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MARINE



LAND



AERIAL

REPORT OF SURVEY FOR HYDROGRAPHIC SURVEY DATA CAPTURE & POST PROCESSING OF 9A & 11 SEAFORTH CR SEAFORTH, NSW 2092

HCS Job Ref:	HCS344
Survey Date:	21 Oct 20
Report Date:	23 Oct 20

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1. GENERAL

Reference:

A. Transport for NSW Maritime Services Information Guide – Maritime Property, Guidelines for Hydrographic and Geotechnical Data, June 2017

1.2 Site address/location:

Adjacent to the shoreside property of 9a and 11 Seaforth Cr, Seaforth, NSW 2092.

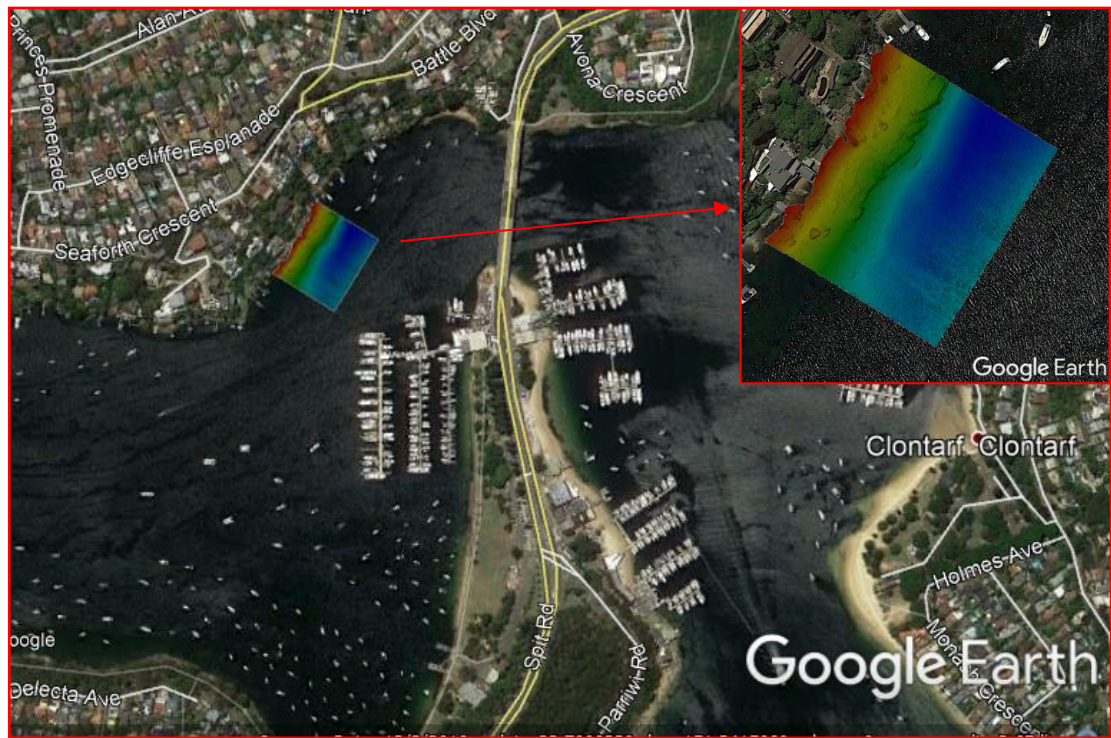


Figure 1: Survey Location

1.3 Client:

C/- Watermark Planning – PO Box 445, Forestville, NSW 2087

1.4 Date of survey:

21 Oct 20

1.5 Start & finish times:

Survey Activity	Start Time (AEST)	Finish Time (AEST)
Mobilisation & Calibration	10:40	11:52
Survey	12:00	13:00

Table 1: Survey start & finish times

1.6 Sea conditions during survey:

WMO Sea State Code	Wave height	Characteristics
0	0 m	Calm (glassy)
1	0 to 0.1 m	Calm (rippled)
2	0.1 to 0.5 m	Smooth (wavelets)
3	0.5 to 1.25 m	Slight
4	1.25 to 2.5 m	Moderate

Table 2: WMO Sea State Definitions

Sea State	3
Wave Period	Average
Wave Height	0.3-0.5m
Wind Speed	13-15 Knots

Table 3: Sea conditions during survey

DATA CAPTURE METHODOLOGY

1.7 Horizontal Positioning

1.7.1 Positioning system used

Horizontal positioning with Applanix (OEM) Wavemaster vector Global Navigation Satellite System (GNSS).

Real Time Kinematic (RTK) corrections from Position Partners AllDay RTK were received through the survey software NTRIP caster and interfaced with the Applanix system.

Soundings are referred to MGA Zone 56 co-ordinates on the GDA94 datum.

1.7.2 Equipment description (manufacturer and model):

Offsets were input to the Norbit Graphical User Interface (GUI) and not the Hysweep acquisition software. Hysweep offsets remain 0,0,0 during acquisition. No adjustments to offsets were made in post processing.

Primary Positioning, Heading and Motion			
Make & Model	Applanix Wavemaster MV-220 ver 5	Serial #	Subsea 28 Applanix 6471
Offsets Measured	Yes	Fore (+) / Aft (-) Offset	-1.000m
Offset	-2.678m Antenna base to top of Norbit bracket	Port/Starboard Offset	0.000m
GPS Correction Service		AllDay RTK CORS	

Table 4: Project equipment for horizontal measurement

- 1.7.3 Control mark/s where used to establish the horizontal datum (description and MGA co-ordinates): AllDay RTK maintained by Position Partners and forming a part of the NSW certified Continuously Operating Reference Station (CORS) network.
- 1.7.4 Describe any checks made to verify the horizontal positioning:

During survey, the position of several pylons with known positions were surveyed by sounding. The following graphic shows pylons detected by multiple passes and subsequently the positions were averaged and then compared to the known position. Results of the dynamic bathymetric position verification are shown below:

Object	Eastings (MGA Zone 56)	Northings (MGA Zone 56)
Pylon Reference	335910.83mE	6256870.87mN
Dynamic position Verification	335910.51mE	6256870.97mN
Residual	0.32m	0.1m
Pylon Reference	335916.69mE	6256872.01mN
Dynamic position Verification	335916.55mE	6256872.05mN
Residual	0.14m	0.04m
THU	±0.24m	

Table 5: Dynamic Position Verification results

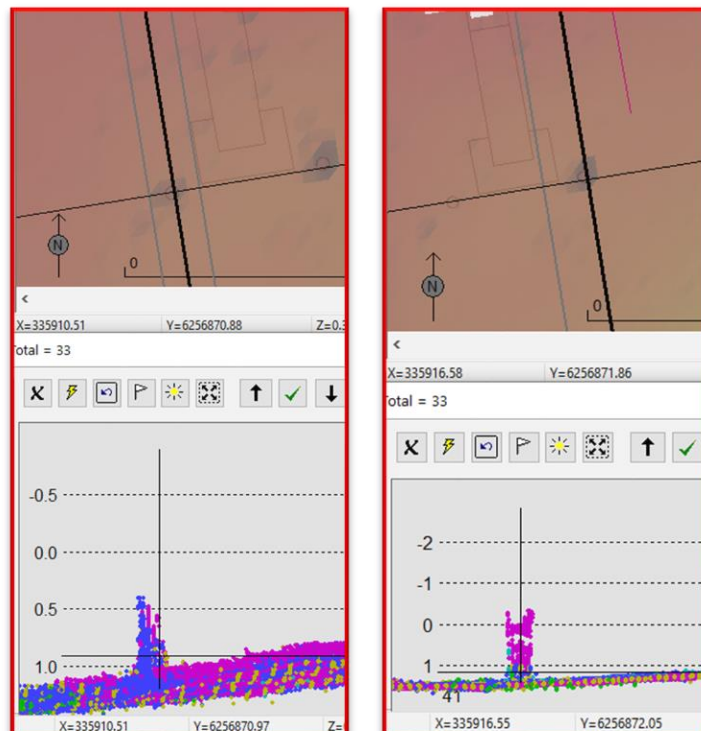


Figure 2: Top - Known pylon as per TfNSW Maritime linework. Bottom - Surveyed pylon position.

1.7.5 Nominate the estimated horizontal position uncertainty achieved:

The estimated horizontal position uncertainty has been shown to be within $\pm 0.2\text{m}$ which is better than IHO Special Order ($\pm 2\text{m}$) and ZOC A1 ($\pm 5\text{m}$) accuracy requirements.

For the purpose of this survey, Total Horizontal Uncertainty (THU) is quoted as $\pm 0.25\text{m}$.

1.8 Vertical Measurement

1.8.1 Measurement system used (e.g. SBES, MBES, Total Station, lead line, etc):

A full seafloor coverage survey of the area was carried out using a NORBIT Wide Band Multi Beam system (iWBMS). Other systems contributing to the vertical measurement of finally reduced soundings include an Applanix (OEM) Wavemaster, a Valeport sound velocity profiler, AusGEOID09 v1.01 and tidal data from the Sydney Ports operated Fort Denison tide gauge (for validation).

1.8.2 Equipment description (manufacturer and model):

NORBIT iWBMS			
Serial #	58	Frequency	400kHz
Software Version	Subsea GUI 10.4 Hysweep 2020	Fore/Aft Offset	0.00m
Vertical Offset	0.00m	Port/Starboard Offset	0.00m

Fort Denison Tide Gauge			
Type	Sonic W/L Sensor	Measurement unit	Metres
Make	Sea Ranger	Calibrated	Yes
Model	SR-10	Operator	Port Authority of NSW

Table 6: Project equipment for vertical measurement

1.8.3 Bench/control mark(s) were used to establish the vertical datum (description and height):

The AHD to Fort Denison Tide Gauge Zero (Chart Datum) relationship was used for tidal reduction of all soundings during processing. No new local control was established within the survey area.

1.8.4 Describe any checks or calibration procedures made to verify the vertical measurements:

A full patch test calibration was carried out prior to commencing survey activities. All settings were zeroed prior to the patch test to provide a pre and post review of motion artefacts.

The patch test values applied to the data during processing are as follows:

Latency	Roll	Pitch	Yaw
0.03s	-0.05s	0.25	-1.00

Table 7: Patch Test results

A lead line dip was conducted as the tidal stream, wind and larger vessel movements were not conducive to a barcheck. No seafloor penetration was observed. If this had occurred, it would normally be detected on the lead weight and measured by tape. The lead line check as carried out in the patch test area with results shown below:

Date / Time UTC	Lead line minus penetration		MBES plus draft	
21 Oct 20 / 03:33	14.5m	Nadir Depth from target file 03:33:36	13.7m	
Measured seabed penetration	Nil	Draft to RP	0.654m	Delta Depth
Calculated Depth	14.5m	Calculated Depth	14.354m	0.146m

Table 8: Lead line check

- 1.8.5 Source and description of any tidal data used to establish the vertical datum:
No observed tidal data was used for establishment of a vertical datum. Soundings were reduced to the previously established chart datum (Fort Denison, -0.925m AHD).

Tide gauge details are shown in the table below:

Gauge Name	Fort Denison Tide Gauge
Station Identifier/Number	60370
Latitude	33° 51' 16.8
Longitude	151° 13' 32.3
Time Zone	AEST
Gauge Datum	-0.925m AHD
Owner	Port Authority of NSW

Table 9: Tide gauge information

- 1.8.6 Where vertical measurement is from a dynamic platform briefly describe the survey vessel:
The survey vessel used was the vessel *SV Eclipse*. This dedicated survey vessel owned and operated by HCSurvey, is a 4.7m aluminium monohull. The over the side multibeam bracket is constructed of 7mm aluminium flat plate and welded to the port side. It provides a rigid and repeatable mounting configuration.

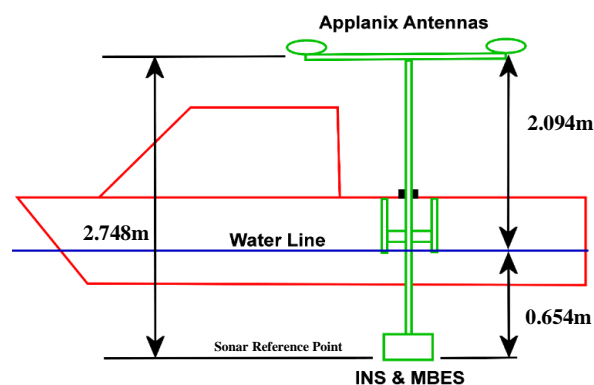


Figure 3: SV Eclipse vessel offset diagram: Profile

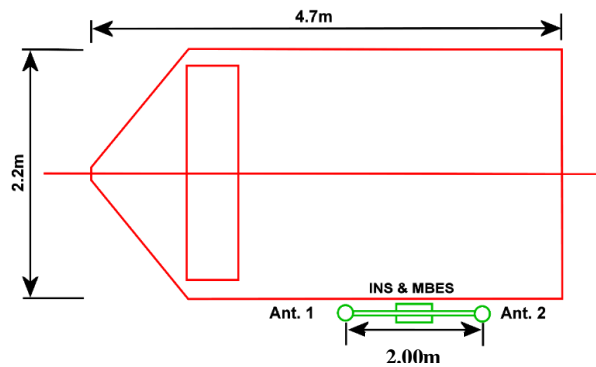


Figure 4: SV Eclipse vessel offset diagram: Plan

1.8.7 Where vertical measurement is done in a static mode describe the methodology used:
No static observations were made.

1.8.8 Nominate the estimated vertical measurement uncertainty achieved:
Vertical uncertainty has been shown to exceed IHO Special Order specifications, whereby vertical error limits can be defined by:
 $\pm\sqrt{(a^2 + (b \times d)^2)}$ Where $a = 0.25\text{m}$ and $b = 0.0075$

The deepest depth (d) as surveyed within this survey was 17m, hence the specification tolerance is calculated to be within $\pm 0.28\text{m}$. This is a conservative estimate, as reference surface checks (see section 2.2.4) have shown data to be well within these tolerances and in the order of $\pm 0.1\text{m}$.

Data is within Zone of Confidence (ZOC) A1 specification and IHO S44 Special Order.

Total Vertical Uncertainty (TVU) is accepted as $\pm 0.15\text{m}$.

FURTHER TECHNICAL DETAIL

1.9 Describe the software (name and version) used for:

1.9.1 Data capture:

Data Capture	Software	Version
Navigation	Hypack 2020	1.20 Shell 20.2.9.0
Swath Bathymetry	iWBMS	10.4
Sound Velocity Profile	Valeport Datalog Express	0400/7115/F2 15/03/2010
.000 (Raw motion and position)	Applanix POS View	9.83

Table 10: Data capture software

1.9.2 Data processing:

Data Processing	Software	Version
Swath Bathymetry	Hysweep 2020	1.20 Shell 20.2.9.0

Table 11: Data processing software

1.9.3 Plan production:

Plans have been created in AutoCAD Lt 2021. They reflect the general bathymetry and are not for navigational use. Sounding returns from wharf structures and moorings have been removed from the dataset so as not to confuse the representation and intent of the plan.

3.2 Was the survey area systematically covered by following pre-planned survey lines:

☒ Yes

☐ No If no, please provide explanatory details:

Survey lines were planned to provide line naming only. As multibeam was used, the online display representing overlap coverage was used to determine compliance with the Guidelines.

3.3 Was data captured at the specified density over the full survey area?

☒ Yes

☐ No If no, please provide explanatory details:

3.4 Can all field data files, log sheets, field notes, tidal records etc, as appropriate to the particular survey, be provided to TfNSW Maritime on request?

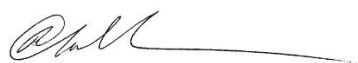
☒ Yes

☐ No

3.5 Please provide any additional comments and photographs as considered necessary, to fully describe the methodology used for all data capture and post processing: Nil

Surveyor's details:

Signature:



Name:

Richard C. Cullen

*SSSI Cert. Professional Hydrographic Surveyor - Level 1
Master of Maritime Policy / PGDip Hydrographic Surveying
Dip Spatial Information Services | Cert IV Training and Assessment*



Date:

23 Oct 20