart comparison spreadsheet.

B.2.7 Nature of the Seabed

The seabed around Andronica Island and is relatively flat to the north and south of the island and more rugged and undulating along the east and west coasts. The Haystacks is quite complex and undulating.

B.2.8 Topography

The LADS Mk II system can measure topographic heights up to 50 meters elevation, subject to the depth / topographic logging window selected. For this survey, a 20 meter topographic height logging window was selected. As a result, the coastline was surveyed and elevations up to 20 meters were measured. Above 20 meters elevation, no coverage has been achieved. On the smooth sheet the height of islets is shown in ( ) and provided in feet above MHW. Maximum heights up to approximately 80 feet are shown as a result of the 20 meter topographic logging window.

B.2.9 Datums

Upon the completion of each flight the GPS data logged on the aircraft and at the base station was processed to determine the post-processed KGPS position and height of the aircraft. This data is used in the calculation of the sea surface datum.

B.2.10 Wind

Survey operations were conducted in wind strengths of up to 20 knots during the survey. In general the wind strength during the time of survey was around 10 knots from the west to northeast. Certain wind directions caused high levels of turbulence, where the wind was coming off high ground. The wind direction also influenced the formation of low cloud and sea fog. Turbulence, low cloud and sea fog influenced the choice of survey area during sortie operations.

B.2.11 Cloud

Low cloud was a significant factor. The wind direction affected the cloud base in the survey area. For example, in southerly or easterly conditions a low cloud base was experienced. The effects of low cloud were managed as follows:

a. Being located in Sand Point allowed close monitoring of the current weather conditions as the survey area was only 45 km north east of Sand Point. Two internet sites proved to be invaluable for forecasting the weather. An aviation site, http://adds.aviationweather.gov/, provided METAR data, actual wind speed and direction, cloud base and satellite cloud data. The observations were updated every 20 minutes. A NOAA weather site, http://pafc.arh.noaa.gov/, provided aviation and general weather.

b. Diversion to the alternate survey area in southeast Alaska under project OPR-0112-KRL-05 occurred during prolonged poor conditions on the Alaska Peninsula.

B.2.12 Effects of High Ground

Survey operations were conducted at 1,800 feet, as high ground was not a significant issue. The proximity of high ground on the Alaska Peninsula caused severe turbulence under certain conditions.

B.2.13 Receiver Gain

Changes in gain levels in the Airborne System automatically accommodate for changes in the sea surface, water column and seabed conditions. In some areas, after long over land passages, low gain levels were initially set on passing back over the water. Where this has been identified in the data these lines were reflown from the opposite direction to improve the coverage.

B.2.14 Raw Laser Waveforms

The raw laser waveform returns from the areas which were covered with kelp are considerably attenuated. In order to detect the seabed in such areas, the threshold in the GS was lowered to detect pulses with low signal-to-noise ratios. This enabled the seabed to be detected but also resulted in increased data validation times. In some areas of kelp the seabed was completely obscured and either no signal was detected (NBD - No Bottom Determined) or noise was detected by the system, in which case an appropriate NBA (No Bottom At) depth was assigned by the hydrographic survey operators during data validation.

B.2.15 Data Processing

The data was processed at the operating site in Sand Point on the return from each sortie. Final validation and checking were conducted at this site and Biloxi, MS. The quality control of the data was done independently in Adelaide, South Australia and the final approval was conducted in Biloxi, MS.

B.2.16 Progress Sketches

Progress sketches were provided to NOAA on a bi-weekly basis, copies of which can be found in Appendix III.

B.3 DATA FORMATS

Data is provided in the following formats:

- Hard copy preliminary smooth sheet. Depths in decimal fathoms and heights in feet.
- Digital preliminary smooth sheet. Produced in MicroStation version 8 and saved as MicroStation version 7 .dgn file. Note contour B-splines have been re-parameterized for compatibility with MicroStation 95 used by NOAA.
- Edited data set. An ASCII file of 3 meter clashed data, which is a subset of all accepted data. Depths are in meters.

- Preliminary smooth sheet data. An ASCII file of all soundings on the smooth sheet. Depths are in meters.
- Caris compatible data. LADS soundings and waveforms, which can be imported into Caris HIPS.
- Accepted mission runs plot.
- Coverage plots and sun illuminated images. Provided in GEOTIFF format.
- Tidal Data provided in ASCII, xls and CSV formats.
- Digital georeferenced image in JPEG, TIFF and ECW formats.

Refer to the Data Acquisition and Processing Report for specific details.

B.4 BENCHMARKS

Depth benchmark areas from the 2003 lidar survey in the Shumagin Islands and Vicinity (H11147 A – I & L – N) were used to check the performance of the LADS Mk II system for the H11434 survey. Five benchmarks were used; two are in Popof Strait and three lie on a line south of Korovin Island. These benchmarks were surveyed to check the LADS Mk II system accuracy.

Center coordinates for the benchmark areas are as follows:

Sand Point Benchmark Line

Benchmark Name	Nominal Depth	Easting (WGS 84)	Northing (WGS 84)
BM_1	14.5 m	404 100	6 135 080
BM_2	5 m	403 087	6 133 148

Korovin Benchmark Line

Benchmark Name	Nominal Depth	Easting (WGS 84)	Northing (WGS 84)
BM_3	4 m	420 620	6 141 390
BM_4	12 m	420 330	6 140 920
BM_5	18 m	420 090	6 140 363

Table 1 – Benchmarks

Either one or both benchmark lines were flown during each sortie. The total number of benchmarks compared during the survey was 58. The tidal model in use for the comparison of benchmarks was the same as the tidal model used to reduce the benchmarks during the 2003 survey. Benchmark comparisons were conducted after the application of tides. Comparison summaries are provided in the Separates.

The LADS data is compared against the gridded benchmark surface in the GS and statistics are generated which include the number of points compared, the mean depth difference

(MDD) and the standard deviation (SD) between the data sets. The benchmark comparison function compares the data against the benchmark surface, and as this data is unedited it may contain noise normally removed during the validation process which is flagged as the shoalest and deepest differences.

B.4.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The benchmarks were flown independently of the database being surveyed at the time. The averages of the mean depth differences and standard deviation for each benchmark run are as follows:

N. Popov Straight Benchmarks

GS ID	BM Name	Nominal Depth	MDD	SD
1	BM_1	14.5 m	0.05 +/- 0.06	0.14 +/- 0.02
2	BM_2	5 m	0.07 +/- 0.04	0.11 +/- 0.01

Korovin Benchmarks

GS ID	BM Name	Nominal Depth	Average MDD	SD
3	BM_3	4 m	-0.05 +/- 0.02	0.25 +/- 0.03
5	BM_4	12 m	0.17 +/- 0.10	0.16 +/- 0.02
5	BM_5	18 m	0.20 +/- 0.07	0.18 +/- 0.04

Table 2 – Benchmark Results

These results are within expected tolerances and show that the LADS Mk II depth performance was within specifications. These results compare well with the 2003 and 2004 surveys and indicate that the LADS Mk II system operated correctly during the survey.

B.5 CROSSLINES

No specific crosslines were planned due to the number of additional lines flown to achieve better coverage around off-lying rocks. These investigation lines were used for the crossline comparisions when deemed appropriate (angle of intersection, data coverage etc.). Areas were selected where the seabed was reasonably flat. This minimizes the apparent differences in depths due to minor positional differences in steeper areas of seabed.

Three crosslines were sounded at 4x4 meter laser spot spacing throughout the survey area as follows:

Line 1445.0.2	14 crossline intersections.	Across the Haystacks and along the east coast of Andronica Island.
Line 1453.0.2	24 crossline intersections.	Across the Haystacks and along the west coast of Andronica Island.

Line 1444.0.1	24 crossline intersections.	Across the north coast of Andronica Island.

B.5.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The averages of the mean depth differences and standard deviation for each crossline are as follows:

Run No.	**Comparisons**	**Mean Confidence**	***Average MDD***	***Average SD***
1445.0.2	29201	5.7	-0.08 +/- 0.10	0.26 +/- 0.10
1453.0.2	51188	5.1	0.02 +/- 0.11	0.33 +/- 0.13
1444.0.1	32486	5.4	0.01 +/- 0.10	0.26 +/- 0.15

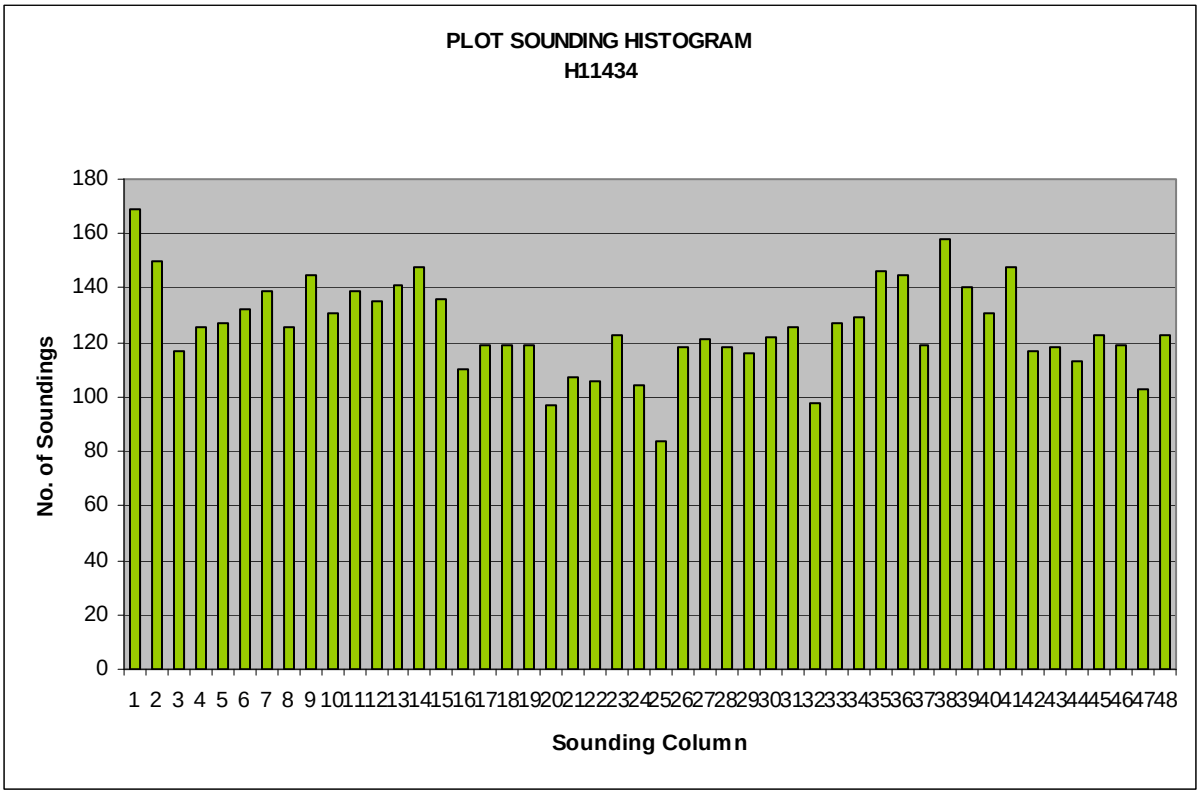
Table 3 – Crossline Comparison Results

Crossline comparison details are provided in Appendix V of the Separates.

All depth comparison results are consistent with IHO Order-1 depth accuracy.

B.6 ANALYSIS OF RESULTS

A sounding histogram has been produced of the column and occurrence of each sounding shown on the smooth sheet. The graph shows that there is no evident scan angle bias in the data.



Graph 1 – Sounding Histogram of Smooth Sheet H11434

B.7 POSITION CHECKS

Two independent positioning systems were used during the survey. Real-time positions were determined by autonomous GPS. A post-processed KGPS position was also determined relative to a local GPS base station that was established on the rooftop of the Popof Pizza Building at the processing facility in Sand Point. The post-processed KGPS positions were applied to each sounding during post-processing.

Position checks were conducted prior to, during and following data collection as follows:

a. DGPS Site Confirmation. A 24-hour certification was conducted of the local GPS base station established at the processing facility on the roof at the Popof Pizza building at Sand Point.

b. Static Position Check. Prior to commencing data collection the coordinates of the aircraft GPS antenna were determined relative to three marks which were surveyed on the tarmac at Sand Point Airport. Data was then logged by each LADS Mk II positioning system enabling the positions to be checked against the known surveyed points. The accuracy of the KGPS solution during the static position check was 0.179 meters (95% confidence). The results and details of the static position check are enclosed in the Vertical and Horizontal Control Report.

c. Dynamic Position Check. During each sortie GPS data was logged on the aircraft and at the local GPS base station. This provided a check between the real-time GPS and post-processed positions. The mean difference between the real-time and post-processed position was 2.333 meters, with an average standard deviation of 0.272 meters. Details are provided in the Vertical and Horizontal Control Report.

d. Navigation Position Check. Navigation checks were also conducted over the local GPS base station on the roof of the processing facility. This enabled the known position of the structure to be checked against the image on the downward looking video. This provided a gross error check of position. The mean error was 1.79 meters with a standard deviation of 7.23 meters. Details are provided in the Separates.

e. Position Confidence. The position quality was also monitored by checking a post-processed position confidence (C3), which is determined from the AS platform error, GPS error and residual errors between the actual GPS positions and aircraft position as determined from the line of best fit. No position anomalies were detected.

The position checks were within the expected tolerances and showed that the positioning systems were functioning correctly.

B.8 CORRECTIONS TO SOUNDINGS

Refer to the Data Acquisition and Processing Report for a description of corrections to soundings, which demonstrates that corrections to the soundings were being applied correctly.

There were no deviations from the corrections described therein.

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the Vertical and Horizontal Control Report for a detailed description of the vertical and horizontal control used during this survey. A summary of vertical and horizontal control for the survey follows.

C.1 VERTICAL CONTROL

Vertical control for the survey was based on the Mean Lower Low Water tidal datum (MLLW). The operating National Water Level Observation Network (NWLON) station at Sand Point, AK (9459450) established vertical control for the LADS depth benchmark areas.

Station details are as follows:

		WGS84	
Gauge	**Location**	**Latitude**	**Longitude**
9459450	Sand Point City Dock	55° 20.2' N	160° 30.1' W

Table 4 – Sand Point and Cushing Bay Tide Gauge

C.2 ZONING

NOAA initially supplied tide zones that cover the extent of the survey, with time and range correctors relative to the Sand Point tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
SWA193A	1	+0 minutes	x1.02	9459450
SWA204A	2	+0 minutes	x1.00	9459450
SWA193	3	-6 minutes	x1.02	9459450
SWA204	4	+0 minutes	x0.98	9459450

Table 5 – Tide Zones

An analysis of crosslines and overlaps of the mainlines of soundings concluded that the preliminary tide zoning was adequate and therefore the preliminary tide zoning correctors have been considered to be the final tide zoning correctors for the survey.

The verified tides were supplied by John Oswald and Associates. The verified tide data was checked against predicted tides to ensure there were no meteorological effects at the tide gauge. The corrected gauge data was smoothed using a fifth order polynomial of five hours length and then supplied to Tenix LADS, Inc. for the application of tides.

For final processing, the time and amplitude correctors were applied to the tidal data delivered by JOA. Soundings were then reduced to MLLW using these corrected tides.

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the Airborne and Ground Systems in World Geodetic System (WGS 84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM (N) in Zone 4, Central Meridian 159° West. All units are in meters. This data was post-processed and all soundings are relative to the North American Datum 1983 (NAD 83).

C.3.1 LADS Local GPS Base Station – Sand Point

Real-time positions were determined using an Ashtech GG24 GPS receiver. A local GPS base station was coordinated by John Oswald and Associates on the roof of the Popof Pizza Building at the processing facility, Sand Point, AK on March 28 - 29, 2004.

The derived NAD83 coordinates for the local GPS base station, are:

NAD 83		**UTM (N) Zone 4**		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
55° 20’ 42.544”	160° 28’ 53.447”	406 048.735	6 134 199.851	72.980

Table 6 – GPS Base Station

Post-processed KGPS positions were determined off-line using data logged at the local GPS base station and on the aircraft. This data was processed through Ashtech PNAV software to calculate both a DGPS and KGPS position solution. The post processed KGPS positions were then imported into the GS and applied to all soundings. This provided increased sounding position accuracy and horizontal redundancy.

The local GPS base station site was checked for obstructions and multipath over a 24 hour period on April 30 and May 1, 2005. The results outlined in the Vertical and Horizontal Control Report reveal that the local GPS base station site is free from site specific problems such as multipath and obstructions.

On April 28, 2005 static position checks of the LADS MkII positioning systems were undertaken using a three-point control network established at the Sand Point Airport. The results outlined in the Vertical and Horizontal Control Report revealed no gross errors and that all positioning systems functioned correctly.

During each sortie, GPS data was logged both on the aircraft and at the local GPS base station, which enabled a post-processed KGPS position solution to be determined. These positions were then compared to the position determined by the real-time positioning system. This dynamic positioning check provided quality control of the positioning systems and the positional differences were within tolerance for the survey. These differences are tabulated in the Vertical and Horizontal Control Report.

Navigation position checks were conducted over the local GPS base station during each sortie when suitable weather conditions prevailed. Following each sortie the logged aircraft position was processed against the downward looking video record to determine the difference in position at the time of overflight. This provided a gross error check on the aircraft positioning.

The tabulated results are presented in the Vertical and Horizontal Control Report and revealed that the positioning systems functioned to within expectations.

D. RESULTS AND RECOMMENDATIONS

Recommendations for charting action for smooth sheet H11434 is provided in sections D.1.1 to D.1.7 below.

In the vicinity of steep coastline some contours on the smooth sheet appear unsupported by the smooth sheet soundings. Particularly around the MLLW depth curve, additional soundings were added from a 15m clashed dataset. The 15m clashed dataset was imported into Microstation Layers "15m_DPT" and "15m_DRY". Where an additional sounding was deemed necessary for the smooth sheet, one would be selected from either the 15m_DPT or 15m_DRY Microstation Layer and placed on the "ADD_DPT" or "ADD_DRY" Microstation Layer respectively. The "ADD_DPT" and "ADD_DRY" Microstation Layers were created in order to track soundings that were added to the smooth sheet from the 15m clash dataset. These are provided in an additional file found with the smooth sheet plot scale clashed data.

D.1 CHART COMPARISON - SMOOTH SHEET H11434 AE

H11434 was compared to:

Preliminary Chart 16553 5th Edition September 2005, at scale 1:80,000. Corrected through NM Sept. 24, 2005. Corrected through LNM Sept. 13, 2005.

This chart was downloaded from the NOAA Office of Coast Survey – NOAA Raster Navigational Charts download website (http://chartmaker.ncd.noaa.gov/mcd/Raster/Index.htm) on April 10, 2006.

Recommendations for charting action are described in section D.1.1 charted depths and features and in the chart comparison spreadsheet under section D.1.4.

D.1.1 Charted Depths and Features

The chart in this area is generally unsurveyed with only the coastline and a number of rocks and islets along the coast portrayed. The area surveyed is represented on the smooth sheet in considerably more detail than is currently shown on the chart. In particular, the position of the coastline, islets and rocks are more accurately portrayed on the smooth sheet.

The following general recommendations are relevant:

a. Coastline. The charted coastline is highly generalized. The surveyed coastline differs from the charted position by up to 40 meters throughout the smooth sheet. It is recommended that the coastline on the chart be amended to match the smooth sheet.

b. Inshore Islets. A large number of islets have been surveyed close to the coastline. Many of these are not shown on the chart, as the charted coastline is highly generalized. It is recommended that the chart be amended to match the smooth sheet. Where significant these islets are detailed in the chart comparison spreadsheet (D.1.4). It should be noted

that new islets are drawn on the smooth sheet in red if they do not currently appear on the chart.

c. Rocks. A number of rocks and drying rocks have been surveyed along the coastline that are not shown on the chart due to the unsurveyed nature of the area. It is recommended that the chart be amended to match the smooth sheet. Where significant, these rocks are detailed in the chart comparison spreadsheet D.1.4.

In addition to the general recommendations above, some 141 significant differences between the chart and the smooth sheet have also been identified. Specific recommendations for these differences are described in the chart comparison spreadsheet. An expanded version of the spreadsheet is included digitally on the survey report CD. The digital .xls version contains information that may be useful for planning of boat sounding and easy to download into other survey packages and has the file name H11434_V1_ChartComp.xls.

The chart comparison was conducted by reviewing the chart, the lidar coverage plot, the digital orthophoto mosaic and the lidar smooth sheet. For each item identified, screen dumps of the Local Area Display and Raw Waveform Display were extracted from the LADS Mk II Ground System. These have been reviewed in order to make the following assessments:

a. Type of Feature
b. Kelp Area
c. Further Examination Recommended
d. Charting Recommendation
e. Remarks

Each chart comparison was categorized as follows:

1. New shoal found
2. Charted shoal disproved / not found

The fields in the chart comparison spreadsheet have been developed from experience learned and feedback received from previous lidar surveys in Alaska, witnessing survey operations in NOAA ship Rainier and from meetings at PHB and UNH. They have been designed for ease of use and to minimize double handling of data and transcription. Continued feedback is welcomed in order to develop these formats in order to achieve further efficiencies in data handling.

D.1.2 AWOIS

No AWOIS were assigned to this Task Order.

D.1.3 Additional Boatwork Inside Lidar Area

A number of significant soundings have been reviewed that were uncertain. For example, some isolated rocks in kelp were detected that were difficult to correctly classify as either rock or kelp. Rocks were also detected in areas that were permanently covered with white water. In circumstances where it was difficult to correctly classify a particular sounding, a recommendation for investigation by boat for 87 uncertain soundings has been made in the chart comparison spreadsheet. An expanded version of the spreadsheet is included digitally on the survey report CD. The digital .xls version contains information that may be useful for planning of boat sounding and is readily downloaded into other survey packages.

D.1.4 Chart Comparison Spreadsheet

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
1	AE1	1				3.51	1.9	55° 16' 42.5021"	160° 5' 8.568"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted 1.8 Rk 190m NW confirmed, 2.4 Rk 75m NE.
2	AE2	2	9	55° 16' 3"	160° 3' 52"	13.69	7.5	55° 16' 1.6074"	160° 3' 51.3517"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 1
3	AE3	1				15.79	8.6	55° 15' 58.3537"	160° 3' 37.4387"	Rk	N	N	Insert	
4	AE4	2	12	55° 15' 58"	160° 3' 23"	17.85	9.7	55° 15' 55.2507"	160° 3' 23.9974"	Rk	N	N	Replace	See Danger to Navigation Report. Item 2
5	AE5	2	Drying Rk	55° 16' 5"	160° 3' 28"	-4.02	(7)	55° 16' 3.3951"	160° 3' 25.3902"	Islet	Y	N	Replace	Note: Charted islet 50m ENE confirmed, -7 drying rock 55m NNW, 3.8 Rk 120m NW.
6	AE6	2	Drying Rk	55° 16' 8"	160° 3' 17"	-5.32	(11)	55° 16' 5.8896"	160° 3' 18.5088"	Islet	Y	N	Replace	Note: Islet 40m NW, cov 1 ft drying rock 100m W, 7.2 Rk 80m E.
7	AE7	1				-0.30	-1	55° 16' 12.5179"	160° 3' 14.5669"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -1 drying rock 25m NW confirmed, 3.5 Rk 90m W, 5.0 Rk 70m S.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
8	AE8	1				4.47	2.4	55° 16' 12.594"	160° 3' 3.4564"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: Charted -5 drying rock 190m ESE confirmed.
9	AE9	1				17.21	9.4	55° 15' 51.567"	160° 2' 38.6042"	Rk	N	N	Insert	
10	AE10	2	Island	55° 16' 16"	160° 3' 7"	-3.52	(5)	55° 16' 17.3854"	160° 3' 2.7353"	Islet	Y	N	Replace	Note: Charted island surveyed as 1 island and 4 separate islets, charted -3 drying rock 105m E confirmed, -8 drying rock 60m W.
11	AE11	2	Drying Rk	55° 16' 18"	160° 2' 46"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
12	AE12	1				-0.42	-2	55° 16' 24.1201"	160° 3' 7.6105"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -2 drying rock 100m N, -0.0 drying rock 115m SSE.
13	AE13	1				7.32	4.0	55° 16' 29.814"	160° 2' 49.5833"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 3
14	AE14	2	5	55° 16' 29"	160° 3' 0"	6.38	3.5	55° 16' 29.4299"	160° 2' 57.7226"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 3.6 Rk 85m N.
15	AE15	1				-12.08	(33)	55° 16' 36.0512"	160° 3' 17.846"	Islet	N	N	Insert	Note: Islet 20m W, many drying rocks in vicinity.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
16	AE16	1				-0.62	-2	55° 16' 27.2858"	160° 3' 26.6617"	DryingRk	Y	Y	N/A	Possible drying rock in kelp.Note: Islet 130m ENE, many drying rocks to E.
17	AE17	1				11.41	6.2	55° 16' 32.3948"	160° 3' 31.0987"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 10.4 Rk 145m WSW. See Danger to Navigation Report. Item 4
18	AE18	1				-0.65	-2	55° 16' 21.8892"	160° 3' 21.564"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -2 drying rock 55m NNE confirmed, -0.0 drying rock 60m E confirmed, 1.3 Rk 70m SW.
19	AE19	2	9	55° 16' 13"	160° 3' 24"	10.92	5.9	55° 16' 15.5895"	160° 3' 24.2206"	Rk	N	N	Replace	Note: 5.7 Rk 70m NNW, 6.2 Rk 140m S.
20	AE20	1				16.41	9.0	55° 16' 18.7426"	160° 3' 36.2901"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 7.6 Rk 65m ESE, 6.9 Rk 105m ESE.
21	AE21	1				19.29	10.5	55° 16' 40.5249"	160° 3' 39.876"	Rk	Y	Y	N/A	Possible Rk in kelp.
22	AE22	2	Drying Rk	55° 16' 42"	160° 3' 15"	-4.53	(8)	55° 16' 41.6665"	160° 3' 13.0527"	Islet	Y	N	Replace	Note: 3 drying rocks to S, 1.9 Rk 115m WSW.
23	AE23	1				7.14	3.9	55° 16' 43.6698"	160° 3' 22.0054"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 6.1 Rk 100m SW.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
24	AE24	1				-1.88	-6	55° 16' 46.8229"	160° 3' 17.0212"	DryingRk	Y	Y	N/A	Possible drying rock in kelp.Note: Charted islet 45m E confirmed, islet 70m SE, -9m drying rock 60m E, 10.9 Rk 160m WNW.
25	AE25	1				-4.66	(9)	55° 16' 50.8845"	160° 3' 15.543"	Islet	N	N	Insert	Note: Islet 45m S, many drying rocks to NE, 1.9 Rk 70m N.
26	AE26	2	Drying Rk	55° 16' 53"	160° 3' 12"	-8.87	(23)	55° 16' 50.982"	160° 3' 9.8838"	Islet	Y	N	Replace	Note: Charted islet 60m ENE confirmed, islet 20m E, 2 drying rocks to SE.
27	AE27	1				-0.53	-2	55° 16' 53.956"	160° 3' 11.5007"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 4.9 Rk 85m N.
28	AE28	2	9	55° 16' 55"	160° 3' 18"	11.74	6.9	55° 16' 54.6438"	160° 3' 19.005"	Rk	Y	Y	N/A	Possible Rk in kelp.
29	AE29	1				13.80	7.5	55° 17' 2.5368"	160° 2' 52.7375"	Rk	Y	Y	N/A	Possible Rk inkelp. Note: 6.8 Rk 85m W. See Danger to Navigation Report. Item 5
30	AE30	1				5.49	3.0	55° 16' 57.9408"	160° 3' 1.9347"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: 6.0 Rk 80m NE.See Danger to Navigation Report. Item 6

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
31	AE31	2	Drying Rk	55° 16' 51"	160° 3' 2"						Y	N	Remove	Not detected by lidar, not observed in downward looking video.
32	AE32	1				-0.76	-3	55° 16' 42.312"	160° 3' 5.7245"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -5 drying rock 75m N confirmed, 7.0 Rk 130m SE.
33	AE33	2	Drying Rk	55° 17' 11"	160° 2' 36"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
34	AE34	2	18	55° 17' 49"	160° 3' 13"	25.29	13.8	55° 17' 50.2543"	160° 3' 13.7607"	Rk	N	N	Replace	
35	AE35	1				-2.82	(3)	55° 17' 57.3534"	160° 2' 9.1698"	Islet	Y	N	Insert	Note: 5 islets to N, NW and W, -9 drying rock 25m S. See Danger to Navigation Report. Item 7
36	AE36	1				18.87	10.3	55° 18' 8.0499"	160° 1' 59.6491"	Rk	N	Y	N/A	Doubtful sounding in deep water.
37	AE37	2	DryingRk	55° 18' 8"	160° 2' 15"						Y	N	Remove	Not detected by lidar, not observed in downward looking video.
38	AE38	1				0.76	cov 2 ft	55° 18' 12.8578"	160° 2' 27.5773"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -1.0 drying rock 195m SW confirmed.

Shoal Categories
1-New Shoal Found
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			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
39	AE39	1				-0.19	-1	55° 18' 13.191"	160° 2' 15.4214"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -3 drying rock 45m NW confirmed, 2.4 Rk 95m SE.
40	AE40	2	Islet	55° 18' 18"	160° 2' 11"	-2.44	-8	55° 18' 16.6066"	160° 2' 11.6292"	Drying Rk	Y	N	Replace	Note: Charted -0.0 drying rock 150m NE, -1.0 drying rock 85m ENE.
41	AE41	1				2.23	1.2	55° 18' 19.711"	160° 1' 59.2833"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted islet 65m NW confirmed, -5 drying rock 40m WNW.
42	AE42	2	Islet	55° 18' 27"	160° 1' 53"	-2.44	-8	55° 18' 25.6465"	160° 1' 53.873"	Drying Rk	Y	N	Replace	Note: Charted -8 drying rock 70m WNW confirmed, charted cov 2 ft drying rock 85m SSW confirmed.
43	AE43	1				0.57	cov 2 ft	55° 18' 23.7131"	160° 1' 50.7182"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.Note: 6.7 Rk 95m NE.
44	AE44	2	Drying Rk	55° 18' 34"	160° 1' 53"	-3.65	(6)	55° 18' 31.9929"	160° 1' 56.6207"	Islet	Y	N	Replace	Note: -5 drying rock 135m N, 8.4 Rk 190m ENE.
45	AE45	2	Islet	55° 18' 43"	160° 1' 57"	-1.88	-6	55° 18' 40.8812"	160° 1' 56.3887"	Drying Rk	Y	N	Replace	Note: Charted -4 drying rock 110m S confirmed.
46	AE46	2	Drying Rk	55° 18' 47"	160° 1' 49"						Y	N	Remove	Not detected by lidar, not observed in downward looking video.

Shoal Categories
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			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
47	AE47	2	14	55° 18' 44"	160° 1' 37"	16.57	9.0	55° 18' 44.357"	160° 1' 41.5863"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 7.7 Rk 90m NW, 9.7 Rk 165m N.
48	AE48	1				-0.30	-1	55° 18' 53.5202"	160° 1' 50.5346"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 2 islets to NNW, -9 drying rock 50m W, -9 drying rock 115m WNW.
49	AE49	1				1.02	0.5	55° 19' 5.9459"	160° 1' 45.6169"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: Charted -1 drying rock 170m WNW confirmed, 2 charted islets to SW surveyed as an extensive drying shelf, 0.7 Rk 90m SW.
50	AE50	1				-1.70	-6	55° 19' 1.2471"	160° 1' 46.6656"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -2 drying rock 70m SE confirmed, -1 drying rock 80m SSW, 8.9 Rk 185m SE.
51	AE51	1				-14.72	(42)	55° 19' 5.7949"	160° 2' 1.0377"	Islet	Y	N	Insert	
52	AE52	2	Drying Rk	55° 19' 9"	160° 1' 45"						Y	N	Remove	Not detected by lidar, not observed in downward looking video.
53	AE53	1				-0.64	-2	55° 19' 12.0694"	160° 1' 35.5035"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.

Shoal Categories
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			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
54	AE54	1				2.14	1.1	55° 19' 13.4247"	160° 1' 30.0904"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted islet to N not detected by lidar, not observed in downward looking video.
55	AE55	1				12.15	6.6	55° 19' 22.6888"	160° 1' 24.0392"	Rk	N	N	Insert	Note: Charted islet 200m WSW confirmed, -4 drying rock 170m WNW confirmed.
56	AE56	1				1.66	0.9	55° 19' 29.9677"	160° 1' 26.4826"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted islet 75m NW confirmed, islet 60m WNW, 2.2 Rk 70m SW, 2.2 Rk 70m SW.
57	AE57	1				-0.98	-3	55° 19' 32.7795"	160° 1' 31.71"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -4 drying rock 50m SE, -3 drying rock 105m SW, -7 drying rock 135m SSW.
58	AE58	2	Drying Rk	55° 19' 37"	160° 1' 37"	2.17	1.2	55° 19' 35.8035"	160° 1' 35.8505"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Ilset 140m SW.
59	AE59	2	Drying Rk	55° 19' 34"	160° 1' 49"	6.30	3.4	55° 19' 36.4792"	160° 1' 50.5696"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -2 drying rock 155m S.

Shoal Categories
1-New Shoal Found
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			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
60	AE60	1				-0.88	-3	55° 19' 37.322"	160° 2' 9.9909"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -2 drying rock 70m ESE, cov 1 ft 90m E, -5 drying rock 210m SE, -4 drying rock 175m W.
61	AE61	1				8.51	4.6	55° 19' 42.601"	160° 2' 13.8902"	Rk	Y	Y	N/A	Possible Rk in kelp.
62	AE62	2	Islet	55° 19' 45"	160° 2' 29"	-1.08	-4	55° 19' 44.7453"	160° 2' 26.8599"	Drying Rk	Y	N	Replace	Note: 6.7 Rk 135m N.
63	AE63	1				-1.19	-4	55° 19' 45.1216"	160° 2' 35.3781"	Drying Rk	Y	N	Insert	Note: Islets and drying rocks along coastline to S and W.
64	AE64	1				-4.05	(7)	55° 19' 50.0457"	160° 2' 47.5111"	Islet	Y	N	Insert	Note: -6 drying rock 125m WNW.
65	AE65	1				6.79	3.7	55° 19' 53.5279"	160° 2' 40.6757"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 10.7 Rk 140m ENE, 7.6 Rk 135m SE.
66	AE66	2	14	55° 19' 56"	160° 2' 28"	18.86	10.3	55° 19' 54.7577"	160° 2' 20.7885"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 8
67	AE67	2	4_3	55° 19' 57"	160° 2' 54"	5.90	3.2	55° 19' 55.4793"	160° 2' 48.9546"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 9
68	AE68	1				-1.16	-4	55° 19' 56.7885"	160° 3' 3.8467"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -4 drying rock 130m SE.

Shoal Categories
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			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
69	AE69	2	Rk	55° 20' 8"	160° 3' 10"	-0.26	-1	55° 20' 6.4685"	160° 3' 10.3521"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 4.6 Rk 105m N.
70	AE70	2	Islet	55° 20' 10"	160° 3' 18"	-2.08	-7	55° 20' 9.0246"	160° 3' 23.5697"	Drying Rk	Y	N	Replace	Note: -5 drying rock 30m S, -3 drying rock 90m W.
71	AE71	1				4.11	2.2	55° 20' 19.9702"	160° 3' 15.7553"	Rk	Y	Y	N/A	Possible Rk in kelp.See Danger to Navigation Report. Item 1O
72	AE72	2	Drying Rk	55° 20' 18"	160° 3' 28"	-5.03	(10)	55° 20' 15.9542"	160° 3' 30.9902"	Islet	Y	N	Replace	Note: Islet 70m NNW, -8 drying rock 30m NW, 1.6 Rk 90m NNE.
73	AE73	1				-0.83	-3	55° 20' 25.1296"	160° 3' 37.6006"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -2 drying rock 30m NE confirmed, cov 1 ft drying rock 170m NW, 2.4 Rk 115m NNE, 1.2 Rk 245m N.
74	AE74	1				3.13	1.7	55° 20' 41.5123"	160° 3' 29.689"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 4 charted islets to E surveyed as 1 large island and 1 off lying islet, -5 drying rock 165m WNW, 3.9 Rk 65m NNW.
75	AE75	1				19.81	10.8	55° 20' 38.741"	160° 2' 57.5668"	Rk	N	Y	N/A	Least depth probably found but need more definition on the feature

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
76	AE76	2	Islet	55° 20' 50"	160° 3' 42"	-0.25	-1	55° 20' 47.883"	160° 3' 43.7712"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 7.6 Rk 55m NE, 10.1 Rk 90m NNW.
77	AE77	2	DryingRk	55° 20' 47"	160° 3' 44"	-4.05	(7)	55° 20' 46.7339"	160° 3' 44.3167"	Islet	Y	N	Replace	Note: Islet 60m ESE.
78	AE78	2	Drying Rk	55° 20' 47"	160° 3' 53"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
79	AE79	2	Islet	55° 20' 44"	160° 3' 59"	-1.96	-7	55° 20' 43.4349"	160° 3' 59.569"	Drying Rk	Y	N	Replace	Note: -3 drying rock 130m ESE.
80	AE80	1				-1.39	-5	55° 20' 40.1556"	160° 4' 7.0707"	Drying Rk	Y	N	Insert	Note: Charted -2 drying rock 65m ESE confirmed, 2 drying rocks to SE.
81	AE81	2	Drying Rk	55° 20' 39"	160° 4' 15"						Y	Y	N/A	Not detected by lidar, not observed in downward looking video.
82	AE82	1				2.06	1.1	55° 20' 44.0167"	160° 4' 23.887"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 2 charted drying rocks to WSW confirmed, 3.3 Rk 110m N.
83	AE83	1				8.71	4.7	55° 20' 52.1968"	160° 4' 28.3626"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 4.5 Rk 70m SE, 3.8 Rk 115m S.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
84	AE84	1				2.48	1.3	55° 20' 54.1393"	160° 4' 22.0838"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: Charted -3 drying rock 85m N confirmed, 1.6 Rk 45m E.
85	AE85	1				19.81	10.8	55° 21' 1.3319"	160° 4' 35.4196"	Rk	N	N	Insert	
86	AE86	1				14.20	7.7	55° 20' 53.5062"	160° 4' 42.3371"	Rk	N	N	Insert	
87	AE87	1				-0.24	-1	55° 20' 39.7294"	160° 5' 2.6326"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 7.8 Rk 165m NW.
88	AE88	2	Drying Rk	55° 20' 53"	160° 5' 15"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
89	AE89	2	Drying Rk	55° 20' 48"	160° 5' 18"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
90	AE90	1				-0.45	-2	55° 20' 32.2093"	160° 5' 44.6555"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -0.0 drying rock 65m confirmed.
91	AE91	1				7.37	4.0	55° 20' 33.763"	160° 6' 13.6269"	Rk	Y	Y	N/A	Possible Rk in kelp.
92	AE92	1				3.62	2.0	55° 20' 26.3099"	160° 6' 48.3204"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: Charted -2 drying rock 390m E confirmed, 7.3 Rk 105m NW.See Danger to Navigation Report. Item 11

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
93	AE93	1				17.78	9.7	55° 20' 28.4678"	160° 6' 58.4796"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 12.6 Rk 195m NE.
94	AE94	1				-0.63	-2	55° 20' 10.4021"	160° 6' 47.7502"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -3 drying rock 120m NE confirmed.
95	AE95	1				-1.23	-4	55° 19' 53.4829"	160° 7' 5.7557"	Drying Rk	Y	N	Insert	Note: Charted -2 drying rock 290m NNE confirmed, charted -1 drying rock 110m N confirmed, 0.6 Rk 65m NW, 1.0 Rk 80m W.
96	AE96	2	Islet	55° 19' 52"	160° 7' 18"	-2.45	-8	55° 19' 50.5666"	160° 7' 19.1716"	Drying Rk	Y	N	Replace	Note: Charted islet 60m S also surveyed as a drying rock.
97	AE97	1				-0.44	-2	55° 19' 49.896"	160° 7' 13.3631"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -1 drying rock 55m E.
98	AE98	2	20	55° 19' 42"	160° 7' 30"	18.93	10.3	55° 19' 40.5242"	160° 7' 27.904"	Rk	N	Y	N/A	
99	AE99	1				11.30	6.2	55° 19' 42.8812"	160° 7' 12.3266"	Rk	Y	Y	N/A	Possible Rk in kelp.Note: Charted -6 drying rock 115m E confirmed, 5.9 Rk 45m SE, 3.0 Rk 95m NE.
100	AE100	1				-0.23	-1	55° 19' 43.8912"	160° 7' 3.6348"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -2 drying rock 50m E confirmed.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
101	AE101	1				2.56	1.4	55° 19' 40.1995"	160° 7' 1.1954"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 1.5 Rk 100m E.
102	AE102	2	Drying Rk	55° 19' 42"	160° 6' 47"					Drying Shelf	Y	Y	N/A	
103	AE103	1				2.12	1.1	55° 19' 33.7867"	160° 6' 38.0906"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -6 drying rock 115m NNE, 0.5 Rk 70m ENE, 6.4 Rk 115m WSW.
104	AE104	1				-1.52	-5	55° 19' 36.766"	160° 6' 43.6225"	Drying Rk	Y	N	Insert	Note: Charted -9 drying rock 75m NE confirmed, -3 drying rock 40m E.
105	AE105	2	3	55° 19' 38"	160° 6' 26"	0.64	cov 2 ft	55° 19' 38.4654"	160° 6' 26.8149"	Slope	Y	Y	N/A	Possible drying rock in kelp.See Danger to Navigation Report. Item 12
106	AE106	2	Drying Rk	55° 19' 31"	160° 6' 21"	1.69	0.9	55° 19' 31.7959"	160° 6' 21.5406"	Rk	Y	Y	N/A	Possible Rk in kelp.
107	AE107	2	14	55° 19' 13"	160° 6' 59"	18.12	9.9	55° 19' 9.5402"	160° 6' 59.7894"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 10.9 Rk 90m NNE.
108	AE108	2	Drying Rk	55° 19' 22"	160° 6' 23"	2.38	1.3	55° 19' 22.4322"	160° 6' 23.4499"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -4 drying rock 210m SSE confirmed.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
109	AE109	1				-0.07	-0	55° 19' 9.4435"	160° 6' 24.088"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Islet 50m SSE.
110	AE110	1				-1.61	-5	55° 19' 3.3396"	160° 6' 28.5402"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted islet 85m NE, charted -5 drying rock 55m NNW confirmed, -1 drying rock 90m SW.
111	AE111	2	Drying Rk	55° 18' 47"	160° 6' 19"	-3.36	(5)	55° 18' 46.0221"	160° 6' 14.9791"	Islet	Y	N	Replace	
112	AE112	1				-0.27	-1	55° 18' 38.4998"	160° 6' 14.4671"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.Note: Charted islet 35m NNE confirmed, 8.2 Rk 110m S.
113	AE113	2	Coast	55° 18' 42"	160° 6' 13"	-8.51	(21)	55° 18' 41.0275"	160° 6' 12.858"	Islet	Y	N	Replace	
114	AE114	1				17.97	9.8	55° 18' 28.4408"	160° 6' 21.1682"	Rk	N	Y	N/A	Possible Rk in kelp. Note: 10.1 Rk 80m NNE. See Danger to Navigation Report. Item 13
115	AE115	1				-3.36	(5)	55° 18' 43.8002"	160° 5' 56.452"	Islet	Y	N	Insert	Note: Islet 60m W, -3 drying rock 75m E, -2 drying rock 125m E.
116	AE116	1				0.48	cov 1 ft	55° 18' 40.528"	160° 5' 39.1586"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted islet 110m ESE confirmed.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
117	AE117	1				16.34	8.9	55° 18' 28.8356"	160° 5' 35.8121"	Rk	Y	Y	N/A	Possible Rk in kelp.
118	AE118	1				-1.59	-5	55° 18' 37.2547"	160° 5' 25.6204"	Drying Rk	Y	N	Insert	Note: Charted -8 drying rock 45m N confirmed, islet 65m NNE.
119	AE119	1				3.23	1.7	55° 18' 32.9156"	160° 5' 24.125"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 14
120	AE120	1				-5.37	(11)	55° 18' 41.5528"	160° 5' 4.2578"	Islet	Y	N	Insert	Note: Islet 60m W.
121	AE121	1				5.07	2.7	55° 18' 34.1238"	160° 4' 49.0572"	Rk	Y	Y	N/A	Possible Rk in kelp.
122	AE122	2	DryingRk	55° 18' 35"	160° 4' 20"	-2.81	(3)	55° 18' 35.9949"	160° 4' 16.9143"	Islet	Y	N	Replace	Note: Islet 115m WNW.
123	AE123	2	Islet	55° 18' 31"	160° 4' 19"	-0.67	-2.0	55° 18' 28.5337"	160° 4' 19.1125"	Drying Rk	Y	N	Replace	Note: Charted drying rock 75m ESE surveyed as drying shelf.
124	AE124	2	Islet	55° 18' 24"	160° 4' 12"	-2.69	-9	55° 18' 24.4608"	160° 4' 11.4659"	Drying Rk	Y	N	Replace	Note: Charted -2 drying rock 185m NW confirmed, charted -3 drying rock 140m SE confirmed.
125	AE125	2	Drying Rk	55° 18' 23"	160° 4' 17"						Y	Y	N/A	Not detected by lidar, not observed in downward looking video.
126	AE126	1				11.85	6.5	55° 18' 19.5099"	160° 4' 38.9109"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 15

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
127	AE127	1				10.17	5.5	55° 18' 12.6759"	160° 4' 14.0593"	Rk	Y	Y	N/A	Possible Rk in kelp. See Danger to Navigation Report. Item 16
128	AE128	1				1.67	0.9	55° 18' 23.0232"	160° 3' 52.1905"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -0.0 drying rock 120m NE.
129	AE129	2	Islet	55° 18' 29"	160° 3' 15"	-2.00	-7	55° 18' 30.5146"	160° 3' 13.0225"	Drying Rk	Y	N	Replace	Note: Charted -6 drying rock 80m SSW confirmed.
130	AE130	2	6	55° 18' 22"	160° 3' 1"	8.55	4.6	55° 18' 22.1529"	160° 3' 0.366"	Rk	N	Y	N/A	Possible RkNote: 6.4 Rk 110m SSW.
131	AE131	2	Islet	55° 18' 30"	160° 2' 55"						Y	N	Remove	Not detected by lidar, not observed in downward looking video. Note: 2 charted drying rocks to W and E surveyed as drying shelves.
132	AE132	1				1.12	0.6	55° 18' 26.8693"	160° 2' 45.2439"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -3 drying rock 150m W confirmed, charted 0.6 Rk 105m NW confirmed.
133	AE133	2	Islet	55° 18' 27"	160° 2' 41"	-1.53	-5	55° 18' 25.777"	160° 2' 40.8356"	Drying Rk	Y	N	Replace	Note: -7 drying rock 110m ENE, -1 drying rock 45m SSE, 1.1 Rk 95m SW.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet / (feet) above MHW)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
134	AE134	1				22.18	12.1	55° 18' 21.5398"	160° 1' 35.5884"	Rk	N	Y	N/A	Possible rock Note: 12.6 Rk 175m SW.
135	AE135	1				25.39	13.9	55° 19' 41.3238"	160° 1' 27.5997"	Rk	N	N	Insert	
136	AE136	1				15.41	8.4	55° 20' 26.3512"	160° 7' 13.6809"	Rk	N	Y	N/A	Sparse lidar coverage in deep water.See Danger to Navigation Report. Item 17
137	AE137	1				-1.73	-6	55° 17' 6.8374"	160° 2' 38.0059"	Drying Rk	Y	N	Insert	Note: -2 drying rock 85m E, -9 drying rock 40m SSW.
138	AE138	1				-0.72	-3	55° 18' 28.3703"	160° 3' 26.2517"	Drying Rk	Y	N	Insert	Note: -1 drying rock 30m SW, -2 drying rock 30m NE.
139	AE139	1				22.84	12.5	55° 18' 43.7552"	160° 1' 30.7852"	Rk	N	Y	N/A	Sparse lidar coverage in deep water.
140	AE140	2	16	55° 20' 59"	160° 2' 1"	18.77	10.2	55° 20' 58.7949"	160° 2' 14.303"	Rk	N	Y	N/A	Sparse lidar coverage in deep water. See Danger to Navigation Report. Item 18
141	AE141	2	28	55° 16' 52"	160° 2' 25"	23.87	13.0	55° 16' 55.6069"	160° 2' 24.5345"	Rk	N	Y	N/A	Sparse lidar coverage in deep water.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

D.1.5 Features Requiring Investigation

During the validation, checking and approving stages of the data processing a spreadsheet of the features was compiled. The list from this spreadsheet was then compared to the chart comparisons and DtoNs reported and their significance evaluated. Some 112 additional soundings were identified for further investigation and are presented in the following table. The full spreadsheet is also provided in Excel format with the digital data (H11434_V1_Features_Inv.xls). Where these areas correlate with a feature listed in the chart comparison spreadsheet, a reference has been made to the shoal number. The kelp areas are described under five general sections:

1. Kelp area observed in video, no detection by system – deep water.
2. Kelp area observed in video, no detection by system within data coverage.
3. Kelp area, some detections, least depth found.
4. Kelp area, some detections, least depth NOT found.
5. No evidence of kelp but poor coverage – least depth NOT found.

All reported features are considered significant for further investigation during boat work and are reported as possible hazards when conducting survey work by boat.

During the approval of the smooth sheet a number of possible small objects were identified on the seabed and these possible features have been assigned the text “Rk” in the category column. These possible features may or may not be kelp related but analysis of the waveform indicates the possibility of a small object.

Sequence No.	**Feature No.**	**Kelp Description Category**	**NAD 83 Latitude (N)** (deg min sec.dd)	**NAD 83 Longitude (W)** (deg min sec.dd)	**Dimension (m)**	**Significance and Chart Comparison Relationship**
1	FAE1	4	55° 19' 40.72"	160° 06' 55.23"	25x25	Seaward edge of kelp, 200m off W coast of Andronica I.
2	FAE2	4	55° 18' 24.14"	160° 04' 24.83"	35x10	200m off S coast of Andronica I.
3	FAE3	4	55° 19' 01.21"	160° 01' 46.82"	80x80	250m off E coast of Andronica I. See AE50
4	FAE4	5	55° 20' 26.30"	160° 07' 13.88"	25x25	750m off NW coast of Andronica I. See AE136
5	FAE5	4	55° 16' 46.79"	160° 05' 16.49"	20x20	180m W of The Whaleback
6	FAE6	5	55° 16' 42.85"	160° 05' 07.49"	30x30	150m SW of The Whaleback See AE1

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
7	FAE7	5	55° 18' 06.85"	160° 02' 00.04"	30x30	200m NE of islets off the SE coast of Andronica I. Note: AE36 40m N.
8	FAE8	4	55° 20' 39.68"	160° 03' 29.91"	80x200	140m off the NE coast of Andronica I. and 100m W of islet. Note: AE74 40m N.
9	FAE9	4	55° 20' 33.90"	160° 05' 44.52"	90x75	200m off the N coast of Andronica I. Note: AE90 30m S
10	FAE10	4	55° 18' 33.90"	160° 04' 47.83"	10x15	200m off S coast of Andronica I. See AE121
11	FAE11	4	55° 20' 47.53"	160° 04' 23.37"	25x30	400m off N coast of Andronica I.
12	FAE12	4	55° 20' 26.50"	160° 06' 47.60"	40x40	350m off NW coast of Andronica I. See AE92
13	FAE13	4	55° 18' 23.65"	160° 01' 50.95"	70x100	200m off SE coast of Andronica I. See AE43
14	FAE14	4	55° 18' 27.04"	160° 02' 45.14"	20x30	In bay, 200m off S coast of Andronica I. See AE132
15	FAE15	2	55° 18' 07.66"	160° 02' 33.46"	10x10	300m off S coast of Andronica I. And 100m NW of islet
16	FAE16	4	55° 18' 20.75"	160° 04' 20.37"	80x70	300m off S coast of Andronica I.
17	FAE17	4	55° 18' 12.62"	160° 04' 13.63"	25x25	350m off S coast of Andronica I. See AE127
18	FAE18	5	55° 16' 40.49"	160° 03' 39.92"	40x40	450m W of The Haystacks See AE21
19	FAE19	5	55° 19' 37.51"	160° 07' 00.36"	10x10	300m off W coast of Andronica I.Note AE101 150m N.
20	FAE20	5	55° 19' 38.30"	160° 07' 30.45"	15x15	600m off W coast of Andronica I. Note: many features to the east
21	FAE21	5	55° 19' 12.42"	160° 06' 58.40"	15x15	650m W of Andronica I., 80m N of AE107
22	FAE22	5	55° 18' 30.88"	160° 06' 19.52"	15x15	350m SW of Andronica I. Note: 70m NE of AE114

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
23	FAE23	4	55° 20' 28.48"	160° 06' 58.50"	15x15	550m off NW coast of Andronica I. See AE93
24	FAE24	4	55° 19' 13.94"	160° 06' 26.00"	15x15	150m off the W coast of Andronica I.
25	FAE25	5	55° 16' 05.45"	160° 03' 50.49"	N/A	750m SW of The Haystacks, 450m W of drying rocks and islets
26	FAE26	4	55° 18' 19.51"	160° 04' 38.94"	40x40	550m off S coast of Andronica I. See AE126
27	FAE27	4	55° 16' 05.10"	160° 03' 31.95"	15x15	450m SW of The Haystacks, 70m W of drying rocks and islets
28	FAE28	5	55° 16' 30.34"	160° 03' 38.23"	N/A	350m W of The Haystacks
29	FAE29	4	55° 16' 31.10"	160° 02' 59.38"	15x15	200m E of The Haystacks
30	FAE30	4	55° 16' 32.21"	160° 02' 57.65"	15x15	250m E of The Haystacks
31	FAE31	Rk	55° 18' 22.15"	160° 03' 00.38"	N/A	200m S of Andronica I. See AE130
32	FAE32	Rk	55° 20' 30.41"	160° 03' 31.99"	N/A	250m E of Andronica I.
33	FAE33	5	55° 18' 08.05"	160° 01' 59.67"	N/A	400m SE of Andronica I., 200m NE of islet See AE36
34	FAE34	4	55° 19' 53.52"	160° 02' 40.67"	15x15	250m NE of Andonica I. See AE65
35	FAE35	4	55° 19' 41.29"	160° 02' 13.96"	15x15	230m NE of Andonica I. Note: AE61 40m N
36	FAE36	5	55° 18' 21.55"	160° 01' 35.58"	N/A	400m SE of Andronica I. See AE134
37	FAE37	5	55° 18' 52.75"	160° 01' 41.66"	N/A	200m E of Andonica I.
38	FAE38	5	55° 18' 53.35"	160° 01' 39.07"	N/A	220m E of Andonica I.
39	FAE39	5	55° 20' 58.80"	160° 02' 14.28"	N/A	1600m NE of Andronica I., 1000m NE of islet.See AE140
40	FAE40	4	55° 20' 50.52"	160° 04' 25.72"	15x15	500m N of Andronica I. In vicinity of AE83 and other features
41	FAE41	4	55° 20' 12.62"	160° 03' 13.29"	15x15	250m NE of Andonica I.
42	FAE42	Rk	55° 20' 02.60"	160° 02' 56.51"	N/A	300m NE of Andonica I.

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
43	FAE43	Rk	55° 19' 48.86"	160° 02' 29.42"	N/A	250m NE of Andonica I.
44	FAE44	Rk	55° 20' 00.18"	160° 02' 49.07"	N/A	250m NE of Andonica I.
45	FAE45	Rk	55° 20' 11.01"	160° 03' 08.26"	N/A	250m NE of Andonica I.
46	FAE46	4	55° 20' 19.97"	160° 03' 15.76"	30x30	300m NE of Andonica I. See AE71 and note possible Rk 50m SW
47	FAE47	5	55° 20' 08.26"	160° 02' 57.23"	N/A	300m NE of Andonica I. Note: possible Rk 30m NW
48	FAE48	Rk	55° 20' 52.77"	160° 04' 09.15"	N/A	500m N of Andronica I., 200m SE of drying rocks
49	FAE49	5	55° 20' 43.06"	160° 05' 29.61"	N/A	400m N of Andronica I.
50	FAE50	Rk	55° 16' 07.72"	160° 03' 13.15"	N/A	200m SW of The Haystacks, 100m NE of drying rocks and islets.
51	FAE51	Rk	55° 16' 49.13"	160° 03' 31.20"	N/A	300m W of The Haystacks
52	FAE52	Rk	55° 16' 52.95"	160° 03' 27.95"	N/A	300m W of The Haystacks
53	FAE53	Rk	55° 16' 56.08"	160° 03' 29.11"	N/A	400m NW of The Haystacks
54	FAE54	5	55° 16' 59.21"	160° 03' 33.62"	N/A	500m NW of The Haystacks
55	FAE55	Rk	55° 18' 18.35"	160° 04' 09.58"	N/A	200m S of Andronica I. See AE130
56	FAE56	Rk	55° 20' 28.69"	160° 06' 52.60"	N/A	500m NW of Anronica I. Note: possible Rk 20m SW
57	FAE57	5	55° 16' 05.70"	160° 03' 55.25"	N/A	800m SW of The Haystacks and 400m W of drying rocks and islets
58	FAE58	5	55° 19' 09.53"	160° 06' 59.80"	N/A	650m W of Anronica I. See AE107
59	FAE59	Rk	55° 16' 04.77"	160° 03' 35.97"	N/A	600m SW of The Haystacks and 100m W of drying rocks and islets
60	FAE60	5	55° 18' 28.44"	160° 06' 21.15"	N/A	400m SW of Andronica I.See AE114
61	FAE61	5	55° 18' 26.54"	160° 06' 23.82"	N/A	430m SW of Andronica I.
62	FAE62	5	55° 16' 00.85"	160° 03' 44.53"	N/A	800m SW of The Haystacks and 400m W of drying rocks and islets
63	FAE63	Rk	55° 18' 36.90"	160° 05' 57.68"	N/A	250m SW of Andronica I.
64	FAE64	Rk	55° 18' 35.68"	160° 06' 00.43"	N/A	280m SW of Andronica I.

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
65	FAE65	Rk	55° 20' 21.23"	160° 06' 51.43"	15x15	280m NW of Andronica I.
66	FAE66	5	55° 19' 40.45"	160° 07' 28.19"	N/A	550m SW of Andronica I. See AE98
67	FAE67	5	55° 19' 42.88"	160° 07' 24.23"	N/A	480m SW of Andronica I.
68	FAE68	5	55° 19' 39.08"	160° 07' 15.84"	N/A	350m SW of Andronica I.
69	FAE69	5	55° 19' 41.55"	160° 07' 18.06"	N/A	350m SW of Andronica I.
70	FAE70	4	55° 20' 43.55"	160° 03' 30.92"	20x20	200m NE of Andronica I., 200m NW of islet. Note: AE74 100m S
71	FAE71	5	55° 20' 32.42"	160° 06' 48.45"	N/A	500m NW of Andronica I.
72	FAE72	4	55° 20' 54.14"	160° 04' 22.07"	20x20	600m N of Andronica I., 80m S of drying Rk. See AE84
73	FAE73	Rk	55° 20' 38.73"	160° 02' 57.58"	N/A	750m NE of Andronica I., 200m SE of islet See AE75
74	FAE74	Rk	55° 16' 01.60"	160° 03' 51.35"	N/A	850m SW of The Haystacks, 400m SW of drying rocks and islets See AE2
75	FAE75	4	55° 16' 18.74"	160° 03' 36.28"	20x20	400m SW of The Haystacks See AE20
76	FAE76	4	55° 16' 47.96"	160° 03' 21.42"	15x15	150m NW of The Haystacks
77	FAE77	Rk	55° 16' 56.11"	160° 03' 17.84"	N/A	150m NW of The Haystacks
78	FAE78	4	55° 16' 57.18"	160° 03' 13.10"	15x15	150m NNW of The Haystacks
79	FAE79	4	55° 16' 53.96"	160° 03' 11.49"	30x30	60m NW of The Haystacks See AE27, many features inshore
80	FAE80	5	55° 15' 59.39"	160° 03' 30.27"	N/A	700m SW of The Haystacks, 100m SW of drying rocks and islets
81	FAE81	Rk	55° 16' 53.64"	160° 02' 56.35"	N/A	150m NE of The Haystacks
82	FAE82	4	55° 16' 56.67"	160° 02' 58.01"	15x15	200m NNE of The Haystacks, Note: AE30 80m NW
83	FAE83	4	55° 17' 01.44"	160° 02' 55.81"	15x15	300m NE of The Haystacks, 150m W of islet

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
84	FAE84	4	55° 17' 02.54"	160° 02' 52.73"	20x20	330m NE of The Haystacks, 120m W of islet See AE29
85	FAE85	N/A	55° 19' 32.10"	160° 01' 28.50"	N/A	170m E of Andronica I.
86	FAE86	5	55° 18' 49.70"	160° 01' 41.92"	N/A	200m E of Andronica I.
87	FAE87	3	55° 16' 39.17"	160° 03' 00.67"	15x15	200m E of The Haystacks
88	FAE88	Rk	55° 16' 10.32"	160° 03' 15.49"	N/A	150m SW of The Haystacks, 50m S of drying rock
89	FAE89	4	55° 16' 27.42"	160° 02' 58.77"	20x20	220m E of The Haystacks
90	FAE90	4	55° 16' 29.82"	160° 02' 49.60"	30x30	350m E of The Haystacks See AE13
91	FAE91	5	55° 16' 30.82"	160° 02' 49.91"	N/A	350m E of The Haystacks Note: AE13 30m S
92	FAE92	5	55° 16' 32.93"	160° 02' 46.00"	N/A	450m E of The Haystacks
93	FAE93	5	55° 16' 55.60"	160° 02' 24.54"	N/A	750m NE of The Haystacks, 250m SE of islet. See AE141
94	FAE94	5	55° 19' 38.48"	160° 07' 17.69"	N/A	350m SW of Andronica I.
95	FAE95	4	55° 19' 56.04"	160° 07' 11.38"	15x15	150m SW of Andronica I.
96	FAE96	5	55° 16' 32.41"	160° 03' 31.09"	15x15	180m W of The Haystacks See AE17
97	FAE97	4	55° 19' 56.95"	160° 07' 07.15"	20x20	200m W of Andronica Island
98	FAE98	5	55° 18' 28.84"	160° 05' 35.79"	N/A	350m S of Andonica Island See AE117
99	FAE99	4	55° 19' 22.51"	160° 06' 23.45"	20x20	150m SW of Andronica I. See AE108
100	FAE100	4	55° 19' 34.33"	160° 06' 36.55"	20x20	150m SW of Andronica I.Note: AE103 20m SW
101	FAE101	4	55° 16' 29.43"	160° 02' 57.75"	20x20	250m E of The Haystacks See AE14
102	FAE102	Rk	55° 16' 54.53"	160° 03' 21.36"	N/A	200m NW of The Haystacks Note AE28 in the vicinity
103	FAE103	5	55° 18' 33.36"	160° 05' 04.27"	N/A	250m S of Andronica Island

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
104	FAE104	5	55° 18' 43.75"	160° 01' 30.77"	N/A	450m E of Andronica I. See AE139
105	FAE105	5	55° 16' 30.22"	160° 05' 45.79"	N/A	850m SW of The Whaleback
106	FAE106	5	55° 21' 08.45"	160° 04' 24.39"	N/A	1000m Nof Andronica I. 550m N of drying Rk
107	FAE107	4	55° 19' 42.88"	160° 06' 59.60"	15x15	100m SW of Andronica I.
108	FAE108	Rk	55° 16' 56.73"	160° 03' 02.21"	N/A	150m NNE of The Haystacks
109	FAE109	Rk	55° 16' 18.90"	160° 03' 18.49"	N/A	150m W of The Haystacks
110	FAE110	N/A	55° 16' 12.52"	160° 03' 26.09"	N/A	300m W of The Haystacks
111	FAE111	N/A	55° 16' 08.64"	160° 03' 22.53"	N/A	300m W of The Haystacks, 100m NW of islet
112	FAE112	N/A	55° 16' 15.08"	160° 03' 14.48"	N/A	80m W of The Haystacks

D.1.6 Aids To Navigation

No Aids to Navigation were seen or detected in the survey area for H11434.

D.1.7 Recommended Overlap With Lidar Data

The smooth sheet H11434 consists of a large number of islands, islets and many kelp covered submerged rocks close to the coast. Heavy kelp is present throughout the smooth sheet especially around Andronica Island and The Haystacks. In general beyond the 3 fathom contour good coverage exists to 15 fathoms with sparse data to 18 fathoms. The recommended overlap by surface vessel is described below. A polygon is also included in the MicroStation file to illustrate the following recommendation and should be consulted when reading the following notes. This polygon is provided as a .dgn file (H11434_v1_Overlap.pzip) and is provided with the digital data in MicroStation version 7 format.

Note: all positions quoted are in NAD 83.

The recommended overlap by surface vessels for smooth sheet H11434 is to seaward of the poly-lines /polygons described as follows:

a)Poly-line H11434_1

This poly-line covers Andronica Island where kelp and many drying rocks exist between the MLLW line and the 3-5 fathom contour resulting in sparse coverage in this region. Good coverage exists in the shallow bays and more sheltered areas. In general beyond the 3-5 fathom contour good coverage exists to 15 fathoms with sparse coverage to 18 fathoms. The

recommended overlap is depicted by the poly-line. In addition, local areas of sparse coverage exists as follows:

- Around 2 drying rocks and islet at 55° 19.8’ N, 160° 07.3’ W
- Deep area at 55° 20.0’ N, 160° 07.3’ W
- Kelp area from 55° 20.2’ N, 160° 06.9’ W and 55° 20.35’ N, 160° 06.8’
- Kelp area at 55° 20.5’ N, 160° 07.0’ W
- Around 2.0Rk at 55° 20.45’ N, 160° 06.8’ W
- Kelp area at 55° 20.45’ N, 160° 06.65’ W
- Around 2ft drying rock at 55° 20.45’ N, 160° 06.45’ W
- Deep area at 55° 20.8’ N, 160° 05.7’ W
- Deep area at 55° 20.7’ N, 160° 05.7’ W
- Around 0ft drying rock at 55° 20.55’ N, 160° 05.75’ W
- Kelp area at 55° 20.7’ N, 160° 04.7’ W
- Around 3ft drying rock at 55° 20.95’ N, 160° 04.35’ W
- Kelp area between Andronica I. and islet at 55° 20.65’ N, 160° 03.5’ W
- Shallowest limit of hydrography along the eastern side of an islet at 55° 20.7’ N, 160° 03.1’ W
- Kelp area at 55° 20.6’ N, 160° 03.5’ W
- Kelp area at 55° 20.5’ N, 160° 03.5’ W
- Around 1.0Rk at 55° 19.6’ N, 160° 01.6’ W
- Within 2fm contour around islet and 2 drying rocks at 55° 19.5’ N, 160° 01.4’ W
- Seaward of 1.1Rk at 55° 19.2’ N, 160° 01.5’ W
- Around 3 drying rocks at 55° 19.0’ N, 160° 01.8’ W
- Kelp area at 55° 18.75’ N, 160° 01.7’ W
- Around kelp area and drying rock at 55° 18.4’ N, 160° 01.85’ W
- Kelp area at 55° 18.2’ N, 160° 02.2’ W
- Around drying rock between Andronica I. and islet at 55° 18.2’ N, 160° 02.45’ W
- Shallowest limit of hydrography along the east and south coast of an islet at 55° 17.9’ N, 160° 02.1’ W
- Around 1ft drying rock at 55° 18.1’ N, 160° 02.6’ W
- Within 2fm contour around islets at 55° 18.05’ N, 160° 02.3’ W
- Around 6.5Rk at 55° 18.3’ N, 160° 04.6’ W
- Deep area at 55° 18.45’ N, 160° 05.1’ W

b)Poly-line H11434_2

This poly-line covers The Haystacks Island where kelp and many drying rocks exist between the MLLW line and the 3-5 fathom contour in places resulting in sparse coverage in this region. Good coverage exists in the shallow bays and more sheltered areas. In general beyond the 5 fathom contour good coverage exists to 15 fathoms with sparse coverage to 18 fathoms. The recommended overlap is depicted by the poly-line. In addition, local areas of sparse coverage exists as follows:

- Shallowest limit of hydrography along the NE, E and S coast of an islet at 55° 17.1’ N, 160° 02.6’ W

- From the MLLW line to the 5fm contour along the east coast of The Haystacks from 55° 16.95’ N, 160° 03.1’ W to 55° 16.3’ N, 160° 03.0’ W
- Shallowest limit of hydrography along the east coast of an islet at 55° 16.1’ N, 160° 02.8’ W
- Deep area at 55° 15.95’ N, 160° 02.9’ W
- Within 2fm contour around 2 drying rocks and 4 islets at 55° 16.1’ N, 160° 03.4’ W
- Around 2 drying rocks at 55° 16.2’ N, 160° 03.25’ W
- Kelp area at 55° 16.3’ N, 160° 03.35’ W
- Kelp area at 55° 16.4’ N, 160° 03.45’ W
- Kelp area at 55° 16.7’ N, 160° 03.3’ W
- Deep area at 55° 17.0’ N, 160° 03.4’ W
- Deep area at 55° 17.05’ N, 160° 03.6’ W

Shoal data also exists seaward of the poly-line in the following locations:

- At 55° 16.0’ N, 160° 03.85’ W
- At 55° 15.9’ N, 160° 03.4’ W

c)Poly-line H11434_3

This poly-line covers The Whaleback. In general good coverage exists to 12 fathoms with sparse coverage to 15 fathoms. The recommended overlap is depicted by the poly-line. In addition, local areas of sparse coverage exists as follows:

- Within the 3fm contour around The Whaleback at 55° 16.8’ N, 160° 05.0’ W
- Around 1.9Rk at 55° 16.7’ N, 160° 05.15’ W
- Deep area at 55° 16.75’ N, 160° 05.2’ W

Shoal and sparse data also exists seaward of the poly-line in the following location:

- At 55° 16.55’ N, 160° 05.75’ W

E. APPROVAL SHEETS

LETTER OF APPROVAL – OPR-P183-KRL-05

This report and the accompanying smooth sheets are respectfully submitted.

Field operations contributing to the accomplishment of this survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and the accompanying smooth sheets have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Report	Submission Date
Descriptive Report – H11434	May 11, 2006

Mark Sinclair
Hydrographer
Tenix LADS Incorporated

Date May 11, 2006

[1] The LIDAR survey referenced in this Descriptive Report has been applied to the multibeam surveys it junctions with. No stand-alone LIDAR information was compiled to either an HCell or an Hdrawing. For information concerning the compilation of LIDAR features and soundings see the Descriptive Report for multibeam survey H11580. LIDAR does not meet IHO object detection requirements. LIDAR was not used to supersede shoaler charted soundings or to disprove charted features.

The Data Acquisition and Processing Report and Horizontal and Vertical Control Report have been filed with the project records.

APPENDIX I – DANGERS TO NAVIGATION –
DTONS Submitted to PHB

1.1.1. Danger to Navigation Report

Hydrographic Survey Registry Number: H11434

State: Alaska

Locality: Shumagin Islands

Sublocality: The Whaleback & Andronica Island

Project Number: OPR-P183-KRL-05

Survey Dates: April - August 2005

Depths are in decimal fathoms and reduced to Mean Lower Low Water using final verified tides. Drying heights are in whole feet. Positions are based on the NAD83 horizontal datum.

Charts Affected

Number	Version	Date	Scale
16553	5th Ed.	09/01/05	1:800,000
16540	12th Ed.	01/01/05	1:300,000

The following items were found during hydrographic survey operations:

No	Feature	Depth (m)	Latitude (N)	Longitude (W)	Remarks
1	Rk on shoal	7.5	55° 16’ 01.60”	160° 03’ 51.35”	Recommend further investigation by boat
2	Rk	9.7	55° 15' 55.27"	160° 03' 23.98"	
3	Rk in kelp	4.0	55° 16' 29.82"	160° 02' 49.60"	Recommend further investigation by boat
4	Rk in kelp	6.2	55° 16' 32.41"	160° 03' 31.09"	Recommend further investigation by boat
5	Rk in kelp	7.5	55° 17' 02.54"	160° 02' 52.73"	Recommend further investigation by boat
6	Rk in kelp	3.0	55° 16' 57.93"	160° 03' 01.96"	Recommend further investigation by boat
7	Islet	(3)	55° 17' 57.36"	160° 02' 09.15"	
8	Rk in kelp	10.3	55° 19' 54.76”	160° 02' 20.78"	Recommend further

No	Feature	Depth (m)	Latitude (N)	Longitude (W)	Remarks
					investigation by boat
9	Rk in kelp	3.2	55° 19' 55.49”	160° 02' 48.95"	Recommend further investigation by boat
10	Rk in kelp	2.2	55° 20' 19.97”	160° 03' 15.76"	Recommend further investigation by boat
11	Rk in kelp	2.0	55° 20' 26.30”	160° 06' 48.33"	Recommend further investigation by boat
12	Drying Rk in kelp	cov 2 ft	55° 19' 38.46”	160° 06' 26.79"	Recommend further investigation by boat
13	Rk in kelp	9.8	55° 19' 38.46”	160° 06' 26.79"	Recommend further investigation by boat
14	Rk in kelp	1.7	55° 18' 32.93”	160° 05' 24.11"	Recommend further investigation by boat
15	Rk in kelp	6.5	55° 18' 19.51”	160° 04' 38.94"	Recommend further investigation by boat
16	Rk in kelp	5.5	55° 18' 12.68”	160° 04' 14.08"	Recommend further investigation by boat
17	Rk	8.4	55° 20' 26.36”	160° 07' 13.71"	Recommend further investigation by boat
18	Rk	10.2	55° 20' 58.80”	160° 02' 14.28"	Recommend further investigation by boat

COMMENTS: Final verified tides have been applied from the Sand Point tide gauge. The shoals were found using LIDAR.

Questions concerning this report should be directed to the Survey Manager, Darren Stephenson, in the Tenix LADS, Inc., Biloxi, MS office at 228 594 6800.

DANGERS TO NAVIGATION – SUBMITTED TO MCD

H11434 Danger to Navigation

Hydrographic Survey Registry Number: H11434

Survey Title: State: Alaska
Locality: Shumagin Islands
Sub-locality: The Whaleback & Andronica Island

Project Number: OPR-P183-KRL-05

Survey Dates: APR-AUG 2005

Depths are reduced to Mean Lower Low Water using verified tides. Positions are based on the NAD83 horizontal datum.

Charts Affected

Number	Version	Date	Scale
16553	5th Ed.	09/01/05	1:800,000
16540	12th Ed.	01/01/05	1:300,000

DANGERS:

Feature	Depth (ft or fms)	Latitude (N)	Longitude (W)
Rock	7 fms 3 ft	55/16/02	160/03/50
Rock	9 fms 4 ft	55/15/55	160/03/25
Rock	4 fms 0 ft	55/16/30	160/02/49
Rock	6 fms 1 ft	55/16/33	160/03/32
Rock	7 fms 3 ft	55/17/02	160/02/53
Rock	3 fms 0 ft	55/16/58	160/03/04
Rock	10 fms 2 ft	55/19/55	160/02/20
Rock	3 fms 1 ft	55/19/56	160/02/49
Rock	2 fms 1 ft	55/20/20	160/03/14
Rock	2 fms 0 ft	55/20/26	160/06/47
Rock	0 fms 2 ft	55/19/39	160/06/25

Feature	Depth (ft or fms)	Latitude (N)	Longitude (W)
Rock	9 fms 5 ft	55/18/28	160/06/22
Rock	1 fms 4 ft	55/18/33	160/05/24
Rock	6 fms 3 ft	55/18/19	160/04/37
Rock	5fms 3 ft	55/18/13	160/04/16
Rock	8 fms 2 ft	55/20/27	160/07/12
Rock	10 fms 1 ft	55/20/59	160/02/13
Islet	3 ft (MHW)	55/17/57	160/02/10

COMMENTS: All features were found using LIDAR. It is recommended that the following statement be charted: "During the recent survey of The Whaleback Andronica Island area, numerous uncharted rocks were located within the 10 fm contour. Please be advised that these rocks are not necessary reflected on the current chart."

Submitted by TENIX/LADS (LIDAR) reviewed by PHB

Submit Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch at *(206) 526-6835*

APPENDIX II – LIST OF GEOGRAPHIC NAMES

Geographical names were not checked during the survey, and no amendments are proposed.

APPENDIX III – PROGRESS SKETCH

FINAL PROGRESS SKETCH

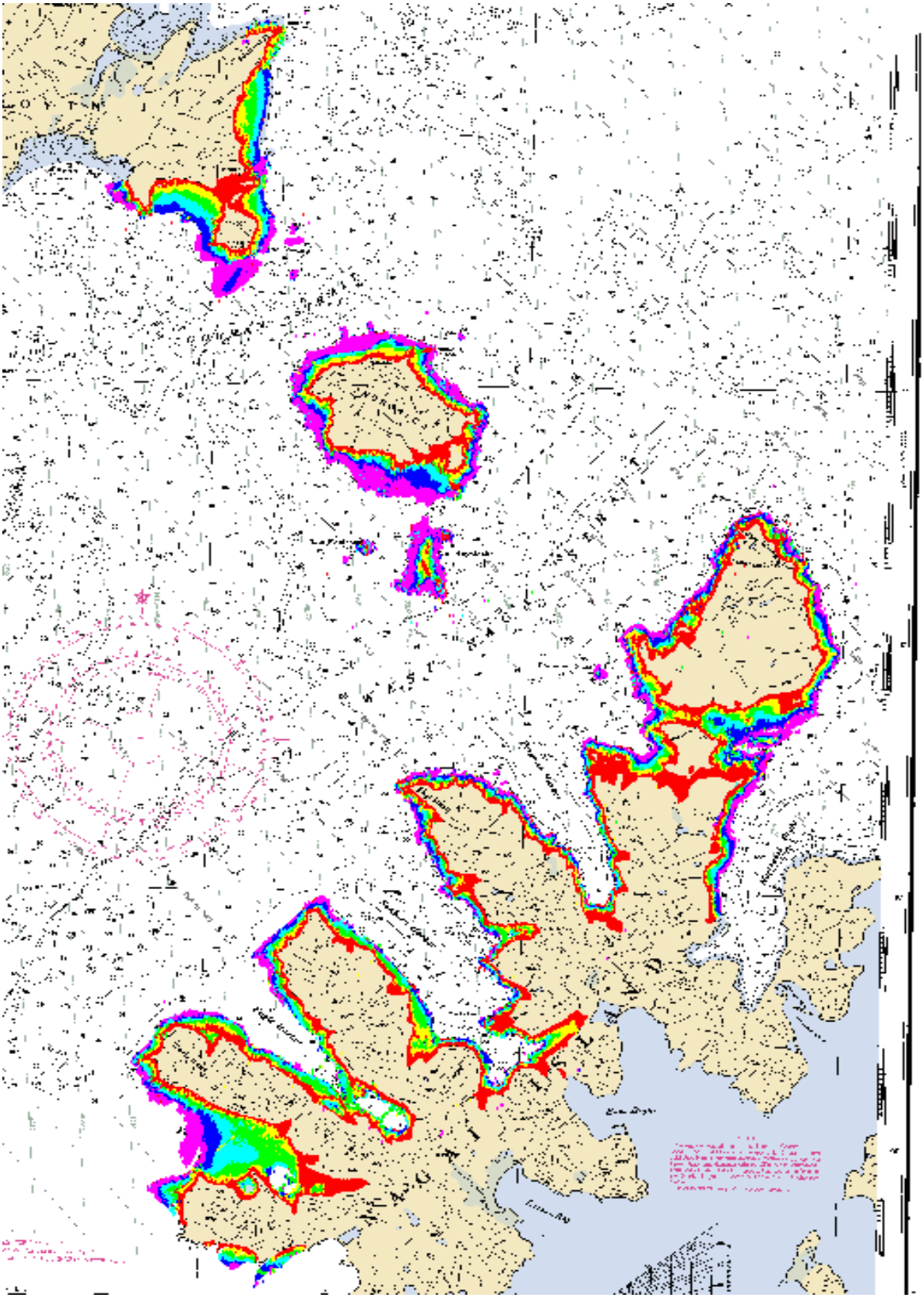
13 August 2005

1.1. OPR-P183-KRL-05 & OPR-P184-KRL-05

Shumagin and Pavlof Islands, AK
Tenix LADS Inc.
Darren Stephenson, Lead Hydrographer

Deployed to the field on April 28, 2005 for survey commencement on April 29, 2005.
This is the status numerically at August 13, 2005 and the chartlet is of July 15, 2005.
Both projects OPR-P183-KRL-05 and OPR-P184-KRL-05 have been combined for ease of reporting.

	April	May	June	July	August	Total	Total Planned	% Complete
Days on project	2	23	26	23	10	84		
Line – nm - flown	250	2907.3	2326.96	2482.0	1370.8	9337.1	6025.5	154.9
Aircraft flown hours	3.2	56.23	51.52	67.65	29.6	208.2		
Aircraft on task hours	2.2	40.61	35.05	43.14	22.9	143.9		
Days with flight	1	9	10	12	5	37	32	115.6
Transit to Sand Point		1	0	0	0	1		
No flight due to weather	1	11	16	11	5	44		
No flight due to water quality		0	0	0	0	0		
No flight due to system		2	0	0	0	2		
Hours lost to weather		3	4	4	0	11		
Hours lost to system		7	4	8	0	19		



APPENDIX IV – TIDES AND WATER LEVELS

Abstract of Times of Hydrography

Start and End times refer to tidal applications requirement.

Time on Task indicates actual time of task in the survey area. All times and dates are in UTC.

05_5Nagai

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
April-29-05	119	5	19:00	00:54	05:54
May-13-05	133	7	01:00	06:54	05:54
May-14-05	134	8	00:00	06:54	06:54
May-16-05	136	9	00:00	00:00	Sortie Not Processed
May-19-05	139	11	20:00	03:54	07:54
May-21-05	141	12	22:00	23:48	01:48
May-22-05	142	13	03:00	05:24	02:24
May-23-05	143	14	21:00	00:48	03:48
May-24-05	144	15	18:30	22:24	03:54
June-03-05	154	16	21:00	23:48	02:48
June-12-05	163	18	21:00	04:54	07:54
June-13-05	164	19	19:30	23:48	04:18
June-16-05	167	20	21:30	04:48	07:18
June-19-05	170	21	18:42	03:00	08:18
June-27-05	178	23	22:30	04:24	05:54
June-28-05	179	24	19:00	02:24	07:24
June-29-05	180	25	21:00	05:24	08:24
July-02-05	183	27	14:00	16:24	02:24
July-07-05	188	30	19:30	04:30	09:00
July-12-05	193	31	22:00	04:54	06:54
July-13-05	194	32	19:00	02:24	07:24
July-14-05	195	33	00:00	00:00	Sortie Not Processed
July-27-05	208	37	22:00	04:54	06:54
July-30-05	211	38	19:00	01:00	06:00
Aug-02-05	214	40	14:00	21:24	07:24
Aug-04-05	216	42	14:00	21:54	07:54
Aug-05-05	217	43	16:00	20:00	04:00

T I D A L D A T U M S

Tidal datums at SAND POINT, POPOF ISLAND based on:

LENGTH OF SERIES: 19 Years
TIME PERIOD: January 1983 - December 2001
TIDAL EPOCH: 1983-2001
CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (12/31/1986) = 3.531
MEAN HIGHER HIGH WATER (MHHW) = 2.204
MEAN HIGH WATER (MHW) = 1.988
MEAN TIDE LEVEL (MTL) = 1.197
MEAN SEA LEVEL (MSL) = 1.181
MEAN LOW WATER (MLW) = 0.406
MEAN LOWER LOW WATER (MLLW) = 0.000
LOWEST OBSERVED WATER LEVEL (11/15/1993) = -1.120

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
9450 R 1991	4.593	2.605
9450 S 1991	4.582	2.594
9450 T 1991	3.836	1.848
9450 U 1991	4.397	2.409
945 9450 SHEET PILE BOLT	4.006	2.018
9450 V 1992	4.180	2.192
9450 W 1992	3.553	1.565
9450 X 1992	3.731	1.743
9450 Y 1997	4.559	2.571
1293-1 1984	3.585	1.598

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

-----Original Message-----
From: Edward J Van Den Ameele [mailto:Edward.J.Vandenameele@noaa.gov]
Sent: Tuesday, May 20, 2003 1:10 AM
To: 'John K Longenecker'; 'Gary Nelson'
Cc: 'John Lowell'
Subject: RE: PHB_visit_7_May_03

See my two comments below; I'm sure John and Gary will have additional comments
-EJ

-----Original Message-----
From: John K Longenecker [mailto:John.K.Longenecker@noaa.gov]
Sent: Monday, May 19, 2003 7:55 AM
To: Gary Nelson
Cc: John Lowell; Edward J Van Den Ameele
Subject: PHB_visit_7_May_03

Could you please review and comment or give concurrence to the following statements or assumptions from the recent meeting at PHB? I will compile the response to Mark. Thanks.

John

Lidar Anywhere Task Order 1 OPR–P183-KR-03

Attendees:

Gary Nelson
Bob Mihailov
Bruce Olmstead
John Lowell
John Longenecker
Edward J Van den Ameele
Mark Sinclair

A meeting was held at Pacific Hydro Branch on 7 May, 2003 at the request of Tenix LADS Inc. The purpose of the meeting was to outline the TLI LADS Mk II survey plan and clarify items in the Statement of Work for Lidar Survey Services.

Summary of items raised:

- The SOW states certain versions of software are to be used. It is acceptable for delivered data to be compatible with the latest versions of Caris and Microstation.

- The requirements for reporting were discussed. 1 HVCR and 1 DAPR are to be provided per Task Order, however each smoothsheet is to have a separate DR which will facilitate standard archiving practices.

- Soundings in kelp were discussed. Sparse soundings in kelp are to be retained in the data set as they provide useful data, even if the coverage in these areas is incomplete. EJ: I believe it was also decided to delineate and denote the extents of kelp areas on the smooth sheet (i.e. with dashed line and "kelp" annotation)

- Automatically generated contours on smooth sheets which are close to gaps in the data, due to kelp or white water, may be placed in the wrong position if they are interpolated form the nearest soundings. In such cases, contours are to be manually edited to reflect the best estimate of the true position of the feature. EJ: This discussion mainly was in reference to the MLLW and MHW lines; and incorrect interpolation of the shoreline from irregularly spaced soundings.

- The requirement to bin the final data set was discussed. A 3 meter clash may be used for the sounding data set in lieu of the 5 meter bin.

- The depiction of drying soundings on the smoothsheet was discussed. Drying soundings shall be at the same density as depths. The datum and units stated in the SOW are to be used.

- 2D Microstation seed files shall be provided to PHB. It was noted that AHB specifies 3D seed files.

- The importance of the correct production of smoothsheets was discussed. Gary Nelson offered to review early drafts and provide feedback. He will also provide an example of a smoothsheet and microstation files.

- EJ advised that for the 2001 survey work, the list of doubtful soundings provided in the DR was very helpful. Such a list shall be provided in the event that doubtful depths are retained in the dataset.

- More information on the interpretation of raw laser waveforms was requested. MJS will plan to visit PHB on his next trip to Alaska and provide a presentation on waveform interpretation.

Prepared by Mark Sinclair
Project Director
Tenix LADS Inc
14 May 03

APPENDIX VI – AWOIS

No AWOIS were assigned to this task order.

APPROVAL SHEET
H11434

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

Katie J. Reser

Katie Reser
2009.09.25
11:16:09 -07'00'

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 disproval 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.

Gary C. Nelson

Gary C. Nelson
2009.09.25
14:27:39 -07'00'

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.

Gary C. Nelson

Gary C. Nelson
for Capt. Neander
2009.09.25 14:28:12
-07'00'

David Scharff

Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS, ou=NOAA, email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check complete
Date: 2009.10.14 09:18:25 -04'00'