REPORT OF SURVEY

Te Huata Proposed Marine Farm Bathymetric Survey

REPORT PREPARED FOR:

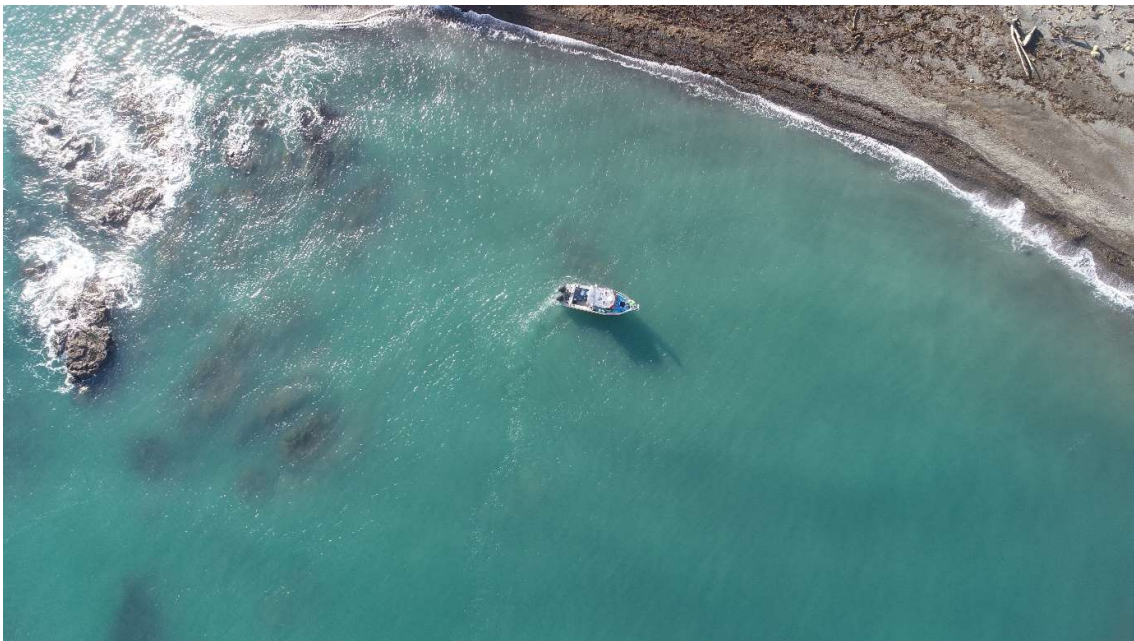**TE HUATA CHARITABLE TRUST**

Photo by Te Huata Charitable Trust

REPORT PREPARED BY:

Surveyed by:	Discovery Marine Ltd.
Surveyor in Charge:	Hayes Ballantyne, CPHS2, MS+SNZ, BSurv
Survey dates:	2 August 2022
Report date:	17 August 2022
Report version:	1.0

EVERYTHING BECOMES CLEAR

1. EXECUTIVE SUMMARY

Discovery Marine Ltd (DML) was contracted by Te Huata Charitable trust to conduct a bathymetric survey for a proposed marine far, near Te Kaha, Bay of Plenty. Additionally. Six 500m x 500m sample locations were surveyed. Grab samples were attempted at all locations. The data capture was completed on the 2 August, data processing and reporting was completed between 4 – 17 August.
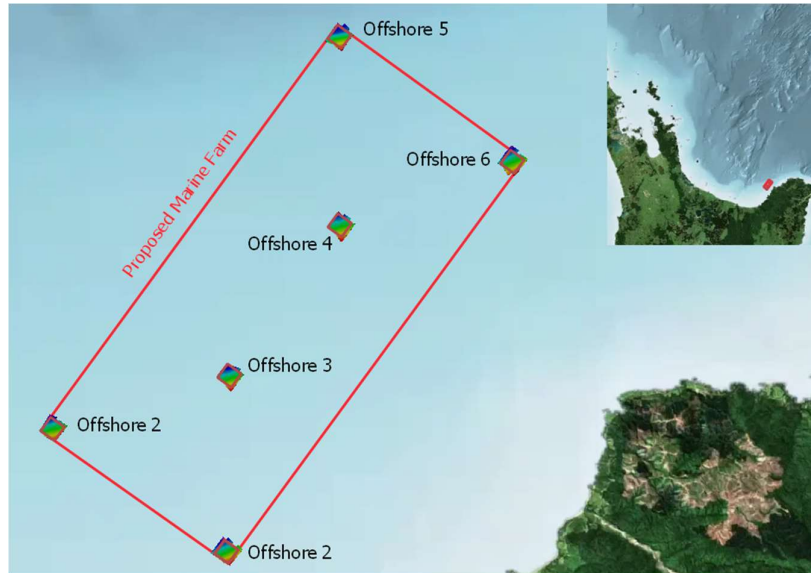

Figure 1 Overview Diagram

2. WEATHER & SEA CONDITIONS

Generally calm seas and favourable conditions were experienced. As the survey progressed to the offshore sections, wind and swell began to increase but at no point exceeded acceptable conditions for safety and data quality.

3. SURVEY VESSEL

This survey was undertaken using DML's 7.7m survey vessel TUPAIA. TUPAIA is equipped with a modern survey spread including GNSS positioning, Inertial Motion Sensor (IMU), and high frequency Multi Beam Echo Sounder (MBES). The Vessel is operated in accordance with the Maritime New Zealand Maritime Operator Safety System (MOSS).

4. EQUIPMENT

All data was logged in Qinsy v9.5.0 hydrographic acquisition and navigation software package. The key equipment is presented below in Table 1

Table 1 Key Equipment

EQUIPMENT	MAKE / MODEL / TECHNICAL SETTINGS
Vessel GNSS / Motion compensation system	**Applanix POS MV Wavemaster II**
	Position Accuracy: 0.1m
	Roll and Pitch Accuracy: 0.02°
	Heading Accuracy: 0.03°
Terrestrial GNSS	**Trimble R8 Base and Receiver**
	Position Accuracy: <0.03cm (95%), Vertical: <0.04cm (95%) (RTK)
Multibeam Echo Sounder	**Teledyne Reason SeaBat T50 R Multibeam Echosounder**
	Operating Frequency: 300khz
	Beam width: Depth and Area dependant between 65° and 135°
	Beam Forming: 800 beams, 0.75° x 1.5° beam width at 300khz.
Speed of sound sensor	**AML-3 SVPT (sound velocity, pressure, temperature sensor)**
	Resolution: 0.001m/s
	Precision: 0.006m/s
Grab Sampler	Van Veen Grab Sampler

5. SURVEY CONTROL AND POSITIONING

5.1 HORIZONTAL DATUM

The survey was completed on the **WGS84 Datum, UTM 60S.** Positioning information was post processed using Applanix POSPac MMS v8.7 to improve the real time navigation data.

5.2 VERTICAL DATUM

Depth data for this survey is presented as below New Zealand Vertical Datum 2016. Data was originally referenced to the WGS84 ellipsoid but reduced further to NZVD2016 during acquisition using the NZGeoid2016 separation model. The NZVD2016 approximates Mean Sea Level (MSL).

5.3 POSITION CHECK

A Real Time Kinematic (RTK) GNSS base station was established on Land Information New Zealand (LINZ) benchmark AC13. A GNSS rover was connected to the base using a radio link and used to measure a position node (In this case the draft measuring point) on TUPAIA while simultaneously recording the position node using the TUPAIA's navigation system. The results of the comparison are displayed below.

Table 2 Position Check

System	Northing (m)	Easting (m)	Height (m)
RTK	579961.884	5836075.484	38.820
TUPAIA post processed	579961.83	5836075.54	38.777
Difference	0.059	-0.058	0.043

6. CONDUCT OF SURVEY

TUPAIA was launched and recovered at the Waihau Bay boat ramp.

Real time MBES coverage was generated in Qinsy data acquisition software and displayed for the helmsman. Due to water depth each of the survey blocks could be completed in three survey lines. Grab samples were attempted upon the completion of sounding of each block.

At each of the offshore survey locations a sound velocity profile was conducted if the water depth had greatly increased or the sound velocity sensor fixed at the head of the MBES indicated a significant change.

7. DATA POST PROCESSING

Navigation data was post processed using Applanix POSPac to improve position and motion data.

Bathymetric data has been processed and validated using Qimera v9.4.5. All erroneous soundings have been manually cleaned from the dataset. QPS FMGT v7.10.0 was used to generate backscatter mosaics from the cleaned MBES bathymetry

Trimble Business Centre v5.70 was used to produce A3 plots of bathymetric images and backscatter mosaics. Spot soundings were generated using Terramodel v10.6.

8. ESTIMATED DEPTH ACCURACY

The accuracy of depths for this survey is assessed as +/-0.10m or better.

9. GRAB SAMPLES

At each of the 6 offshore survey locations a grab sample was attempted. The deep-water depth of these sites meant that the grab sampler did not always successfully deploy. Additional weights were added to the sampler to assist in deployment. Despite this at two sites, Offshore 2 and Offshore 5, no sample was successfully recovered. Table 3 provides details of the offshore grab samples. Photos of the samples are provided as part of the electronic deliverables accompanying this report. The sample locations are shown graphically on the pdf backscatter plots provided as part of the electronic deliverables accompanying this report.

Table 3 Offshore grab sample details (UTM60S)

Sample	Location	Northing	Easting	Water Depth	Comment
THDW1	Offshore1	5824962.86	552657.67	70m	Mud
THDW2	Offshore2	-	-	100m	Three attempts, Sampler did not successfully deploy
THDW3	Offshore3	5830177.62	552810.36	100m	Mud
THDW4	Offshore4	5834790.10	556095.64	130	Mud
THDW5	Offshore5	-	-	220m	No successful sample
THDW6	Offshore6	5836575.70	561136.62	130m	Mud

10. COMMENTS & RESULTS

At all offshore locations bathymetry and backscatter indicate a flat featureless seabed. Table 4 displays the depth ranges of each of the areas.

Table 4 Offshore area depth ranges

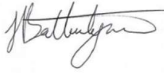| Area	Depth Range (m)
Offshore1	67 - 72
Offshore2	102 - 107
Offshore3	102 - 108
Offshore4	124 - 129
Offshore5	216 - 249
Offshore6	126 - 131

Successful grab samples indicated a mud sea bed and the backscatter indicated little variation over any of the sites. If more samples are required in future it is recommended that they be conducted using a larger Van Veen grab, from a larger vessel with a winch to ensure more successful results.

11.RETENTION OF DATA

DML will retain copies of the project deliverables, including source data files, on its servers for a period of 12 months from completion of the project. The data will then be archived to a digital medium and retained for 7 years. After the initial 12-month period client requests to access and supply project data will incur a fee.

DML wishes to thank Te Huata Charitable Trust for the opportunity to undertake this project and looks forward to working with Te Huata Charitable Trust again in the future.

For Discovery Marine Ltd

Authored by		Date: 17 August 2022
	Hayes Ballantyne (BSurv, CPHS2)	Hydrographic Surveyor
Approved by		Date: 19 August 2022
	Declan Stubbing (BSurv,CPHS1)	Chief Executive Officer

Enclosures:

A.   Report of Survey
B.   Survey Bathymetry and Backscatter Plots
C.   Survey Data xyz points
D.   Grab sample photographs

APPENDIX A - METADATA

Survey Company	Discovery Marine Ltd
Project Name	Te Huata Outfall Survey
Project Number	2236
Location	Te Kaha, Bay of Plenty
Client	Te Huata Charitable Trust
Contract Number	1224

Survey Start Date	1/08/2022	Survey End Date	3/08/2022

Surveyor in Charge	HBallantyne
Field Personnel	HBallantyne, WRoest, BWaller
Office Personnel	HBallantyne

Horizontal Datum and Projection	WGS84, UTM60S
Vertical Datum	NZVD2019

Sea Level Reduction	POSPac, NZGeoid2016 separation model to convert online to NZVD2016	Tide Stations:	-

Origin of Coordinates and Levels	POSPac, Geodetic Mark AC13 used for Position Check

Survey Vessel	Tupaia
Positioning System	G2+
Sonar System	RESON T50R
Sonar System Freq.	300kHz

Acquisition Software	Qinsy v9.4.5
Processing and Delivery Software	Qimera v2.4.5, FMGT v7.10.0, POSPac MMS v8.7, Trimble Business Centre V5.70, Terramodel v10.6

Data Collected	Bathymetry, seafloor backscatter, Grab Samples
Coverage Achieved	Full Seafloor
Accuracy Standard Achieved	-
Bathymetric Gridded Surface Method	Average
Bathymetric Gridded Surface Resolution	Variable, dependant on water depth
Seafloor backscatter file type	*.db
File Format	*.db
Data Custodian Contact Details	hayes@dmlsurveys.co.nz