



HAUV OFFSETS AND CALIBRATION

Dimensional Control Survey Report



OP-1230
HAUV DC Survey
FINAL Report_00
06 June 2024

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Abbreviations and Definitions

Abbreviation	Definition
BTM	Bottom
CF	Circle Fit
CL	Centreline
C-O	Computed minus Observed
CP	Control Point
CRP	Common Reference Point
E	East
GNSS	Global Navigation Satellite System
H	Height
HAUV	Hybrid Autonomous Underwater Vehicle
ID	Identification
M	Meters
N	North
No.	Number
PORT	Port Side
PT	Point
QC	Quality Control
Ref.	Reference
S	South
SOW	Scope of Work
STBD	Starboard Side
St.DEV	Standard Deviation
TS	Total Station
UTM	Universal Transverse Mercator
UV	Unit Vector
W	West
WGS84	World Geodetic System 1984

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1 INTRODUCTION

1.1 Background

Modus Seabed Intervention Limited contracted Ocean Phoenix International Ltd to carry out the following work on the HAUV offsets and calibration. Paulina Zysk, Rhys Simkins and Scott Mitchell were mobilized to conduct the work. The survey was carried out at Sunderland docks, UK between 11th January and 7th February 2024.

1.2 Scope of Work

Sufficient measurements shall be made to enable the following information to be obtained:

- Establish the Reference Frame and CRP
- Determine the offsets to the following Points of Interest:
 - PORT & STBD MBES
 - Edgetech Transducer Sub Bottom Profiler
 - GNSS Antenna Phase Centre
 - DVL Bottom Centre
 - Mini SVS
 - Depth Sensor
 - Sprint NAV Measuring Point
 - TSS Back Frame Bottom Centre
 - AVTrak Top Centre
- Determine the True Heading, Pitch and Roll of the vehicle
- Compare True Heading, Pitch and Roll of the vehicle with logged values from the SPRINT NAV system and derive the C-Os
- Perform a verification of the C-Os

2 DATUM

2.1 Reference Frame Orientation

Orientation	The Centreline of the vehicle has been defined as vehicle North (+Y) with positive being towards the bow from the CRP. The CL was established from observations to the vehicle pins centres. Positive X axis is heading to the vehicle Starboard side from the CRP. Positive Z axis is heading Upward from the CRP.
Horizontal Datum	The Horizontal origin of coordinates ($X = 0.000$ m, $Y = 0.000$ m) is the CRP which is at the centre of a brass insert at the front of the vehicle frame (See figure below). Vehicle Horizontal plane was established from observations to the vehicle pins centres, 2 on each side.
Vertical Datum	The Vertical origin of coordinates ($Z=0.000$ m) is at the CRP.

Table 1: HAUV – Reference Frame Orientation

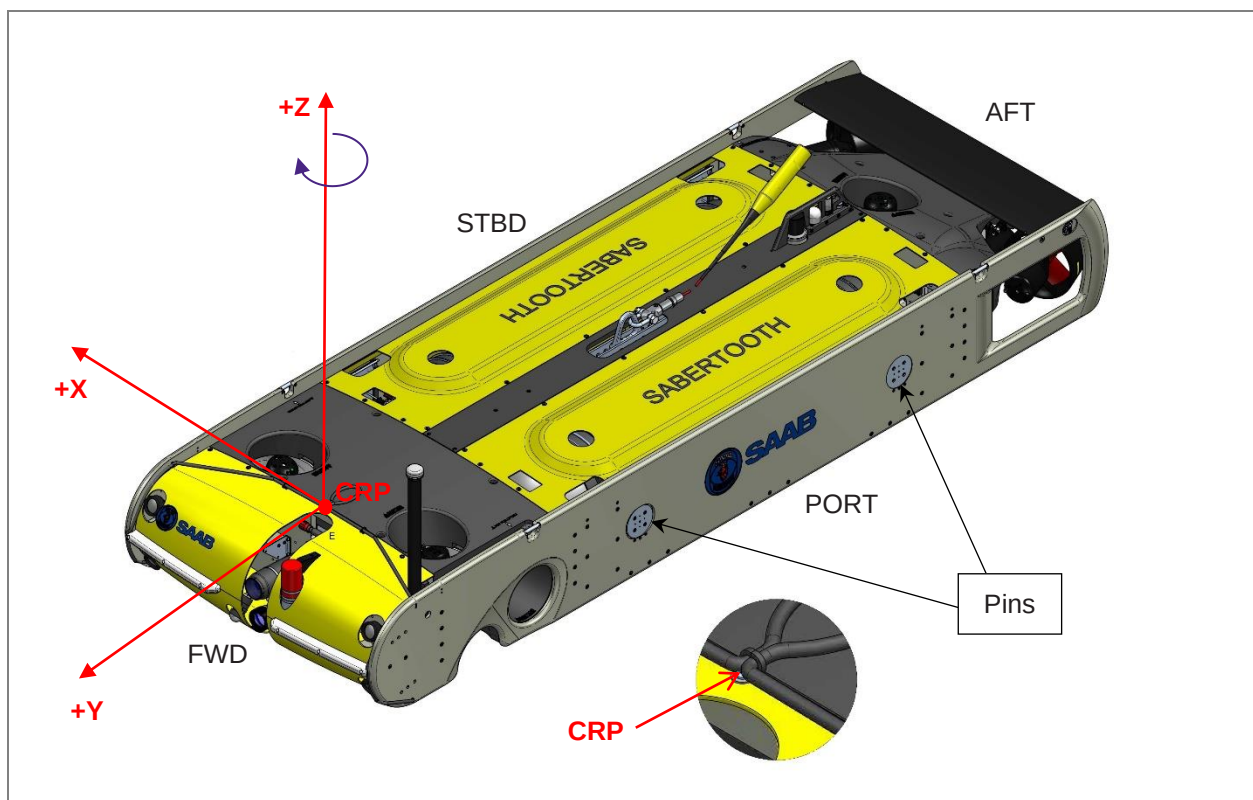


Figure 1: HAUV – CRP Location

2.2 Rotation Convention

Heading Convention	Heading is measured CLOCKWISE from vehicle North (+Y axis)
Pitch Convention	Positive Pitch is BOW (Structure North) UP
Roll Convention	Positive Roll is PORT (Structure West) UP

Table 2: HAUV – Rotation Convention

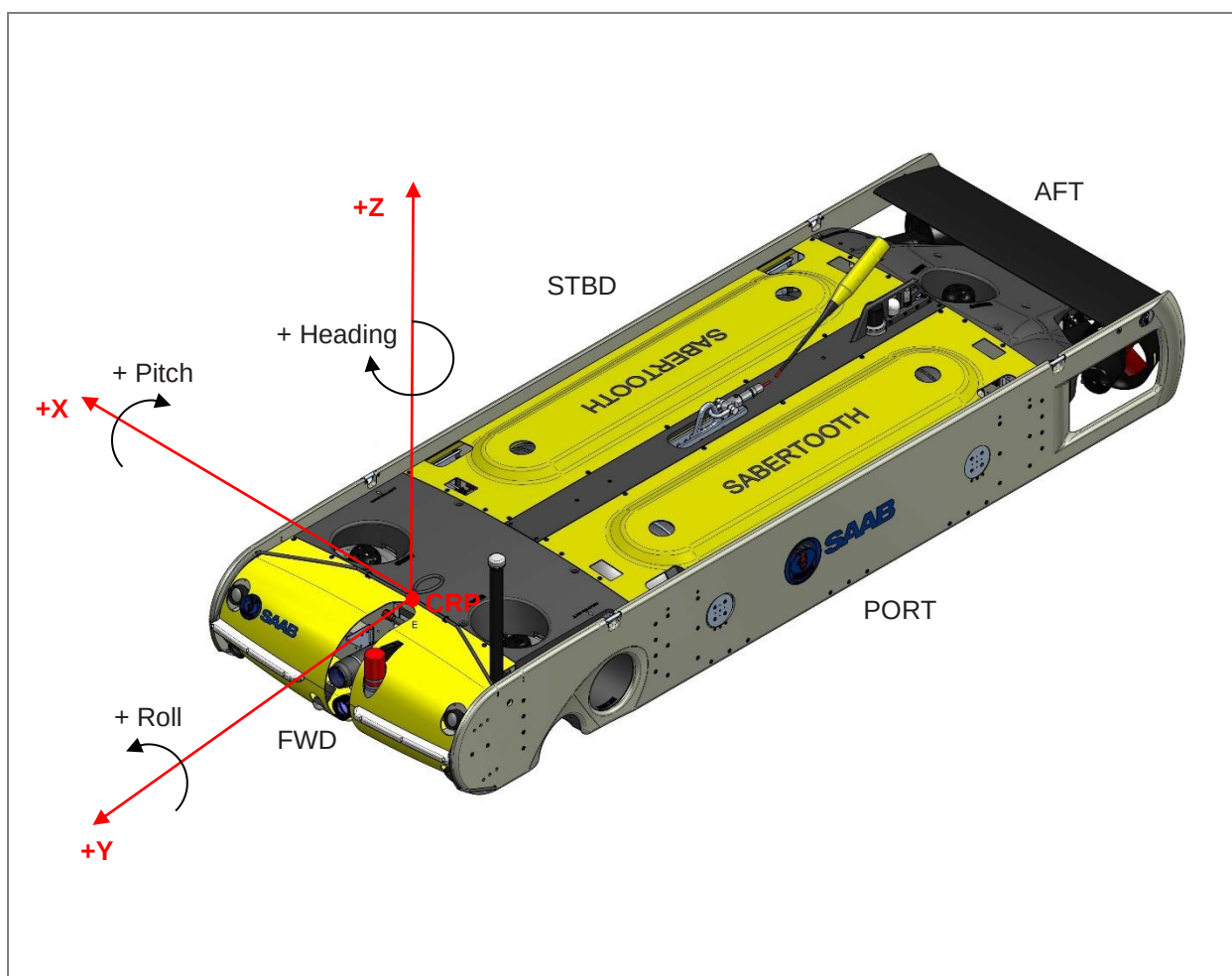


Figure 2: HAUV – Rotation Convention

3 CALIBRATION RESULTS

3.1 Methodology of C-O (Computed minus Observed)

The term C-O refers to all values derived and computed during the survey by the Ocean Phoenix surveyors (Computed) minus data observed by the Client (Gyro reading = Observed). The final result (C-O) provides the correction value. It is recommended that all the gyrocompasses are rectified by this C-O value in order to adjust for any errors or misalignment.

3.2 SPRINT NAV Calibration Results

A local Control Network was created on the quayside for the purpose of the gyrocompass verification. This Control Network was orientated relative to True North using the known GNSS baseline True azimuth. This azimuth was obtained after processing the GNSS static observations over the baseline points on the quayside. The observation files were uploaded to Trimble RTX (Trimble post-processing service) and Latitudes/Longitudes/ /El. Heights were obtained, see Appendix B. QCalc software was used for calculation of the UTM coordinates in the agreed zone and baseline Grid Heading was calculated. Meridian Convergence coming from the QCalc software was applied to the calculation to obtain the baseline True Heading. The Gauss-Bomford Convention was used for converting Grid Heading to True Heading:

$$\text{Grid North } (\beta) = \text{True North } (\alpha) - \text{Convergence } (\gamma)$$

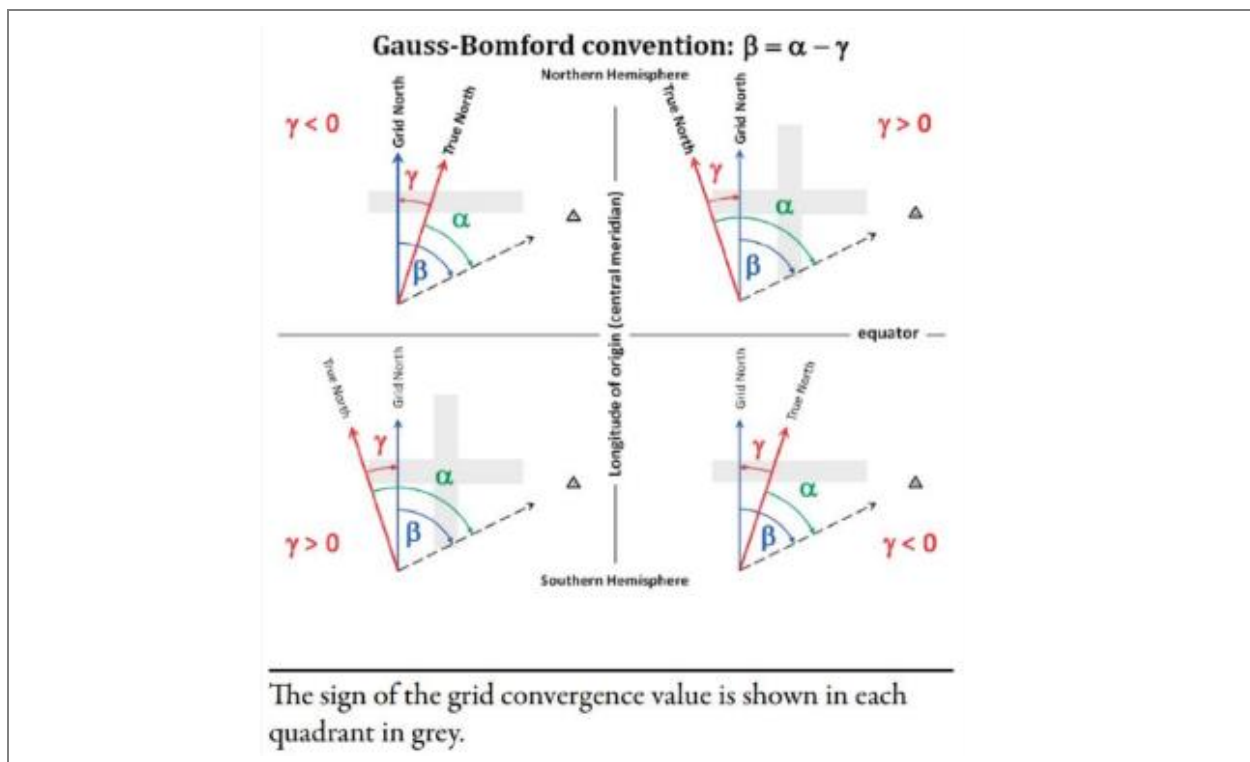


Figure 3: HAUV – Meridian Convergence Gauss-Bomford Convention

The HAUV was placed on the quayside, after being moved around the port in order to align the Sprint Nav 500 sensors to achieve accurate values for its calibration. GNSS Baseline Points, Retro Targets on the vehicle and the vehicle pins centres were surveyed by a total station in order to determine the True Heading, Pitch and Roll of the vehicle.

Sprint Nav 500 readings were recorded for approx. a 1 hour period of time. These logged values were then compared with the corresponding calculated values in order to determine the average C-O correction.

Prior to the start of data logging, the Ocean Phoenix surveyors asked the online surveyors to remove any existing C-Os from the software.

The table below shows the corrections determined. The full list of obtained results can be seen in Appendix C.

Sprint Nav 500	Average Computed Value [°]	Average Observed Value [°]	C-O [°]	St. Dev [°]
Heading	224.60	224.65	-0.05	0.01
Pitch	+1.63	+1.40	+0.23	0.00
Roll	-0.49	-0.82	+0.33	0.00

Table 3: HAUV – Sprint Nav 500 Calibration Results (29/05/2024)

3.3 HAUV GNSS Verification Results

A GNSS baseline was established on the quayside and observations were taken for ~2 hours. Absolute positions of the quayside Control Marks were received from Trimble RTX Online GNSS Processing Service (see Appendix H).

Absolute positions of the survey GNSS antenna were calculated using the known Control Mark coordinates in WGS84, UTM Zone 30, Central Meridian 3° W.

Readings for the GNSS antenna were recorded for an extended period of time. These logged values were then compared with the corresponding calculated values to determine the differences.

The table below show the deviations determined. The full list of obtained results can be seen in Appendix G.

GNSS Antenna	Average Computed Position (WGS84 UTM Zone 30 CM 3°W)			Average Observed Position (WGS84 UTM Zone 30 CM 3°W)			C-O (St. Dev.)		
	Easting [m]	Northing [m]	El. H [m]	Easting [m]	Northing [m]	El. H [m]	East. [m]	North. [m]	El. H. [m]
HAUV Antenna	613652.63	6050219.30	-	613652.59	6050219.30	-	+0.04 (0.02)	+0.00 (0.00)	-

Table 4: HAUV – GNSS Antenna Verification Results (29/05/2024)

4 OFFSET SURVEY RESULTS

4.1 Offsets to Points of Interest

As required by the Client, an offset survey was carried out on the vehicle. The following tables show the results relative to the CRP (Table 5). All the Points of Interest are shown in the following photographs and figures. The list of all surveyed points can be seen in Appendix A.

4.1.1 HAUV Offsets Relative to the CRP

Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
6000	0.000	0.000	0.000	CRP
T1	0.504	0.264	-0.006	Reference Point
T2	0.499	1.057	-0.039	Reference Point
T3	0.683	-3.038	0.005	Reference Point
T4	0.681	-2.221	-0.434	Reference Point
T5	0.680	-1.225	-0.435	Reference Point
T6	0.675	0.080	-0.020	Reference Point
T7	-0.496	1.047	-0.029	Reference Point
T8	-0.505	0.258	-0.005	Reference Point
T9	-0.674	0.071	-0.017	Reference Point
T10	-0.667	-1.248	-0.427	Reference Point
T11	-0.669	-2.403	-0.436	Reference Point
T12	-0.668	-2.697	0.001	Reference Point
200	0.303	0.401	-0.438	STBD MBES Rx Centre
300	-0.306	0.397	-0.438	PORT MBES Rx Centre
200a	0.304	0.598	-0.440	STBD MBES Acoustic Centre
300a	-0.306	0.596	-0.439	PORT MBES Acoustic Centre
270	0.003	-1.287	-0.609	Edgetech Transducer Sub Bottom Profiler
800	0.005	-1.814	-0.677	Edgetech Bathy Reference Centre
260	0.115	-1.814	-0.601	Edgetech Transducer STBD Reference Point BTM Centre
250	-0.106	-1.813	-0.600	Edgetech Transducer PORT Reference Point BTM Centre
290	0.009	-2.705	0.347	Antenna GNSS Phase Centre
370	0.008	-3.865	-1.489	TSS Back Frame Bottom Centre

Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
240	-0.201	-0.696	0.059	AVTrak Top Centre
350	0.282	-0.684	-0.434	Mini SVS
360	0.267	-0.682	-0.375	Depth Sensor
230	0.003	-0.853	-0.504	Sprint NAV DVL Sensing Point
230a	0.003	-0.853	-0.297	Sprint NAV Measuring Point

Table 5: HAUV – Offsets to Points of Interest Relative to the CRP



Figure 4: HAUV – CRP Location and Detail

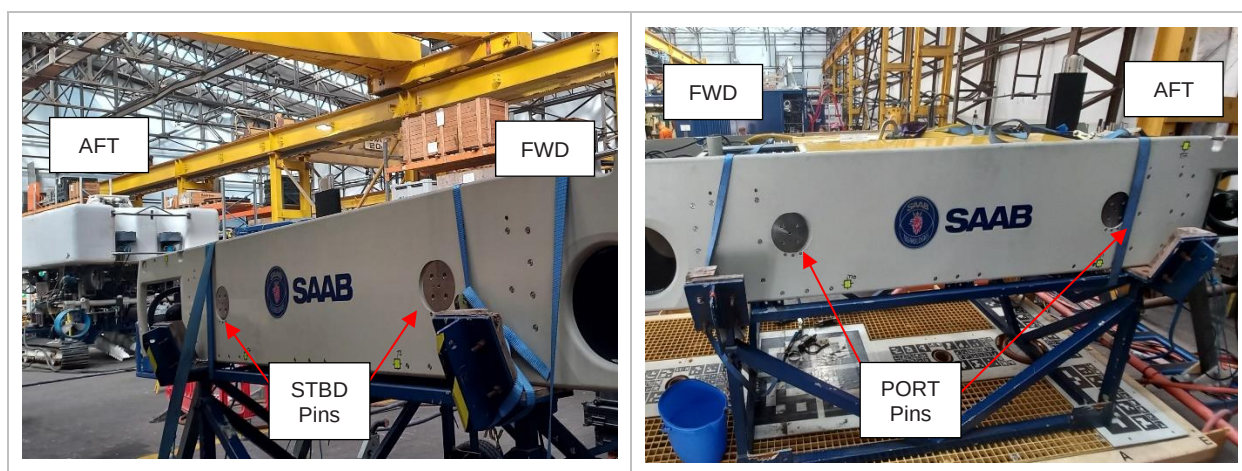


Figure 5: HAUV – Pins Location and Detail

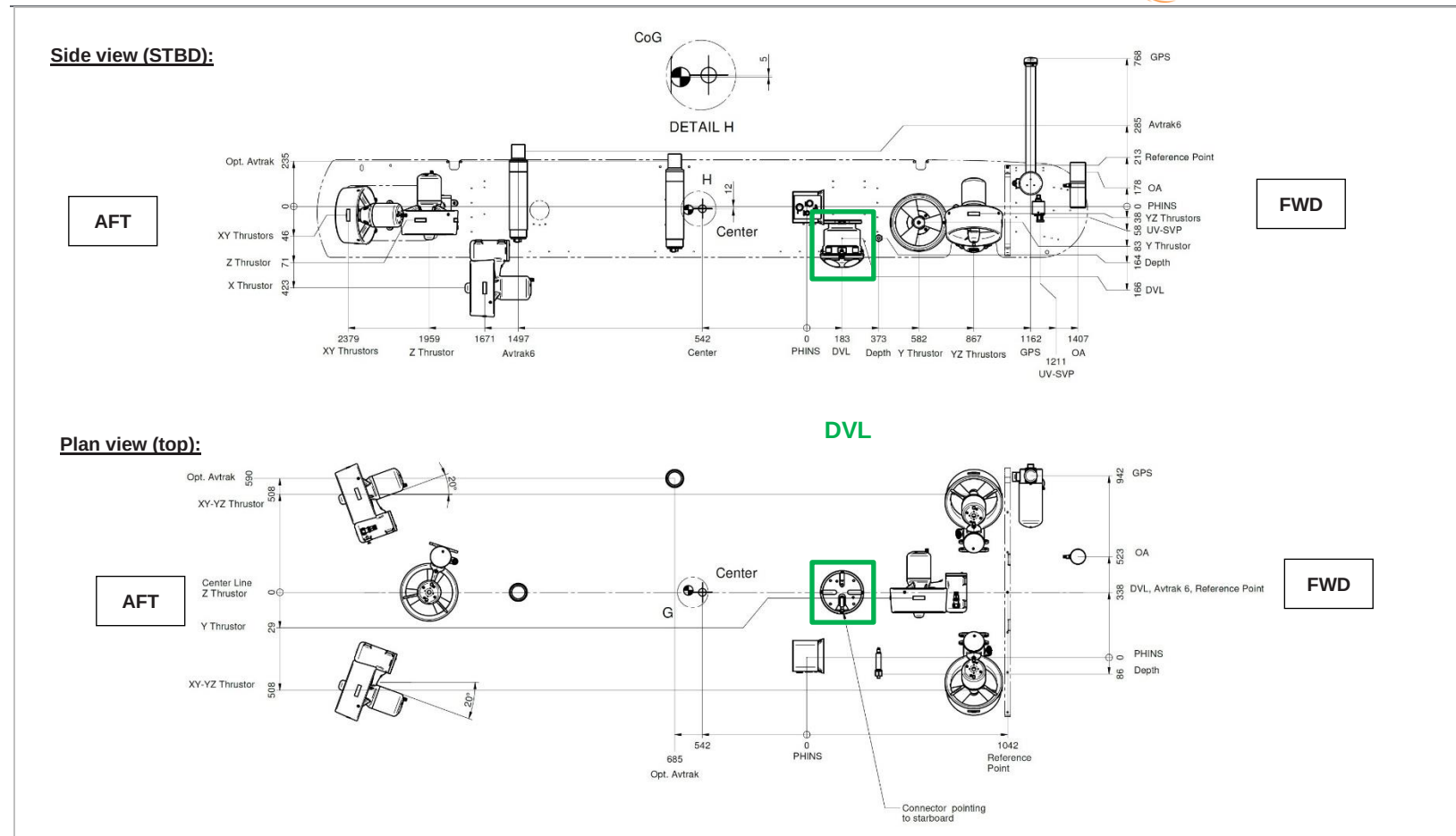


Figure 6: HAUV – Lever Arms Sensors and Thrusters Arrangement

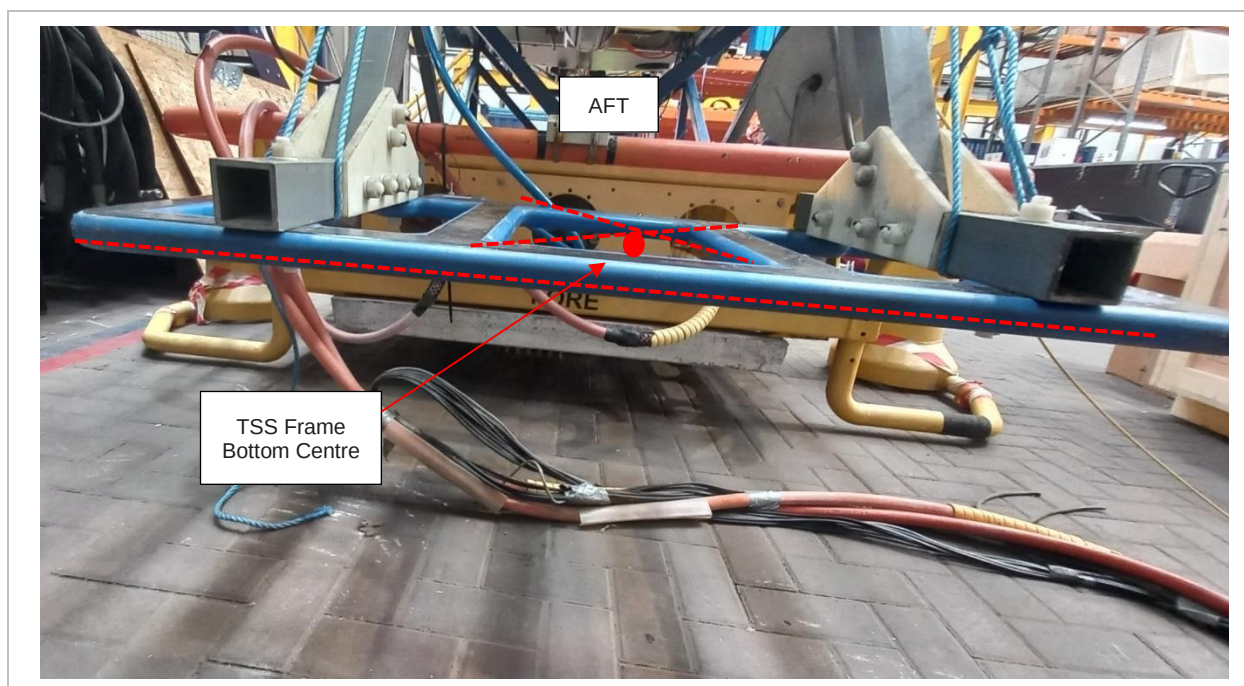


Figure 7: HAUV – TSS Frame Details View



Figure 8: HAUV –Sprint NAV DVL Location and Detail

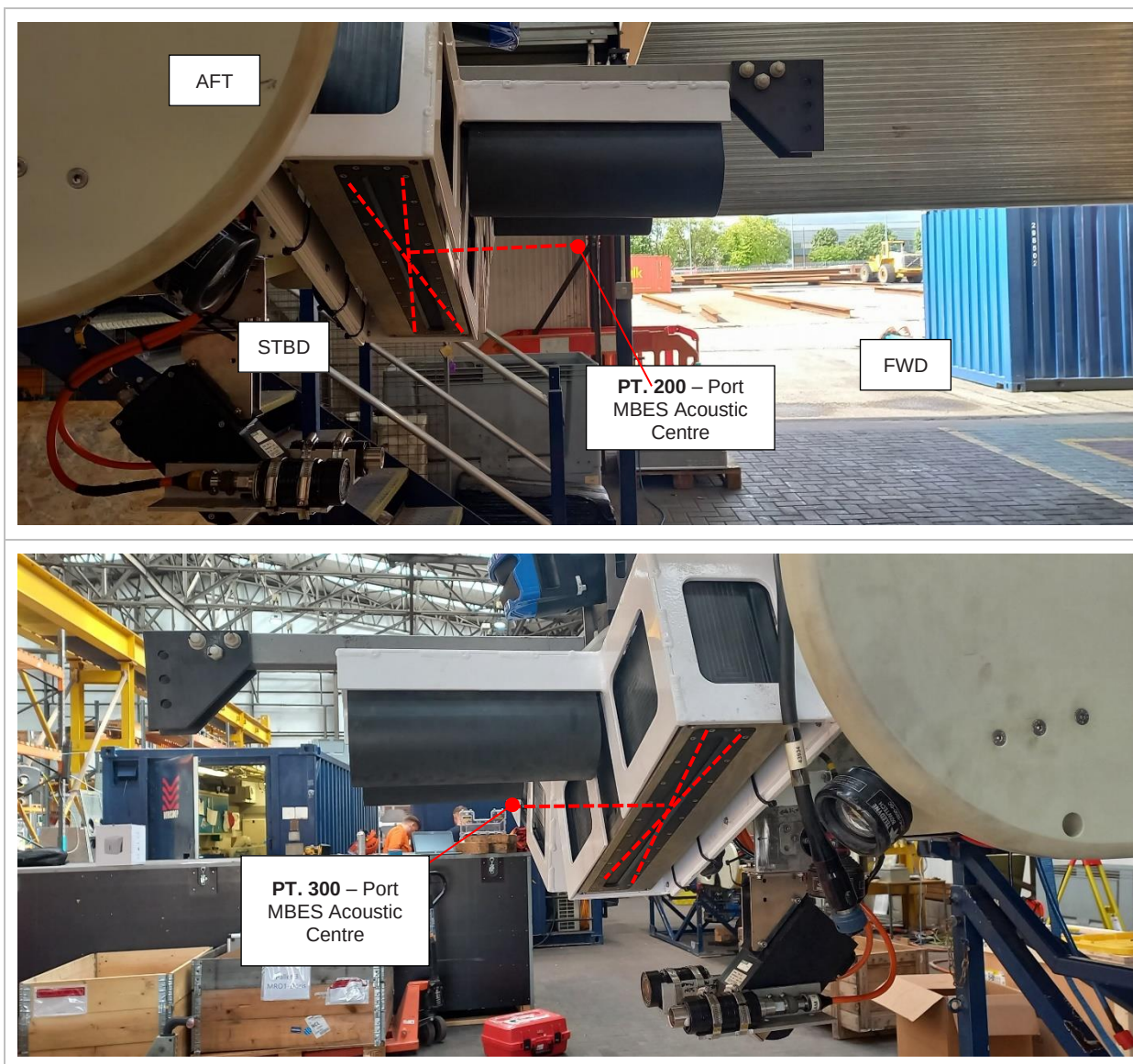


Figure 9: HAUV – PORT & STBD MBES Acoustic Centre Location & Detail



Figure 10: HAUV – AVTrack Location & Detail

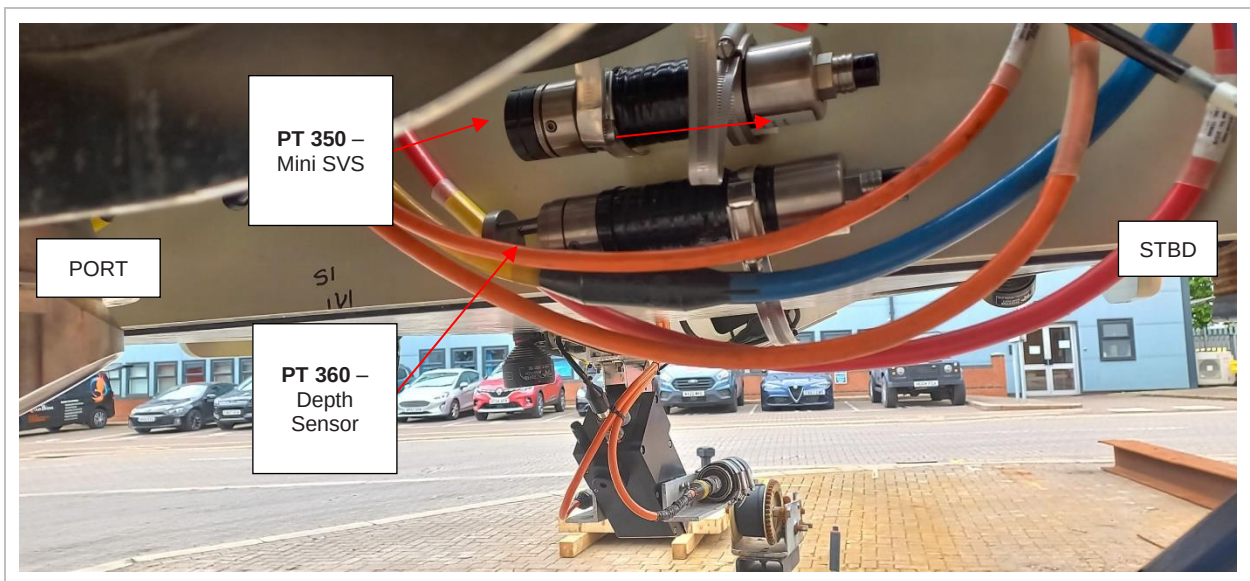


Figure 11: HAUV – Depth Sensor & Mini SVS Location & Detail



Figure 12: HAUV – STBD & PORT Reference Points Location

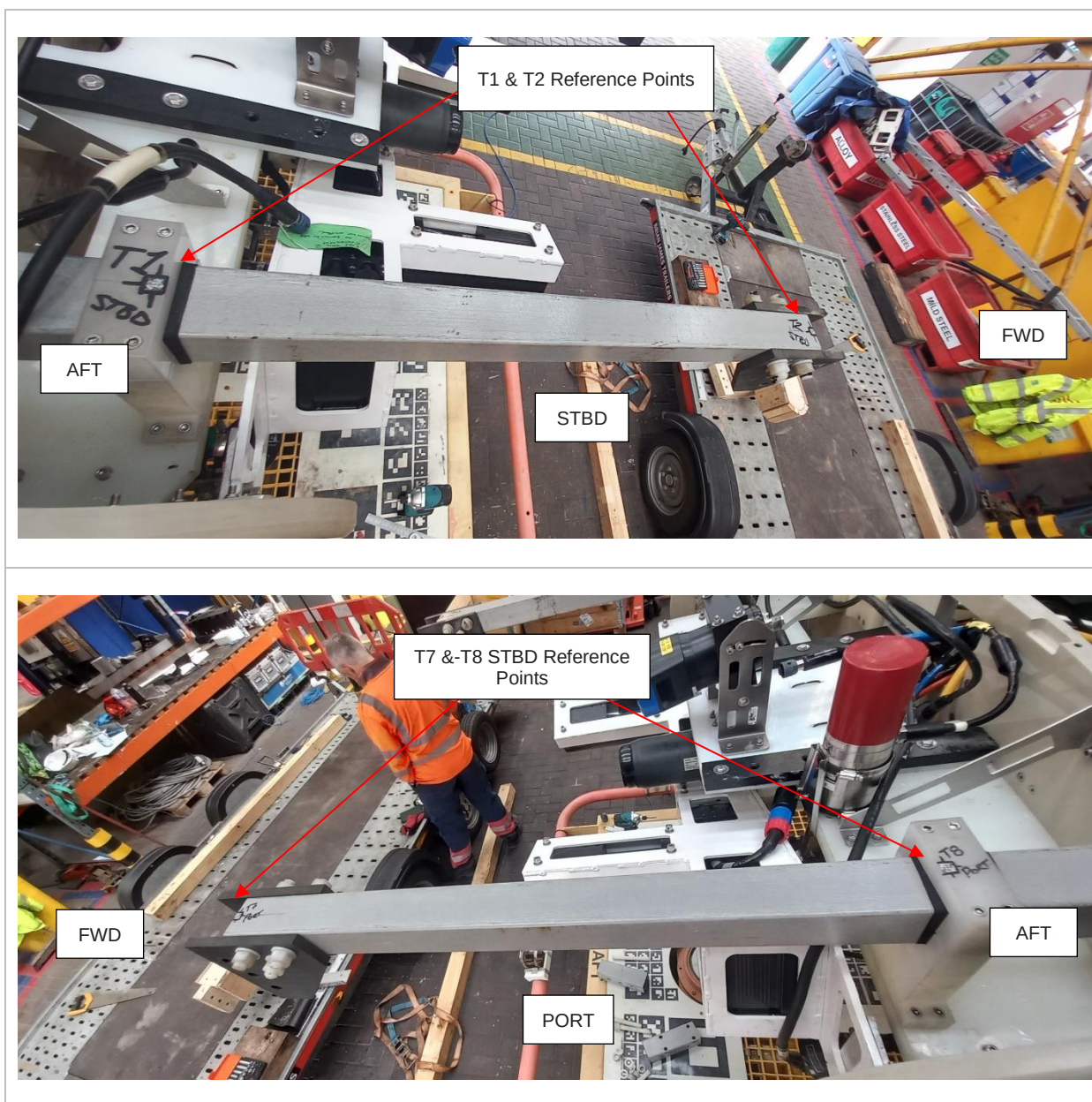


Figure 13: HAUV – FWD Face Reference Points Location



Figure 14: HAUV – GNSS Antenna Location & Detail



Figure 15: HAUV – Workshop Wall Heading Details



Figure 16: HAUV – Rail Heading Details

5 QUAYSIDE CONTROL

Station	5001
Harbour	Port of Middlesbrough; UK
Mark Description	Nail in Ground
Geographic Coordinates WGS84	
Latitude	54°35'11.39029"N
Longitude	01°14'27.98281"W
Ellipsoid Height	53.237m
Grid Coordinates WGS84 UTM Zone 30	
Easting [m]	613662.125
Northing [m]	6050200.872

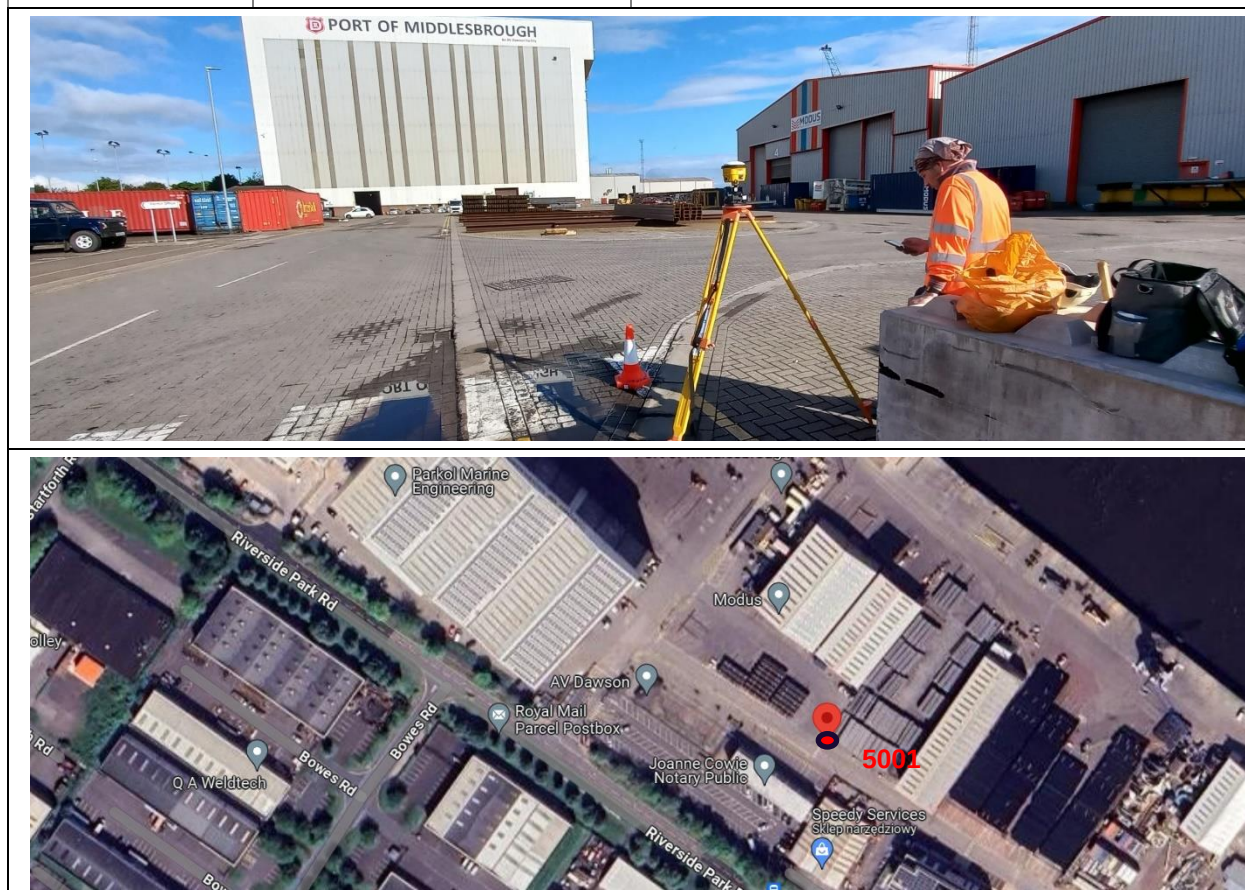


Figure 17: HAUV – Quayside Control 5001



Figure 18: HAUV – Quayside Control 5002

6 EQUIPMENT

Quantity	Description	Serial Number / ID
2x	Leica Mini Prism	-
1x	SC4W Dongle	-
1x	Tripod Legs	-
1x	Total Station – Leica TS16 P 1" R1000	3261812
1x	Laptop Lenovo	-

Table 6: HAUV– Equipment

7 PERSONNEL

Name	Company
Paulina Zysk	Ocean Phoenix International Ltd
Scott Mitchell	Ocean Phoenix International Ltd

Table 7: HAUV offsets and calibration – Personnel

8 SEQUENCE OF SIGNIFICANT EVENTS

Date	Time	Activity
28 th May	-	PZ travels from Aberdeen pick up SM in Perth, continues travel
	16:00	Arrived at Middlesbrough
	16:15	Discuss the Scope of Work with the Party Chief
	18:25	Depart yard
	20:30	Dinner, take a rest.
29 th May	07:00	Breakfast
	08:00	Depart hotel
	08:20	GNSS Antenna starts logging on the quayside.
	08:30	Start Survey
	11:30	Lunch
	13:00	GNSS Antenna second location starts logging on the quayside.
	13:30	Continue survey on the vessel
	16:00	Finished Survey
	16:10	Post-processing
	17:30	Preliminary results provided to the Client
	18:00	Depart yard
	21:00	Dinner, take a rest.
30 th May	07:00	Breakfast
	07:30	PZ and SM depart hotel for home destination
	-	Processing, QC
31 st May	-	Report writing

Table 8: HAUV – Sequence of Significant Events

Appendix A

Sprint NAV Calibration Results Spreadsheets

Appendix A1

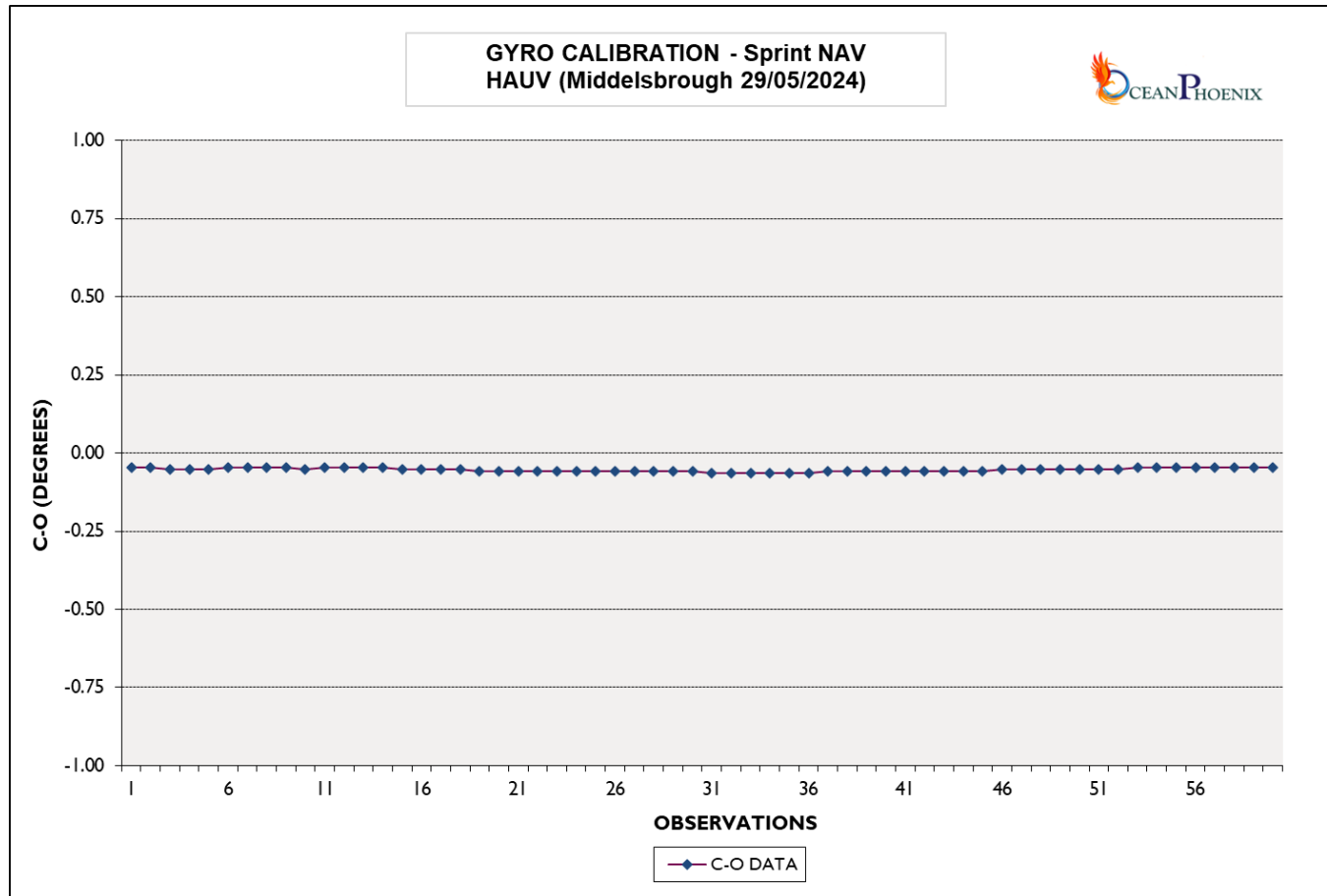
SPRINT NAV Heading Calibration Results Spreadsheet

Sprint NAV GYRO CALIBRATION

VESSEL: HAUV
CLIENT: Modus
LOCATION: Middelbrough
DATE: 29/05/2024



OBS	TIME	Computed True Heading [°]	Observed Heading [°]	C-O [°]	QC Checks	
					Deviation from mean	Worst Outlier
1	12:00:00	224.60	224.64	-0.05	0.00	
2	12:01:00	224.60	224.64	-0.05	0.00	
3	12:02:00	224.60	224.65	-0.05	0.00	
4	12:03:00	224.60	224.65	-0.05	0.00	
5	12:04:00	224.60	224.65	-0.05	0.00	
6	12:05:00	224.60	224.64	-0.05	0.00	
7	12:06:00	224.60	224.64	-0.05	0.00	
8	12:07:00	224.60	224.64	-0.05	0.00	
9	12:08:00	224.60	224.64	-0.05	0.00	
10	12:09:00	224.60	224.65	-0.05	0.00	
11	12:10:00	224.60	224.64	-0.05	0.00	
12	12:11:00	224.60	224.64	-0.05	0.00	
13	12:12:00	224.60	224.64	-0.05	0.00	
14	12:13:00	224.60	224.64	-0.05	0.00	
15	12:14:00	224.60	224.65	-0.05	0.00	
16	12:15:00	224.60	224.65	-0.05	0.00	
17	12:16:00	224.60	224.65	-0.05	0.00	
18	12:17:00	224.60	224.65	-0.05	0.00	
19	12:18:00	224.60	224.65	-0.06	0.01	
20	12:19:00	224.60	224.65	-0.06	0.01	
21	12:20:00	224.60	224.65	-0.06	0.01	
22	12:21:00	224.60	224.65	-0.06	0.01	
23	12:22:00	224.60	224.65	-0.06	0.01	
24	12:23:00	224.60	224.65	-0.06	0.01	
25	12:24:00	224.60	224.65	-0.06	0.01	
26	12:25:00	224.60	224.65	-0.06	0.01	
27	12:26:00	224.60	224.65	-0.06	0.01	
28	12:27:00	224.60	224.65	-0.06	0.01	
29	12:28:00	224.60	224.65	-0.06	0.01	
30	12:29:00	224.60	224.65	-0.06	0.01	
31	12:30:00	224.60	224.66	-0.06	0.01	X
32	12:31:00	224.60	224.66	-0.06	0.01	X
33	12:32:00	224.60	224.66	-0.06	0.01	X
34	12:33:00	224.60	224.66	-0.06	0.01	X
35	12:34:00	224.60	224.66	-0.06	0.01	X
36	12:35:00	224.60	224.66	-0.06	0.01	X
37	12:36:00	224.60	224.65	-0.06	0.01	
38	12:37:00	224.60	224.65	-0.06	0.01	
39	12:38:00	224.60	224.65	-0.06	0.01	
40	12:39:00	224.60	224.65	-0.06	0.01	
41	12:40:00	224.60	224.65	-0.06	0.01	
42	12:41:00	224.60	224.65	-0.06	0.01	
43	12:42:00	224.60	224.65	-0.06	0.01	
44	12:43:00	224.60	224.65	-0.06	0.01	
45	12:44:00	224.60	224.65	-0.06	0.01	
46	12:45:00	224.60	224.65	-0.05	0.00	
47	12:46:00	224.60	224.65	-0.05	0.00	
48	12:47:00	224.60	224.65	-0.05	0.00	
49	12:48:00	224.60	224.65	-0.05	0.00	
50	12:49:00	224.60	224.65	-0.05	0.00	
51	12:50:00	224.60	224.65	-0.05	0.00	
52	12:51:00	224.60	224.65	-0.05	0.00	
53	12:52:00	224.60	224.64	-0.05	0.00	
54	12:53:00	224.60	224.64	-0.05	0.00	
55	12:54:00	224.60	224.64	-0.05	0.00	
56	12:55:00	224.60	224.64	-0.05	0.00	
57	12:56:00	224.60	224.64	-0.05	0.00	
58	12:57:00	224.60	224.64	-0.05	0.00	
59	12:58:00	224.60	224.64	-0.05	0.00	
60	12:59:00	224.60	224.64	-0.05	0.00	
	MEAN	224.60°	224.65	-0.05°	0.013	Maximum
	S.D.	0.00	0.01	0.01		Deviation



Appendix B

MRU Calibration Results Spreadsheets

Appendix B1

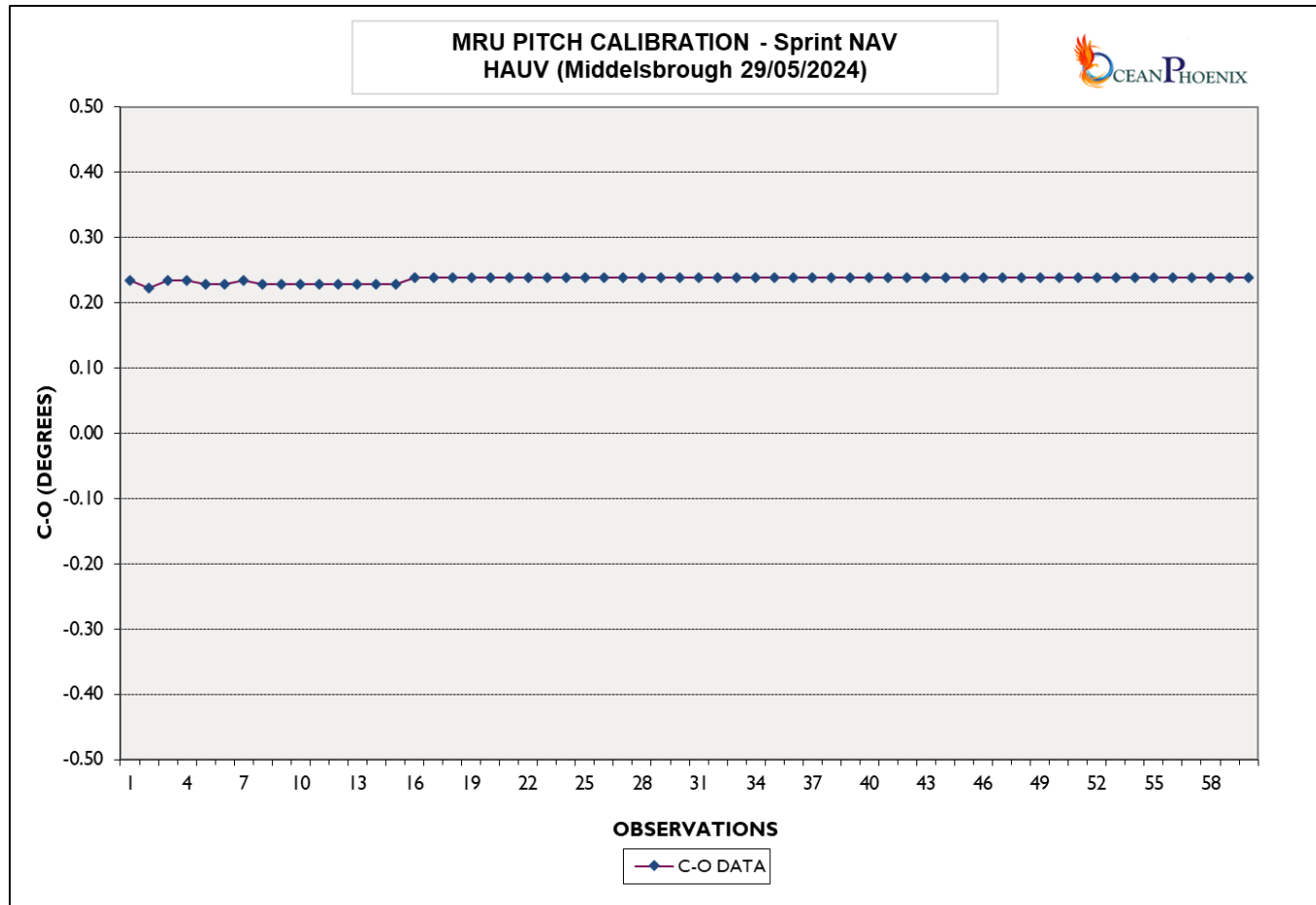
SPRINT NAV Pitch Calibration Results Spreadsheet

Sprint NAVMRU PITCH CALIBRATION

VESSEL: HAUV
CLIENT: Modus
LOCATION: Middelsbrough
DATE: 29/05/2024



OBS	TIME	Computed PITCH [°]	Observed PITCH [°]	C-O [°]	QC Checks	
					Deviation from mean	Worst Outlier
1	12:00:00	1.63	1.40	0.23	0.00	
2	12:01:00	1.63	1.41	0.22	0.01	
3	12:02:00	1.63	1.40	0.23	0.00	
4	12:03:00	1.63	1.40	0.23	0.00	
5	12:04:00	1.63	1.41	0.23	0.00	
6	12:05:00	1.63	1.41	0.23	0.00	
7	12:06:00	1.63	1.40	0.23	0.00	
8	12:07:00	1.63	1.41	0.23	0.00	
9	12:08:00	1.63	1.41	0.23	0.00	
10	12:09:00	1.63	1.41	0.23	0.00	
11	12:10:00	1.63	1.41	0.23	0.00	
12	12:11:00	1.63	1.41	0.23	0.00	
13	12:12:00	1.63	1.41	0.23	0.00	
14	12:13:00	1.63	1.41	0.23	0.00	
15	12:14:00	1.63	1.41	0.23	0.00	
16	12:15:00	1.63	1.40	0.24	0.01	X
17	12:16:00	1.63	1.40	0.24	0.01	X
18	12:17:00	1.63	1.40	0.24	0.01	X
19	12:18:00	1.63	1.40	0.24	0.01	X
20	12:19:00	1.63	1.40	0.24	0.01	X
21	12:20:00	1.63	1.40	0.24	0.01	X
22	12:21:00	1.63	1.40	0.24	0.01	X
23	12:22:00	1.63	1.40	0.24	0.01	X
24	12:23:00	1.63	1.40	0.24	0.01	X
25	12:24:00	1.63	1.40	0.24	0.01	X
26	12:25:00	1.63	1.40	0.24	0.01	X
27	12:26:00	1.63	1.40	0.24	0.01	X
28	12:27:00	1.63	1.40	0.24	0.01	X
29	12:28:00	1.63	1.40	0.24	0.01	X
30	12:29:00	1.63	1.40	0.24	0.01	X
31	12:30:00	1.63	1.40	0.24	0.01	X
32	12:31:00	1.63	1.40	0.24	0.01	X
33	12:32:00	1.63	1.40	0.24	0.01	X
34	12:33:00	1.63	1.40	0.24	0.01	X
35	12:34:00	1.63	1.40	0.24	0.01	X
36	12:35:00	1.63	1.40	0.24	0.01	X
37	12:36:00	1.63	1.40	0.24	0.01	X
38	12:37:00	1.63	1.40	0.24	0.01	X
39	12:38:00	1.63	1.40	0.24	0.01	X
40	12:39:00	1.63	1.40	0.24	0.01	X
41	12:40:00	1.63	1.40	0.24	0.01	X
42	12:41:00	1.63	1.40	0.24	0.01	X
43	12:42:00	1.63	1.40	0.24	0.01	X
44	12:43:00	1.63	1.40	0.24	0.01	X
45	12:44:00	1.63	1.40	0.24	0.01	X
46	12:45:00	1.63	1.40	0.24	0.01	X
47	12:46:00	1.63	1.40	0.24	0.01	X
48	12:47:00	1.63	1.40	0.24	0.01	X
49	12:48:00	1.63	1.40	0.24	0.01	X
50	12:49:00	1.63	1.40	0.24	0.01	X
51	12:50:00	1.63	1.40	0.24	0.01	X
52	12:51:00	1.63	1.40	0.24	0.01	X
53	12:52:00	1.63	1.40	0.24	0.01	X
54	12:53:00	1.63	1.40	0.24	0.01	X
55	12:54:00	1.63	1.40	0.24	0.01	X
56	12:55:00	1.63	1.40	0.24	0.01	X
57	12:56:00	1.63	1.40	0.24	0.01	X
58	12:57:00	1.63	1.40	0.24	0.01	X
59	12:58:00	1.63	1.40	0.24	0.01	X
60	12:59:00	1.63	1.40	0.24	0.01	X
MEAN		1.63°	1.40°	0.23°	0.009	Maximum
S.D.		0.00	0.00	0.00		Deviation



Appendix B2

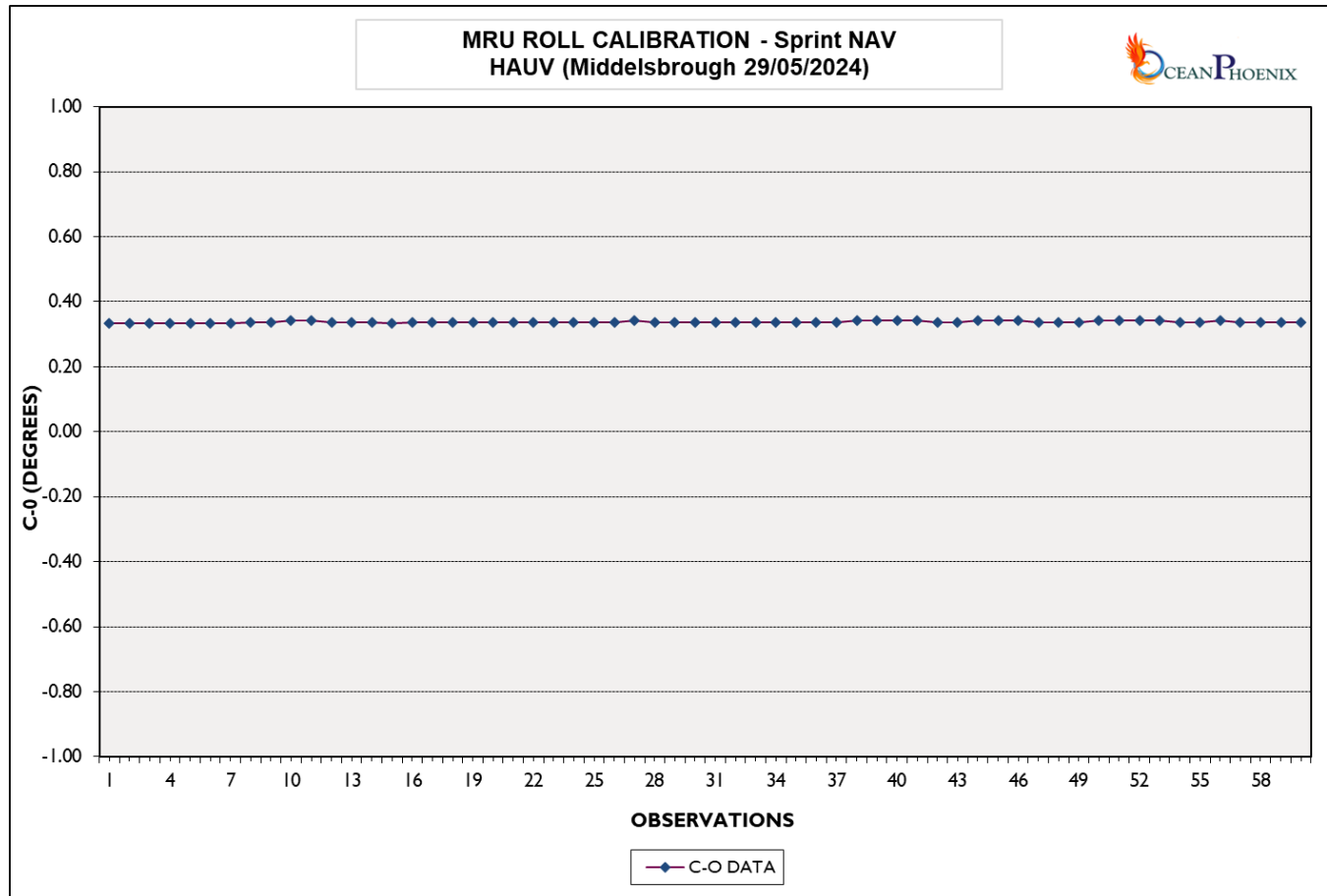
SPRINT NAV Roll Calibration Results Spreadsheet

Sprint NAV MRU ROLL CALIBRATION

VESSEL: HAUV
CLIENT: Modus
LOCATION: Middelbrough
DATE: 29/05/2024



OBS	TIME	Computed ROLL [°]	Observed ROLL [°]	C-O [°]	QC Checks	
					Deviation from mean	Worst Outlier
1	12:00:00	-0.49	-0.82	0.33	0.00	
2	12:01:00	-0.49	-0.82	0.33	0.00	
3	12:02:00	-0.49	-0.82	0.33	0.00	
4	12:03:00	-0.49	-0.82	0.33	0.00	
5	12:04:00	-0.49	-0.82	0.33	0.00	
6	12:05:00	-0.49	-0.82	0.33	0.00	
7	12:06:00	-0.49	-0.82	0.33	0.00	
8	12:07:00	-0.49	-0.82	0.34	0.01	
9	12:08:00	-0.49	-0.82	0.34	0.01	
10	12:09:00	-0.49	-0.83	0.34	0.01	X
11	12:10:00	-0.49	-0.83	0.34	0.01	X
12	12:11:00	-0.49	-0.82	0.34	0.01	
13	12:12:00	-0.49	-0.82	0.34	0.01	
14	12:13:00	-0.49	-0.82	0.34	0.01	
15	12:14:00	-0.49	-0.82	0.33	0.00	
16	12:15:00	-0.49	-0.82	0.34	0.01	
17	12:16:00	-0.49	-0.82	0.34	0.01	
18	12:17:00	-0.49	-0.82	0.34	0.01	
19	12:18:00	-0.49	-0.82	0.34	0.01	
20	12:19:00	-0.49	-0.82	0.34	0.01	
21	12:20:00	-0.49	-0.82	0.34	0.01	
22	12:21:00	-0.49	-0.82	0.34	0.01	
23	12:22:00	-0.49	-0.82	0.34	0.01	
24	12:23:00	-0.49	-0.82	0.34	0.01	
25	12:24:00	-0.49	-0.82	0.34	0.01	
26	12:25:00	-0.49	-0.82	0.34	0.01	
27	12:26:00	-0.49	-0.83	0.34	0.01	X
28	12:27:00	-0.49	-0.82	0.34	0.01	
29	12:28:00	-0.49	-0.82	0.34	0.01	
30	12:29:00	-0.49	-0.82	0.34	0.01	
31	12:30:00	-0.49	-0.82	0.34	0.01	
32	12:31:00	-0.49	-0.82	0.34	0.01	
33	12:32:00	-0.49	-0.82	0.34	0.01	
34	12:33:00	-0.49	-0.82	0.34	0.01	
35	12:34:00	-0.49	-0.82	0.34	0.01	
36	12:35:00	-0.49	-0.82	0.34	0.01	
37	12:36:00	-0.49	-0.82	0.34	0.01	
38	12:37:00	-0.49	-0.83	0.34	0.01	X
39	12:38:00	-0.49	-0.83	0.34	0.01	X
40	12:39:00	-0.49	-0.83	0.34	0.01	X
41	12:40:00	-0.49	-0.83	0.34	0.01	X
42	12:41:00	-0.49	-0.82	0.34	0.01	
43	12:42:00	-0.49	-0.82	0.34	0.01	
44	12:43:00	-0.49	-0.83	0.34	0.01	X
45	12:44:00	-0.49	-0.83	0.34	0.01	X
46	12:45:00	-0.49	-0.83	0.34	0.01	X
47	12:46:00	-0.49	-0.82	0.34	0.01	
48	12:47:00	-0.49	-0.82	0.34	0.01	
49	12:48:00	-0.49	-0.82	0.34	0.01	
50	12:49:00	-0.49	-0.83	0.34	0.01	X
51	12:50:00	-0.49	-0.83	0.34	0.01	X
52	12:51:00	-0.49	-0.83	0.34	0.01	X
53	12:52:00	-0.49	-0.83	0.34	0.01	X
54	12:53:00	-0.49	-0.82	0.34	0.01	
55	12:54:00	-0.49	-0.82	0.34	0.01	
56	12:55:00	-0.49	-0.83	0.34	0.01	X
57	12:56:00	-0.49	-0.82	0.34	0.01	
58	12:57:00	-0.49	-0.82	0.34	0.01	
59	12:58:00	-0.49	-0.82	0.34	0.01	
60	12:59:00	-0.49	-0.82	0.34	0.01	
	MEAN	-0.49°	-0.82°	0.33°	0.013	Maximum
	S.D.	0.00	0.00	0.00		Deviation



Appendix C

Antennae Verification Results Spreadsheets

Appendix C1

HAUV GNSS Antenna Verification Results Spreadsheet

REPORT

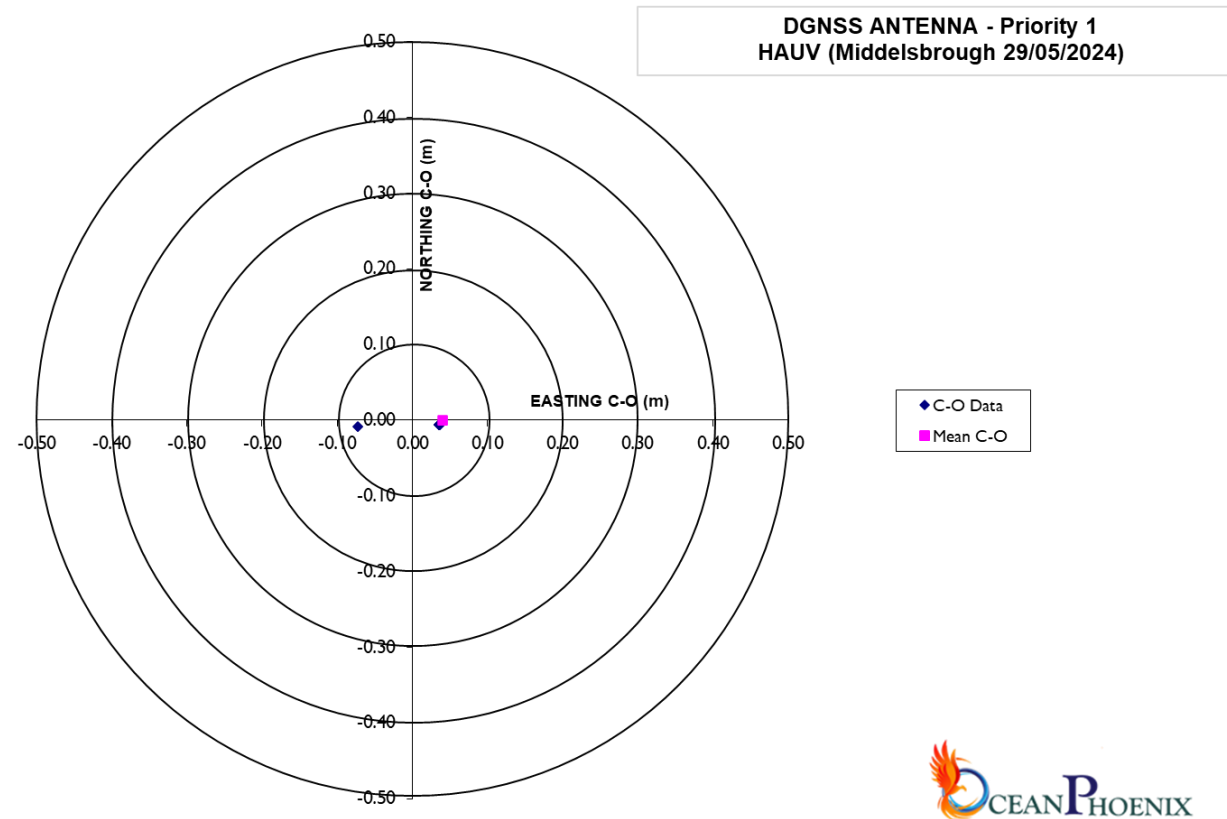


DGNSS ANTENNA VERIFICATION - OBSERVATIONS AND RESULTS

SET UP: 500I	R.O. : 5002	ANTENNA : Priority I	CLIENT : Modus
EASTING: 613662.13	GRID BEARING	SPHEROID : WGS84	VESSEL: HAUV
NORTHING: 6050200.87	TO R.O.: 293.5249	PROJECTION : UTM 30	LOCATION: Middelbrough
SCALE FACTOR: 0.999758	DDO MMSS	C.M. : 3 W	DATE: 29/05/2024

OBS No	TIME	OCEAN PHOENIX		CLIENT		C - O		OUTLIER ANALYSIS		
		EASTING [m]	NORTHING [m]	EASTING [m]	NORTHING [m]	EASTING [m]	NORTHING [m]	C-O Magnitude [m]	Deviation from mean	Worst Outlier
1	12:43:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
2	12:44:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
3	12:45:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
4	12:46:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
5	12:47:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
6	12:48:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
7	12:49:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
8	12:50:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
9	12:51:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
10	12:52:00	613652.63	6050219.30	613652.70	6050219.31	-0.07	-0.01	0.073	0.036	◀
11	12:53:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
12	12:54:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
13	12:55:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
14	12:56:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
15	12:57:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
16	12:58:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
17	12:59:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
18	13:00:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
19	13:01:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
20	13:02:00	613652.63	6050219.30	613652.70	6050219.31	-0.07	-0.01	0.073	0.036	◀
21	13:03:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
22	13:04:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
23	13:05:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
24	13:06:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
25	13:07:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
26	13:08:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
27	13:09:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
28	13:10:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
29	13:11:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	

OBS No	TIME	OCEAN PHOENIX		CLIENT		C - O		OUTLIER ANALYSIS		
		EASTING [m]	NORTHING [m]	EASTING [m]	NORTHING [m]	EASTING [m]	NORTHING [m]	C-O Magnitude [m]	Deviation from mean	Worst Outlier
30	13:12:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
31	13:13:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
32	13:14:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
33	13:15:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
34	13:16:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
35	13:17:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
36	13:18:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
37	13:19:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
38	13:20:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
39	13:21:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
40	13:22:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
41	13:23:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
42	13:24:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
43	13:25:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
44	13:26:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
45	13:27:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
46	13:28:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
47	13:29:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
48	13:30:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
49	13:31:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
50	13:32:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
51	13:33:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
52	13:34:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
53	13:35:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
54	13:36:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
55	13:37:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
56	13:38:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
57	13:39:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
58	13:40:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
59	13:41:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
60	13:42:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
61	13:43:00	613652.63	6050219.30	613652.59	6050219.30	0.04	-0.01	0.036	0.001	
MEAN		613652.63m	6050219.30m	613652.59	6050219.30	0.04m	0.00m	0.037	0.036	Max. Dev.
S.D.		0.00	0.00	0.02	0.00	0.02	0.00			



Appendix D

Coordinate Listing

HAUV Offsets relative to CRP				
Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
B1	9.252	1.598	0.131	CP Ball
B2	8.989	-5.483	0.119	CP Ball
B3	1.584	-5.292	-0.354	CP Ball
B4	-5.149	6.800	-0.192	CP Ball
B5	0.809	0.788	-1.224	CP Ball
B6	1.525	5.530	0.076	CP Ball
B7	-6.169	1.114	-0.063	CP Ball
6000	0.000	0.000	0.000	CRP
101	0.686	-2.427	-0.226	STBD Level/Heading
102	0.685	-1.020	-0.226	STBD Level/Heading
103	-0.675	-2.428	-0.226	PORT Level/Heading
104	-0.674	-1.023	-0.226	PORT Level/Heading
201	0.497	0.375	-0.360	STBD MBES Rx Corners
202	0.497	0.427	-0.360	STBD MBES Rx Corners
203	0.109	0.425	-0.517	STBD MBES Rx Corners
204	0.110	0.375	-0.515	STBD MBES Rx Corners
211	0.111	0.353	-0.549	STBD MBES Plane
212	0.217	0.355	-0.507	STBD MBES Plane
213	0.349	0.349	-0.453	STBD MBES Plane
214	0.509	0.361	-0.389	STBD MBES Plane
215	0.520	0.427	-0.386	STBD MBES Plane
216	0.373	0.423	-0.445	STBD MBES Plane
217	0.251	0.422	-0.494	STBD MBES Plane
218	0.117	0.419	-0.547	STBD MBES Plane
221	0.278	0.461	-0.376	STBD MBES Tx
222	0.280	0.735	-0.381	STBD MBES Tx
231	0.003	-0.853	-0.535	Sprint NAV DVL Bottom Centre
241	-0.067	-0.757	-0.458	Sprint NAV DVL CF
242	-0.027	-0.737	-0.458	Sprint NAV DVL CF
243	0.064	-0.748	-0.458	Sprint NAV DVL CF
244	0.111	-0.799	-0.458	Sprint NAV DVL CF
245	0.121	-0.883	-0.458	Sprint NAV DVL CF

HAUV Offsets relative to CRP				
Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
246	0.095	-0.932	-0.457	Sprint NAV DVL CF
S1	0.117	-0.649	-0.464	Survey Point
251	-0.071	-1.344	-0.609	Edgetech Transducer Front CF
252	0.068	-1.355	-0.609	Edgetech Transducer Front CF
253	0.098	-1.294	-0.609	Edgetech Transducer Front CF
254	0.056	-1.209	-0.608	Edgetech Transducer Front CF
255	0.026	-1.196	-0.608	Edgetech Transducer Front CF
261	0.082	-2.138	-0.656	Edgetech Transducer STBD Bolts
262	0.081	-1.490	-0.659	Edgetech Transducer STBD Bolts
263	0.115	-1.491	-0.602	Edgetech Transducer STBD Bolts
264	0.116	-2.138	-0.600	Edgetech Transducer STBD Bolts
271	0.073	-1.836	-0.654	Edgetech Transducer STBD Face
281	0.008	-1.785	-0.677	Edgetech Transducer Z Elevation
291	0.030	-2.713	0.312	Antenna GNSS CF (BTM)
292	0.031	-2.705	0.313	Antenna GNSS CF (BTM)
293	0.028	-2.694	0.312	Antenna GNSS CF (BTM)
294	0.022	-2.686	0.312	Antenna GNSS CF (BTM)
295	0.020	-2.686	0.312	Antenna GNSS CF (BTM)
296	0.017	-2.684	0.313	Antenna GNSS CF (BTM)
301	0.007	-2.705	0.386	Antenna GNSS Top Centre
311	-0.110	0.371	-0.517	PORT MBES Rx Corners
312	-0.113	0.423	-0.517	PORT MBES Rx Corners
313	-0.500	0.421	-0.359	PORT MBES Rx Corners
314	-0.500	0.371	-0.359	PORT MBES Rx Corners
321	-0.519	0.359	-0.384	PORT MBES Plane
322	-0.408	0.353	-0.430	PORT MBES Plane
323	-0.257	0.352	-0.491	PORT MBES Plane
324	-0.124	0.360	-0.545	PORT MBES Plane
325	-0.132	0.426	-0.543	PORT MBES Plane

HAUV Offsets relative to CRP				
Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
326	-0.246	0.427	-0.496	PORT MBES Plane
327	-0.357	0.419	-0.451	PORT MBES Plane
328	-0.526	0.428	-0.382	PORT MBES Plane
331	-0.280	0.460	-0.376	PORT MBES Tx
332	-0.284	0.731	-0.378	PORT MBES Tx
342	-0.201	-0.696	0.059	Beacon Top Centre
351	-0.073	-1.489	-0.658	Edgetech Transducer PORT Bolts
352	-0.074	-2.136	-0.656	Edgetech Transducer PORT Bolts
353	-0.107	-2.136	-0.598	Edgetech Transducer PORT Bolts
354	-0.106	-1.490	-0.602	Edgetech Transducer PORT Bolts
361	-0.066	-1.808	-0.654	Edgetech Transducer PORT Face
371	-0.151	-3.626	-1.337	TSS Back Frame Corners (z = -36mm)
372	0.169	-3.627	-1.340	TSS Back Frame Corners (z = -36mm)
373	0.165	-4.105	-1.367	TSS Back Frame Corners (z = -36mm)
374	-0.154	-4.101	-1.367	TSS Back Frame Corners (z = -36mm)
MNPL101	3.656	1.152	0.541	UV
MEAN101	0.005	-2.427	-0.226	SP
MEAN102	0.005	-1.021	-0.226	NP
MNPL211	-0.372	0.014	0.928	STBD MBES UV
MNPL321	0.379	0.010	0.926	PORT MBES UV
260	0.115	-1.814	-0.601	Edgetech Transducer STBD Reference Point BTM Centre
250	-0.106	-1.813	-0.600	Edgetech Transducer PORT Reference Point BTM Centre
T1	0.504	0.264	-0.006	Reference Point
T2	0.499	1.057	-0.039	Reference Point
T3	0.683	-3.038	0.005	Reference Point
T4	0.681	-2.221	-0.434	Reference Point

HAUV Offsets relative to CRP				
Point No.	X [m] (+ve STBD)	Y [m] (+ve Fore)	Z [m] (+ve Up)	Description
T5	0.680	-1.225	-0.435	Reference Point
T6	0.675	0.080	-0.020	Reference Point
T7	-0.496	1.047	-0.029	Reference Point
T8	-0.505	0.258	-0.005	Reference Point
T9	-0.674	0.071	-0.017	Reference Point
T10	-0.667	-1.248	-0.427	Reference Point
T11	-0.669	-2.403	-0.436	Reference Point
T12	-0.668	-2.697	0.001	Reference Point
200	0.303	0.401	-0.438	STBD MBES Rx Centre
300	-0.306	0.397	-0.438	PORT MBES Rx Centre
200a	0.304	0.598	-0.440	STBD MBES Acoustic Centre
300a	-0.306	0.596	-0.439	PORT MBES Acoustic Centre
270	0.003	-1.287	-0.609	Edgetech Transducer Sub Bottom Profiler
800	0.005	-1.814	-0.677	Edgetech Bathy Reference Centre
260	0.115	-1.814	-0.601	Edgetech Transducer STBD Reference Point BTM Centre
250	-0.106	-1.813	-0.600	Edgetech Transducer PORT Reference Point BTM Centre
290	0.009	-2.705	0.347	Antenna GNSS Phase Centre
370	0.008	-3.865	-1.489	TSS Back Frame Bottom Centre
240	-0.201	-0.696	0.059	AVTrak Top Centre
350	0.282	-0.684	-0.434	Mini SVS
360	0.267	-0.682	-0.375	Depth Sensor
230	0.003	-0.853	-0.504	Sprint NAV DVL Sensing Point
230a	0.003	-0.853	-0.297	Sprint NAV Measuring Point

Appendix E

GNSS Processing Reports

5001



Post-Processing Service Based on RTX Technology

TrimbleRTX.com

Contributor: scottmitchell63@hotmail.co.uk
 Reference Name: 23601500.T02
 Upload Date: 05/29/2024 12:43:37 UTC

Report Time Frame:
 Start Time: 05/29/2024 07:24:50 UTC
 End Time: 05/29/2024 09:16:10 UTC
 Observation File Type(s): T02
 Observation File(s): 23601500.T02
 Antenna:
 Name: TRMSPS986 NONE
 Height: 1.473 m
 Reference: Bottom of antenna mount
 Receiver Name: TRIMBLE SPS986
 Coordinate Systems: ETRF2000-R05 & ITRF2014
 Tectonic Plate: Eurasia
 Tectonic Plate Model: MORVEL56
 Processing Interval: 10 s

Statistics

# Total Obs	# Usable Obs	# Used Obs	Percent
669	669	669	100

Used Satellites

# Total Satellites:	33
GPS:	G05 G08 G09 G16 G18 G20 G23 G25 G26 G27 G28 G29 G31
GLONASS:	R07 R08 R13 R14 R15 R16 R17 R22 R24
Galileo:	E03 E05 E08 E10 E11 E12 E24 E25 E26 E31 E33

Processing Results

ETRF2000-R05 at Epoch 2000.0		
Coordinate	Value	σ
X	3703366.649 m	0.008 m
Y	-80233.099 m	0.004 m
Z	5174888.410 m	0.010 m
Latitude	54° 35' 11.37006" N	0.004 m
Longitude	01° 14' 28.00918" W	0.004 m
El. Height	53.228 m	0.011 m

ITRF2014 at Epoch 2024.41		
Coordinate	Value	σ
X	3703366.155 m	0.008 m
Y	-80232.615 m	0.004 m
Z	5174888.781 m	0.010 m
Latitude	54° 35' 11.39029" N	0.004 m
Longitude	01° 14' 27.98281" W	0.004 m
El. Height	53.237 m	0.011 m

Report Information

Trimble RTX Solution ID: 30622422
 Solution Type: Static
 Software Version: 8.5.1.20196
 Creation Date: 05/29/2024 12:44:02 UTC

Disclaimer

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5002



Post-Processing Service Based on RTX Technology

TrimbleRTX.com

Contributor: scottmitchell63@hotmail.co.uk
 Reference Name: 23601501.T02
 Upload Date: 05/29/2024 12:43:50 UTC

Report Time Frame:
 Start Time: 05/29/2024 09:25:20 UTC
 End Time: 05/29/2024 11:35:10 UTC
 Observation File Type(s): T02
 Observation File(s): 23601501.T02
 Antenna:
 Name: TRMSPS986 NONE
 Height: 1.474 m
 Reference: Bottom of antenna mount
 Receiver Name: TRIMBLE SPS986
 Coordinate Systems: ETRF2000-R05 & ITRF2014
 Tectonic Plate: Eurasia
 Tectonic Plate Model: MORVEL56
 Processing Interval: 10 s

Statistics

# Total Obs	# Usable Obs	# Used Obs	Percent
780	780	780	100

Used Satellites

# Total Satellites:	32
GPS:	G02 G05 G08 G10 G15 G16 G18 G21 G23 G26 G27
GLONASS:	R01 R02 R07 R08 R09 R14 R15 R16 R17 R18 R19 R24
Galileo:	E10 E11 E12 E19 E24 E25 E31 E33 E36

Processing Results

ETRF2000-R05 at Epoch 2000.0		
Coordinate	Value	σ
X	3703335.047 m	0.008 m
Y	-80310.501 m	0.004 m
Z	5174910.055 m	0.008 m
Latitude	54° 35' 12.56419" N	0.005 m
Longitude	01° 14' 32.35631" W	0.004 m
El. Height	53.532 m	0.010 m

ITRF2014 at Epoch 2024.41		
Coordinate	Value	σ
X	3703334.553 m	0.008 m
Y	-80310.016 m	0.004 m
Z	5174910.425 m	0.008 m
Latitude	54° 35' 12.58442" N	0.005 m
Longitude	01° 14' 32.32994" W	0.004 m
El. Height	53.542 m	0.010 m

Report Information

Trimble RTX Solution ID: 30622423
 Solution Type: Static
 Software Version: 8.5.1.20196
 Creation Date: 05/29/2024 12:44:08 UTC

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Appendix F

Certificate of Calibration



8 Elphinstone Square, Deans Industrial Estate, Livingston, EH54 8RG
01506 674 990 | survey-service@sunbeltrentals.co.uk | sunbeltrentals.co.uk

Certificate of Conformity

Certificate No.: 0000278903

Instrument Serial No.: 1665302

Prepared For: Ocean Phoenix International Ltd

Instrument Make: Leica

Plant No.: TS05

Instrument Model: TS15 P 1" R400

This is to certify that the equipment detailed hereon has been inspected and unless otherwise stated conforms in all aspects to the manufacturer's original specifications or company work instructions.

Testing was carried out using equipment which is subject to regular verification and where applicable, is traceable to International/National standards.

Signed for and on behalf of
Sunbelt Rentals - Survey

Kathryn Stewart

Technician: Kathryn Stewart

Test Date: 19/01/2024

Retest Due: 18/01/2025

Appendix G

Risk Assessment

Ocean Phoenix International Limited



F-HS21 – Site Risk Assessment (Yard Operations)

Completed by : Paulina Zysk & Scott Mitchel	Date : 29/05/2024	Assessment No. : RA-HS41
Location : Port of Middlesbrough Project: OP1230		
Risk Assessments / Safety Guidance Currently in place covering operations at this Location :		
Yard & Site Specific Inductions Permit to Work to be Undertaken		

Details of any Additional Hazards / Risks not covered in the above Risk Assessments

(If any additional hazards or risks identified)

Risk Rating

Tolerable - Risk Acceptable**Moderate** - Monitor & If possible reduce risk**Substantial** - Additional controls required

	Risk Rating Table	Consequence		
		H1 - Slightly Harmful	H2 - Harmful	H3 - Very Harmful
Likelihood	L1 - Very Unlikely	L1H1 - Tolerable	L1H2 - Tolerable	L1H3 - Moderate
	L2 - Unlikely	L2H1 - Tolerable	L2H2 - Moderate	L2H3 - Substantial
	L3 - Likely	L3H1 - Moderate	L3H2 - Substantial	L3H3 - Substantial

Hazard Summary

Description of Hazard and Potential Consequences	Control Measures	Risk Rating
Working at Height Risk of injury if fall or from falling objects - All personnel working at height / in vicinity	RA-HS01 – Working at Height	L2H2
Access to Premises Unknown / unauthorised entry; Theft, property damage, violence to staff. - All staff, site visitors	RA-HS09 – Security & Safety	L1H2
Vehicles on site / Driving Motor vehicle crash - All staff on site, Drivers of vehicles	RA-HS11 – Vehicles on Site	L1H1
Risk of Vehicle Movements, Lifting Operations & Restricted Access Areas	RA-HS12-Warehouse	L1H1
Use of Work Equipment Risk Of injury, Tripping, Slippage. Electrocutation, Fumes, Fire - All Personnel using tools / in work Vicinity	RA-HS18 - Using Work Equipment	L1H1
Lifting / Manual Handling / Use of storage shelving Manual Handling Injuries. Slipping or falling from step ladders. Heavy items falling from height. - All staff	RA-HS19 – Manual Handling	L1H2
Use of Hand Tools Risk Of injury, Tripping, Slippage. Flying Debris, Dust - All Personnel using tools / in work Vicinity	RA-HS24 – Hand Tools	L2H2
Use of Power Tools Risk of injury, electrocution or hand-arm vibration syndrome - All personnel using power tools / in vicinity	RA-HS25 – Power Tools	L2H2
Use of Ladders Risk of injury if fall or from falling objects - All personnel working at height / in vicinity	RA-HS26 – Ladders	L1H2
Use of Lifting equipment risk of injury or damage - all personnel in vicinity	RA-HS31-Lifting Operations	L1H2

F-HS21 – Site Risk Assessment
[issue 1]

[Business Use]

Page 1 of 2

Ocean Phoenix International Limited



Description of Hazard and Potential Consequences	Control Measures	Risk Rating
Close Proximity Working - COVID All Personnel Working with 2m of Each other	RA-HS38-Covid 19	L1H1
Working Close to Water Risk of falling into Water / Contact with Contaminated Water- All Personnel working in vicinity	RA-HS40-Working Close to Water	L2H2
Use of Mobile Elevated Work Platforms (MEWPs) Risk of injury if fall or from falling objects - All personnel working at height / in vicinity	RA-HS32-MEWPs	L2H1
Who is affected / at risk : • Own Workers • Vessel Crew / Persons Onsite • Public		
Notes / Feedback from Affected Parties / Additional Controls Required: • N/A		

END OF DOCUMENT