



# F/V SCANDIES ROSE

## Search and Survey Report

February 25, 2020



F/V SCANDIES ROSE – February 11, 2020

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## **1 Introduction**

The F/V SCANDIES ROSE capsized and sank in heavy weather on the night of January 31, 2019. Global Diving & Salvage, Inc. was engaged by the vessels owners and interested underwriters to conduct a sonar search to locate the vessel and to conduct a subsea survey of the vessel utilizing a Remotely Operated Vehicle (ROV).

## **2 Background**

Global was engaged by the owners on January 30, 2020. A subcontract for the multibeam sonar and subsea navigation was put into place with eTrac, Inc. Necessary equipment was mobilized to Kodiak by Global and eTrac where it was staged for deployment ashore pending a favorable weather forecast.

Global identified the M/V ENDURANCE, a 207' ice class towing vessel based in Kodiak, as the appropriate vessel to serve as the operations platform. The sturdy ENDURANCE allowed Global to safely complete the operations in the challenging location, weather and sea conditions. A charter agreement was negotiated with Paradigm Marine, Inc. for the M/V ENDURANCE. On January 31 Global dispatched a Salvage Master to Kodiak who berthed onboard ENDURANCE to monitor the weather and sea condition forecasts. To ensure the best forecasting Global engaged the National Oceanic and Atmospheric Administration to provide a detailed daily spot forecast for the location of the casualty. Equipment and personnel were on standby pending weather.

On February 5 Global determined the outlook for favorable weather and sea conditions was suitable for operations. Crew and equipment were mobilized onto ENDURANCE. Paradigm completed fabrication and installation of the hydrographic pole. ENDURANCE sailed from Kodiak the morning of February 9 and arrived on location in the early morning hours of the 10<sup>th</sup> and commenced search and survey operations.

Global had been provided a range of potential locations of the SCANDIES ROSE. Sources included AIS data provided by the Alaska Maritime Prevention & Response Network, tracking data provided by the vessels owners, US Coast Guard investigators and depth sounder indications and coordinates obtained by a passing fishing vessel. These locations were plotted and used as the baseline for the search. The SCANDIES ROSE was located immediately and imaged by sonar. The sonar resolution was impacted by the water depth, vibration and the copious crab pot buoys and lines suspended above the vessel. The hydrographic report is attached.



### 3 Vessel of Opportunity - M/V ENDURANCE

The Kodiak based M/V ENDURANCE is owned and operated by Paradigm Marine, a company staffed with seasoned mariners with extensive local knowledge of winter operations in the area of Sutwik Island. ENDURANCE worked closely with Global to develop the operational plan and monitor conditions. On location the vessels crew worked seamlessly with Global to conduct the search and survey operation safely.



Figure 1: M/V ENDURANCE at her Kodiak berth

#### GENERAL DETAILS:

**Vessel Type:** ETV/Anchor Handling Supply Tug  
**Port Of Registry:** Valdez, AK  
**Flag:** USA  
**Official #:** 589291  
**Call Sign:** WDK3877  
**Builder:** Campbell Industries  
**Class:** ABS A1 Towing Service, Ice Class

#### VESSEL PARTICULARS:

**OA:** 207'/63.1M  
**Beam:** 40'/12.2M  
**Depth:** 17'/5.2 M  
**Draft:** 16' 9" Max/5.1M  
**Tonnage:** GRT 299.65/Net 203.00  
**Displacement at Load Line:** 2158 Long Tons  
**Deadweight:** 906 Long Tons  
**Deck Space:** 118 x 32 Ft





#### 4 Remotely Operated Vehicle (ROV)

Global utilized the SAAB Seaeye Falcon Remotely Operated Vehicle for the survey. The SAAB Seaeye Falcon is an inspection-class vehicle rated for depths up to 330 meters. Lightweight yet powerful, the Falcon is an exceptionally efficient, versatile machine. The Falcon is small enough to be deployed and retrieved by hand and transported in a pick-up. Global's Falcon is fitted with single-beam scanning sonar and supports a number of other sonar options, additional sensors and tooling add-ons. The Falcon's high-resolution fixed-focus camera is fitted to a platform that can be tilted up to 90-degrees

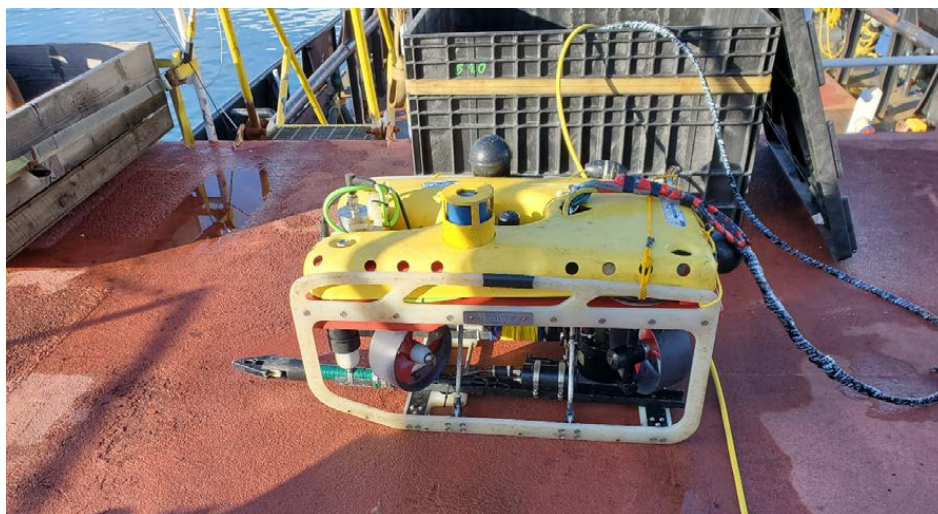


Figure 2: SAAB SeaEye Falcon ROV



Figure 3: ROV Pilot testing the ROV Sonar and camera systems



## 5 Surface / Subsea Navigation System

Maneuvering the Falcon ROV in the vicinity of the SCANDIES ROSE required precise real time location for the ENDURANCE and the ROV. Precision Differential Global Positioning System equipment was temporarily installed onboard ENDURANCE. Sensors and associated equipment were mounted to a hydrographic survey pole that was mounted on the port side of the ENDURANCE. Location pingers were attached to the ROV and the clump weight to provide a 3 dimensional surface/subsea navigation capability for the survey.

### 5.1 Hydrographic Pole

The ENDURANCE was outfitted with a hydrographic survey pole that was used to support all of the electronic components that were required to be submerged in the sea below the hull of the ENDURANCE.

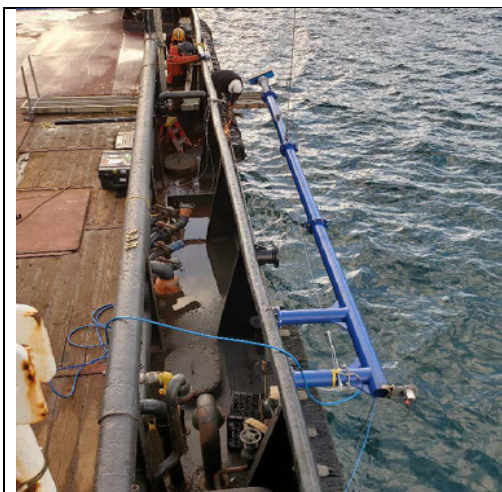


Figure 4: Crew deploying hydrographic pole after installation of the multibeam sonar head. The pole is stored in this position during transit.

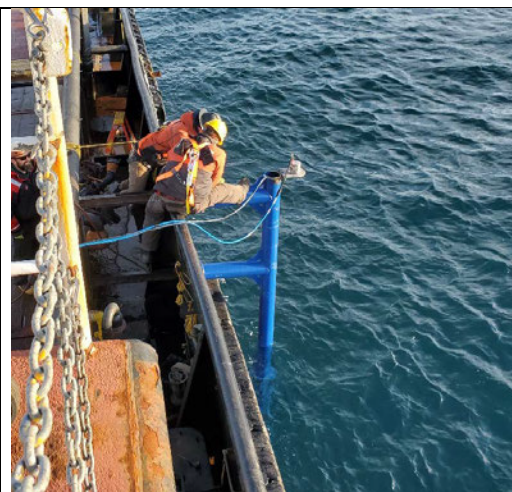


Figure 5: Hydrographic pole deployed and being secured into the vertical position



## 5.2 Surface Positioning System

A POS MV OceanMaster V5 was used to provide accurate attitude, heading, heave position and velocity data for the survey vessel ENDURANCE. The POS MV OceanMaster blends GNSS data with angular rate and acceleration data from an IMU and heading from the GNSS Azimuth Measurement Subsystem (GAMS) to produce a robust and accurate full six degrees-of-freedom position and orientation solution.



**Specification Details:** Position Accuracy, Horizontal: +/- (10mm + 1 ppm x baseline length) Position Accuracy, Vertical: +/- (20mm + 1 ppm x baseline length) Roll and Pitch Accuracy: 0.03° Post processed to 0.015° Heading Accuracy: 0.03° Heave Accuracy: 5cm

## 5.3 Sound Velocity

Sound velocity profiles were obtained during the survey to adjust the computation of data due to speed of sound variation in the water column. Sound velocity profiles were acquired using an AML Base X



**Specification Details:** Depth Range: up to 100 meters Sound Velocity Range: 1375 to 1625 m/s Sound Velocity Precision (+/-): 0.006 m/s Sound Velocity Accuracy (+/-): 0.025 m/s, Sound Velocity Resolution: 0.001 m/s Pressure Range: Up to 6000 dBarUSBL

## 5.4 Subsea Positioning System

The High Precision Acoustic Positioning System on board ENDURANCE was the Kongsberg HiPAP 351P. The HiPAP 351P provided precise location of transponders attached to the ROV and clumpweight.

**Specification Details:** Range: up to 5000 meters Beam Angle: 160 degrees Diameter: 345mm. Beam Angle Accuracy: 0.18 degrees @ 20dB Number of Active Elements: 46



## 5.5 Transponders

The Mini SSBL Transponder (MST) used in conjunction with the HiPAP system was the MST 324 seen below in Figure 5.

**Specification Details:** Length/Weight/Diameter: 368mm/2.7kg/76mm Transducer Beam: +/- 45 degrees. Depth Rating: 4000m Source Level: 197dB Buoyancy: 4kg





## 6 Findings of the Survey

### 6.1 Fuel

Upon arrival in the vicinity of the SCANDIES ROSE the crew observed the sheen of diesel fuel rising to the surface and extending with the current approximately  $\frac{1}{4}$  mile. This discharge was observed throughout the time spent on the location. At one point during the ROV survey fuel bubbles were observed at the front of the house but no point of origin could be determined due to debris and entanglement hazards.



Figure 6: Diesel fuel on the surface

### 6.2 Multibeam Sonar Survey

The complete hydrographic report from eTrac is attached.

### 6.3 ROV Survey

The hydrographic pole was reconfigured for ADCP and USBL operations to support the positioning of the ENDURANCE on the surface and the subsea position of the ROV and 500# clump weight which were fitted with acoustic pinger locator beacons.

The Falcon ROV was deployed twice, once on February 11 and again on February 13. Unedited video recordings of both dives have been provided separately.

Tidal currents in the area were constant and variable with observed currents speeds of 2.0 - 0.5 knots. No slack tide was observed while on location.

Following are screen captures from the ROV surveys. Note the date and time stamps on the images to view the video.





Figure 7: First image of SCANDIES ROSE





Figure 8: Crab pots, a tethered life ring and random lines extend upward from SCANDIES ROSE to within 40' of the surface



Figure 9: A man door located at the starboard stern of the accommodation suffered damage.







Figure 10: The EPIRB bracket was located on the port rail aft of the wheel house door.



Figure 11: Port side forward main deck door is damaged





Figure 12: Dislodged crab pots are piled on the sea floor



Figure 13: Foremast lies on the seafloor



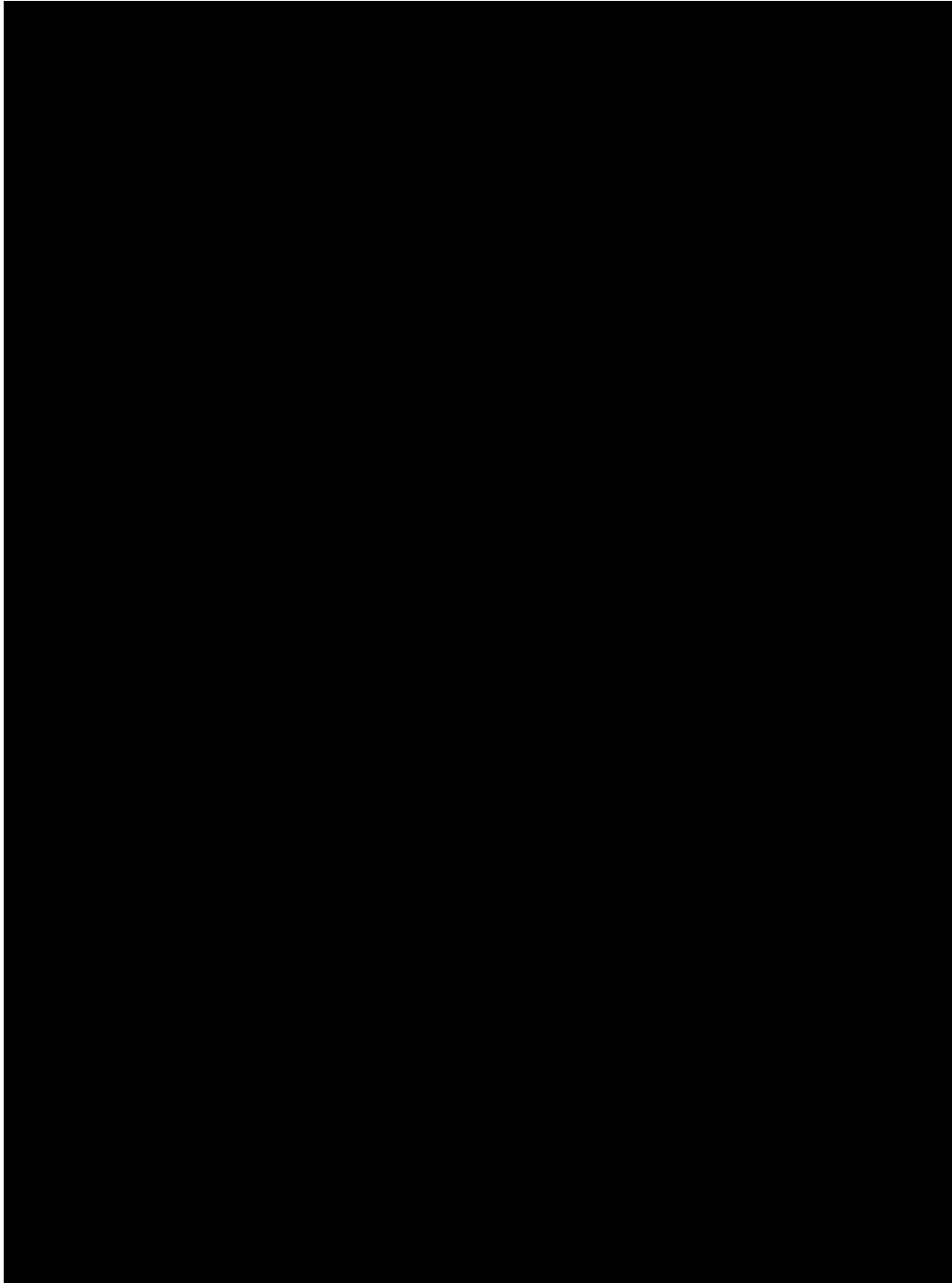




Figure 14: Starboard side shell impacting the seafloor and crushed debris precluded inspection of the starboard area of concern.

## 7 Victims

During the survey Global identified two orange survival suits inside the vessel. The suits appear to contain the remains of individuals.







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## eTrac Summary Report





## Global Diving & Salvage Scandies Rose Location and Imaging Survey

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## 1. EXECUTIVE SUMMARY

eTrac, Inc. completed a multibeam bathymetric survey of the F/V Scandies Rose that sank in the waters off Sutwick Island ~130 miles west of Kodiak, AK for Global Diving & Salvage. Bathymetric survey data was collected using the Paradigm owned and operated vessel *Endurance*. The Scandies Rose was found on the morning of February 10, 2020 and successfully imaged in depths ranging from -141ft to -167ft NAVD88.



Horizontal Datum and Projection is NAD83 (2011) 2010.00, AK SPC Zone 06 (U.S. Survey Feet). Vertical Datum is NAVD88. Geoid 12B was used for height corrections.

A continuously operating RTK Base Station "AB13" operated by UNAVCO at Chignik Harbor, was used to post-process the multibeam data.

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## 2. ABBREVIATIONS

°	Degree(s)
°F	Degree(s) Fahrenheit
3D	ThreeDimensional
CMR(+)	CompactMeasurementRecord
CORS	Continuously Operating ReferenceStation
Ft	Feet
GLONASS	Global NavigationSatelliteSystem (Russia's version of GPS)
GNSS	Global NavigationSatelliteSystem
GPS	Global PositioningSystem
Hz	Hertz
IHO	InternationalHydrographicOrganization
LiDAR	Light Detection andRanging
MBES	Multibeam EchosounderSystem
MLLW	Mean Lower LowWater
NAD83	North AmericanDatum of1983
NAVD88	North AmericanVerticalDatum of1988
NOAA	National OceanicAtmosphericAdministration
OPUS	Online Positioning UserService
POSMV	Position and OrientationSystem for MarineVessels
PPK	Post ProcessedKinematic
QA	QualityAssurance
QC	QualityControl
QPS	Quality PositioningSystems
RTK	RealTimeKinematic
SBET	SmoothedBestEstimate ofTrajectory
SV	SoundVelocity
TLS	Terrestrial LaserScanning
USM	UniversalSonarMount

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### 3. INTRODUCTION

The F/V Scandies Rose sank on December 31, 2019 approximately 3 miles south of Sutwick Island, AK (Figure 1). eTrac was tasked to find the Scandies Rose via multibeam sonar and provide positioning guidance for an ROV survey of the vessel.

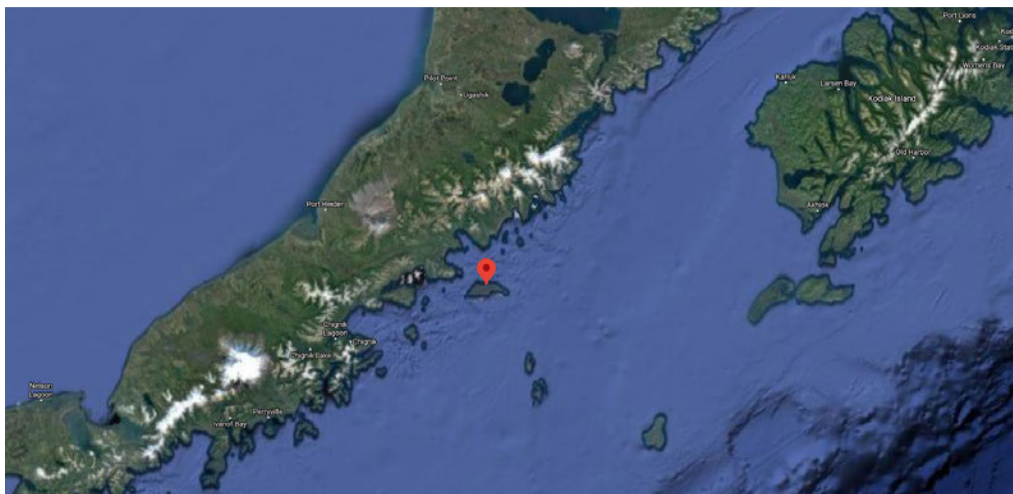






Figure 1 Project Location

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### ***a. Objectives***

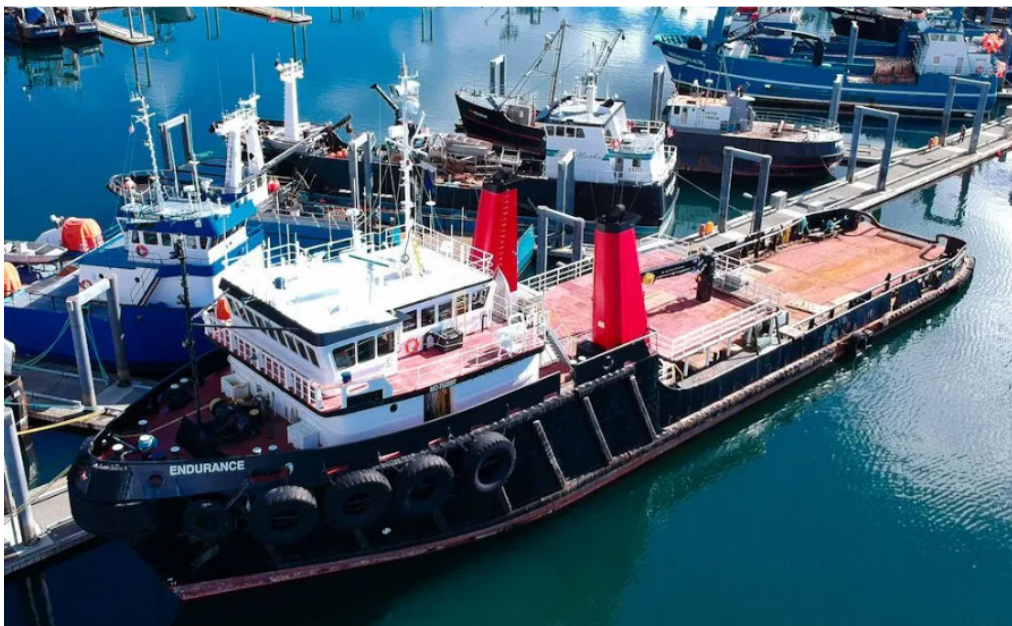
Objectives associated with the Scandies Rose survey are outlined below:

- Conduct a Multibeam Bathymetric Survey to locate the Scandies Rose. Once the vessel was found, collect extra data to attempt to assist in understanding of why it sank.
- Use a High Precision Acoustic Positioning (HiPAP) 351P to navigate an ROV to the vessel once the Scandies Rose was found.
- Use an Acoustic Doppler Current Profiler (ADCP) to monitor current flow under the Endurance to aid in positioning itself during the ROV survey of the Scandies Rose

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### ***b. Mobilization***



The Paradigm Marine owned and operated vessel *Endurance* (Figure 2) was used for the survey. *Endurance* is a 207ft ocean going tug home ported in Kodiak, AK. eTrac personnel mobilized an R2Sonic 2024 Multibeam Echosounder, an Applanix POSMV Wavemaster V5, an AML Base X SVP, an HiPAP 351P, and an ADCP on *Endurance* three days before it left Kodiak.



**Figure 2 Endurance**

To mount the R2Sonic 2024 sonar, HiPAP 352 and ADCP on *Endurance*, the crew had a custom sonar arm fabricated (Figure 3 *Endurance* Sensor Mount)



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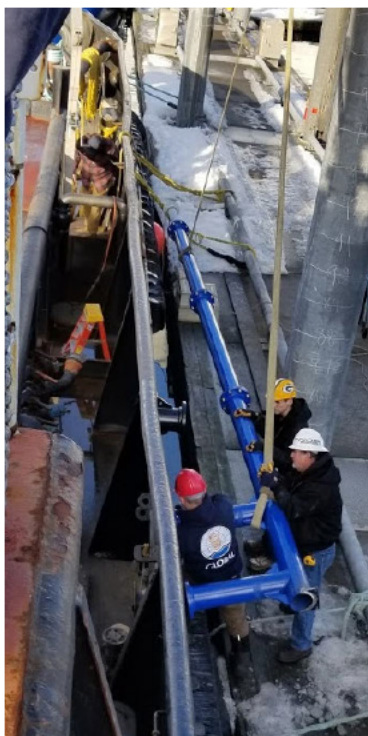


Figure 3 Endurance Sensor Mount



Figure 4 R2Sonic 2024 Multibeam Echosounder System





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Figure 5 HiPAP (inboard) & ADCP (outboard) mounted on Endurance

### c. Geodesy

All data was collected in reference to NAD83 (2011), State Plane, Alaska Zone 6, U.S. Survey Feet. A continuously operating RTK Base Station designated “AB13” operated by UNAVCO near Chignik Harbor was used to post process the multibeam survey data. Geoid 12B was used for height correction.

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## 4. HYDROGRAPHIC SURVEY

### *a. Methods & Procedures*

Multibeam data was acquired on February 10, 2020. All multibeam data and positioning of the vessel data was acquired in QINSy software. Vessel positioning data was logged in POSView software. Sound velocity casts were collected to account for change throughout the water column at varying depths; casts were also taken every 2 hours to account for potential influencing environmental factors. Sound velocity was also measured and monitored at the sonar head to account for rapid changes and aid in beam forming for precise depth measurements.

### *b. Data Processing & Calibration*

#### *i. Patch Test*

A patch test calibration quantifies and adjusts for misalignment angles between the multibeam sonar and the IMU. During the survey, specific planned lines were run to account for Roll, Pitch, and Yaw misalignment values.

Based on this patch test, each of the three misalignment angles can be isolated and corrected in post processing. An example of a pre and post patch test calibration can be seen below in Figure 6 and Figure 7.

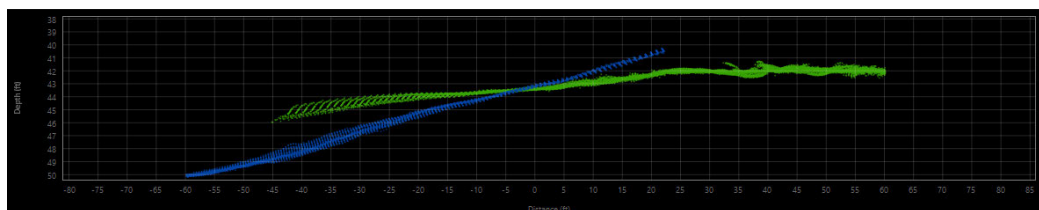


Figure 6 Pre-Patch Test Roll Calibration

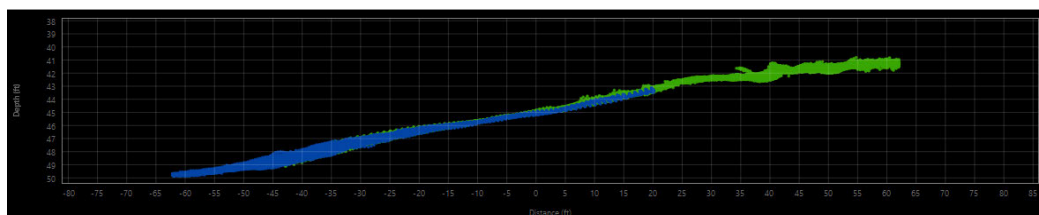




Figure 7 Post-Patch Test Roll Calibration

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## ii. Vessel Position Data

Position data was post-processed in Applanix POSPac MMS Inertial Processing Software using both the vessel data file and receiver file (RINEX). This allowed for the creation of a more accurate and robust Smoothed Best Estimate of Trajectory (SBET) solution which was applied to the Multibeam data for positioning corrections and horizontal and vertical control throughout the duration of the surveys. Prior to applying corrections, the SBET was analyzed for errors as seen below in Figure 8. After the data was analyzed for errors, the full motion and position solution of the SBET was applied to the MBES data to maximize overall accuracy.

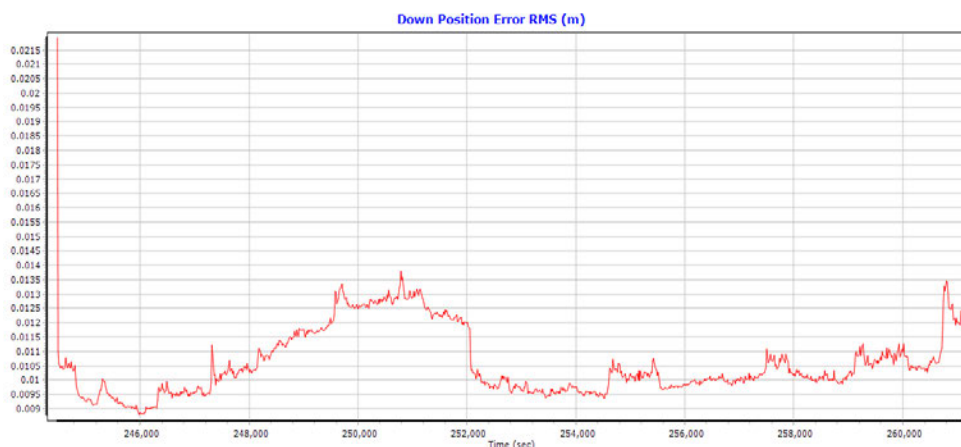




Figure 8 Example Down Position Error for MBES Surveys

## iii. Multibeam Bathymetry Data

All MBES bathymetry data was processed in Qimera. The position SBET was applied to the data and then data was cleaned of spurious soundings caused by noise in the water column. Sound velocity casts were QC'ed against each other to check for outlier data.

Multibeam data was analyzed in both a 3D point cloud, which visualizes the full dataset, as well in 2D which is down sampled as a gridded dataset. Cleaning and analyzing data in point cloud and gridded data set gives the ability to fully analyze features and environments from different perspectives. The gridded dataset gives a representation of the general trend in bathymetry whereas depths, geological features, and objects can be better visualized by looking at the data in a 3D environment. Figure 9 shows a 2D view from the software used to view the bathymetry data to gain an understanding of the final resting position of the Scandies Rose.

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The multibeam bathymetric surface for the Scandies Rose ranges from -141ft to -167ft NAVD88 (Figure 9). What can be gathered from the multibeam data is the Scandies Rose is lying on its starboard side in an east-west direction with the bow pointing east. Off the deck side of the vessel is a debris field roughly 94ft x 42ft with height off the seafloor of ~20ft. East of the vessel shows various sized objects that could potentially be other debris that fell off the vessel during the sinking (Figure 10).



**Figure 9 2D gridded surface of Scandies Rose**



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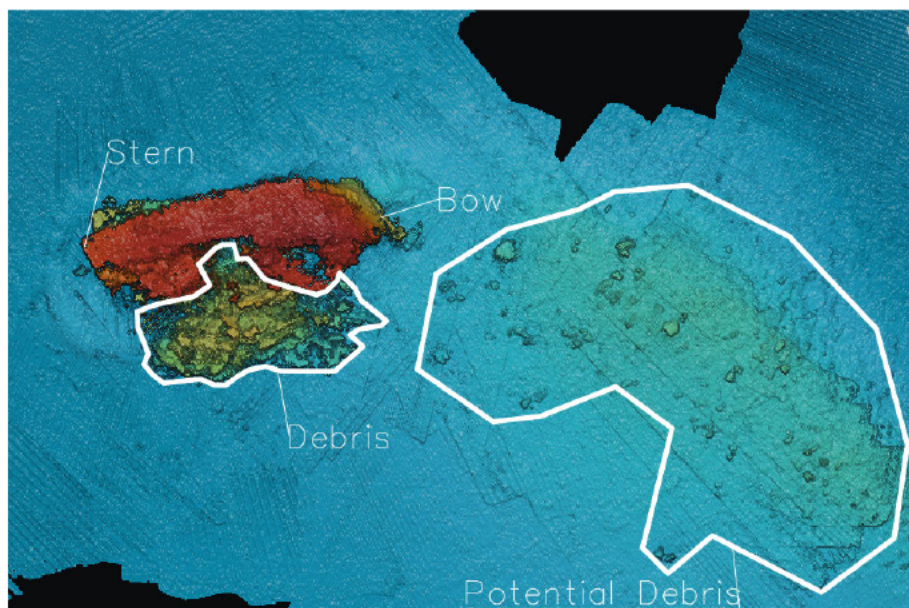


Figure 10 Potential Debris



#### iv. Scandies Rose Bow & Stern Coordinates

Using the multibeam data, we were able to choose bow and stern locations as final positions for the Scandies Rose (Table 1).

Table 1 Scandies Rose Bow and Stern Coordinates

Scandies Rose	NAD83 (2011) 2010.00		State Plane Alaska Zone 6 USft	
	Latitude	Longitude	Easting	Northing
BOW	56°29'28.18"N	157°01'04.14"W	1838889.0	911220.4
STERN	56°29'28.09"N	157°01'06.49"W	1838757.0	911209.9



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### **Additional Deliverables**

#### **1) CAD FILES**

- eTransmit Zip: GLOB\_20200210\_ScandiesRose.zip
- CAD Plot in PDF: GLOB\_20200210\_ScandiesRose

#### **DISCLAIMER**

All data analysis, interpretations, and conclusions in this document are based upon sound scientific principles, using appropriate technology, and have been completed by qualified and experienced hydrographic surveyors, engineers and geophysicists. None of the above information constitutes a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations, or ordinances. eTracinc cannot be held liable or responsible for consequences arising from the use of the information presented in this report. All data is valid for the time in which the survey was conducted.



