

Mullach Mor, Isle of Rum

Hydrographic Data Report: Deployment ID450

23rd June – 1st August 2025

November 2025

Mowi Scotland Limited

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QUALITY ASSURANCE

Mowi Scotland maintains a Quality Manual which defines the Quality and Environmental Policy of Mowi Scotland Farming Limited and includes an overview of its processes and acts as a signpost to key elements of its Quality Management System according to the requirements of BS EN ISO 9001, BS EN ISO 14001, GLOBALG.A.P. and British Retail Consortium Global Standard Food. Note the BRC standard is relevant to Blar Mhor processing plant only.

1. Introduction

Mowi Scotland Ltd. is preparing an application to the Scottish Environmental Protection Agency (SEPA) for a new salmon farm site Mullach Mor, north-east off the Isle of Rum. Eight 160 m circumference pens, in a 2 x 4 formation, will be sought.

Mowi Scotland Ltd have carried out a hydrographic survey at the site in 2025 between 23rd June and 1st August (ID450). This report describes the data from this deployment at Mullach Mor and assesses the suitability of the collected hydrographic data for calibration of a hydrodynamic model around the Small Isles region.

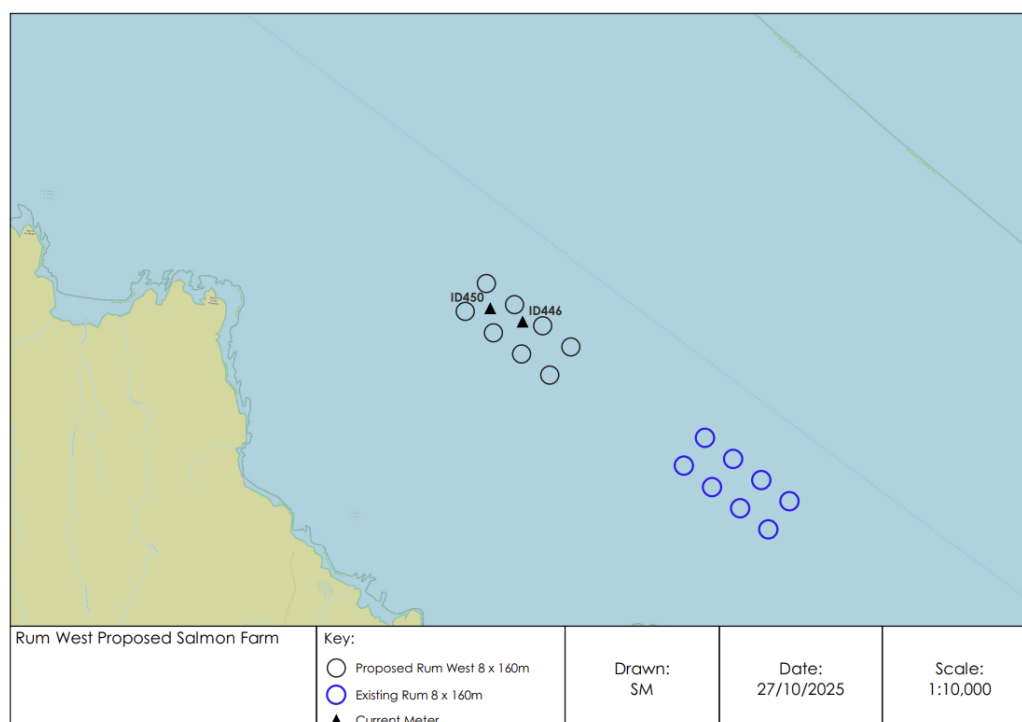


Figure 1. The proposed Mullach Mor, the existing Rum site and current meter deployment (▲) location.

2. Materials & Methods

2.1 Bathymetry

Bathymetry for the study area was taken from the European Marine Observation and Data Network (EMODnet) bathymetry data ([Bathymetry | European Marine Observation and Data Network \(EMODnet\)](#)).

2.2 Current Data

Mowi staff carried out a hydrographic survey at the site in 2025. The purpose of this hydrographic report is to assess the suitability of the collected hydrographic data for use with the hydrodynamic model. The data contained in this report were recorded at the site from 23rd June to 1st August 2025.

The instrument used was a Teledyne RDI Sentinel V100 Acoustic Doppler Current Profiler (ADCP) and was moored on the seabed 32.09 m below mean sea level. The deployment location was positioned at 57.04867, -6.28083 (140477 E, 803437 N), which was approximately 745 m from the nearest shoreline and 100 m from the centre of the pen group (Figure 1).

The cell size was set at 1.0 m and the number of cells to 49. The data were averaged at 300 s intervals (20 minutes). The blanking distance above the transducers was 1.6 m, as recommended by the manufacturer to maintain good data quality, giving a first cell height of 3.02 m above the transducer heads.

Data was automatically written and stored to the internal memory within the Sentinel V100 ADCP main body and then downloaded to computer after completion of the deployment period via WiFi or a USB cable.

2.3 Magnetic Variation

No magnetic variation correction was made to the Signature 1000 ADCP during deployment, this was undertaken to the data after the instrument was recovered and data downloaded. The magnetic variation used was -1.19° ; this was determined using the British Geological Survey Grid Magnetic Angle Calculator. Further details can be found at https://geomag.bgs.ac.uk/cgi-bin/gma_calc.

2.4 Data Processing

Upon retrieval of the Sentinel V100 ADCP current meter, all data was downloaded to a computer for analysis. The raw data file was opened in Teledyne's "Velocity" software and exported to Matlab. Deployment diagnostic data (beam intensity, correlation, pitch and roll) were analysed to confirm that the deployment was successful with the instrument orientated upright. The heading data were also examined to identify any movement of the Sentinel V100 ADCP mooring frame during the deployment.

The diagnostic data suggested that velocities from the first 24 bins were valid (Figure 2). Calculations were undertaken to identify the cells to be used for surface and middle currents. Surface data was taken at an average depth (derived from the pressure sensor) of 5.36 m (cell 24), and cage-bottom data at 17.36 m (cell 12). Surface and middle cell heights above were 26.72 m and 14.72 m from the seabed respectively. The bottom cell (cell 1) was at a mean depth of 28.36 m and 3.72 m above the seabed.

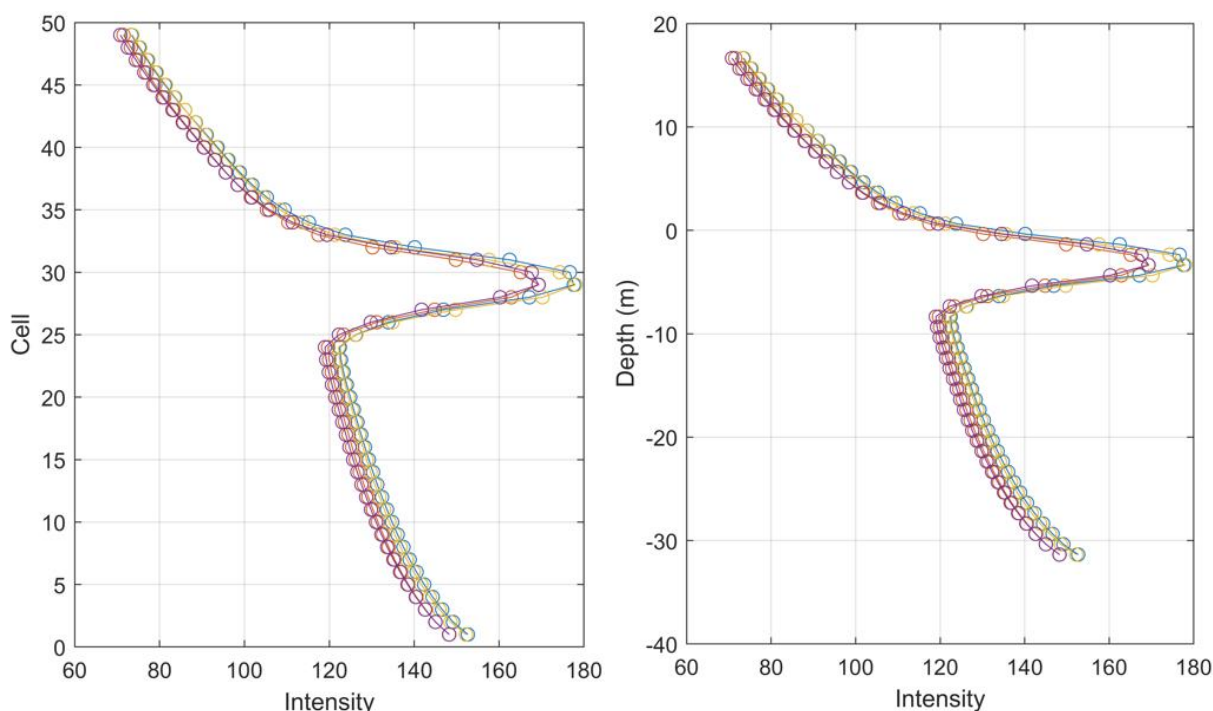


Figure 2. Mean beam intensity of the ADCP signal for the ID450 dataset from 23rd June to 1st August 2025 plotted by cell number and depth.

Table 1. Sentinel V100 ADCP Specifications.

Depth Cell Size ¹	V20 (1000kHz)		V50 (500kHz)		V100 (300kHz)		
	Depth Cell Size ¹	Range (m) ^{2,3}	Std Dev (cm/s) ^{3,4}	Range (m) ^{2,3}	Std Dev (cm/s) ^{3,4}	Range (m) ^{2,3}	Std Dev (cm/s) ^{3,4}
		Wide/Narrow	Wide/Narrow	Wide/Narrow	Wide/Narrow	Wide/Narrow	Wide/Narrow
	0.25m	18.0/22.6	19.2/36.5				
	0.3m	19.3/24.0	11.1/20.8				
	0.5m	20.2/24.9	7.1/13.4	44.1/57.6	19.2/36.5		
	1.0m	22.1/26.9	3.6/6.7	50.5/64.6	7.1/13.5	94.5/120.6	10.9/20.6
	2.0m	24.5/29.4	1.7/3.2	56.0/70.6	3.6/6.7	103.5/130.4	5.5/10.3
	4.0m	26.9/32.0	0.8/1.6	63.1/78.2	1.7/3.2	114.6/142.3	2.7/5.2
	6.0m			67.4/82.8	1.1/2.1	121.7/151.5	1.8/3.3
Communications and Recording	Wireless			802.11b/g/n			
	Internal memory			One 16GB Micro SD Card included			
Profile Parameters	Velocity accuracy	V20/V50: 0.3% of the water velocity relative to the ADCP ±0.3cm/s					
	Velocity resolution	V100: 0.5% of the water velocity relative to the ADCP ±0.5cm/s					
	Velocity range	0.1cm/s					
	Ping rate	±5m/s (default); ±20m/s (maximum)					
		Up to 4Hz					
Echo Intensity Profile	Vertical resolution	Depth cell size					
	Dynamic range	80dB					
	Precision	±1.5dB					
Transducer and Hardware	Beam angle	25°					
	Configuration	4-beam, convex; 5th beam vertical					
	Depth rating	200m					
	Materials	Transducer, housing, and end cap: plastic					
		Connector: metal shell					
Standard Sensors	Temperature (mounted on transducer)	Range -5° to 45°C, precision ±0.4°C, resolution 0.1°					
	Compass (magneto-inductive sensor)	Accuracy 2° RMS, resolution 0.1°, max. dip angle 85°					
	Tilt (MEMS accelerometers)	Pitch range ±90°, roll range ±180°, accuracy 2° RMS, precision 0.05° RMS, resolution 0.1°					
	Pressure sensor (mounted on transducer)	Range 300m, accuracy 0.1%FS					
Power	External DC input	12–20VDC					
	Internal battery voltage	18VDC new					
	Battery capacity; over-the-counter @0°C	100 watt hours (typical)					
	Battery pack @5°C	510 watt hours					
Software	Teledyne RDI's new software included	ReadyV—Pre-deployment (testing, planning, and data recovery) ⁵					
		Velocity—Post-processing (data handling, display, and export) ⁶					
Environmental	Standard depth rating	200m					
	Operating temperature	-5° to 45°C					
	Storage temperature (without batteries)	-30° to 60°C					
	Weight in air	7.5kg – 16.0kg					
	Weight in water	1.6kg – 6.0kg					
Available Options	External battery case						
	• AC/DC power converter • 5th beam (at time of order only) • Waves processing • Straight or right-angle metal shell connector						
Dimensions	Special configuration drawing available upon request						

¹ User's choice of depth cell, not limited to the typical values specified.

² Ranges specified are typical at temperature of 5°C and salinity of 35psu; longer ranges are possible.

³ User selects the bandwidth mode; wide ~ 25% or narrow ~ 6%.

⁴ Standard deviations (Std Dev) are typical values for single ping data.

⁵ Resident in ADCP accessed via a web browser.

⁶ Windows™ based software program.

1. User's choice of depth cell not limited to the typical values specified.

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3. User selects the bandwidth mode; wide = 25% or narrow = 6%.

4. Standard deviations (Std Dev) are typical values for single ping data.

5. Resident in ADCP accessed via a web browser.

6. Windows® based software program.

Specifications subject to change without notice.

2.5 Meteorological Data

The collection of meteorological data is no longer required to support the assessment process and consequently has not been undertaken. The current data used is collected using multiple deployments and over a longer period and thus provides a more realistic representation of site conditions than short deployments, thus allowing an assessment of the influence of meteorological conditions.

3. Results and Discussion

A summary of the current data is shown in Figure 3 to Figure 12. Over the period analysed for this report, the currents at the sea bed, cage bottom and sub surface had speed averages of 9.08 cm/s, 9.2 cm/s and 10.03 cm/s respectively. This gave an overall average of 9.44 cm/s. The orientation of the tidal velocities was north-west – south-east.

The residual currents at the three depths were all toward the south-east (152°G, 167°G, 152°G) Figure 6 - Figure 8. The magnitude of the residual currents for the three analysed depths were moderate, with mean values of 0.021 m/s, 0.014 m/s and 0.021 m/s respectively.

Time series of the instrument heading, pitch and roll, and measured pressure are shown in Figure 10 – Figure 12 respectively and demonstrate that the deployment during the selected period of 38 days was stable and the data reliable.

4. Hydrographic Data Summary Sheets

Site Name	Mullach Mor
CAR Licence Number (if applicable)	CAR/L/
Easting	140477
Northing	803437
Latitude (decimal deg)	57.04867
Longitude (decimal deg)	-6.28083
Type of Data (single/stitched)	Single
Bin (surface/middle/bottom)	Surface
Bin Number	24
Bin Height (above seabed) (m)	26.72
Site Water Depth (m)	32.09
ADCP Model	Teledyne Sentinel
ADCP Serial Number	24614
ADCP Deployment (seabed/mid-dep)	Seabed

Deployment Details	
Number of Records	2799
Start Time (GMT)	23/06/2025 15:00:00
End Time (GMT)	01/08/2025 11:40:00
Number of Days	38.86
Interval (mins)	20

Depth Analysis (m)	
Max	30.46
Mean	28.37
Min	26.34

Velocity Analysis			
	Scalar Speed (m/s)	Parallel Component (m/s)	Normal Component (m/s)
Max	0.286	0.286	0.141
Mean	0.091	0.020	0.006
Min	0.002	-0.228	-0.123

Residual Analysis	
Residual Speed (m/s)	0.021
Residual Direction (deg)	152

Direction Analysis				
Major Axis (+ve) (Deg)	135	Parallel Amplitude	0.129	Amplitude Anisotropy
Minor Axis (+ve) (Deg)	225	Normal Amplitude	0.058	2.246

Bath Model Input Data		
Mean Speed (m/s)		0.091
Residual Speed (m/s)	Parallel Component	0.020
	Normal Component	0.006
Tidal Amplitude	Parallel Component	0.129
	Normal Component	0.058

Fishfarm Database Input Data							
Number of Days	Mean Speed (m/s)	% <= 0.095 m/s	Major Axis (deg)	Major Amp/Minor Amp	Residual Speed (m/s)	Residual Direction (deg)	% <= 0.030 m/s
38.86	0.091	57%	135	2.246	0.021	152	8%

Figure 3. Current Data Summary Sheet for the near-surface, cell 24, 3.34 m below min sea level, 23rd June – 1st August 2025 inclusive (ID450).

Site Name	Mullach Mor
CAR Licence Number (if applicable)	CAR/L/
Easting	140477
Northing	803437
Latitude (decimal deg)	57.04867
Longitude (decimal deg)	-6.28083
Type of Data (single/stitched)	Single
Bin (surface/middle/bottom)	Middle
Bin Number	12
Bin Height (above seabed) (m)	14.72
Site Water Depth (m)	32.09
ADCP Model	Teledyne Sentinel
ADCP Serial Number	24614
ADCP Deployment (seabed/mid-dep)	Seabed

Deployment Details	
Number of Records	2799
Start Time (GMT)	23/06/2025 15:00:00
End Time (GMT)	01/08/2025 11:40:00
Number of Days	38.86
Interval (mins)	20

Depth Analysis (m)	
Max	19.46
Mean	17.37
Min	15.34

Velocity Analysis			
	Scalar Speed (m/s)	Parallel Component (m/s)	Normal Component (m/s)
Max	0.403	0.403	0.117
Mean	0.092	0.012	0.007
Min	0.001	-0.254	-0.119

Residual Analysis	
Residual Speed (m/s)	0.014
Residual Direction (deg)	167

Direction Analysis				
Major Axis (+ve) (Deg)	135	Parallel Amplitude	0.146	Amplitude Anisotropy
Minor Axis (+ve) (Deg)	225	Normal Amplitude	0.044	3.319

Bath Model Input Data		
Mean Speed (m/s)		0.092
Residual Speed (m/s)	Parallel Component	0.012
	Normal Component	0.007
Tidal Amplitude	Parallel Component	0.146
	Normal Component	0.044

Fishfarm Database Input Data							
Number of Days	Mean Speed (m/s)	% <= 0.095 m/s	Major Axis (deg)	Major Amp/Minor Amp	Residual Speed (m/s)	Residual Direction (deg)	% <= 0.030 m/s
38.86	0.092	60%	135	3.319	0.014	167	12%

Figure 4. Current Data Summary Sheet for the cage bottom, cell 12, 15.34 m below min sea level, 23rd June – 1st August 2025 inclusive (ID450).

Site Name	Mullach Mor
CAR Licence Number (if applicable)	CAR/L/
Easting	140477
Northing	803437
Latitude (decimal deg)	57.04867
Longitude (decimal deg)	-6.28083
Type of Data (single/stitched)	Single
Bin (surface/middle/bottom)	Bottom
Bin Number	1
Bin Height (above seabed) (m)	3.72
Site Water Depth (m)	32.09
ADCP Model	Teledyne Sentinel
ADCP Serial Number	24614
ADCP Deployment (seabed/mid-dep)	Seabed

Deployment Details	
Number of Records	2799
Start Time (GMT)	23/06/2025 15:00:00
End Time (GMT)	01/08/2025 11:40:00
Number of Days	38.86
Interval (mins)	20

Depth Analysis (m)	
Max	30.46
Mean	28.37
Min	26.34

Velocity Analysis			
	Scalar Speed (m/s)	Parallel Component (m/s)	Normal Component (m/s)
Max	0.286	0.286	0.141
Mean	0.091	0.020	0.006
Min	0.002	-0.228	-0.123

Residual Analysis	
Residual Speed (m/s)	0.021
Residual Direction (deg)	152

Direction Analysis			
Major Axis (+ve) (Deg)	135	Parallel Amplitude	0.129
Minor Axis (+ve) (Deg)	225	Normal Amplitude	0.058
		Amplitude Anisotropy	2.246

Bath Model Input Data		
Mean Speed (m/s)		0.091
Residual Speed (m/s)	Parallel Component	0.020
	Normal Component	0.006
Tidal Amplitude	Parallel Component	0.129
	Normal Component	0.058

Fishfarm Database Input Data							
Number of Days	Mean Speed (m/s)	% <= 0.095 m/s	Major Axis (deg)	Major Amp/Minor Amp	Residual Speed (m/s)	Residual Direction (deg)	% <= 0.030 m/s
38.86	0.091	57%	135	2.246	0.021	152	8%

Figure 5. Current Data Summary Sheet for the near sea bed, cell 1, 26.34 m below min sea level, 23rd June – 1st August 2025 inclusive (ID450).

	Percentiles	Current Speed (m/s)
Percentile Analysis	1%	0.012
	5%	0.024
	10%	0.033
	25%	0.054
	50%	0.085
	75%	0.124
	90%	0.155
	95%	0.172
	99%	0.218
	100%	0.286
Threshold Values	8%	0.030
	18%	0.045
	57%	0.095
Mean	55%	0.091

Major Axis (Deg)	135	0.129 m/s
Residual Current (m/s)	0.021	at 152 Deg

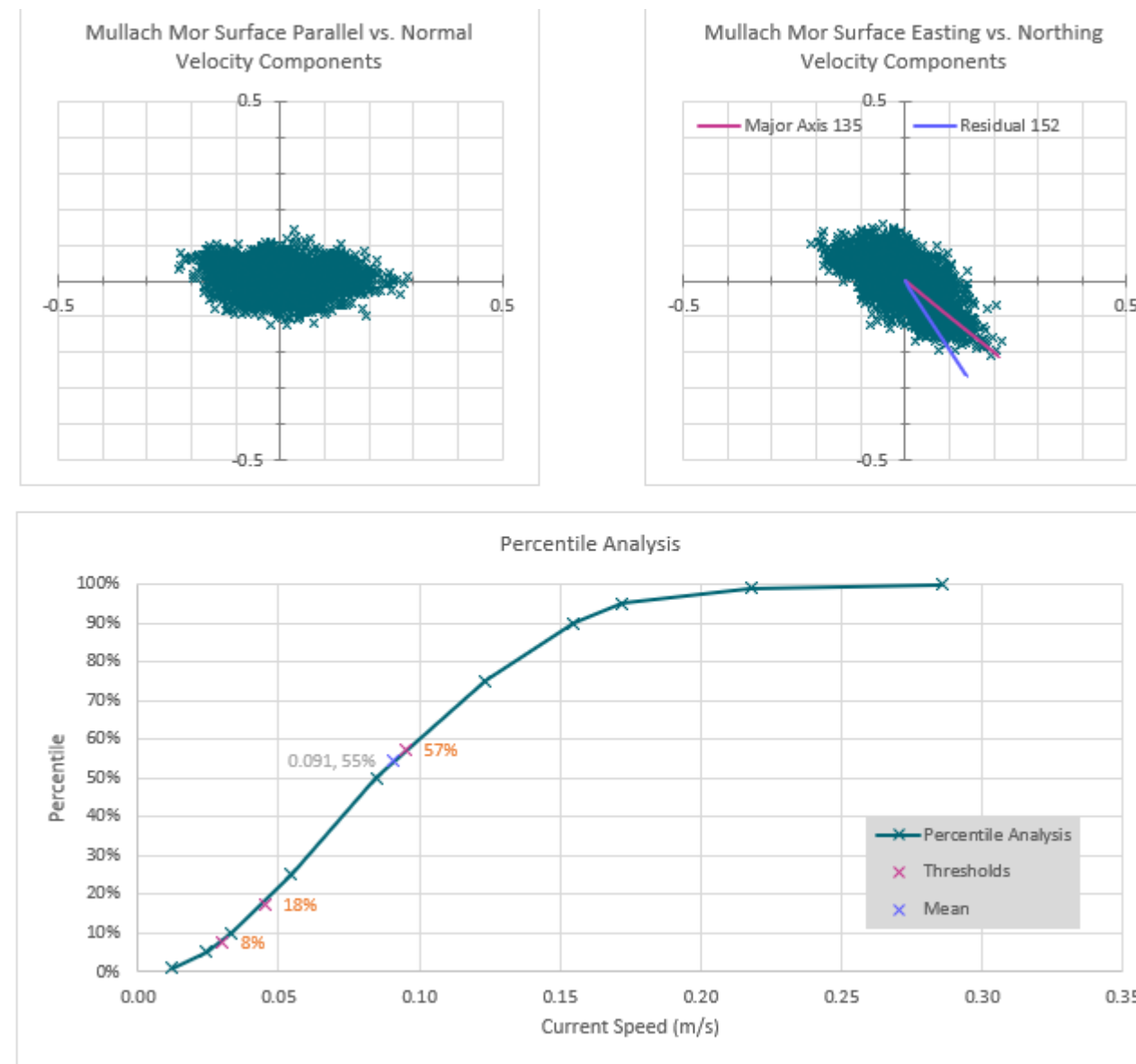


Figure 6. Speed and direction components of the near surface cell

	Percentiles	Current Speed (m/s)
Percentile Analysis	1%	0.009
	5%	0.018
	10%	0.027
	25%	0.049
	50%	0.082
	75%	0.121
	90%	0.175
	95%	0.202
Threshold Values	99%	0.261
	100%	0.403
Mean	12%	0.030
	22%	0.045
	60%	0.095

Major Axis (Deg)	135	0.146 m/s
Residual Current (m/s)	0.014	at 167 Deg

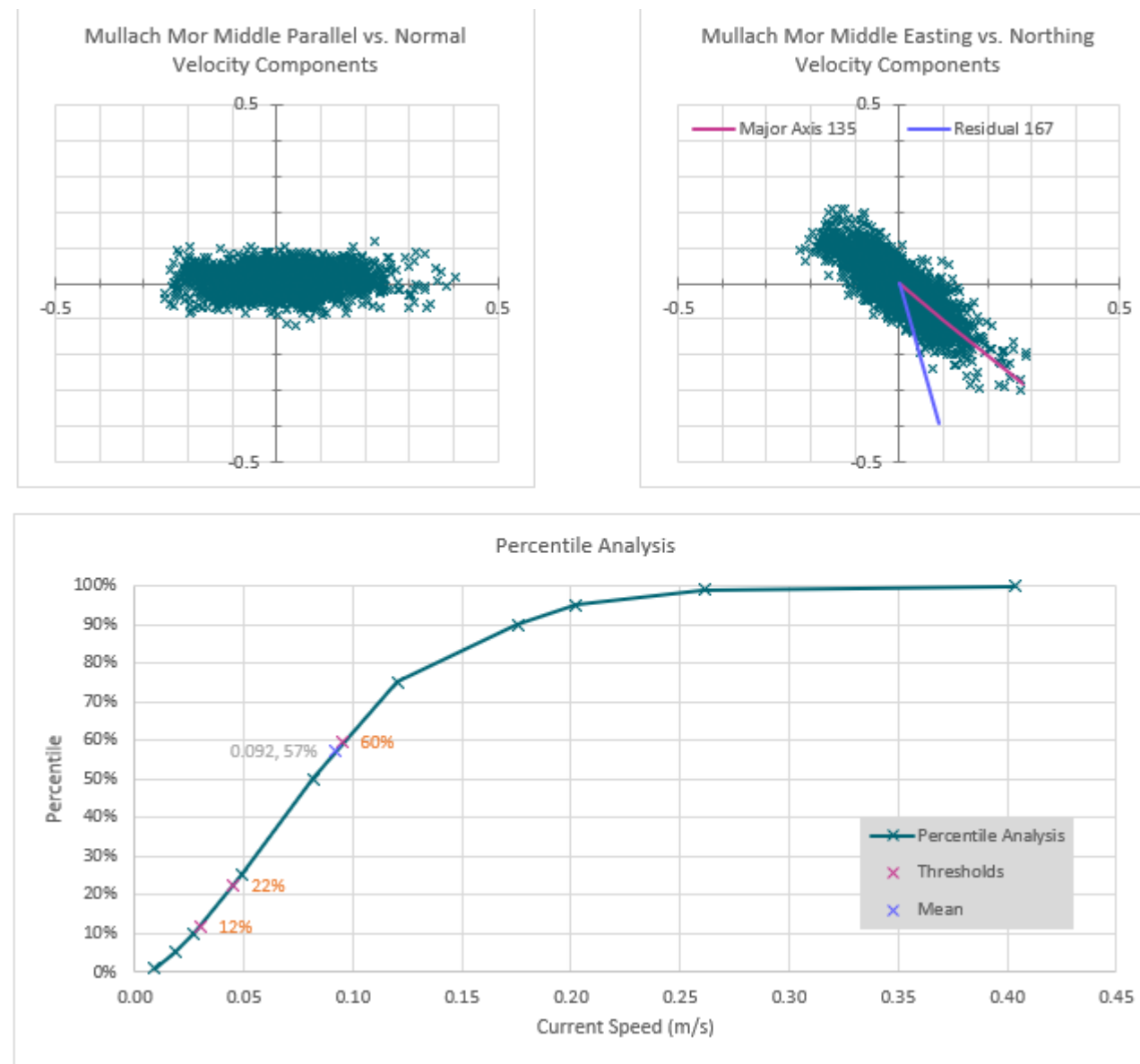


Figure 7. Speed and direction components of the cage bottom cell.

	Percentiles	Current Speed (m/s)
Percentile Analysis	1%	0.012
	5%	0.024
	10%	0.033
	25%	0.054
	50%	0.085
	75%	0.124
	90%	0.155
	95%	0.172
	99%	0.218
	100%	0.286
Threshold Values	8%	0.030
	18%	0.045
	57%	0.095
Mean	55%	0.091

Major Axis (Deg)	135	0.129 m/s
Residual Current (m/s)	0.021	at 152 Deg

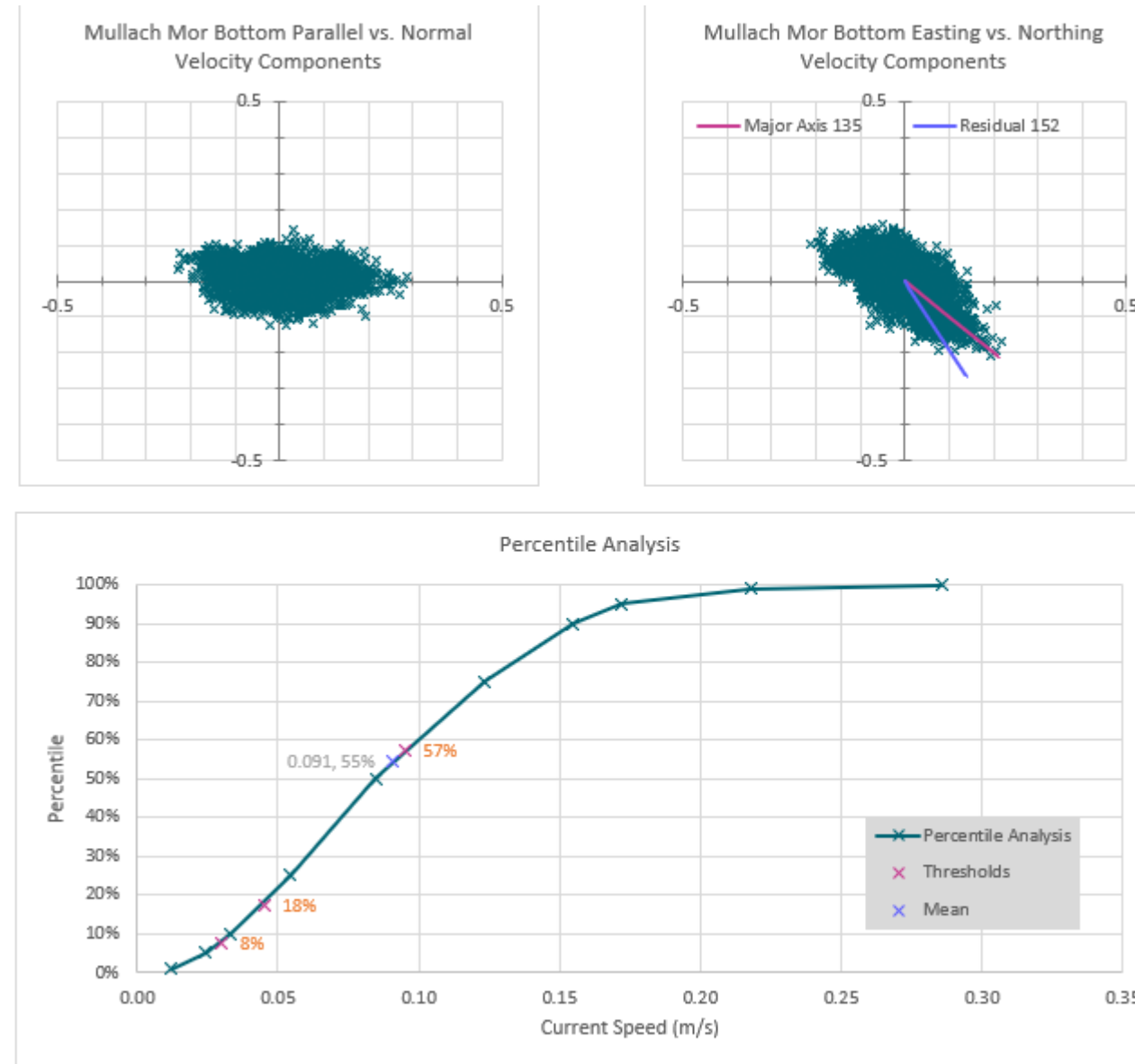


Figure 8. Speed and direction components of the near sea bed cell.

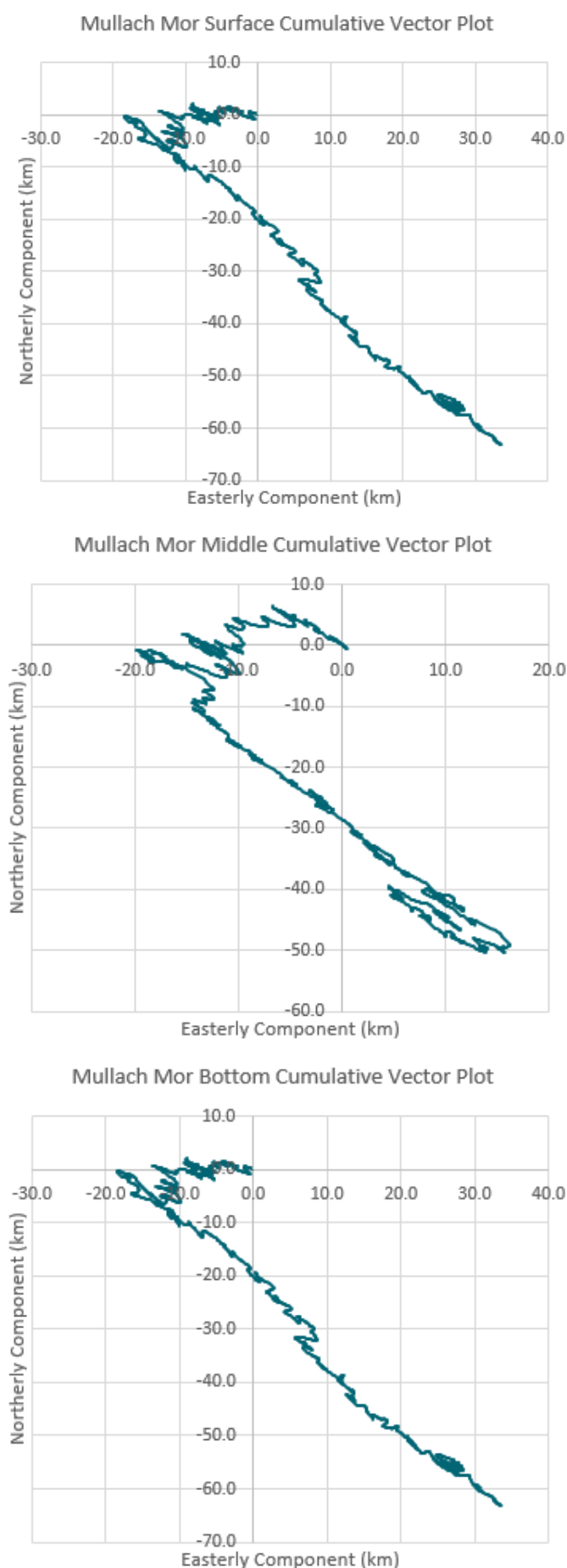


Figure 9. Cumulative vector plots of all velocity data from near-surface cell 24, cage bottom cell 12 and near sea bed cell 1 for ID450.

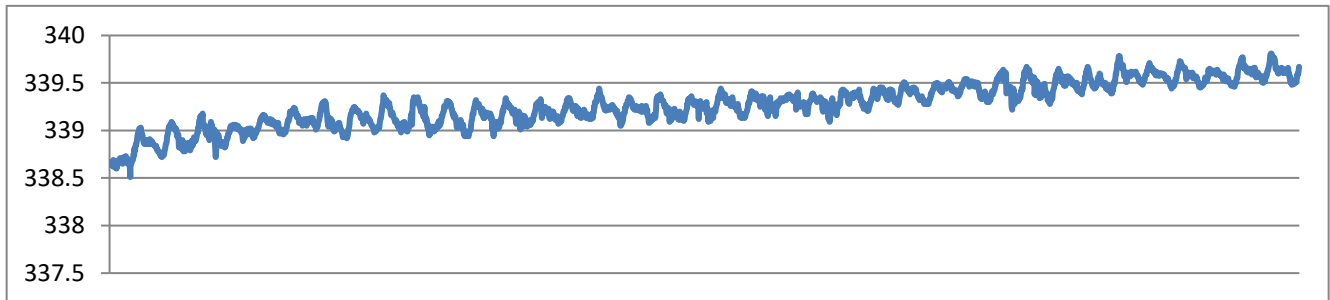


Figure 10. Summary of heading data throughout deployment ID450.

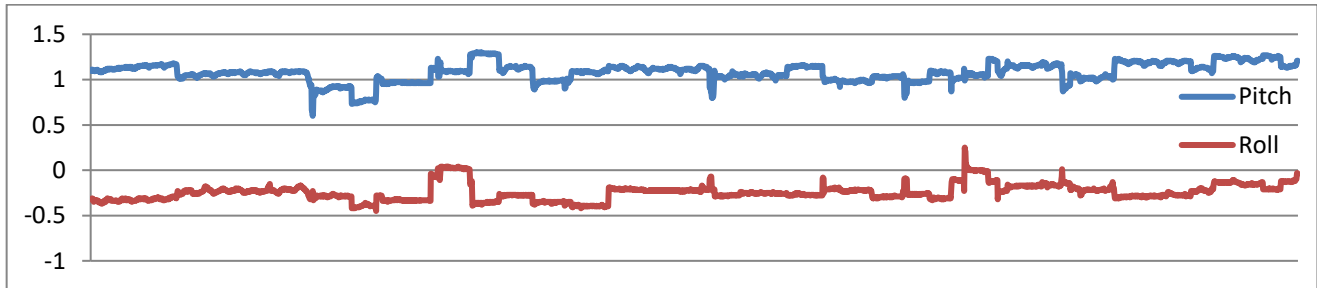


Figure 11. Summary of pitch and roll data throughout deployment ID450.

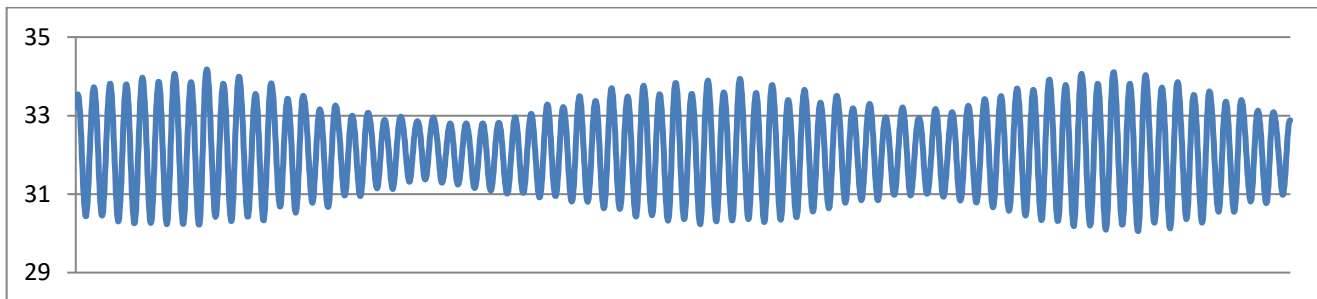


Figure 12. Pressure data throughout deployment ID450.

5. Conclusion

Mowi Scotland Ltd. has collected and analysed current and bathymetric data for the proposed salmon farm at Mullach Mor. The analysed current data for the 38 days and 21 hours period are believed to be reliable and representative of the proposed location. The bathymetric data from the EMODnet, provided a coherent bathymetric dataset for the site.

Annex 1. Survey Equipment Deployment Log

Location: Mullach Mor
 Nearest tidal port: Mallaig
 Time zone: UTC (raw data in BST)
 Meter switched on: 15:00:00 23/06/2025
 Meter switched off: 11:40:00 01/08/2025
 Period used for this report: 15:00:00 23/06/2025 – 11:40:00 01/08/2025
 ADCP serial number: 24614
 Meter position: 57.04867 N, -6.28083 W
 140477 E, 803437 N
 Minimum water depth: 30.06
 Mean water depth: 32.09
 Depth of meter from surface: 31.39 m (below mean sea level)
 Height of meter from seabed: 0.7 m

Table A1. ADCP meter settings.

Reference:	Transducer
Bin Size (m):	1
Dist. to 1st Bin (m):	3.02
Number of Bins:	49
Frequency (kHz):	307
Recording Interval (mins):	20
No. of Pings per Ensemble:	300
Magnetic Correction:	0
Ensemble (s):	300
Velocity Precision (cm/s):	0.63
Time/Ping (s):	2